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The following is an end-of-season progress report on the excavation of 2 wreck sites of the XVII century off the island of Mozambique and Mogincual, designated MOG-003 and IDM-003, and the survey and assessment of IDM-017. 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 and in the case of IDM-003 the site was systematically visited by them to extract lead bars. The bronze cannons from MOG-003 were about to be picked up by local fishermen with the intention to sell them as scrap metal.

**Aims.**

The objective of this archaeological excavation of two potentially important wreck sites in historical and cultural terms in the waters of the province of Nampula was first to define the debris field of cultural material on each site as well as the extent and nature of the overburden, excavate the overburden and recent deposits until the sterile layer underneath the station, and began the study of the artillery, cargo composition, naval construction and life on board of these particular ships.
Abstract.

This excavation operation took place in the waters off Ilha de Moçambique and Mogincual from the 01/05/2005 to the 30/11/2005 without interruption for a total of 214 days of Operations. The time of operation was split as follows:

| Transportation (sailing to and from the sites) | 6 days |
| Mobilization/Logistics (refuelling, water, food, etc and repairs) | 32 days |
| Bad weather | 16 days |
| Days off | 15 days |
| Diving days | 145 days |

During these 145 diving days a total of 1371 dives were done amounting to 2,000,14 diving hours at a rate of 14,19 diving hours per day.

**MOG-003 (possibly Almiranta São Jose, 1622):**
- Days worked on the site | 35 days |
- Dives | 441 dives |
- Dive hours | 482.56 hours |
- Artefacts recovered | 57 artefacts (20.248 silver coins) |
- Excavation status (approx) | 20% |

**IDM-003 (possibly Nossa Senhora da Consolação, 1608):**
- Days worked on the site | 110 days |
- Dives | 839 dives |
- Dive hours | 1359.45 hours |
- Artefacts recovered | 169 artefacts |
- Excavation status (approx) | 40% |

**IDM-017 (possibly Capitana Santa Teresa, 1622):**
- Days worked on the site (simultaneously with MOG-003) | 13 days |
- Dives | 91 dives |
- Dive hours | 158.13 hours |
- Artefacts recovered | 0 artefacts |
- Excavation status (approx) | 0% |
Sites Report.

MOG-003 Infusse shoal, 35 days between 06/05/05 and 20/11/05

Site description and first finds.

This site was found on the 27th of September 2004, during the systematic magnetometer and visual surveys on Infusse shoal. The main part of the wreck site is located in the Northwest side of Infusse reef on a depth of 21.5 m on a seabed of sand and loose rocks.

In total were found 3 bronze cannons, 5 iron cannons, a rudder pintle and 6 anchors, distributed in a scattering axis of 3800m length, ending in the spot of anchors A6 and A7 and cannons G6 and G7. The iron cannons are very concreted but the 3 bronze cannons are in reasonably good condition with complete dolphins, trunnions and cascabel.

Survey started from a spot in the South of Infusse shoal where an historic anchor (A3) was found in a previous survey, from there we continued surveying towards North- Northeast (downwind) and another two anchors (A2 and A1) and an iron cannon (G0) were found at a distance of approximately 452m from A3. No other wreck material was observed in their surrounding area. About 1500m to the North of this area the first 2 bronze cannons and 1 iron gun were found in a depth of 14.3 m on a seabed of sand, loose rocks and pebbles. One of the bronze cannons is upside down (G1) and could probably have marks to help in their identification, the other (G2) is slightly turned but no marks are visible. G1 is 3.43 m long and G2 is 3.31 m. A detailed visual survey was immediately carried out in order to find more wreck material in the surrounding area but without success. At the same time all measurements of the cannons and their relation were taken in order to produce a site sketch at scale of the area. Digital underwater photos and video of the site were also taken. Another bronze cannon (G4) was found at 95.3m to the NW of cannon G2 in 14m depth with no other evidence of wreckage in the vicinity. All measurements of these cannon were taken as well as digital pictures. Another iron cannon (G5) was found by magnetometer survey at 442m to NW of cannon G2 in a depth of 13m, very concreted (barely recognizable) and with no other visible evidences of wreckage in its surrounding area. A wide survey with metal detectors was done in this spot but no readings were recorded. One isolated ballast stone was found in the area between cannons G2 and G4. One anchor with a broken fluke (A5) was found by visual survey on a depth of 14m in a rocky seabed. A metal detection survey was carried out immediately in its vicinity finding only an iron bolt concreted on the seabed, no other sign of wreckage.

An anomalous area was detected by the magnetometer further to the NNW of A5 on a depth of 21.5m and diving inspection revealed another two historic anchors (A6 and A7) partially buried on the sand, two iron cannons (G6 and G7) at 25m NNW from A6 and an iron rudder pintle. The fact that cannon G7 and anchor A7 were completely buried made us change the approach to the site and started looking deeply into the sediment in order to find buried evidences. As result of these controlled test pits were found 8 cannon balls, one unidentified massive iron object, 2 pewter bottle tops and several silver coins in clusters of various sizes, all buried under the sediment. Part of the silver coins still conserved traces of arrangement in rows, as they supposedly were stored inside containers; therefore they were probably part of the ship's cargo. The
**S18 Grid.**

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0,30m
Depth of the cultural layer: 0,80m
Average depth excavated: 1,2m
Artefacts observed: Silver coins and 1 cannon ball
Artefacts recovered: 15 artefacts (app. 4048 silver coins)
Excavation status: 50% excavated

The excavation of this grid started from the Northern edge (adjacent to S2) going in SE direction at the depth of 0,60m, where the most concentration of artefacts was observed in S2. In the Eastern sector of the grid we found the first conglomerations of silver coins with some trace of arrangement or original storage order. Four of these clumps still had the shape of the container where originally stored, apparently canvas bags, the canvas, as organic material, was already decomposed but the coins concreted together kept its shape. Two of these clumps had as well 90° angles in two corners pointing to the assumption that these individual bags were stored inside squared or rectangular chests or boxes.

The concentration of coins was decreasing when excavating towards the West of the grid. No other artefact from the wreck was found besides one cannon ball on the very southern edge of the grid.

**S19 Grid.**

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0,30m
Depth of the cultural layer: 0,80m
Average depth excavated: 1m
Artefacts observed: Silver coins
Artefacts recovered: 14 artefacts (app. 6259 silver coins)
Excavation status: 40% excavated

Excavation of S19 started from the Western edge of the grid, adjacent to S18 at the same depth on the cultural layer (0,6m) and finding the same kind of artefacts. The density of loose silver coins and clumps was similar to the one observed in S18 although more coins were recovered.
the first ballast stones, lead sheathing from the hull, small fragments of wood and fragments of coarse ceramics and one fragmented olive jar. This is the area where excavation started this year.

**Sediment nature and hydrographical conditions.**

The wreck site is located at 21.5m of depth in a tidal channel between the outer reef and the continental coastline, which is formed by beaches in that area. Strong tidal currents are felt coming from the North and the South according to the phase of the tide and stronger in the days of the spring tides. The area is also affected regularly by ground swell (generally coming from the SE) generated by oceanic events on distant areas, not been connected with the particular meteorological conditions on the site. The seabed in the area is formed by loose sand and fragments of small size of dead coral colonies (so far identified *Diploria sp.*, *Acropora sp.* and *Mussa sp.*), all mixed until a depth of approximately 1.5m where the sediment appears to be more compact.

The dynamic of the sediment is driven by the massive surge present on the days of ground swell when the sand and small fragments of coral are pushed back and forth, sometimes in a scope of 3 to 5m. There is as well a heavy deposition of sediment in suspension in the water column, provided mainly by the flow of the Mogincual river and by the smaller streamlets of Infusse and Curvelane.

Deposition of the soft sediment on the site so far hasn't been proved to be seasonal as initially expected. Continuous monitoring of this issue for 15 months had shown a rate of deposition of approximately 1cm per month over the entire area, been the wreck more and more buried on every intervention. Test pits and excavation grids are refilled in a term of few hours when the surge of the ground swell is present.

**Excavation.**

Excavation began on 06 May 2005. The team largely consisted of divers, IT-specialists and archaeologists, all people with long experience in marine archaeological field work. The first objective was to establish a web of permanent datum points which would permit the precise mapping of the terrain and the wreck remains.

During the first dives on the site, 5 months after the survey and reconnaissance, we found it very sedimented in comparison with the moment we left after the test sondages. Every test pit (including the one around G6 and G7, which was 1.5m deep) was completely filled with fine sand and mud to the same level as the original seabed. Apparently the current had played an important role in this fact as the smaller stones moved during the trial excavation appeared in almost perfect rows orientated North-South, which is the main direction of the current. The water in the site had a lot of fine suspension and is very possible that the continuous deposition of it is one of the reasons of this fast coverage.

After a detailed survey and careful reflection an area was established where cultural debris was observed, either expose on the seabed or buried into the sediment but at the reach of the metal detectors, to deploy our grid system for this first phase of the excavation.
There are two simple approaches to excavation: one is to excavate over large areas of the site, layer by layer; the other is to work the site in small sections, layer by layer, repeating section by section across the site. The former approach is taken where the site lies in relatively calm conditions, there is a large staff available and there are no time constraints. The latter method tends to be utilized where conditions are rough, or there is a limited number of staff, or where weather conditions restrict the length of excavation. We chose the latter case also because excavation can be rapidly terminated, in case of adverse weather conditions without danger to the site.

We established a grid system to be adopted with a starting area of 24 grids (5 x 5m, 25m²) orientated North-South and East-West, covering the entire area with visible cultural material. The grids were built with white plastic rope of 8mm in diameter and marked every meter with a small plastic tag; at every 5m (beginnings, ends and intersections) the line was also marked in black for easy reference. The fixing points for this datum grid were plastic bags filled with sand and stones in order to avoid unnecessary contamination of the area with modern objects as lead weights or steel rods. The entire area prepared for excavation covered 750m².

Two areas were investigated, one at 15m to the East and the other 15m to the West of the respective ends of the defined excavation area, in order to use them as dumping site for the debris produced during the excavation. As these were found sterile in terms of cultural material a thicker line was settled from the centre of the excavation area to these “dumping sites” to be used by the divers on their trips back and forth.

The underwater tools used during this first phase of the excavation were one air-lift and one water-lift, both to help in the evacuation of the sediment previously removed manually by the divers and to improve the visibility during sediment removal. All artefacts were collected by hand into net bags and tagged still under the water with their location inside the grid where were found.
The picture above shows the long scattering trail of wreck material that evidences the drift of the ship before sinking. From the first anchor in the South to the excavation area (last red square to the North) the distance is 3800m.
Results.

Excavation started on grid S2. This decision was made considering the visible objects on the seafloor, the proximity of one of the two nucleuses of heavy objects of the site (anchors A6 and A7) and the fact that during the reconnaissance the cultural layer on that spot was found quite shallow. Details of excavation results on each grid are explained below.

S2 Grid.

| Nature of the overburden:       | Sand and loose dead coral fragments |
| Depth of the overburden:        | 0,25m                                 |
| Depth of the cultural layer:    | 0,75m                                 |
| Average depth excavated:        | 1,10m                                 |
| Artefacts observed:             | Cannon balls and silver coins         |
| Artefacts recovered:            | 15 artefacts (app. 4049 silver coins) |
| Excavation status:              | Finished                               |

Excavation in S2 was lead from the NE corner and advancing to the South when was reached the cultural layer after the first 25cm under the seabed. At the beginning the only artefacts observed were silver coins of different denomination, all of them loose. When excavation continued to the western end of the grid at a depth of approximately 60cm under the seabed, several silver coins were found scattered or forming small clumps, with no trace of arrangement. The entire layer of the 60cm depth appeared covered with coins in ¾ of the grid area, been more scarce and scattered in the north-western sector. In the Southeast corner of the grid were located the only wreck remains which were not silver coins and these were 2 iron cannon balls. These cannon balls were found superficially (10cm deep) and concreted to several silver coins as if the balls had fallen over one chest of the coins cargo. This grid was excavated to its extent until a depth of 1,10m where no more wreck material was found. It was surprising that not a single nail, bolt, ceramic shard or the usual fragments of lead sheathing were observed in this area.
S3 Grid.

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0,30m
Depth of the cultural layer: Unknown, but deeper than 1,2m
Average depth excavated: 1,60m
Artefacts observed: Anchor A6, fragmented olive jar, fittings from the rudder, cannon balls and silver coins
Artefacts recovered: 6 artefacts (app. 3283 silver coins)
Excavation status: 40% excavated

The excavation of grid S3 was done starting from the Western edge (adjacent to S2) and going around anchor A6, trying to reach a depth into the sediment where the most concentration of artefacts could be found. Understanding that anchor A6 would perform as a physical barrier for the horizontal displacement of the smaller and lighter artefacts from the ship; the excavation of the Southern and Northern edges of the anchor’s shaft was given priority. Contrary as expected these areas didn’t contained any important accumulation of artefacts at least until a depth of 1,5m, although the only artefact belonging to the domestic category in the ship was found there. This artefact is a small olive jar, partially fragmented, that is concreted under the ring area of A6 at a depth of 1,1m. That finding leads us to think that anchors A6 and A7 rolled during the event of the accident falling over an unknown amount of parts of the ship and acting as a physical trap, preventing the natural dispersion produced on the site by the strong surge. To reinforce this theory, a group of iron fittings (apparently pintles from the rudder) were found trapped between the ring of A6 and the flukes of A7. The sterile layer under the anchor hasn't been found yet, although the expected density of wreck material hasn’t been found as well, keeping the probability that could be in a deeper layer.

The silver coins of this grid were very concentrated in the West side of the flukes of A6, making part of the main body of loose coins coming from S2.
The cannon balls were located in the NW corner of the grid and again very shallow under the sand. This fact is probably produced by the size and nature of these objects; which makes it difficult to penetrate the sediment as deep as smaller and heavy items.
**S4 Grid.**

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0,30m
Depth of the cultural layer: Unknown, but deeper than 1,2m
Average depth excavated: 1,60m
Artefacts observed: Anchor A7, iron fittings from the rudder
Artefacts recovered: No artefacts
Excavation status: 5 % excavated

The excavation of grid S4 was done along the shaft of anchor A7 continuing to the North of the excavation from S3. No artefacts from the wreck were observed in the little area so far excavated, besides the anchor itself.

**S6 Grid.**

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0,25m
Depth of the cultural layer: 0,75m
Average depth excavated: 1,10m
Artefacts observed: Cannon balls, iron object, silver coins
Artefacts recovered: 2 artefacts (48 silver coins)
Excavation status: 30 % excavated

The excavation of this grid started from the Southern edge coming from S2 and covering 1/3 of it. Only one artefact was recovered (8 silver coins forming a small cluster) but several cannon balls were observed in the superficial layer. The absence of any other wreck material to the North of this grid and underneath the cultural layer made us move further east, in the direction of S7. In the Eastern end of S6 was found an unidentified iron object (apparently from the rigging) at a depth of 0,30m under the seabed, but as it was attached to cannon balls and very misshaped by the concretion, it was left in situ.
**S7 Grid.**

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0,25m
Depth of the cultural layer: Unknown
Average depth excavated: 0,50m
Artefacts observed: Cannon balls
Artefacts recovered: No artefacts
Excavation status: 10 % excavated

The excavation of this grid was focused in few magnetic anomalies detected during the preliminary survey and all of them turned out to be scattered cannon balls at a depth of 0,25m. Adverse weather conditions forced us to stop excavation.

**S8 Grid.**

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: Unknown, artefacts found at 1m depth
Depth of the cultural layer: Unknown
Average depth excavated: 1m
Artefacts observed: Iron rudder pintle
Artefacts recovered: 2 artefacts (2 pewter tops)
Excavation status: 1% excavated

This grid was target of one deep test pit during the preliminary survey in order to establish the depth of the sediment and the bedrock. It was open a sondage underneath the iron rudder pintle (Pt1) and went as deep as 1m without reaching neither the bedrock nor the sterile layer. We found in this pit two pewter tops, apparently like the ones used on the medicine bottles, curiously enough the only two artefacts which could be personal belongings.
**S16 Grid.**

Nature of the overburden: Sand and loose dead coral fragments  
Depth of the overburden: Unknown, objects exposed  
Depth of the cultural layer: Unknown  
Average depth excavated: 1,5m  
Artefacts observed: Iron cannons G6-G7, lead shot, wood  
Artefacts recovered: No artefacts  
(only a small piece of wood for analysis)  
Excavation status: 1% excavated

On this grid a wider test pit was done during the preliminary survey around cannon G6 trying to determine the depth of the sediment and another iron cannon (G7) was found completely buried in the sand. At a depth of 1,5m small and fragile pieces of wood were located (most probably not belonging to the ship’s hull structure). One of the wood pieces was recovered for dendro-chronology analysis in Europe. Three lead shot were observed as well in this spot and left in situ.
S23 Grid.

Nature of the overburden: Sand and loose dead coral fragments
Depth of the overburden: 0.30m
Depth of the cultural layer: Unknown
Average depth excavated: 0.50m
Artefacts observed: Silver coins
Artefacts recovered: 3 artefacts (app. 1767 silver coins)
Excavation status: 10% excavated

Due to adverse weather conditions the excavation of this grid covered only the NW corner of it, coming from S19. The only artefacts found were loose silver coins and very small clumps (the biggest of approximately 15 coins). We did not reach the sterile layer under the cultural layer.
Interpretations.

As very little of the debris field of this wreck site has been excavated (approximately 20%), all interpretations showed in this intermediary report are just an attempt of better understanding the site and should (and will) change when excavation continues, giving us more ground for study.

The distribution pattern of artefacts, horizontal and vertical, in this wreck hasn’t been completely understood yet. It is quite obvious that it doesn’t respond to the typical conical dispersion pattern so commonly found in wreck sites in shallower waters and under the hydrodynamic tension of permanent swell. The strong surge and the nature of the seabed in the area made some objects travel long distances without any mechanical barrier to stop them or any deep gullies or other sort of natural collectors amass them.

The stratigraphic arrangement of the wreck material is quite simple on this site showing, as in many cases on wreck sites, that there is no stratigraphy to speak of. One simply finds that there is a sterile overburden, followed by an archaeological layer, followed by a sterile layer.

The depth of the overburden vary very little, from a minimum of 0.25m (e.g in S2) to a maximum of 0.30m, although in one spot of S8 the only artefacts were found at 1m depth, but as it was on an isolated pit we can’t assume that the rest of the grid will show the same depth.

The depth of the archaeological layer is still mostly unknown as in only a few spots we have reached the sterile layer underneath and nowhere bedrock could be observed. The rapid deposition of sediment observed during the excavation time lead us to believe that there might be places in grids which still need to be finished, where the cultural layer is much deeper and thicker than studied so far, which makes it possible that a large number of artefacts are still buried in deeper sediments.

The horizontal dispersion of artefacts is more complex, although at a large scale we recognized a conical debris field of approximately 3800m of length; the situation in the main part of the site differs of that pattern. Actually the artefacts seem to have been driven more by the surge, back and forth, from their original position on the seabed than by the tidal currents. This situation creates a radial pattern of distribution, quite clearly recognizable in the case of the coins. The main accumulation of silver coins (bigger clumps and higher density of loose coins) appears in grids S18 and S19 (eastern and western sections respectively) and the scattering of loose coins and small clusters was observed to the North and South of this spot with the same response, until approximately 5m of radius from the nucleus. We observed a slight tendency to a NNW-SSE arrangement on the artefacts, coinciding with the most common directions of the surge, but in the overall picture we can identify a radial pattern of distribution, at least in the excavated area.

So far the only two categories of artefacts found on this wreck had been Cargo and Ordnance (silver coins and cannon balls) with only two occurrences of Domestic / personal items, in the cases of the broken olive jar and two bottle tops. No navigational instruments or any other category usually found on wrecks have been found yet. This is understandable due to the rough sea conditions where the wreck lies, as heavier objects would travel shorter distances than lighter artefacts; presenting us with a situation where the debris field of wreck material could be sensibly bigger than originally expected.

For the type of artefacts observed on the site (rudder pintles, anchors, cargo
being excavated, but the absence, so far, of stronger structural parts of the hull or fittings does not yet confirm this theory.

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

**Ordnance.**

The artefacts belonging to this category observed on the site during this initial phase of the excavation were 3 bronze cannons, 5 iron cannons, 14 iron cannon balls and 3 lead shot.

**Bronze cannons.**
The bronze pieces of artillery were found at 812m to the SE of the main site, on a rocky seabed at 14m depth, and were named G1, G2 and G4. Another cannon (G3) was found in their vicinity, but as is made of iron, which will be explained later.

Cannons **G1** and **G4** are of the same type (demi-cannons), most likely made by Cristoforo Giordano who worked in Naples for Filipe II between 1583 and 1594. The name of the Capitan General of the Spanish artillery in Italy (probably Juan Vazquez de Acuña) might be written in one of the 3 shields engraved on the cannons, but the concretion does nor yet allow proper reading, which might be possible once the cannon are recovered and treated at our conservation facilities at Ilha de Moçambique. These cannons are in remarkable condition with 3 visible marks (apparently the Spanish shield and two illegible oval coat-of-arms) and more ornamented than G2.

![Measurements of bronze cannons G1 and G4](image)

*Overall measurements of cannons G1 and G4 and location of the shields.*
The work of Giordano can be recognized, among other features, by the particular dolphins which are representing two wrestlers facing each other.

Detail of the dolphins of G4, still concreted on the seabed (left) and one of the dolphin on a cannon made by Giordano (right). Note the similarity.

Rear end of G4 showing the location of the shield and coats-of-arms.
Cannon G2 presents no shields or inscriptions which could help in its identification, but resembles the work of the Bocarro's, Portuguese family who worked in India in the early XVII century. The only mark that was found on cannon G2 is located on the upper part of the rear end of the cannon, near by the cascabel and is not very legible; the surviving characters are “oo----8s”

Measurements of bronze cannon G2

Archaeologist taking the measurements of cannon G2 and detail of the dolphins.

Note: As these cannons are still in situ, some measurements could be not completely accurate due to the sea growth. When storage and conservation facilities are ready, these pieces will be recovered and conserved and more information for their study will be available.
Iron cannons.

The iron pieces of artillery found on this wreck are all similar but due to the heavy concretion on them only very rough measurements were possible to take. Cannons were named G0, G3, G5, G6 and G7, all are 2.5m long, muzzle loaders and only G6 and G7 are in relation, as the rest of the guns are isolated and very far one from the other. G3 is in the vicinity of bronze cannons G1 and G2 and it has a curious feature resembling a pair of dolphins, but as is so misshaped because of the concretion there is no chance to assure or discard that.

Iron cannon balls.

A total of 14 cannon balls had been found on the site, some of them concreted to clumps of silver coins, the other isolated. They can be separated in two groups, Medium (5kg or 11 pounds) and Small (2kg or 4.4 pounds). The Medium size group (7 items) it has a diameter of 0.10m and considering the logical loss of mass after almost four centuries of immersion in salt water, we can assume that were to be used in the bronze demi-cannons (G1, G2 and G4) which were 12-pounders with a diameter in the bore of 0.11m and 0.13m. The Small size group (7 items) it has a diameter of 0.07m and were probably used by the iron cannons; which by their size seems to be 4-pounders. No stone shot or bar shot had been found on the site.

Lead shot.

The three lead shot found on the test pit around cannons G6 and G7 are exactly the same type with a weight of 35gr and a diameter of 18mm. None of these lead shot were fired.
Cargo.

A total of 55 artefacts catalogued as Cargo had been recovered so far from the wreck, all of them silver coins, loose, in clumps and concreted with cannon balls. Each artefact number is composed by a group of coins found in a specific area, giving this way the exact location from where the coins were recovered. Therefore we have a considerable higher number of individual coins than artefacts numbers.

All silver coins were found buried into the sediment, varying in depth from 0,15m to 1m in few of the cases. From the central nucleus of these artefacts (eastern edge of S18 and western edge of S19), where the concentration of heavy clumps was located, the scattering covered a radius of approximately 5m in every direction, where the loose coins were located as a layer 0,2m thick.

Layer of loose silver coins at a depth of 0,4m in S2 grid

The approximate number of silver coins recovered so far (contained in the referred 55 artefacts) is 20,248 and the final exact number will only be possible to know when all the coins are properly cleaned and conserved, as today there are many of them in clumps and the amount can only be estimated.
Once one artefact number, containing various numbers of items, were cleaned in the laboratory, the coins from its content were catalogued individually in three groups as follows:

1. **Numismatic coins**: All pieces with information (mintmarks, assayer marks, etc.) that could help in their study and identification.
2. **Eroded coins**: All pieces without marks but still with the shape and features of a coin. In most of the eroded coins the geographical area of origin is recognizable.
3. **Washers**: All pieces that have lost all information on them and have become a thin sheet of silver.

All numismatic coins were introduced individually in the Access database prepared for that purpose, with each coin acquiring an individual number rooted on the artefact number from which it belongs. That way the coins from artefact 2085 were numbered 2085.001, 2085.002, etc.

Some of the clumps (e.g. artefacts 2095 and 2111) still conserved the shape of the canvas bags that contained the coins and were object of very careful attention during the conservation process and cataloguing in order to find a storage system by types or denomination, but so far that has not resulted in a comprehensible pattern.

For instance, artefact 2095 (the one that looked more complete as the original bag) provided 748 coins, from which 351 (46.92%) were of 8 reales and 397 (53.07%) were of 4 reales, representing 4396 reales. As to the geographical area of origin of the coins we could see that 314 (41.97%) were minted in Spain, 114 (15.24%) were minted in Potosi and 320 (42.78%) in Mexico.

The only trace of regularity in the packing was found in artefact 2105, a clump of 146 coins from which 142 (97.26%) were minted in Potosi and only 4 (2.73%) were minted in Mexico.

These proportions, as we will see below, are not the ones shown in the wider sample of catalogued coins. Also, no soft packing material was found between the coins to prevent them from scratching against each other.
Coin statistics.

The preliminary study of the coin collection from this wreck has been based in the coins already cleaned in the laboratory which have enough information to be, at least, statistically useful if not more. Therefore all the numismatic coins and most of the eroded coins (the ones where geographical area of origin and denomination had been recognizable) have been included. As for the Washers, they are only listed by their number and weight as no further information could be retrieved from them.

From the estimated 20,248 coins recovered from the MOG-003 wreck site a total of 6,552 were cleaned and studied. 797 of them fall in the category of Washers, 2,466 are eroded coins and 3,289 are numismatic coins. This makes a sample size of 5,755 coins, which were analyzed.

From this sample the denominations distribution is: 58% in coins of 8 reales (3,328 coins), 42% in 4 reales (2,421 coins) and 0.14% in 2 reales (6 coins). No other denomination was found in the sample.

The geographical distribution of the sample showed a majority of coins minted in Mexico (2,385) followed by the Spanish coins (2,032) and in a smaller percentage the ones minted in Peru (1,338).
The Mexican coins have been found in a 70%–30% perfect proportion between 8 reales (1675 coins) and 4 reales (710 coins) respectively, with a date range from 1600 to 1621, based on the assayers' period of work, although there are a few coins with the mark of assayer "O" who is known to have worked only under the reign of Philip II (1556-1598). The assayers found on the Mexican mint sample are D (Diego de Godoy), F (Francisco de Morales), A (Antonio de Morales) and O (Luis de Oñate?) distributed as follows:

One of the earliest Mexican coins found on the wreck. Assayer O, minted between 1556 and 1598 under the reign of Philip II. Artefact 2089.066
With regards to the denomination, the Spanish coins have an inverse proportion to that of the Mexican coins, with the 4 reales appearing in a 70% (1412 coins) and the 8 reales in a 30% (614 coins). Also the only 6 coins of 2 reales found so far are all minted in Spain. The mint distribution inside the Spanish sample coins has a wider variety than that of the other geographical areas, as we find coins minted in several Spanish mints to include: Seville, Toledo, Madrid, Segovia, Valladolid and Granada. This study also included the coins that although not having a visible mintmark, showed all the characteristics of the coins minted in Spain during that period. These coins are identified as “unreadable mint” in the graphic below; which shows the proportion of the different mints inside the Spanish coins.

As expected in this heterogeneous sample the variety of assayers is consequently high, finding the following assayer marks: C, P, encircled M and V in Toledo; D, B, G, H, P and V in Seville; V and G in Madrid; M in Granada, IO in Valladolid and IM in Segovia. The data range comprises from 1590 (in a coin from Toledo, assayer encircled M) to 1622 (coin from Seville, assayer D).
The sample of coins minted in Peru (Lima and Potosí) shows the highest proportion of coins of 8 reales (78%, 1039 coins) in comparison with the other geographical areas. Also the vast majority of coins in this group were minted in Potosí (1334 coins, 99.70%) and only finding 4 coins that have been minted in Lima (0.30%). The assayers found in the coins from Potosí are: Juan Ballesteros Narváez with brother and son (B, 1591-1601), Baltasar Ramos Leceta (R, 1602-1614), Agustín de la Quadra (Q, 1614-1616), Juan de Muñoz (M, 1617) and Juan Ximenez de Tapia (T, 1618-1621), with a span of dates from 1591 to 1621 and the following distribution:

![Pie chart showing assayers distribution](image)

*Coin minted in Potosí in 1617, Assayer M (Juan de Muñoz), date above the cross, Artefact 2087.001*
Coins comments.

The dates in the American Hispanic coins didn't appear until long after those of Spain. So it is normal to find coins of Mexico of the assayer O and F (from Philip II and Philip III), undated, the same as coins from Potosí previous to 1618.

It is known by a document with date of 1564 that the name of the assayer O was Bernardo de Oñate. By the middle of 1580, the post was occupied by one Luis de Oñate. So far the relationship between both hasn't been completely established, but for the similarity of the last name and the immediate succession one can suppose that Luis de Oñate should have been the son of Bernardo de Oñate. On this matter one can say with security that assayer Bernardo served before, during the transition of the coins with Carlos and Juana legends (the coins with the Columns), to Philip II coins (the coins with the shield of Hapsburg). Now the problem is that, as both used the initial O in the Philip II coins, so far one cannot determine to which of the two assayers this mark belongs and we doubt that one can ever arrive to a concrete answer.

Among the coins of Mexico there is also an instance in that there was a double assayer in the coins and they appear with an F/D in the same coin (apparently D over F). Both are assayer marks and these coins are considered rare. They are known in all denominations and are rarely mentioned in numismatics' books.

Few Mexican coins of the assayer A were found with a struck date of 1600, but this date is not very reliable. These coins are quite well-known, but it is accepted that for unknown reasons they were made between 1608 and 1610 with this struck date of 1600. It is known that assayer Antonio de Morales (assayer A) worked in his father’s absence, Francisco de Morales, for a 10 years period; but from him are only known coins with dates from 1608 to 1610 (with exception of the coins with date 1600). As it is accepted that the mint of Mexico began to use dates on the coins only in 1607, it is considered that these coins and others with date of 1603 and assayer's mark F, were made after 1607, although for inexplicable reasons they were dated with previous dates.

Of the 4 coins found so far as minted in Lima, 3 belong to the assayer Diego de la Torre (D with "o" above). Diego de la Torre served as assayer from 1577 up to 1587 and then in a last intent around 1592. The coins always shows a * that is the supplemental mark of Lima to differentiate them, since the P at that time was also used by Potosí. The coins of Lima of this period are always those of better appearance, all being almost perfectly round. It is strange to find a coin of Diego de la Torre that doesn't have this high quality.

A curiosity was a coin minted in Sevilla found with a denomination of 2 reales struck on the coin and a weight of 4 reales, what is without a doubt an error. This error has been seen in several occasions but what gets the attention in this coin is that it is always more common to find the opposite of this case that is to say, coins of smaller denominations with stamps of higher denominations (e.g a coin of 4 reales weight with a stamp of 8 reales). In the coin of our case, it seems that it became very thick and in spite of the cut it had to be left in 4 reales independently of the stamp of 2.
Miscellaneous.

The iron rudder pintle (PT1) located in S8, was found in 2004 half exposed on the seabed, with the pin protruding about 0.25m over the sand. Today is completely buried and was relocated only due to the measurements previously taken during the non-intrusive survey.

This pintle is of the type that was attached to the hull in the stern, above the water and pinned into one of the gudgeons (generally bronze) which were attached to the rudders itself. There are no internal pins or bolts remaining in this pintle, although it hasn’t been completely excavated to this date. The possibility of this pintle had been actually attached to the hull makes it more probable that at least part of the stern of the ship ended in the area we are investigating right now. The 6 anchors found on the debris field of the wreck are of the same “arrow” type and measurements. All of them are complete with the only exception of A5 that has a missing fluke.
Tentative Identification.

Based on archival research we know that the *São José*, under the command of the captain Dom Francisco Mascarenhas was the *Almiranta* of the Portuguese fleet that left Lisbon on the 18th of March 1622 on the annual journey to Goa, India. The accompany ships were the *Capitana* of the fleet, the nau *Santa Teresa*, under the command of Dom Filipe Lobo and the nau *São Carlos*, under the guidance of Dom Francisco Lobo and where the future Vice-Roy of India Dom Francisco da Gama, Conde de Vidigueira, was travelling himself. A small galleon named *São Salvador* was together with these big carracks and, curiously enough, was the only ship that arrived unharmed in the harbour of Ilha de Moçambique during this trip.

On the night of the 22nd of July, when the four ships were near Mogincual almost arriving to Ilha de Moçambique they were attacked by the Anglo-Dutch War Fleet. The Anglo-Dutch charged with five ships first against the *Almiranta São José* which; because of her position in the fleet (at that time in the rear, closing the convoy) was quite isolated and therefore an easy target. Four ships started firing their cannons against the *São José* meanwhile one sailed a little further to the North to intercept the *São Carlos* which was coming back to assist the distressed *Almiranta*. Both ships fought the Anglo-Dutch Fleet the entire night and the morning of the 23rd, but at the end of the afternoon the *São José* had almost stopped resisting due to the fact that the Captain and most of the crew were ill and the Pilot was killed during the battle. The ship itself was very damaged by the enemy fire having ripped most of the sails and cracked even the main mast, therefore they made to decision to turn towards the coast in an ultimate and desperate attempt to escape from the enemy and gain some time to repair the ship.

But on the way to land a shoal in Mogincual (today called *Infusse*) was blocking their way. The ship first struck a deep reef losing the rudder been left ungoverned and in the hands of the elements. They threw an anchor trying to stop the ship but were washed away towards land into deeper waters again and drifted closer to the coast where the ship finally broke apart and sank in deep waters the next day.

The Anglo-Dutch Fleet left the *São José* alone and continued chasing the *Santa Teresa* and *São Carlos* until the very entrance of the Moçambique Island. Once inside the island of Goa these ships beached on a sand bank (today's Banco São Lourenço) before arriving under the protective cannons of the São Sebastião fortress.

Considering these ships of no further interest the Anglo-Dutch Fleet returned to Mogincual with the intention of recover the treasure carried by the *Almiranta* of the Portuguese Fleet as they knew that the *Capitana* and *Almiranta* were carrying the majority of the King's money.

The Portuguese on the *Almiranta São José* were in the meantime able to unload only a small part of the King's money, nothing of the treasure of privateers and 120 people, because the auxiliary boat of the ship was destroyed during the battle, they were quite far from land and the Captain and the Pilot were unable to direct that operation.

When the Anglo-Dutch arrived to the *São José* they took "some 66000 rials" and 100 prisoners, but rapidly the ship started to brake up and sank "with an infinite wealth" and "drowning three or four hundred people and one Englishman" which were on board.
As the original cargo manifest of this ship is missing there are many speculations about the exact amount of money that was lost in the wreckage, but almost all agree that a "huge treasure" was lost.

The figures vary depending of the various versions known:

- The Portuguese say that they salvaged "some of the King’s money and nothing of privateers" (confirming that private bullion was transported in the ship besides the King’s money) and that the Anglo-Dutch only managed to steal 30 000 cruzados. "Da nao almirante se salvou parte do cabedal do Rei, e nenhum das partes, e ate as orfás del Rei levarão os inimigos e muita outra gente cativa" (Biblioteca Nacional de Lisboa; Reservados; Caixa 26, nº 153)
- The English version says that they recovered 68 558 cruzados and split this amount between themselves.
- From the Portuguese archives we can assume that 160 000 cruzados were on board when the ship sank; from a letter of the Vice-King of March 11, 1624 (BNL Fondo General 1871) " 9 chests of silver with 18 000 cruzados and 142 000 cruzados were lost ".
- Boxer (Charles) says- "a part of the Portuguese would have saved part of the silver and the Anglo-Dutch took 68 558 cruzados and 100 prisoners".
- Foster (Williams) says- "66 000 pieces of 8 were saved before she sunk".

Due to the nature of the artefacts, the characteristics of the ordnance and the composition of the cargo of silver coins, we can assume that the wreck remains located and partially excavated belonged to an early XVII century ship, most probably of Portuguese origin and so far everything indicates that was coming from Lisbon and not from India.

The geographical area where the wreck is located, the long scattering of evidences of the struggle of the ship and her crew during the accident, the amount of silver coins excavated and the information provided by the cannons and coins points most probably to the identification of this wreck as the São José.

The uniformity of the whole coins sample, regarding denomination, geographic area of origin and date range, made it quite obvious that we found parts of a cargo and not the belongings of privateers or merchants. This, in addition to the fact that not one single coin or assayer has been found of a date later than 1622, and that every coin with a visible 1622 date struck in it was minted in Spain, strongly reinforces the theory that MOG-003 wreck site might in fact be the 1622 Portuguese fleet Almiranta – The São Jose. Nonetheless, further excavation, conservation and a deeper analysis to be made on the coin cargo of this wreck by a numismatist would help to shed more light on the comprehension of this highly interesting site.
Site description and first finds.

This wreck site is located at 5m depth on the North side of the channel 1110 meters in front of the San Sebastian fortress and consist of a ballast stone mound under a coral reef that grows over the wreck, some iron debris, possibly rudder pintles, is also present. 6 Interesting lead ingots were found in small test sondages performed on the site during the survey of 2001. These ingots were boat shaped; with marks and weight app. 50kg each. One of these lead ingots was recovered for identification purposes. At that time no wood structure, anchors or cannons were found in this site. On a later survey during 2003, one iron cannon (G1) was located, very concreted and partially covered by the ballast.

The entire area around the ballast pile was checked with metal detectors and test sondages were made in order to define the stratigraphy and the depth of the wreck remains. Two of the sondages were stopped reaching the hull timbers and the third stops at the layer where the lead ingots were found with loose wood. Some sample artefacts were recovered to help in the assessment of the site and the possible identification of the wreck. All the test areas were backfilled at the end of the dives in order to protect the hull remains from further degradation and future detailed study.

By the nature of the finds, including ornamented ceramic artefacts and the type of lead ingots suggested that IDM-003 was most probably a Portuguese ship that sank on its return voyage from India at the end of the XVI century or the beginning of the XVII.

Excavation was then planned for 2005, when a bigger team and adequate equipment could be mobilised.

Sediment nature and hydrographic conditions.

The area where the wreck site is located is a deposition bank at the edge of the deep channel of entry to Mozambique Bay: is the area of counter currents, either in the incoming or the out coming tides, creating a kind of swirl which concentrates the sediments transported by the tides. Therefore the nature of the seabed in the place is made by very fine grain sand (mostly mud) on the first layer, followed by a thick layer of packed dead shells and coelenterates skeletons. The surface of the seabed presents some patches of sea-grass, mainly *Thalassia testudinum* and *Siringodium filiforme*, over a clean layer of sand. The only coral formation in the area is precisely the one that grew over the wreck; which, providing a solid basement, allowed the coral colonies to conquer the site, something that would be impossible on the soft ground of the seabed there. The coral colonies though, are of very fast growth with light skeletons and weak attachment to the ground (leaf coral predominantly), been the only big colonies (*Montastrea Sp.* and *Diploria Sp.*) attached to some big iron objects and concretions.

The area is of quite gentle hydrographic conditions, not been exposed to important ground swell, surge or even heavy swell. Currents are felt on spring tides but not strong enough to be taken into consideration as for wreck material dispersal, although sedimentation is very fast and objects are buried very deep under the sand quite quickly.
Excavation.

Excavation began on 04 July 2005. The first objective was to establish a web of permanent datum points which would permit the precise mapping of the terrain and the wreck remains. On a previous survey done in 2003, with the objective to assess the site and learn if was of enough cultural interest to justify an archaeological excavation, we opened 4 small test pits with the following results:

**Test 1** (Northern edge of the ballast pile, 1.5 x 1.5m) – 4 lead ingots (left *in situ*) were found at a depth of app. 50 cm under the sand with no indication of arrangement, small fragments of coarse ceramic were observed as well as some small remains of wood (not ship’s timbers). This sondage didn’t reach the bedrock or the hull of the ship at a depth of 60 cm under the sand.

**Test 2** (Western edge of the ballast pile, mid section, 2.5 x 1m) – 4 intact olive jars (including one which was still closed and with its contents later identified as olive seeds) were found on top of the hull timbers under 15 cm of sand, mixed with fragments of a martaban, other necks of olive jars and black earthenware. A section of 4 hull timbers (3 parallel planks and 1 rib) were exposed at a depth of 35 cm under the sand and buried under a big coral head located in the southern edge of the pit. Inside the cavities between the timbers we found small ceramic flasks in good condition and several fragments of them, as well as 3 lead shot, 9 silver coins (very concreted) and 2 pendants in form of a hand (so far unknown material but possibly lignite). The excavation was stopped when we reached the wood structure.

**Test 3** (Southeast of Test 2, adjacent, 0.75 x 0.75m) – 1 intact olive jar was found in this small trench at a depth of 15 cm under the sand and also resting on one timber. Many fragments of olive jars were seen. Excavation stopped at the wood structure (the plank exposed is parallel to the other 3 in Test 2).

**Test 4** (5m South of Test 3, 1 x 1m) – 1 intact olive jar was found in this trench at a depth 25 cm under the sand but no timbers were observed, just a few loose wooden parts. Several fragments of coarse ceramics were also discovered.

Based on these results a decision was made to start the excavation by the Western edge of the ballast mound, on the mid section (where Test 2 was opened) as the ship seemed to have fallen to that side and collapsed over the starboard side.

A grid network was deployed with 2 grids in the beginning (5m x 5m), S1 and S2 with the intention to open the next one led by the excavations results on these two grids. The grids were demarcated by plastic ropes of 6mm diameter marked every meter with a plastic tag and marked in black every 5m. Also vertical datum points were prepared for the case that stratigraphy was to play an important role in the understanding of the site.
It is worth noting that under water, archaeological chronology can have a different significance to that of an archaeological site on land. In the excavation of a shipwreck, stratigraphy usually relates to a single event in time. Consequently, the stratigraphy may have little or no temporal significance, but it may have a particular spatial significance. Thus a shipwreck lying upright on the seabed will disintegrate in time. Anything lying on top of another thing is there because of a spatial relationship rather than a temporal one. If the ship settled upright on the bottom, material would generally collapse downward and outwards. If a ship sank heeled over on its port side, the guns (for example) on the starboard side would lie on top of the port guns after the wreck collapsed. This would tell the excavator where they had come from on the ship after the interpretation of the events subsequent to wreck from the excavation. The unusual circumstance of a wreck, with the immediacy of the event, makes the spatial aspect of the site of much greater significance than the temporal. This does not mean that one should ignore stratigraphy; the point is simply that the vertical component may be of no more significance than the horizontal.

Due to the soft nature of the sediment and the fragility of some of the artefacts observed during the test sondages, we decided to use only the water lift to remove the overburden from the site and the lifting bags to remove the coral heads that were attached to the iron concretions.

All divers were carrying writing slates to record the exact measurements and locations of the artefacts, net bags and plastic rigid boxes to bring the artefacts to the surface and measuring tapes to refer the depth under the original seabed in where the artefact or structure feature was found.

The water pump, fueling the water lift, was placed in an inflatable boat right over the excavation spot in order to release a minimum length of hose and therefore to avoid any unnecessary disturbance of the site.

In total were excavated 9 grids over the 2005 season, covering an area of 225\(m^2\) of the western and part of the northern sectors of the wreck and excavating approximately 40% of the area with cultural interest.
Geographical location of IDM-003 wreck site in Ilha de Mozambique.
IDM-003 Site plan
(as per 30 November 2005)

Category
- Cargo
- Domestic
- Professional instrument
- Personal belongings
- Unknown
Results.

Excavation started on grid S1 from the Northern side of the coral head and going North. We reached the wood structure of the hull found on the previous test pit and excavation continued at that level following the spaces between the timbers until the wood planking underneath.

**S1 Grid.**

| Nature of the overburden:       | Fine sand/mud and some shells |
| Depth of the overburden:        | 0.30m                         |
| Depth of the cultural layer:    | 0.25m                         |
| Average depth excavated:        | 0.50m                         |
| Artefacts observed:             | Wood structure, coarse ceramics |
| Artefacts recovered:            | 42 artefacts                  |
| Excavation status:              | Finished                      |

The excavation of this grid started from the Southern edge, besides the big coral head, going first East and North and then to the West at a depth of 0.35m. The excavation was done in two phases (in this and all other grids); first removing the overburden of the entire grid until a depth of approximately 0.30m, where the first artefacts began to appear and the second excavating carefully this thin layer and going deep between the hull timbers until reaching the planking underneath. The Southern sector provided most of the artefacts, apparently concentrated there due to the action of the coral head acting as a mechanical barrier for the horizontal dispersion. There was a mixture of cargo, domestic and personal belongings, with a majority of domestic items. There are also clearly burned timbers indicating a fire on board.
S2 Grid.

Nature of the overburden: Fine sand/mud and some shells
Depth of the overburden: 0,30m
Depth of the cultural layer: 0,25m
Average depth excavated: 0,70m
Artefacts observed: Wood structure, coarse ceramics, lead seals
Artefacts recovered: 28 artefacts
Excavation status: Finished

We opened S2 to the South and adjacent to S1 surrounding the coral head. The wood structure from S1 continued all along S2 in a Southwest direction although in the Southern section of the grid many loose and smaller timbers started appearing. The hull continued uninterruptedly under the coral head, which grew over an unidentified iron object resting on top of the timbers. We studied the possibility of removing this coral to excavate underneath but this proved to be too risky endangering the wood structure; we therefore decided to excavate to the best of our means under the coral and left it undisturbed. Most of the artefacts were found in the NE corner of the grid, adjacent to S1, S3 and S4 and were of the same categories as the last grid, of special interest a small group of silver coins found beneath the timbers. Two very interesting lead seals were excavated under the timbers, one of them with the Portuguese “esfera armilar” and the other one with an unidentified coat of arms, both with relief. On the West sector of the grid the wood structure disappeared, been broken and burnt in the ends of the timbers; the sediment as well was deeper in this part of the grid, reaching 1,8m to the sterile layer. Three big concretions produced by iron objects were located in the centre of the grid but were left undisturbed.
**S3 Grid.**

<table>
<thead>
<tr>
<th>Nature of the overburden:</th>
<th>Fine sand/mud and some shells</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depth of the overburden:</td>
<td>0.30m</td>
</tr>
<tr>
<td>Depth of the cultural layer:</td>
<td>0.25m</td>
</tr>
<tr>
<td>Average depth excavated:</td>
<td>0.70m</td>
</tr>
<tr>
<td>Artefacts observed:</td>
<td>Wood, olive jars</td>
</tr>
<tr>
<td>Artefacts recovered:</td>
<td>21 artefacts</td>
</tr>
<tr>
<td>Excavation status:</td>
<td>60% Excavated</td>
</tr>
</tbody>
</table>

This grid was excavated following the trail of coarse ceramic artefacts found in the NE corner of S2 at the depth of the wood structure. An interesting concentration of olive jars was found on the SW corner of S3, entering S4 to the South. The olive jars were arranged between the ship timbers in a row of 6, pointing the mouth to the SE, all in the same direction. Several fragments of olive jars were found as well in the centre of the grid, apparently broken by a slid of ballast stones over them. The part of the hull exposed from the ballast pile appeared very loose and disorganized. Mostly Cargo artefacts were found in this grid, although a few domestic items were excavated in the NW sector of the grid and the entire eastern half of the grid is still not excavated. The excavation to the East stopped when was reached the main body of ballast stones resting on the timbers and no artefacts were visible on the whole cultural layer. The removal of the ballast is planned for the next phase, when the study of the hull underneath it can be started.
S4 Grid.

Nature of the overburden: Fine sand/mud and some shells
Depth of the overburden: 0,30m
Depth of the cultural layer: 0,25m
Average depth excavated: 0,70m
Artefacts observed: Wood, olive jars
Artefacts recovered: 12 artefacts
Excavation status: 70% Excavated

The wood structure in this grid almost disappeared to the East and South of the area and the only artefacts found belonged to the Cargo category. Some pieces of round timbers were found in the centre of the grid, apparently transported in the ship for minor repairs of the woodwork. The only concentration of artefacts was the olive jars located in the NW corner of the grid belonging to the group which was excavated in S3. The depth of the sediment gets higher when advancing to the South, but the sterile layer is reached at approximately 0,70m the same as the previous grids.
**S5 and S6 Grids.**

Nature of the overburden: Fine sand/mud, sea-grass and some shells
Depth of the overburden: 0,50m
Depth of the cultural layer: 0,15m
Average depth excavated: 1m
Artefacts observed: Wood, olive jar
Artefacts recovered: 2 artefacts (S5) 1 artefact (S6)
Excavation status: Finished

These grids made the Southern end of the debris field of this wreck site. The wood structure disappears in the very North of both quadrants and only few loose pieces of wood were observed. Almost no ballast stones are present in this area which we believe could be the bow of the ship. Two Domestic category and one olive jar were found on both grids, reinforcing the theory that no more debris is present further to the South. Excavation continued until 1,9m depth under the sand in order to try to locate any other wreck remains possibly buried deeper but no further wreck evidence was registered.
S7 Grid.

Nature of the overburden: Fine sand/mud, sea-grass, shells
Depth of the overburden: 0,40m
Depth of the cultural layer: 0,40m
Average depth excavated: 0,90m
Artefacts observed: Wood structure, olive jars, tusks
Artefacts recovered: 37 artefacts
Excavation status: Finished

This grid was established at the North and adjacent to S3, following the bigger timbers in the structure of the hull which were orientated SW-NE within this area. The overburden was thicker than in the previous grids and the cultural layer was also wider, mostly to the West of the grid. Several olive jars from the cargo were found, but a higher occurrence of personal belongings and the first professional instruments were also noticed. As highlights of the artefacts excavated in this grid an intact statue of Jesus Christ (13cm height, made in pewter), one intact Chinese porcelain ewer (from the Ming Dynasty) and two sets of navigational dividers in very good condition must be mentioned. Several fragments of a Chinese porcelain plate were found on different areas of this grid and which were later restored to form the entire piece. The diverse nature of the finds in this grid lead us to believe that we were approaching the stern section of the ship, where most of the cabins were located and therefore more diverse categories of artefacts are to be expected. Some elephant tusks and hippopotamus fangs were located as well but left in-situ for further study before excavation. Some small fragments of glass were observed in this grid and one intact drinking glass was recovered.
S8 Grid.

Nature of the overburden: Fine sand/mud, sea-grass, shells
Depth of the overburden: 0,40m
Depth of the cultural layer: 0,60m
Average depth excavated: 1,20m
Artefacts observed: Wood structure, olive jars, tusks
Artefacts recovered: 17 artefacts
Excavation status: Finished

This grid was deployed at the North and adjacent to S7, following the timbers in the structure of the hull which continued with the orientation from the previous grid. Excavation started from the SE locating the wood structure at 0,45m that continued further North as well as the common fragments of coarse ceramics and more abundant Chinese porcelain shards. The fragmented bottom of an unusually large Martaban jar was observed in the NE corner of the grid (under the coral) and was partially excavated, but left in-situ. The wood structure disappeared towards the West, where some loose portions of timbers were observed without being related. The depth of the grid increased in that direction getting up to 1.20m to reach the cultural layer. More navigational instruments (one intact set of dividers and one intact copper measuring instrument) were found in this area as well as stone shot and iron cannon balls. Two interesting concentrations of lead shot were observed between the timbers, contained between two thinner planks as if this was the original location of these items.
**S9 Grid.**

- Nature of the overburden: Fine sand/mud, sea-grass, shells
- Depth of the overburden: 0,50m
- Depth of the cultural layer: 0,30m
- Average depth excavated: 1,00m
- Artefacts observed: Wood structure, personal belongings, lead ingots
- Artefacts recovered: 9 artefacts
- Excavation status: Finished

This grid was opened to the East and adjacent to S8, 1m displaced to the North avoiding the main concentration of ballast stones. The wood structure is less organized in this grid than in the previous ones, but the first evidence of breaking and collapsing of a side (starboard side of the ship, we believe) was observed under the Northern edge of the ballast pile. More concentration of fragments of ceramics and a large iron concretion laying on the timbers were observed in the West sector of S9 at a depth of 0,35m. Two boat-shaped lead ingots of approximately 50Kg of weight were located in the Northern sector of the grid, but were left in-situ for further photography and excavation during the next phase. Small fragments of Chinese porcelain still occurred in this grid, mostly among the ballast stones of the East sector. Elephant tusks, hippopotamus fangs, and coarse ceramics were present in the North of the grid where the depth of the sediment reached 1,90m to the cultural layer. One ivory piece of a table game (probably checkers) and one pewter buckle were the personal belongings found in S9, but another set of navigation dividers was found deeply within the timbers. Due to this finds is very likely that S9 belongs already to the stern section of the ship.
Interpretations.

As approximately 40% of the probable debris field of this wreck site has been excavated we can already start getting a rough idea about the position of the wreck and the area we had been working. There is a strong possibility that the ship had run aground in the shoal when sailing from the interior of the Mozambique bay to the open sea. An accident in the rudder, a temporary loss of control of the ship in the channel, with the Southerly predominant winds in the area, would force the vessel to end on top of that shoal in a matter of minutes. What we believe is the bow section of the ship is pointing SSW, almost parallel to the navigation channel in that spot and heading outwards, been the stern section on NNE direction pointing to the interior of the bay. The excavated area, on the S, E, NE and North (partially) seems to have covered the starboard side of the ship, from the bow until approximately 4/5 of the level of the stern along 23m.

The distribution pattern of artefacts, horizontal and vertical, in this wreck is quite typical for a ship sunk in shallow waters but in a relatively calm area. There are no strong currents that deserves to be taken into account when analyzing scattering of artefacts, only the action of the moderate swell produced by the storms which comes from then South is of some importance. The fact that this area is of fast deposition sediment, normally carried by the current on ebb and high tide, helped in creating a “trap” which holds the artefacts stored in the interior of the ship which no sensitive displacement in the horizontal component. Therefore the artefacts found in a specific section of the wreck are more likely to belong originally to that section of the ship, in the different levels of decks and hold.

The stratigraphic arrangement of the wreck material in this site is simple showing a typical pattern of collapsing decks and their contents, been the shallower objects the ones which belonged to the upper decks. There is a certain horizontal displacement (to the West) in the case of the upper decks material due to the natural inclination of a stranded ship in such shallow waters.

The depth of the overburden increases to the West of the debris field where the wreck material is scarcer, from a minimum of 0,30m in the eastern grids to a maximum of 0,90m to the West of S7 where wreck material was found at a depth of 1m.

The depth of the archaeological layer varies from 0,15m to 0,60m mostly modulated by the location of the stone ballast mound on the centre of the ship (where the cultural layer is thinner), increasing to the West like the depth of the overburden. The kind of sediment observed on the area made very well possible that there could be spots towards the West which could contain wreck material at levels deeper than 1m, most probably part of the rigging and loose elements of the upper decks.

The type of artefacts found so far comprises the categories of Cargo, Domestics, Personal belongings, Professional instruments and Ordnance, showing a rich scope of the trade, navigation and life on board during the early XVII century.
The artefacts.  (Complete list in Annex)

Ordnance.

The artefacts belonging to this category observed on the site during this initial phase of the excavation were 1 iron cannon, several iron cannon balls, stone shot and lead shot.

The iron cannon.

The only cannon found so far on this site is a muzzle loader (G1) of 2.5m length and most probably a 4-pounder, based on its length and the presence of this type of ammunition on the site. The measurement of this piece is very rough as the cannon is heavily concreted and misshaped due to its location in the centre of the ballast mound. The fact that is partially buried by ballast stones suggests that the cannon was originally placed on deck and when the ship stranded and fell to starboard side this piece fell as well and partially covered by the slide of ballast stones. The bore, cascabel, trunnions and any other feature of the cannon are completely unrecognizable in the present condition of concretion and oxidization.

Iron cannon balls.

A large amount of cannon balls had been found on the site, all of them concreted in clumps on grids S7, S8 and S9 mainly. They can be catalogued as Small (2kg or 4.4 pounds), with a diameter of 0.07m and were probably used by the iron cannon and others similar to G1.

Stone cannon balls.

Four stone shot were observed in the site. They are perfectly spherical and their diameter varies between 0.15m and 0.25m. No piece of ordnance has been found so far on the site that could have used these projectiles.

Lead shot.

The large amount of lead shot found on grid S8 are exactly the same type with a weight of 35gr and a diameter of 18mm. None of these lead shot were fired. Two interesting concentrations of lead shot were observed between the timbers of the hull, contained between two thinner planks as if were the original storage location of these items.
**Cargo.**

The types of artefacts found so far on this site that can be catalogued as cargo are the olive jars, Martaban jars, ceramic lids, lead ingots and elephant and hippopotamus tusks. This conclusion has been reached due to the large amount of these kinds of artefacts and the traces of arrangement observed among them.

**Animal tusks.**

A total of 22 animal tusks have been found on the wreck, only 7 of them were recovered and conserved for identification purposes. Four of these tusks apparently belong to Asian elephants (*Elephas maximus*) and three to hippopotamus (*Hippopotamus amphibious*).

![Two elephant tusks (Art. 15009 and 15010) left, and hippopotamus fangs on the right (Art. 15000).](image)

The animal tusks were observed mostly scattered on grids S7, S8 and S9, but in two occasions (West sector of S8 and North sector of S9) these objects were closely related with fragments of a thick Martaban jar, in the case of the West of S8 the tusks were arranged inside the remains of the jar. This could probably indicates that at least in two occasions the tusks were transported inside this ceramic containers which were mostly used for pepper and other species.

All pieces of tusks observed so far are in reasonable good condition, with little degradation due to the scarcity of oxygen and bacterial action deep under the sediment.

The remaining tusks observed on the wreck site and not recovered, were relocated and buried in the southern sector of S9 after been measured and photographed, exactly on the edge of the stone ballast pile. They will be recovered next season for documentation and conservation.
Olive jars.

This kind of artefact has been found in almost every grid along the wreck site, with an important concentration between grids S1, S2, S3 and S4, where some kind of storage arrangement was observed.

*In situ olive jars resting on the hull's timbers on the Northwest section of grid S4*

These are jars for shipping and storage, with three general shapes. Goggin (1960) established a basic typology still in use, designating the oblong shape as **Type A**, the globular form as **Type B**, and the tapering "carrot-shape" as **Type C** (Hurst et al. 1986:66). All have a constricted neck and a thick rim, some of which have been found with pitch-covered corks still in place.

Volume measurements of examples from shipwrecks imply Type A oblong jars were meant to hold the Castilian wine arroba of 4.26 gallons, although two 1695 examples seem to be for the Castilian oil arroba of 3.31 gallons (Marken 1994:127). Late 16th-century Type B globular jars appear to be half of an oil arroba (1.65 gallons), but early 17th-century samples showed an average volume of about 1.56 gallons (Marken 1994:123). Type C carrot-shaped jars had an average volume of about 0.57 gallons (Marken 1994:123).

In total has been found 51 olive jars on this wreck site and although they are all different in shapes and fabric, is still possible to catalogue them in three essentially different groups.
Type A

Only 4 olive jars from this wreck site were described as Type A (oblong shape) by their shape, but with the difference that in our case the volume of these items is of 6 Lts (1.65 gallons or ½ oil arroba), more similar to the volume described for Type B in the early XVII century.

Two samples of Type A olive jars (Art. 15004 left and Art. 15098 right) and drawing of Art. 15098

The colour of these items is light-sand with no trace of glazed neither on the inside nor outside. They are made of a thick fabric with coarse sand, and with large air pockets in the mass.

Type B

The vast majority of the sample with 46 artefacts, quite similar in shape if we disregard the deformations produced during the process in the kiln. They are all of the same volume (6 Lts / 1.65 gallons) although with great differences in the fabric, showing some of them traces of green or grey glazed in both interior and exterior, mainly around the neck and other protected areas.

Typical sample of Type B olive jar (Art. 15051) and its drawing
Type B with flattened base

Only one olive jar of this type has been found so far. It is of the same volume (6 Lts / 1.65 gallons) of the large group described above but the feature of the flat base and the fact that was found in the western sector of S2, completely isolated and far from the main concentration of olive jars, lead us to believe that it had a domestic function in the ship instead of being part of the cargo. It is made of reddish clay with large air pockets in its fabric, partially cracked and with a small fragment missing. The base is slightly concave and with a thick wall.

![Type B with flattened base olive jar (Art. 15061) and its drawing](image)

Ceramic lids.

A group of 8 ceramic lids belonging to the cargo of the ship have been found, always related to the olive jars. This fact in addition to their diameter (84 to 88mm) and shape, which perfectly matches with the mouth of the olive jars, made us believe that could be possible that they were used to close the olive jars over the cork.

![Example of a ceramic lid in relation with an olive jar, both in-situ, suggesting a closing function](image)
In all cases these ceramic lids present traces of glazed in both the interior and exterior, being 7 of them of green colour and one of dark grey.

Ceramic lid and its drawing (Art. 15094) showing clear traces of glazed in its interior and rim.

Martaban jars and other containers.

This group comprises a wide variety of large ceramic containers or fragments of them which were found in the wreck site. The martaban is a large earthenware jar, usually glazed (to stop liquid contents leaking), bearing circular lugs on the upper shoulders. Made since the Tang dynasty (618 to 906AD), and possibly earlier, their original purpose was to store liquids, especially water, on long voyages. But they were also used for storing such things as food, pickles, spices and even breakable porcelains. Made in South China, they were exported in large numbers for at least 1,000 years to the Philippines, Indonesia and other parts of South East Asia. Although some of the fragments are of very different thickness and the partially complete artefacts are of different sizes, we grouped them based on the kind of glaze, the flat base and the presence of lugs or "ears". The reason for this is that we really know very little about these huge jars and that they are notoriously hard to date, and finally that they are all called "Martabans" despite the fact that lots of these jars could actually have been made all over Asia and that these jars have been practically unchanged from the 13th/14th century up until the 19th century.

Fragmented Martaban jar (Art. 2007) and its drawing. Note the marks of the tar used to close and seal the mouth of the jar.
There are clearly two kinds of jars, the ones that are undecorated or decorated with common motifs (dragons, flowers, symbols and emblems) and were clearly made for use. Then there are jars which were produced in quite fine quality, glazed in several colours (up to five) and were also used, but probably inside the houses and functioned at the same time as decorative pieces or as an urn. The most common decoration in our artefacts is the one showed above and below, made only by simple strips with dots simulating reinforces in the material, suggesting a clear use for storage more than decorative.

Two views of another fragment of Martaban jar (Art. 15088) showing the same decoration.

Is in fact interesting the variety in the size, thickness and colour of the material these jars were made of, having found several fragments of different Martaban in the wreck site and none of them identical to another. Is also curious that most of the animal tusks observed during the excavation were in close relation with the largest Martaban fragments, suggesting that were transported inside them, an utilization that is not described as the main purpose for the use of these jars.

Examples of different characteristics of the material and manufacture of Martaban jars found in the wreck (Arts. 15015, 15017 and 15089 in the right).
Another type of storage container was also found (Artefact No. 15092) of a smaller size but very similar in shape, flat base and glaze to the bigger Martaban jars, with the main difference that has no lugs. Shows part of the rim missing and some faint traces of tar running down the body until about 0.05m from the base.

Artefact No. 15092 and technical drawing. A similar jar was found on the site but was left in-situ as is strongly attached to a coral colony.

Lead ingots.

So far two interesting lead ingots were found in the Southern section of grid S2 and left in-situ for further excavation. These ingots are boat shaped with a triangular transversal section and narrower towards the ends for easier handling. In the flat upper face they show circular marks, probably stating the ownership of these objects. The weight of these ingots is approximately of 50kg each. One ingot was recovered for identification purposes and photographed.

Lead ingot (Artefact No. 133) and a close up of one of the stamps.
Domestics.

The types of artefacts found so far on this site that can be catalogued as domestics are pottery containers, glass vessels, Chinese porcelain, glazed ceramics, pewter tableware, copper kitchen ware and pewter tops. Due to the diversity of artefacts, these will be described below by material.

Pottery.

An interesting group of small and delicate flasks, bowls and cups was found in the intersections of grids S1 and S2, laying between the timbers. The flasks are decorated with leaves motifs around the globular part of the body. They seems to have been manufactured in India and used for fine oil or other precious liquid as in both cases the outlet orifice is very narrow.

Ceramic flasks (Artefacts No. 2009 and 2015) and technical drawings
Other interesting artefacts are a small dispenser, apparently for salt or pepper, found in relation with the previous flasks and a small cup, all made of the same fine grain earthenware.

Ceramic dispenser and cup (Artefacts No. 2017 and 2011)

Together with these small and delicate objects was found a stack of four earthenware bowls as they were originally stored. These objects were supposedly used in the quotidian life on board as no packing material was found between them; which could indicate long-term storage.

Stack of bowls as was found, bowls displayed and drawing of one (Artefact No. 2019)

Various pottery vessels belonging to the daily life on the ship were found as well, been used the wider ones for thicker liquids (as honey) and the narrower ones for wine, water, etc.

Pottery vessels. Art No. 15003 and drawing (left and center) and Artefact No. 15081.
Also two earthenware pots, of apparently African origin, were found in the site, one partially cracked and concreted to a cannon ball and the other one intact. They are both of a very dark tone of brown and very porous material, product of a relative low firing temperature. Artefact 15080 is decorated around the wider part of the bulge with a design of "hills" filled with a very symmetrical pattern of dots arranged in diagonal and parallel lines. It shows a smaller belt around the base of the neck with crossed lines, both deeply carved in the paste.

![Different moments of the conservation and restoration process of Art No. 15080. Above left in the moment of the finding, still attached to the cannon ball. Above center during the reconstruction works and above right after restoration has finished. Technical drawing of the artefact in the right.](image)

Artefact 15102 is of the same manufacture but much simpler decoration, presenting only shallow marks of crossed diagonal lines in the rim. Is of a form of a bowl with acute concave bottom and presents the same dark brown tone in the clay.

![Earthenware bowl, Art No. 15102 and technical drawing.](image)
Glass.

As expected in a wreck of such an early period, very few fragments of glass had survived. During excavation were observed different typologies of glass, varying from flat transparent fragments (possibly from lanterns) of a very fine glass to a thick “sodium glass” found in the only intact glass artefact of the wreck.

Fragmented blue glass bottle (Art No. 15090) and drawing. Made on blown glass.

Intact drinking glass (Art No. 15091) and detail of the ornaments in the bottom. Soda glass.

The drinking glass is nicely ornamented with four petals “Fleur de Lis” around its body and in the bottom; which is concave and presents a shallow “thieve” with the mark of the blowing stem in the centre.

This sodium silicate, or soda glass, is a vitreous substance, and although not colourless and transparent, may be taken as a type of glass in general. Although it is said that glass is a silicate of some one of the basic metals, and speak of sodium glass, potassium glass, lead glass, etc., this is never the case in practice, each glass being a mixture of these different silicates in varying proportions; the silicate of the metal from which is named the glass usually imparting to it some marked characteristic, or else halving the predominance. In every case of glass fragments found on the wreck they show bubbles inside the material.
Chinese porcelain.

Only two artefacts made of Chinese porcelain have been found in this phase of the excavation (a plate and a Kendi), although some fragments have been observed in grids S7, S8 and S9 but not in enough quantity to be considered as Cargo, therefore the Chinese porcelain objects of this wreck have been catalogued so far as Domestic items.

The plate was found in 12 fragments scattered all along grid S7 and was put together during the conservation process in the laboratory. The deer's landscape motifs are very common in the "Kraak" porcelain, the Chinese export porcelain typically from the period 1580-1640's. It is characterised by shapes seemingly related to metal and by its busy decoration mostly organized in radiating panels. Kraak porcelain was introduced to the west by Portuguese traders who in the 16th century began to import late Ming dynasty blue-and-white porcelain into Europe. It is generally believed that the name "kraak" is taken after the Portuguese ships, called carracks, in which the porcelain was transported.

![Deer plate (Art. 15107) as was found and after conservation. No stamp was placed in the back.](image)

The Kendi (also called "nose drinking cup") was found in the centre of grid S7, heavily attached to an iron bolt, with a crack at the base of the stem; which was restored in the lab during the conservation process.

This particular artefact is made of white porcelain with blue cobalt decoration under the glaze, showing a circular bulge, long straight stem and very prominent spout. Is decorated with a scroll of stylized lotus around the bulge as well as curled and straight leafs around the stem.

The base is showing a mark depicting a white hare in front of a blue rock. This form is typically found in the Ming porcelain from the late XVI century, most probably during the Wanli period (1573-1619).
A *Kendi* is a pouring vessel with a spout on the side but without a handle. While pouring, the pot is held around its neck. Pouring vessels of this kind are not found at all in China before the Song dynasty where the earliest types seems to have been straight spouted vessels with South Chinese brown-black *Jian* type glaze.

In South East Asia *kendis* seems to have had all uses a pouring vessel with a spout could possibly have from medication, drinking, washing, blessing to sacrificial. Its main use seems to have been as a water drinking vessel, where many persons hygienically and without using any cups could share one water bottle by drinking directly from the stream coming from its spout when tilted. It might also be that a "Kendi" is the vessel which is actually referred to in *Jingdezhen Tao Lu* translated by G. R. Sayer in 1951, where the following entry #65, page 90, tells that "Southerners practice nose-drinking. They have pottery vessels like cups or bowls with a small tube like the lip of a bottle fixed at the side..." The source Tao Lu is citing is a *Treatise on the Geography and Natural History of the South of China*, dated to the eleventh century (mid Northern Song dynasty).

Contemporary paintings, literary or archaeological evidence has so far not confirmed that anybody ever "drank through the nose". The original name mentioned in the Northern Song source above might instead have been *spout drinking* vessel instead of *nose drinking*, since the protruding spout even today sometimes are called the "nose" of a vessel and the *Kendi* was unique by that one actually were supposed to drink directly from the spout. The 'nose drinking cup' in the Northern Song source above might in that case have been a *Kendi*. *Kendis* comes in all sizes from very large ones to miniatures possibly used as water droppers. Some *kendis* from medium size to small have confirmed use for medication. Whether some of the drugs at some time could have been administered through the nostrils will probably remain an open question.
Glazed ceramics.

Few fragments of glazed ceramics, both European and of Asian origin have been found in the excavation of this site. The fragments identified as coming from Europe are of the Majolica type, a tin-glazed earthenware. Tin enamel is a form of glaze, containing an oxide of tin, with which earthenware is coated before being painted with colours. When fired, the glaze and the pigments fuse to give a bright and glowing appearance.

Two views of Art. 15142 one of the few fragments of Majolica found on the wreck.

*Majolica*, the first tin-glazed earthenware seen in Europe, reaches Italy in the 14th century when the painters of the region are moving into the heady excitements of the Renaissance. In about 1400 they are exported from Spain to Italy by merchants of Majorca. They become known to the Italians as Majorcanware, or *majolica*.

The only complete artefact of this kind is one of the two lids, found in grid S2, all fragmented but with all fragments present. The artefact was later conserved and restored in the Conservation laboratory, showing us now its original form.

Artefact 15027 as was found in grid S2 (upper left), during its restoration process (above, center), technical drawing after the pieces were assembled together (upper right) and after completion of its conservation and restoration (right).
One interesting glazed ceramic fragment was found on grid S7, with leafs motifs but also depicting a swastika, whether of Chinese or Indian origin, at this phase of the study that hasn't been determined yet.

The swastika is an ancient symbol that has been used for over 3,000 years. (That even predates the ancient Egyptian symbol, the Ankh) Artefacts such as pottery and coins from ancient Troy show that the swastika was a commonly used symbol as far back as 1000 BCE.

During the following thousand years, the image of the swastika was used by many cultures around the world, including in China (waô), Japan, India (swastika), and southern Europe. By the Middle Ages, the swastika was a well known, if not commonly used, symbol but was called by many different names as in England (fylfot), in Germany (Hakenkreuz) and Greece (tetraskelion and gammadion). In general the swastika was used by many cultures throughout the past 3,000 years to represent life, sun, power, strength, and good luck.

![Artefact 15126](image)

Artefact 15126. Almost the entire glazed is presently missing, having only few traces of green in the upper right corner. Note the swastika motifs around the base.
Pewter.

Various artefacts made of pewter and catalogued as domestics were found, from tableware to medicine bottles tops. Any of the pewter artefacts found had marks of the provenience or quality of the material as is commonly found, leading us to think that were utilitarian objects with no ornamental function.

A pewter jar (Artefact 2008) found in grid S1 and a pewter lid (Artefact 15011) found in grid S1 but 4m to the North. Due to the measurements and characteristics of these artefacts, we think they belonged together.

Two plates made of very fine pewter were also found, heavily concreted with iron pieces and cannon balls in grid S7. One of these plates was partially cracked along the rim and was restored in the laboratory.

A pewter plate (Artefact 15103) found in grid S7 during the restoration process and in its final condition. Technical drawing on the upper right.
The bottle tops recovered (5) are all of a similar type, with two parts, one with an outer thread and the other one with an inner thread and an attaching ring on the top. The lower part was attached to the rim of a green glass bottle as evidenced by some remains of this material still attached to the body and the upper part is screwed to the latter. As observed on some marks on the sediment in the vicinity of these finds, the container bottle might be of flat base, like the ones used for medicine on board of the ships at the time.

Samples of pewter bottle tops (Artefacts 15097 and 15121) after conservation. Note that 15121 had the top missing and clearly visible the thread where the upper part was attached.

Copper.

The sample of the Domestic artefacts made of copper is formed by mainly kitchen ware, as a frying pan and an unidentified object. Both were found in relationship with fragments of the handle of a larger copper pot and fragments of pottery coarse ware, most probably belonging to the galley of the ship.

Above the surviving part of the frying pan (Art. 15106) and the object with an unknown function (Art. 15012), but presumably from the kitchen.

Other type of objects made of copper alloy were the lids, concave, with 8 attaching holes and a pattern in the inner face. They seem to have been part of lamps.
Personal belongings.

This group includes a large variety of artefacts that presumably were used for the crew, officials and passengers of the ship. As expected they are of many different materials and uses, therefore we will explain here the most interesting ones or those that could shed more light into the provenance of the ship and its crew.

Silver coins.

A total of 37 silver coins have been found in this site, either concreted in small clumps or loose. They appeared in almost every grid, but with a higher concentration in grids S1 and S2, where most of the personal belongings were found. In general the conditions of this kind of artefacts is very poor and was common the case that when cleaned the concretion no silver nucleus was found inside. In the case of the concretions which still had some part of the coin surviving, those were in such a bad condition that almost no information was possible to gather from them. The only visible information found so far in most of the coins is that they were minted in Mexico and Potosi, been hardly visible an assayer mark in one of the Mexican coins of an F, possibly Francisco de Morales who worked in the Mexican mint house since 1607.

![Silver coins from Artefact 15020, the better conserved sample of coins of the wreck.](image)

This uncommon degradation of the silver might have been produced by the close contact with decaying organic material on their vicinity for almost four centuries. The load of spices carried in this ship as suggested by the remains of Martabans and big jars might have been the source of the nitric acid that worked so intensely on the silver.
Beads and pendants.

During excavation in grid S2 were found three ornamental beads, apparently from a necklace or a bracelet. These beads are made of a light material of very dark black colour, possibly ebony or lignite (a soft coal) and carved in the front face with a four petal flower and diagonal lines creating a frame around it. They present two longitudinal perforations drilled through the body presumably for the string which linked them together.

![Ornamental bead, Artefact 15064, and drawing showing the perforations.](image)

Two pendants of the same material but in a form of a hand were found also in grid S2. These pendants represent the "mano fico", also called figa, which is an Italian amulet of ancient origin. It represents a hand gesture in which the thumb is thrust between the curled index and middle fingers in obvious imitation of heterosexual intercourse. Examples have been found from the Roman era, and it was also used by the Etruscans. *Mano* means "hand" and *fico* or *figa* means "fig," with the idiomatic slang connotation of a woman's genitals.

![Two views of one of the "Mano fico" amulets, Artefact 2012, and drawing.](image)

Whether made as an apotropaic gesture or worn as an amulet, the "mano fico" is used for magical protection against the evil eye even nowadays. In this it resembles other hand gestures and hand images that ward off evil, including the *hamsa* hand, the *eye-in-hand*, the *mano cornuta* (horned hand), and the interlocked thumb gesture. This popular amulet is present in many cultures until today and is well known among the Portuguese since the time before the Indian career. It is also believed that had the function of protecting the person against infertility.
Religious icons.

An interesting artefact of this category was found in the centre of grid S7 laying between two timbers of the hull and in relation with one silver coin. It is a small statue showing Jesus Christ in the crucifixion position, spread arms, palms up and crossed legs. The cross is missing as probably was made of wood, but the nails in both hands are still in-situ and the nail from the legs is missing as well. The statue is made of pewter which is a metal alloy, traditionally between 85 and 99 % tin, with the remainder consisting of 1-4 % copper, acting as a hardener, with the addition of lead for the lower grades of pewter and a bluish tint. There were three grades: Fine, for eating ware, with 96-99 % tin, and 1 to 4 % copper; Trifle, also for eating and drinking utensils but duller in appearance, with 92 % tin, 1-4 % copper, and up to 4 % lead; and Lay or Ley metal, not for eating or drinking utensils, which could contain up to 15 % lead.

![The statue of Jesus (Art. 15094) as found, after conservation and technical drawing.](image1)

By the appearance and weight of this particular artefact we believe that it is made of Ley metal, which would have a higher content of lead, making it heavier. It is interesting to note that the statue have been made with high detail also in the back side of the figure, the side that should had been covered by the cross and therefore hardly visible.

![Back side of the statue of Jesus (Art. 15094) showing the details in its construction.](image2)
Professional instruments.

The artefacts belonging to this category excavated on the site during this initial phase of the excavation were 5 navigation dividers and 1 ruler. The sample of navigational instruments of this wreck is impressive due to the remarkable conservation condition of some of the dividers and the ruler. They are made of copper along the entire body, without the removable steel points of the legs, so common in other early dividers. Four of these instruments are of the One Hand Divider type, showing the top part of the handles curved so that they can be opened and closed with only one hand meanwhile working on the nautical chart and the other divider is of straight pattern type.

One hand navigational divider (Art. 15138) and drawing of Art. 15140.

Straight pattern navigational divider (Art. 15130) and drawing.
The ruler is made of copper and presents different scales on both faces and a flattened wider end in the top for easier grip. Each of the scales increases the size of the divisions when approaching to the lower end of the stem, hence the divisions very close together in the upper part of the ruler and wide apart in the lower end.

Both sides of the ruler (Art. 15129) and drawing showing details of the scales.

The graduation of the scale in one side is from 1 to 4, repeated three times, and although is not clearly visible seems to have the "grade" symbol (°) over the numbers. The scale in the opposite side of the ruler is not clearly defined but maintains the pattern of variable divisions' size. This ruler seems to be part of an instrument to measure arcs or angular distances and needs further research to determine if it is an example of a very early navigational instrument or any other measuring tool.

Lead seals.

Three lead seal have been found so far, two with not recognizable stamps and one depicting the Portuguese symbol "Esfera Armilar". This image was the personal emblem of the King D. Manuel I, even before becoming King, when was still the Duke of Beja and represents the Portuguese navigational epic. This seal probably confirms that the ship was transporting official cargo from India to the Portuguese King.
Tentative identification.

Based on the study of the wreck material found in this first phase of the excavation, the nature of the artefacts, the typology of the ceramics and the period and origin of the silver coins; we are lead to think that IDM-003 was a Portuguese ship that sank in the early XVII century when coming from India.

The archival research done previously shows the following entries regarding wrecked ships in that area:
- **Nº S° da Consolação**, 26/7/1608, Captain Diogo de Sousa. Burned out to avoid be captured by the Dutch. Money spent on reinforcing the fortress' defense system. Burned near Cabeceira with another galleon. Not everything was salvaged from both ships.
- **Santa Isabel**, Portuguese, 28/01/1624, Cap. D. Diogo de Castelo Branco e D. João Coutinho, was staying over winter, possibly only the artillery was lost. Other sources name her as "lost at the entrance of the barra in a winter storm, people saved and most of the cargo. Some artillery and cargo lost". Not totally salvaged (salvou-se a gente e perdeu-se alguma fazenda).

From the wrecked ships mentioned above the one that seems more likely to be IDM-003 is **Nº S° da Consolação**, sunk on 26/7/1608, during an attempt of the Dutch so steal her. The historic records refers that during the Dutch siege to Ilha de Mozambique in 1608, the attackers repeatedly attempted to steal the **Nº S° da Consolação**, which was on anchor in the bay and most of her crew sheltered in the **São Sebastião** fortress, defending the island.

The Dutch knew that the ship was laden with cargo from India and waiting to resume her trip to Lisbon, therefore of great interest for them. After some failed attempts, the Dutch managed to send 3 boats entering the channel by the Southern edge, very close to the fortress and taking advantage of the spring low tide they passed almost under the cannons of the Portuguese, being the artillery masters unable to aim so low. Once inside the bay they cut the cables of the Nau and another ship which name is not known and started towing them out of the bay with the intention of taking them as a prize. By that time the Portuguese gunners had corrected their pieces and started a vicious fire against the 3 boats which were stealing their ships, almost sinking one of the boats and forcing the Dutch to cut the cables and abandon the ships to save their lives. In this moment **Nº S° da Consolação** drifted helplessly pushed by the Southern winds towards the shoals on the North side of the channel and stranded there with her consort.
Under the pressure of the siege, the Portuguese couldn’t organize a coherent salvage operation on both ships, so the Captain of the Fortress, D. Estevão de Ataide, sent in the night a small boat with 8 men to set them on fire and avoid that way that the Dutch could return and take the cargo with them.

As stated in the historic documents not everything could be saved from both ships, but the majority of the cargo and the money was recovered and used in the reinforcement of the fortress defence system, so battered after the ruthless siege.

IDM-003 shows clear signals of having been partially salvaged, evidence of this is the lack of artillery pieces (only one cannon found so far and because was under the ballast stones) and large elements as the anchors. Anyhow there are some areas where rescue at the time of the accident might have been extremely difficult due to the displacement of the ballast over the starboard side of the ship.

The composition of the artefact's sample recovered from this wreck is the typical one of a Portuguese trader coming from India. Chinese porcelain, although with little occurrence so far, Martaban jars for the transport of spices, ceramic flask of Indian manufacture, ornamental beads and pendants and a lead seal with the “Esfera armilar” clearly strengthens that hypothesis.

Further excavation in the rest of the cultural area of the site will allow us to extensively investigate the naval construction of this early Portuguese Indiaman as the section of the hull laying under the ballast seems to be very well preserved.
Site description and assessment.

This wreck was found on the 7th of June 2004 during the magnetometer survey of the _São Lourenço_ bank, located at the Southeast of Ilha de Moçambique. The site is located on the Northeast edge of Nivula shoal, the shallowest part of _São Lourenço_ Bank. The site is completely buried under 2.5m of sand at 4m depth in medium tide. No part of the wreck was visible in the moment of the first inspection. The magnetometer recorded a very strong anomalous area of about 50 x 50m showing various peaks within its limits.

A test pit was opened on top of the GPS position of the strongest magnetometer reading and we found a conglomerate of at least 10 massive iron cannons and some iron bolts. The cannons are much concreted forming a mass where is difficult to make accurate measurements of each individual piece, but as overall size they are 3m long and all of them identical. Due to the nature of the overburden on the site (clean and heavy sand) the test pit refilled constantly and most of the dives were done to widening the edges of the sondage in order to go deeper and establish the final layer with wreck material and the level of the original seabed in the moment of the accident. During the sondage an iron ring was found under the deepest cannon (G8) with the first ballast stones underneath; 2.8m below the sand level. The iron ring is 0.75m diameter and have 3 iron bars attached to it, two parallel in the tangent and one sticking out from the centre of the circumference, all in the same direction and broken.

A micro magnetometer survey was done in the area in order to produce a 3D map locked on the geographic coordinates of the site and the bathymetric information of the area. To plan a future excavation, or even to define where to open a test pit, we could only rely on the information of the magnetic field deviations observed in the area. The map showed an anomalous area of 90m length per 40m width orientated almost North-South (345° - 165°) with several peaks of high magnitude distributed on an oval patch. We established a datum point in the southern edge of the anomalous area (Point 1) at 30m-165° from the "Zero" point (cannon G3) and made a metal detection sweep along the line 4m wide without results. The depth of the sand made the metal detectors useless until first layers of the overburden were removed.

Under the mass of cannons appeared a layer of ballast stones over the hull timbers. Following the level of the ballast stones (between 1.7m and 2.8m under the seabed) a trench was open in a SSE direction (165°) starting from cannon G3 and advancing 15m in that direction at a trench width of 2m. Only ballast stones and wood structure of the hull were observed in that area, confirming the original assumption that a large part of the hull have survived under the thick layer of sand.

With this information we finished the assessment of this site and refilled the trench to avoid undesirable exposure and accelerated degradation.
Geographical location of IDM-017 wreck site in Ilha de Mozambique.
Magnetic response of the IDM-017 site. Note the group of cannons in the centre.
**Tentative identification.**

Based on the location of the wreck site and the typology of the iron cannons observed during this assessment intervention, we are inclined to think that the remains located belong to the *Santa Teresa*, the "Capitana" of the Portuguese 1622 fleet. The archival research done previously shows the following entry:

- *Santa Teresa*, Portuguese Capitana, 25/07/1622, Captain Dom Francisco de Gama. Ship going to India lost in the “barra” of Mozambique been hunted by the Dutch, it was the nau of the Vice Roy the Count of Vidigueira, Dom Francisco de Gama. She wrecked during the night on sand shoals in the inside, after S. Jorge Island (after Sancule point). Only the top deck cargo could be saved, but she lost the rest of the cargo and the artillery. The ship was set on fire to avoid that the Dutch could profit from her.

When the Anglo-Dutch Fleet considered that the *São José* was defenceless after the battle in Mogincual it was left the alone and they continued chasing the *Santa Teresa* and *São Carlos* until the very entrance of the Mozambique Island. Once inside the island of Goa these ships beached on a sand bank (today’s Banco São Lourenço) before arriving under the protective cannons of the São Sebastião fortress. The *Santa Teresa* immediately fell to the port side, the artillery breaking loose and water entering the ship from over the gunwale. As the Father D. Jeronimo Lobos described "only the top deck cargo could be saved, but she lost the rest of the cargo and the artillery". When the Anglo-Dutch fleet was seen outside of Goa Island after returning from the failed attempt of salvaging the *São José*, the Portuguese set the ship on fire to avoid that the enemy could profit from her.

**NOTE:** The history of this ship, the particular conditions of her wreckage and the characteristic of the seabed in the area, make it very probable that there is still a large amount of artefacts and ship structure surviving. This site is due to the well preserved structural remains probably of high cultural importance.
**Conservation.**

All artefacts recovered were conserved and stabilized locally in the temporary conservation facility set during the final touches in the construction of the Centro de Conservação Marítima (CCM). The conservation works allowed rescuing a total of 218 artefacts listed below according to the constitution material:

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity of Artefacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brass</td>
<td>24</td>
</tr>
<tr>
<td>Ivory</td>
<td>6</td>
</tr>
<tr>
<td>Lignite</td>
<td>5</td>
</tr>
<tr>
<td>Glass</td>
<td>4</td>
</tr>
<tr>
<td>Ceramic</td>
<td>96</td>
</tr>
<tr>
<td>Lead and Pewter</td>
<td>20</td>
</tr>
<tr>
<td>Silver</td>
<td>53</td>
</tr>
</tbody>
</table>

**Total** 218

The total of individual artefacts was **6731** since in many artefact numbers were associate several objects, fundamentally in the case of the silver coins clumps. In the execution of the conservation works, the following recommended treatments were applied:

**Silver:**
- De-concretion with Hydrochloric acid.
- Elimination of corrosion products with Ammonia
- Neutralization with Sodium Hydrogen Carbonate

**Bronze:**
- Elimination of concretions and products of corrosion with solution of Citric acid and Thiourea.
- Neutralization with Sodium Sexquicarbonate
- Drying to the air
- Sealing with Microcrystalline Wax.

**Lead and Pewter:**
- Treatment with Hydrochloric acid.
- Intense rinse.
- Drying to the air
- Sealing with Microcrystalline Wax.

**Ceramic:**
- De-concretion with Hydrochloric acid and with manual tools.
- Desalinisation with water
- Drying to the air
- Application of PVA like sealer and consolidant
- Restoration with plaster of paris.
Ivory:
Elimination of concretions with manual tools and punctual application of Hydrochloric Acid
Consolidation with PVA
Drying to the air.
Sealing with microcrystalline. Wax.

Glass:
Elimination of concretions with Hydrochloric acid.
Removal of stains with Hydrogen Peroxide.
Intense rinse.
Drying to the air
Sealing with PVA

Lignite:
Elimination of concretions with punctual application of Hydrochloric acid.
Intense laundry.
Drying with Alcohol.

At this moment all conserved artefacts are stable and stored in Ilha de Mozambique for further study and classification.
Equipment

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

- *Zanj* Explorer Recovery vessel (20m length, accommodation for 14).
- *Isis* Catamaran Recovery vessel (15m length, accommodation for 8)
- RIB *Humber* (5.5 m length).
- RIB *Omega* (4.5 m length).
- Zodiac *Mark VI* (6 m length).
- 2 x Honda 20 HP four strokes outboard engines.
- 1 x Mercury 25 HP outboard engine.
- 1 x Yamaha 30 HP outboard engine.
- 2 x GPS GARMIN map 168 (with echo sounder) and NMEA interface.
- 2 x GPS GARMIN 128 with NMEA interface.
- GPS Eagle view with NMEA interface.
- Handheld GPS Magellan 3000.
- Echo sounder MAP2000/SAM MODULE.
- Echo sounder GARMIN 160.
- 2 x ELSEC 2000 Metal detectors.
- Aquascan AQUAPULSE Metal detector.
- U/W Digital photo camera Ricoh with housing.
- U/W Digital video camera Sony with housing.
- U/W Digital video camera Panasonic with housing.
- Surface digital camera Ricoh Caplio 3,2 Megapixel.
- 2 x towing sledges for visual survey.
- 16 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.
- 1 x 12 Lts aluminium diving bottle.
- Diving compressor BAUER (Electric engine).
- Diving compressor EXPLORER (Diesel engine).
- U/W Scooter Apollo.
- U/W Scooter Submerge.
- 2 x Honda water pumps, 4,5 bar, 1400 Lts/min.
- 1 x LP Compressor Hatz, 7 bar.
- Laptop Compaq Presario, Pentium IV.
- Laptop Toshiba Satellite, Pentium IV.
- Laptop Acer Travel Mate, Pentium IV.
- Laptop Gericom, Pentium IV.
- 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 these excavation operations the following team was mobilized:

Team.

- Alejandro Mirabal (Archaeologist/ OPS Manager/ Diver)
- Faure Cambiella (Magnetometer Operator/ Surveyor/ Diver)
- Manuel Navarro (Dive Supervisor)
- Ramiro Pereira (Diver)
- Danijar Morandin (Diver)
- Boris Basnuevo (Diver)
- Lucas Sillem (Diver)
- Carlos Bosch (Archaeological Registrar/ Diver)
- Alejandro Raul Mirabal (Draftsman/ Diver)
- Alina Reyes (Archaeological Registrar/ Administration)
- Grant Ruffel (Skipper Zanjí Diver)
- Gastón Bernal (Engineer Zanjí Diver)
- Justin Dewey (Deckhand/ Diver)
- Nicolette Killoran (Chef Zanjí)
- Debbie Killoran (Chef Isis)
- Domingos Diofelo (Deckhand Isis/ Diver)
- Otomane Valhale (Boatman/ Diver)
- Manuel Almeida (Senior conservator)
- Salimo Djuma (Conservation assistant)
- Wassia Sualehe (Conservation assistant)
- Sara Guerreiro (Administration)
- Zuleida Russo (Representative PI)
- Zinha Selemane (Cook / housemaid)
- Carlitos Almeida (Cook)
- Mohanza Abdala (Guard)
- Mustafa (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)
- Stefan Schins (Sales Director)
- Jens Neiser (AWW Business Consultant/ AWW Shareholder / Diver)
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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 Arqueonautas Representative Office in Germany, where Stefan Schins and their team produced the means to finance this project.

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 Excavation Team 2005 for their excellent performance and hard work in despite of the many times adverse weather conditions and technical challenges faced.

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.

Lic. Alejandro Mirabal Jorge
Archaeologist / AWW OPS Manager