
M.Sc. Alejandro Mirabal
- January 2009 -
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The following is an end-of-season progress report on the survey in the waters off the island of Mozambique and Mogincual in various wreck sites and potentially dangerous areas. These sites were selected not only because of their historical significance but also because they were clearly endangered as some fishermen knew of their existence.

**Aims.**

*Survey and assessment was carried out with the objective of better understanding some of the previously known wreck sites and of properly evaluating their importance as well as continuing the systematic search for lost ships in the surrounding waters of Ilha de Mozambique. The main target for this season was to try to locate the "São Bento", Portuguese ship reportedly lost in the vicinity of Ilha de Goa in 1642.*

*In the case of MOG-001 this report is the continuation of the 2007 Excavation Report and is unavoidably linked to it, therefore, information contained in the previous will not be repeated here.*
Abstract.

This Operation took place in the waters off Ilha de Moçambique and Mogincual from the 27/04/2008 to the 19/09/2008 without interruption for a total of 145 days of Operations. The time of operation was split as follows:

<table>
<thead>
<tr>
<th>Total days of OPS</th>
<th>145 days</th>
</tr>
</thead>
<tbody>
<tr>
<td>Magnetometer and visual survey days</td>
<td>65 days</td>
</tr>
<tr>
<td>Excavation / Reconnaissance diving days</td>
<td>14 days</td>
</tr>
<tr>
<td>Bad weather</td>
<td>19 days</td>
</tr>
<tr>
<td>Days off and International/national holidays</td>
<td>12 days</td>
</tr>
<tr>
<td>Logistics (Refuelling, food, fresh water, spare parts, etc)</td>
<td>11 days</td>
</tr>
<tr>
<td>Mobilization</td>
<td>7 days</td>
</tr>
</tbody>
</table>

During the 79 effective magnetometer survey and diving days a total of 453 dives were performed amounting to 536.47 diving hours and 390 magnetometer hours.

**IDM-020 (possibly São Bento, 1642):**
- Days worked on the site | 5 days |
- Dives | 39 dives |
- Dive hours | 55.31 hours |
- Artefacts recovered | 4 artefacts (incl. 16 silver coins) |
- Excavation status | Not excavated, only test sondages |

**MOG-001 (possibly NªSª Madre Deus e São Jose, 1802):**
- Days worked on the site | 9 days |
- Dives | 64 dives |
- Dive hours | 112.29 hours |
- Artefacts recovered | 19 artefacts (incl. 14 gold coins) |
- Excavation status | Not excavated, only test sondages |

Magnetometer and visual survey were done in the areas of the channel of Ilha de Moçambique, Cabeceira, Goa, Sena, Inhaka and Sete Paus islands, only one of them revealing a newly discovered wreck.

- Channel Ilha de Mozambique (No wreck found)
- Cabeceira (9 historical anchors found)
- Ilha de Goa (New wreck found IDM-020)
- Ilha de Sena (No wreck found)
- Ilha de Inhaka and Sete Paus (No wreck found)
Sites Report.

**IDM-020 North of Goa Island, 5 days between 20/05/08 and 31/05/08**

**Survey**

According to historical archives, the *São Bento* sunk in 1642. The archival information on the location of the wreck ultimately led to the magnetometer survey. Research documents analysed by Arqueonautas described the accident of the ship as being at the entry of the Northern channel to the bay of the island of Mozambique. Several interviews with local fishermen further revealed that the artillery bronze pieces in the backyard of Capitania were recovered from an unknown place within the area described in these historical records. We had the location of 3 anchors (A12, A13 and A14) from our team’s previous surveys in 2004, 2005 and 2006 in the vicinity. From their typology, these could match with those used on a ship from that period.

With this information in hand, a relatively small survey area was defined to the North of the Island of Goa. The dimensions of the survey area were 1000m x 1000m (1,000,000m²) with depths of between 9m and 16m.

*General view of the survey area at the North of Ilha de Goa. Note anchors A12, A13 and A14 in the right section of the area.*
For methodological purposes the survey area was divided into quadrants of 500m x 500m, which are possible to cover in one working day. They were named SA1, SA2, SA3 and SA4. For this survey a Proton magnetometer AX-2000 was employed, using the survey boat “Arvor” as a working platform.

The magnetometer was towed in parallel lines (tracks) in East-West direction separated from one another at 0.004 of a minute (lane spacing of approximately 7m), ensuring that no major ferrous object on the seabed could pass unnoticed. The team needed to perform approximately 71 tracks to completely cover one quadrant was. Each track slightly overlapped the adjacent quadrants to the East and West in order to assure that no gaps were left between them.

Counting with a 40m overlapping to each adjacent quadrant the length of each track is approximately 580m.

Our magnetometer was set up to get 1 sample of the magnetic field of the earth every 1.5 seconds. To guarantee that we got at least 1 sample of the seabed every 3m, the survey speed adopted was of a maximum of 4 knots (7.4 Km/h).

Several magnetic hits were recorded in the defined survey area, mostly produced by a large and fragmented underwater cable scattered on the seabed, making the inspection of the anomalies a very slow task. Other modern junk such as small anchors, steel drums and steel debris from a modern wreck on the East of the island were also recorded by the magnetometer.

On the third day of survey a large hit within a field of smaller anomalies was recorded and dive inspection revealed an historic anchor, a small scattering of ballast stones and a large amount of lead shot. The site was codenamed IDM-020 and the reconnaissance works were immediately started.
Reconnaissance

This wreck site was found on the 5th of May of 2008 during the magnetometer survey on the North of Goa island. The site is located at 9.8m of depth (in low tide) on a rocky seabed with loose rocks and patches of marine grass in the close vicinity. It consists of a scattering of iron pieces (bars), lead sheathing, lead shot, ballast stones and one historic anchor (A-1), very concreted into the rocks. Following a short visual survey around the anchor, the team located several lead shot and various anomalous spots within the concretion of rocks. However, due to short visibility, the visual survey was aborted and planned for the following days.

This wreck site is presumably the one where the Portuguese military recovered the 6 bronze cannon (3 in Capitania and 3 in the museum) in 1973. As expected, the remaining visible evidences were very scarce but we thought at the time that test sondages would provide more information. There was also evidence of recent disturbance of the site as a lead weight (from a diving weight belt) was found in the centre of the scattering field.

The first task on the next day was to produce a micro-localized magnetometer map of the area of the wreck site in order to identify possible wreck material scattering patterns. This particular task was a failure. The magnetometer was giving erratic readings making it impossible to identify anything.
The team started the reconnaissance of the wreck by cleaning the anchor (A-1). The anchor was resting in a layer of medium-sized ballast stones slightly concreted to it and to other unidentifiable iron pieces. Various test sondages were also practiced in the close vicinity of A-1 where the same kind of material (concreted ballast stones, lead sheathing and lead shot) was found. We further observed a few fragments of coarse ceramics heavily attached to the bedrock (which can be reached only after 10cm under the sediment) as well as lead sheathing fragments. There was a strong current that day on the site (to the West), leading us to believe that the lighter material of the wreck could have been washed several metres in that direction. Therefore the scattering field of this site could be large and somehow difficult to interpret due to the strong current and flatness of the seabed in most of the areas.

Measurements of visible objects were taken for the site plan whilst the first test sondages were made. During the sondages in the ENE area 15m from A-1 we found the first silver coins (14) in a depression of the bedrock, together with lead sheathing, lead shot and bronze handles. The area presents various spots with strong metal detector reading. Nonetheless, the seabed appears to be very hard and unlikely to be hiding anything. Thus we arrived to the conclusion that the rocks in the area are highly mineralized. The team started cleaning works around A-1 and found several ballast stones underneath, as well as what looks like a fragment of a bronze cannon. In the sondages on the N and NNW area from A-1 we found various iron pieces concreted with ballast stones, one bronze dolphin from a cannon, several lead shot, 1 very eroded silver coin and cannon balls. The team continued cleaning around A-1 and found a bronze pestle of a mortar and a pewter bottle top.

_Eroded silver coins, bronze mortar pestle and a pewter bottle top, recovered as sample, after the conservation process. (Art. IDM-020/08/5000, 5001, 5002 and 5003)_)
Another fragment of a bronze cannon was found close to anchor A-1. Several pewter bottle tops were observed during the test sondages around the flukes of A-1. The survey to the North and Northwest (around 25 to 35m from A1) revealed more iron pieces, these ones of relatively large dimensions, as well as several lead shot and bronze blocks.

We continued with the assessment of the wreck site, removing rocks and sediment from the area around anchor A-1. We found remains of wood structure, apparently from the hull. Several pewter bottle tops were observed in this place as well as lead sheathing and caulking.

After finding fragments of a bronze cannon and two loose manoeuvring handles (dolphins) from the same kind of object, in addition to the vast dispersion of ballast and iron pieces, we deducted that the site had been worked on with dynamite, probably during the recent (1973) extraction of the bronze cannons.

The team undertook two reconnaissance dives in two selected points at W and NW of A-1, as part of the assessment of IDM-020. The intention was to find out if more scattering was present in that direction. In one of the points two concreted small modern anchors were observed, probably from the ship (s) from which the salvage of the site was carried out in recent times. No more wreck debris was observed in that direction.

The site IDM-020 unfortunately has to be added to the list of recently pillaged wreck sites in the area of Ilha de Mozambique. There is clear evidence of the use of dynamite and heavy lifting, based on the remains of fragmented bronze cannons and broken concretions on the seabed. The site has all necessary proof to ascertain that it was clearly and profoundly disturbed with modern machinery.
Site plan of IDM-020 at the end of the reconnaissance
Tentative identification

Based on the scarce evidence gathered on the wreck site from the few sample artefacts recovered, the characteristics of the coins, the typology of the anchor, the fragments of bronze artillery and mainly the geographical location of the wreck, we are inclined to believe that IDM-020 is probably the São Bento, lost in 1642.

The São Bento, Capitana of the fleet of 1642, under the command of D.João da Gama, was on her trip from Lisbon to Goa and arrived to Ilha de Mozambique with the intention of replenishing food and fresh water. On the 27th of December that year, when the ship was entering the “barra” of Mozambique, she was caught by surprise in a hurricane, her cables broke and she was driven on the reef where she split in two. Some of the accounts of the loss read as follows:

(fl. 3)“chegado o galeão à barra de Moçambique entre as ilhas”(1)

(fl. 9)“uma ou duas léguas [da barra] o tempo cresceu e arrebentando (...) 2 âncoras das 3 com que estavam surtos (...) com a força do mesmo tempo indo à casca tocou o dito galeão (...) para salvação do galeão cortaram os mastros e não foi bastante para não se perder”(1)

(fl. 8v)“viera o tempo refrescando e foi à casca e se encostou a uma banda do canal onde se perdeu”(1)

(fl. 2v)“atravessou-se sobre a areia onde se perdeu”(1)

30 Dezembro 1653 - “A fortaleza de Moçambique está bem provida de artilharia e gente de que ali ficou do galeão S. Bento”(2)

Bibliography:

(1) AHU, Índia, Cx. 25, doc. 100

(2) TT, Livros das Monções, vol. 48, F. 775, fl. 287
MOG-001 Mogincual, 9 days between 08/08/08 and 30/08/08

Survey and reconnaissance

This site was revisited by our team with the aim of continuing the survey and trial excavation that started during the 2007 season.

The wreck is located approximately at 3 km from the entrance to Mogincual River, in 5 to 7m of depth on the Northwest end of the Mucalanga shoal. The site is on a flat plateau of rock covered by a thin layer of sand of 5 to 10cm. There are some remains of dead and broken coral inside the gullies and within the cannons. There are clear signs of previous excavation.

As the hydrographic conditions in the reef were quite hard with strong waves and surge, and taking advantage of the large number of iron cannons which serve as strong reference points, the team decided to survey the site and map it using triangulation instead of a grid system. The conditions for diving are difficult, with waves breaking over the site creating strong current pulling divers back and forth. Visibility on these exploratory dives was good, approximately 8 to 10metres.

Resumed the survey and test excavation of MOG-001. The western part of the wreck area (cannons G6, G7 and G8) was surveyed by metal detection. We found several squared tin plates with an “R” engraved in the centre. A gold coin was recovered 1m to the West of G10, quite isolated. The test excavation was focused on that area of the debris field, going to the SE and to the East of the cannon. One gold coin was recovered 1m to the East of G10, and another 3 at 5m to the SE of G10 (SW of G12). Metal detection was made in the vicinity of G78 finding two gold coins to the SW of its cascabel. During the afternoon dive the metal detection was wider and another gold coin was found 1m to the East of G8, inside a surge channel.

Metal detection was also conducted in the NE area of the wreck site, where divers found several copper pins and one button made of black amber. We started excavation in the Southern area of the big concretion of cannon and iron bars (East of G31 and West of G97) and found several eroded copper coins as well as one gold coin. Metal detection was then continued to the NW area of the wreck site, where one gold coin at 1m from G9 was found. The trial excavation continued in the Southern area of the big concretion of cannon and iron bars (East of G31 and West of G97) finding a glass stopper and several copper pins.
The artefacts recovered during this survey and reconnaissance were 14 Portuguese gold coins (Josephus I, Maria I and Maria I et Petrus III) dating between 1754 and 1801, 2 metallic square plates with an "R" engraved in the centre, 7 fragments of bronze sword handles, 1 black polished button with a small attached ear in the back and 1 glass stopper.

This site may contain many more artefacts of interest; taking into account that there are large sections not yet investigated beneath the cannons and associated conglomerates of iron and lead bars. It is difficult to evaluate the importance of the site, as there has been massive intrusion in the past by someone or by several unknown persons.

**The artefacts.** (Complete list in Annex)

**Coins**

The most interesting artefacts in this wreck so far, without a doubt, are the gold coins. Although they are all from the Portuguese kingdom, there are different types minted in various countries. We will show them chronologically in this report.

1. **D. José I** (JOSEPHUS I), 1750-1777, peça (4 escudos), 6.400 réis

![Both faces of a Josephus I coin](image)

2. **D. Maria I & D Pedro III** (MARIA I ET PETRUS III), 1777-1786, peça (4 escudos), 6.400 réis

![Both sides of Maria I et Petrus III coin](image)
3. **D. Maria I** (MARIA I), 1777-1799, peça (4 escudos), 6.400 réis

*Obverse and reverse of Maria I coin (Art. MOG-001/08/2198), minted in Rio, 1801*

List of gold coins found in MOG-001 during this 2008 reconnaissance:

<table>
<thead>
<tr>
<th>Artefact number</th>
<th>Denomination</th>
<th>Type</th>
<th>Minted</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOG-001/08/2190.000</td>
<td>6,400 réis</td>
<td>Maria I et Petrus III</td>
<td>Rio</td>
<td>1778</td>
</tr>
<tr>
<td>MOG-001/08/2190.001</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Rio</td>
<td>1798</td>
</tr>
<tr>
<td>MOG-001/08/2190.002</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Lisbon</td>
<td>1792</td>
</tr>
<tr>
<td>MOG-001/08/2195.000</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Rio</td>
<td>1801</td>
</tr>
<tr>
<td>MOG-001/08/2196.000</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Rio</td>
<td>1800</td>
</tr>
<tr>
<td>MOG-001/08/2197.000</td>
<td>6,400 réis</td>
<td>Josephus I</td>
<td>Rio</td>
<td>1754</td>
</tr>
<tr>
<td>MOG-001/08/2198.000</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Rio</td>
<td>1801</td>
</tr>
<tr>
<td>MOG-001/08/2199.000</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Baia</td>
<td>1799</td>
</tr>
<tr>
<td>MOG-001/08/2200.000</td>
<td>6,400 réis</td>
<td>Josephus I</td>
<td>Rio</td>
<td>1761</td>
</tr>
<tr>
<td>MOG-001/08/2201.000</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Baia</td>
<td>1801</td>
</tr>
<tr>
<td>MOG-001/08/2202.000</td>
<td>6,400 réis</td>
<td>Maria I</td>
<td>Rio</td>
<td>1787</td>
</tr>
<tr>
<td>MOG-001/08/2203.000</td>
<td>6,400 réis</td>
<td>Josephus I</td>
<td>Rio</td>
<td>1768</td>
</tr>
<tr>
<td>MOG-001/08/2204.000</td>
<td>6,400 réis</td>
<td>Maria I et Petrus III</td>
<td>Rio</td>
<td>1786</td>
</tr>
<tr>
<td>MOG-001/08/2206.000</td>
<td>6,400 réis</td>
<td>Josephus I</td>
<td>Rio</td>
<td>1777</td>
</tr>
</tbody>
</table>

**Sword handles**

Seven copper sword handles (fragmented) and several other sword pieces were observed in the debris field of this wreck. There are no visible marks or engravings in those pieces but for their similarity and sobriety we can assume that they were part of the soldiers’ regiment.

*Sword handle parts (Art. MOG-001/08/2192 and 2194), after conservation.*
Metallic plates

Two metallic squared plates were recovered during this year’s reconnaissance from the MOG-001 wreck site. These plates, which seem to be made of tin, had a letter “R” engraved in relief in the centre. Such mark, present in all plaques observed in the site, could be a sign of property and therefore they can be considered as Cargo.

Metallic square plate (Art. MOG-001/08/2193), after conservation.

Tentative identification.

Evidence gathered during survey, reconnaissance and archival research suggests that MOG-001 was a Portuguese Indiaman from the late XVIII or early XIX century.

In our historical files the record which seems to match best with the location and time of this wreck is the one of Nossa Senhora da Madre de Deus e S. José, sunk on the night of the 2nd of September of 1802 “stranded at Mongicale shoals, the morning after break in two, 232 people saved and 136 died.”

“Encalhou no baixo de Ferabras no Canal de Moçambique em a noite de 2 de Setembro próximo passado, tão perto daquele estabelecimento que a lancha e o escaler da mesma nau, de que se serviram para mandar pedir socorro a Moçambique, chegou no dia 3 pelas duas da tarde, constando que em a noite deste mesmo dia 3 expediu o governador 2 bergantins que se achavam naquele porto pelo que se espera que possão salvar a gente e os cofres, considerando-se perdido o tabaco e os géneros de comércio, porque a nau encalhou com tanta força que perdeu o cadaste e fazia muita água”.

Although this identification is not conclusive it seems very probable that the large amount of cannons discovered on the site would help to identify this ship in the archives.
Magnetometer Survey

The systematic magnetometer survey of the surroundings of Ilha de Mozambique, initiated in 2000, was continued during 2008, covering a large part of the hitherto unexplored area. The magnetometer methodology adopted was the one already explained in pages 5 and 6 of this report and areas around the islands of Sena, Inhaka, and Sete Paus were included.

Areas surveyed by magnetometer during 2008 season (highlighted in yellow).

During this survey a total of 18 historical anchors (A-28 to A-44) were located as well as two iron cannons. The cannons and 6 of the historic anchors seem to be related to the IDM-018 wreck site discovered by the Arqueonautas survey team in 2004 in the area of Cabo de Boa Vida. The rest of the cultural material was found isolated, giving the impression that the anchors were abandoned by ships after being moored at the entrance of the harbour.

Some modern debris was also located by the magnetometer and properly recorded in the charts: these were a steel barge, a modern fishing vessel and recent anchors. Below is a table with the details of each object found during this 2008 magnetometer survey.
<table>
<thead>
<tr>
<th>Visible remains</th>
<th>GPS Position</th>
<th>Depth</th>
<th>Dive Log ; Date found</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 iron cannons</td>
<td>15° 01,041’ S; 40° 47,630’ E</td>
<td>3 m</td>
<td>IDM000/08/6267; 06/06/08</td>
<td>Possibly related to IDM-018 wreck site</td>
</tr>
<tr>
<td>A28</td>
<td>15° 02,145’ S; 40° 47,641’ E</td>
<td>16 m</td>
<td>IDM000/08/6201; 14/05/2008</td>
<td>Broken ring, Stem pointing NNE.</td>
</tr>
<tr>
<td>A29</td>
<td>15° 02,616’ S; 40° 45,013’ E</td>
<td>38 m</td>
<td>IDM000/08/6256; 05/06/2008</td>
<td>1,5 long anchor, pointing ESE</td>
</tr>
<tr>
<td>A30</td>
<td>15° 01,731’ S; 40° 47,512’ E</td>
<td>12 m</td>
<td>IDM000/08/6271; 07/06/2008</td>
<td>3,4 m long anchor (isolated)</td>
</tr>
<tr>
<td>A31</td>
<td>15° 02,155’ S; 40° 47,500’ E</td>
<td>14 m</td>
<td>IDM000/08/6298; 19/06/2008</td>
<td>4 m long anchor (isolated)</td>
</tr>
<tr>
<td>A32</td>
<td>15° 02,338’ S; 40° 46,583’ E</td>
<td>13 m</td>
<td>IDM000/08/6313; 20/06/2008</td>
<td>3 m long anchor. Poss. related to IDM-018</td>
</tr>
<tr>
<td>A33</td>
<td>15° 02,321’ S; 40° 46,874’ E</td>
<td>13 m</td>
<td>IDM000/08/6315; 20/06/2008</td>
<td>4 m long anchor. Poss. related to IDM-018</td>
</tr>
<tr>
<td>A34</td>
<td>15° 02,231’ S; 40° 46,598’ E</td>
<td>14 m</td>
<td>IDM000/08/6324; 21/06/2008</td>
<td>3 m long anchor. Poss. related to IDM-018</td>
</tr>
<tr>
<td>A35</td>
<td>15° 02,206’ S; 40° 46,843’ E</td>
<td>17,5 m</td>
<td>IDM000/08/6334; 24/06/2008</td>
<td>5 m long anchor. Poss. related to IDM-018</td>
</tr>
<tr>
<td>A36</td>
<td>15° 02,061’ S; 40° 46,827’ E</td>
<td>15 m</td>
<td>IDM000/08/6336; 24/06/2008</td>
<td>3 m long anchor. Poss. related to IDM-018</td>
</tr>
<tr>
<td>Flukes</td>
<td>15° 01,976’ S; 40° 46,751’ E</td>
<td>16 m</td>
<td>IDM000/08/6344; 24/06/2008</td>
<td>No stem. Poss. related to IDM-018</td>
</tr>
<tr>
<td>A37</td>
<td>15° 01,575’ S; 40° 44,890’ E</td>
<td>35 m</td>
<td>IDM000/08/6449; 11/08/2008</td>
<td></td>
</tr>
<tr>
<td>A38 and A39</td>
<td>15° 01,477’ S; 40° 44,817’ E</td>
<td>36 m</td>
<td>IDM000/08/6451; 11/08/2008</td>
<td></td>
</tr>
<tr>
<td>A40</td>
<td>15° 01,512’ S; 40° 44,843’ E</td>
<td>37 m</td>
<td>IDM000/08/6451; 11/08/2008</td>
<td></td>
</tr>
<tr>
<td>A41</td>
<td>15° 01,589’ S; 40° 45,071’ E</td>
<td>37 m</td>
<td>IDM000/08/6454; 12/08/2008</td>
<td>1 m long anchor, heading 330° (isolated)</td>
</tr>
<tr>
<td>A42</td>
<td>15° 01,583’ S; 40° 45,064’ E</td>
<td>35 m</td>
<td>IDM000/08/6454; 12/08/2008</td>
<td>1,2 m long grapnel, heading 190° (isolated)</td>
</tr>
<tr>
<td>A43</td>
<td>15° 01,545’ S; 40° 45,042’ E</td>
<td>33 m</td>
<td>IDM000/08/6454; 12/08/2008</td>
<td>2 m long anchor, heading 210° (isolated)</td>
</tr>
<tr>
<td>A44</td>
<td>15° 01,567’ S; 40° 45,054’ E</td>
<td>36 m</td>
<td>IDM000/08/6454; 12/08/2008</td>
<td>2,5 m long grapnel, heading 300° (isolated)</td>
</tr>
<tr>
<td>Modern anchor with chain</td>
<td>15° 02,613’ S; 40° 47,537’ E</td>
<td>7 m</td>
<td>IDM000/08/6206; 17/05/2008</td>
<td></td>
</tr>
<tr>
<td>Small anchor</td>
<td>15° 01,631’ S; 40° 45,063’ E</td>
<td>40 m</td>
<td>IDM000/08/6256; 05/06/2008</td>
<td>1,5 m long anchor</td>
</tr>
<tr>
<td>Steel Boat</td>
<td>15° 00,869’ S; 40° 47,915’ E</td>
<td>13 m</td>
<td>IDM000/08/6261; 06/06/2008</td>
<td>Remains of light steel boat</td>
</tr>
<tr>
<td>Steel Barge</td>
<td>15° 01,229’ S; 40° 47,894’ E</td>
<td>13 m</td>
<td>IDM000/08/6264; 06/06/2008</td>
<td>Remains of steel barge</td>
</tr>
<tr>
<td>Modern anchor</td>
<td>15° 01,525’ S; 40° 44,858’ E</td>
<td>14 m</td>
<td>IDM000/08/6451; 11/08/2008</td>
<td></td>
</tr>
</tbody>
</table>
The historic anchors that might be related to the IDM-018 wreck site are showed in the map below and are represented by black circles.

Geographical distribution of anchors A-28 to A-36 at the South of Cabeceira reef.

The isolated historic anchors that were not possibly related to any known wreck site were found in the entry channel to the Mozambique bay and are showed in the map below with red circles.
**Bathymetry**

As a complementary work of the survey around Ilha de Mozambique a detailed 3D bathymetry of the deepest part of the channel was carried out. The channel had been object of several visual survey dives but its depth and sinuous geography makes it very difficult to understand. The modern remains of human activity such as steel cable, steel drums and different man-made junk items also hinder a proper magnetometer investigation of the area.

Based on the above mentioned difficulties we took the decision to first make a topographic map of the seabed inside the channel, in order to consequently plan the best way to explore this important area in the future.

![Area of the channel where the bathymetry was done (highlighted in yellow).](image)

This bathymetric mapping was done with a similar methodology to the magnetometer survey, differing only in the lane spacing which was shorter (5m instead of the 7m for the magnetometer survey) and the sample rate of the magnetometer which was reduced to 0.6 sec instead of the 1.5 sec used in the magnetometer survey.

The above settings allowed us to record a high density of bathymetric data per square meter and to produce a highly detailed map of the seabed in the area of study.
This bathymetric mapping of the channel comes as a big help in understanding the area for future survey as well as aid for the navigation.
Conservation.

Although Operations in 2008 were mainly focused on survey and very few artefacts were recovered, some conservation works were carried out at the Centro de Conservação Marítima (CCM), including the primary conservation of bronze cannons owned by Capitania and not belonging to our archaeological project. These works are listed below:

Cannons of MOG-003 (Possibly the São José, 1622)

Because of the continually degrading state of the laboratory building, the conservator decided to remove all artefacts from display and store them in the adjacent room whilst waiting for materials and equipment needed for its repair.

During this time, we began the second cleansing of the cannons as planned. The general state of the cannons was good. When oxidized stains were found (some areas more severe than others) we treated them as follows:

We wrapped the cannons in sections with cloths soaked in an alkaline solution, in this case Rochelle salts, for 3 days. Then with a toothbrush, sponge and an abundance of water we began to remove the solution from the cannon’s body. Once removed, we continued with a sulfuric acid solution of 10% and focused on the more severe areas of oxidization. We then dried the cannons with acetone and finished with a covering of Incralac.

Cannons of the “Capitania”

These bronze cannons were already in the backyard of Capitania when our archaeological project in Ilha de Mozambique started in the year 2000. Although there is no information available as to where these cannons were found and removed from the seabed, some of them supposedly come from the IDM-020 wreck site, recently discovered by the Arqueonautas survey team.

We cleaned the shields, emblems and marks of the cannons that belong to “Capitania”, to be able to study their identity and origin. For that purpose we covered the marks with a cloth soaked in a citric acid solution of 10% for 3 days and then cleaned the marks with fine copper brushes and an abundance of water. We finished with a protective layer of Incralac.

Cleaning of the sample ceramic fragments

Two ceramic samples were recovered during the survey and thereafter treated in the lab. The pieces were submerged in a hydrochloric acid solution of 10%, and then cleaned with toothbrushes. They were left submerged in fresh water during a period of 15 days, renewing the water every 3 to 4 days, until we were satisfied using a test of silver nitrate to ensure that they were completely desalinized. We then covered the fragments with a water/acetone solution of 50/50%, and then in pure acetone leaving it to dry. Once dry, we gave one last protective cover using wax.
During the exploration of IDM-020, two conglomerates of silver coins were recovered (IDM-020/08/5000 and IDM-020/08/5002) which were completely concreted.

We proceeded by submerging the conglomerates in a hydrochloric acid solution of 10% for a few minutes. They were cleaned with a toothbrush and sodium carbonate, and once again submerged in the acid solution. This process was repeated until all the concretion was removed. We then prepared a glass beaker, covered the inside with sheets of aluminium paper, a group of coins placed on the bottom of the beaker covering them with an alkaline ditionito (hydrosulfite) solution. To accelerate the ionic exchange between the aluminium paper and the coins we heated the beaker. The coins were then taken out and cleaned with a toothbrush and sodium carbonate and once again introduced in the alkaline hydrosulfite solution for 12 hours to a maximum of 3 days depending on the state of the coin or the level of cleaning wanting to be reached. Finally they were properly cleaned with a toothbrush, sodium carbonate and an abundance of water. They were then dried using acetone and given a final protective layer using wax. We recovered 14 coins from one conglomerate (DM-020/08/5000) and 3 from the other (IDM-020/08/5002). These were classified as eroded coins because of their unidentifiable bodies.

Also recovered was a pewter tap (IDM-020/08/5001), which was cleaned with a hydrochloric acid solution of 10% and then scrubbed well using a toothbrush, sodium carbonate and an abundance of water. Once dry it was covered with a protective layer using Incralac.

Also recovered was a brass pestle (IDM-020/08/5003), which was treated with a sulfuric acid solution of 10%. It was then scrubbed well with a toothbrush, sodium carbonate and an abundance of water and finished off with a protective layer using Incralac.

**MOG-001**

During the excavation of MOG-001 14 gold coins were recovered. Because of the particular characteristics of this wreck all the coins were found loose and with different grades of concretion. They were treated with a nitric acid solution of 1% to remove all concretion and to bring them back their original state. They were then well scrubbed with a toothbrush, sodium carbonate and abundant water. We then submerged them in a solution of ammonium and water for 2 or 3 hours and then finally rinsed them with an abundance of water.

Two square pieces were also recovered from MOG-001. At first they appeared to be made from lead, with a letter "R" written into their surface (MOG-001/08/2191 and MOG-001/08/2193). After their conservation to remove the concretions, using a hydrochloric acid solution of 10%, a toothbrush, sodium carbonate and an abundance of water, we carried out several tests to identify the material presented to us and concluded that they are made of tin rather than lead.
Two brass pieces were also conserved creating the hilt and the guard of a sword (MOG-001/08/2192), along with 5 hilts (MOG-001/08/2194) which were badly eroded. These were treated with a sulfuric acid solution of 10%, and then scrubbed with a toothbrush, sodium carbonate and an abundance of water. Once dry they were then given a final protective cover using Incralac.

The ebony button (MOG-001/08/2205) and the glass stopper of a small medication flask (MOG-001/08/2207) were treated with a hydrochloric acid solution of 10% then cleaned well with a toothbrush, sodium carbonate and an abundance of water, subsequently giving them a protective layer using Incralac.

IDM-010

During the excavation of IDM-010, two flasks of medicine (IDM-010/08/20601 and IDM-010/08/20602), a glass bottle (IDM-010/08/20600) and a gin stoneware bottle (IDM-010/08/20599) were recovered. These pieces were submerged in fresh water, which will help in their desalinization and will remain there until the beginning of the next season when they can be treated properly.
Equipment

Following equipment and peripherals were used in this phase of the excavation and survey.

- **Zanj** survey vessel (21m length).
- **Arvor** survey boat (7.8m length)
- RIB **Humber** (5.5 m length).
- RIB **Zodiac** (6.6 m length)
- 2 x Honda 20 HP four strokes outboard engines.
- 1 x Honda 30 HP four strokes outboard engine.
- 2 x AX-2000 Aquascan proton magnetometers.
- 2 x GPS GARMIN map 168 (with echo sounder) and NMEA interface.
- 2 x GPS GARMIN 128 with NMEA interface.
- Handheld GPS Magellan 3000.
- Echo sounder MAP2000/SAM MODULE.
- Echo sounder GARMIN 160.
- 2 x ELSEC 2000 Metal detectors.
- U/W Digital photo camera Sony with housing.
- U/W Digital video camera Sony with housing.
- Surface digital camera Sony Cybershot 7 Megapixel.
- 2 x towing sledges for visual survey.
- 20 x full diving gear sets.
- 2 x full diving gear as spare.
- 15 x 16 Lts steel diving bottles.
- 10 x 15 Lts steel diving bottles.
- Diving compressor **BAUER** (Gasoline engine).
- Diving compressor **EXPLORER** (Diesel engine).
- U/W Scooter Apollo.
- Laptop Fujitsu Siemens Amilo, Intel Core Duo.
- 2 x Laptop Toshiba Satellite, Pentium IV.
- Laptop Apple i-book.
- Desktop **Acer** + scanner HP.
- CMAPEcs Navigation software.
- AxLogger editor software.
- AQLogedit software.
- Surfer 8 software.
- Corel Draw 10 software.
- Adobe Photoshop 7.0 software.
- Microsoft Office suite 2004 software.
- Iridium Satellite phone for data transfer.
Staff

For this survey and reconnaissance operation the following team was mobilized:

Team.

- Alejandro Mirabal (Archaeologist/ OPS Director/ Diver)
- Faure Cambiella (OPS Manager/ Magnetometer Operator/ Surveyor)
- Alina Reyes (Archaeological Registrar/ Administration)
- Manuel Navarro (Dive Supervisor)
- Alejandro Raul Mirabal (Draftsman/ Diver)
- Lucas Sillem (Diver)
- Jorge Ponce (Senior conservator)
- Gaston Bernal (Skipper Zanj/ Diver)
- Selemane Matano (Boatman)
- Salimo Djuma (Conservation assistant)
- Wassia Sualehe (Conservation assistant)
- Carlitos Almeida (P.I Representaive)
- Amisse Abdul (Guard)
- Anifa Joao (Cook)
- Jale Indinane (Guard)
- Rachite Omar (Guard)
- Amade Mustafa (Fiscal Coastguard)
- Mario Lima (Fiscal Coastguard)
- Maricano Denis (Fiscal Coastguard)
- Agostinho Assuate (Fiscal Ministry of Culture)
- Saide Gelane (Fiscal Ministry of Culture)

With the fulltime backup and temporary help in the field of:

- Nikolaus Graf Sandizell (CEO AWW/ Diver)
Acknowledgements

I want to thank the help and support received from many people, who helped to make this operation a success.

To Patrimonio Internacional SARL, namely Dr. Jacinto Veloso, and Urgel Barrera for providing us with liaison and logistics support from Maputo / Moçambique.

To AWW head office in Estoril with the CEO Nikolaus Graf Sandizell coordinating operations from Europe.

To the Moçambique Ministry of Education and Culture, for providing us with the help of the functionaries who acted as Fiscals, following every step of the recovery, conservation and documentation processes.

To Dr. Margaret Rule, CBE, FSA, Maritime Archaeologist, lecturer and author for her full-time support and wise consultancy regarding this excavation.

To Aquascan International in England, namely the managing director Robert Williams, for allowing us to now have the know-how of magnetometer in-house, by providing us with relevant equipment and constant advise.

To the Local Authorities of Ilha de Moçambique for all their care and help regarding our expedition’s logistical issues.

To the fishermen of Ilha de Moçambique for all their know-how and help in the field and the close cooperation they provided.

And last, but not least, I would like to thank each and every member of the Arqueonautas Survey Team 2008 for their excellent performance and hard work in despite of the adverse weather conditions and technical challenges faced on many occasions.

The success of this operation was only possible thanks to all people mentioned above.

I take full responsibility for any errors, which might be found in this report.

M.Sc. Alejandro Mirabal Jorge
Archaeologist / AWW OPS Director