

Zeewijk 2014

Georeferencing a 36-year-old survey plan

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Photo: Post Office Island jetty

Introduction



Figure 1. Aerial photograph of Pelsaert Group showing main islands and wreck sites.

In the late 1970s the Western Australian Museum's Department of Maritime Archaeology conducted a series of expeditions, under the direction of Caterina Ingleman-Sundberg, to investigate the Dutch East India Company (VOC) Zeewijk (1727) wreck site, on Half Moon Reef in the Pelsaert (Southern) Group of the Houtman Abrolhos (Ingleman-Sundberg, 1976a & b; 1977a & b; 1978 & 1979). The work in 1976 completed a detailed survey of the material washed onto the inside of the reef from the main Zeewijk wreck site. Work on the outside of the reef, where the main site was located, proved to be extremely difficult, the area being subject of very large swells, at times up to 5 m in height. However, during a period of extremely flat calm in 1978, the outside site was finally surveyed. By the end of 1978 a detailed plan of the wreck site existed (see Figure 1 on page 4) that recorded the location of 31 cannon and 8 anchors, the majority of the items located on the outside reef area but with 4 cannon lying in the inside reef area. The survey work being a mixture of triliteration with tape measures to provide detailed site plans and theodolites and a tellurometer to connect the various plans to a base line on nearby Gun Island.

A detailed map of the study area, likely a coastal or reef environment. The map includes several labeled zones and features:

- MAIN ANCHOR**: Located at the top center.
- 8 Cannon area** and **12 Cannon area**: Located at the top left and top center, respectively, marked with small cross symbols.
- REEF**: A wavy line representing the reef edge, with points **x 10**, **x 12**, and **x 11** marked along it.
- Area A**: A shaded rectangular area near the reef, containing a **Coral lump** and a point labeled **fe**.
- Area B**: A shaded rectangular area to the right of Area A, containing points **C1**, **D1**, and **x 13**.
- TOW SEARCH AREA**: A dashed rectangular area to the right of Area B, containing point **x 3**.
- Area C**: A rectangular area in the center, subdivided into a grid of smaller rectangles labeled **A** through **M**. It contains a point labeled **timber**.
- Area F**: A shaded rectangular area below Area C, containing point **x 5**.
- Area D**: A shaded rectangular area at the bottom right, containing points **x 14**, **x 15**, and **x 16**.
- Area E**: A shaded rectangular area at the bottom right, containing points **x 17** and **x 18**.
- Area G**: A shaded rectangular area at the bottom right, containing points **x 19** and **x 20**.
- Area H**: A shaded rectangular area at the bottom right, containing points **x 21** and **x 22**.
- Area I**: A shaded rectangular area at the bottom right, containing points **x 23** and **x 24**.
- Area J**: A shaded rectangular area at the bottom right, containing points **x 25** and **x 26**.
- Area K**: A shaded rectangular area at the bottom right, containing points **x 27** and **x 28**.
- Area L**: A shaded rectangular area at the bottom right, containing points **x 29** and **x 30**.
- Area M**: A shaded rectangular area at the bottom right, containing points **x 31** and **x 32**.
- Area N**: A shaded rectangular area at the bottom right, containing points **x 33** and **x 34**.
- Area O**: A shaded rectangular area at the bottom right, containing points **x 35** and **x 36**.
- Area P**: A shaded rectangular area at the bottom right, containing points **x 37** and **x 38**.
- Area Q**: A shaded rectangular area at the bottom right, containing points **x 39** and **x 40**.
- Area R**: A shaded rectangular area at the bottom right, containing points **x 41** and **x 42**.
- Area S**: A shaded rectangular area at the bottom right, containing points **x 43** and **x 44**.
- Area T**: A shaded rectangular area at the bottom right, containing points **x 45** and **x 46**.
- Area U**: A shaded rectangular area at the bottom right, containing points **x 47** and **x 48**.
- Area V**: A shaded rectangular area at the bottom right, containing points **x 49** and **x 50**.
- Area W**: A shaded rectangular area at the bottom right, containing points **x 51** and **x 52**.
- Area X**: A shaded rectangular area at the bottom right, containing points **x 53** and **x 54**.
- Area Y**: A shaded rectangular area at the bottom right, containing points **x 55** and **x 56**.
- Area Z**: A shaded rectangular area at the bottom right, containing points **x 57** and **x 58**.

A scale bar at the bottom left indicates a distance of 300 units. A north arrow is located at the bottom center.

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While the plan was internally consistent, in that the measurements between the objects were accurate to within a few metres, the actual location of the objects could not be given a precise latitude and longitude. This work was of course before GPS and so, up to the present day, it has not been possible to plot these plans on a modern map or aerial georeferenced mosaic.

This issue was exacerbated when an aerial magnetometer survey was undertaken in 1998 in an attempt to locate, what was thought to be, a second 18th century wreck site thought to have been lost in the neighbourhood of the *Zeewijk*. This operation was financed by Kerry Stokes on behalf of Hugh Edwards, and was flown by Fugro Airborne, a Western Australian geophysical company.

The existence of the second site arose from the accounts of the survivors of the *Zeewijk* who noted material in the area that they believed came from another shipwreck (de Heer, n.d.; Zuiderbaan, n.d.). The whole issue of the second is complex. Every VOC ship arriving at its destination, in this case Batavia (modern Jakarta) would have the various journals that were kept on the voyage transcribed and multiple copies would be either kept at Batavia, sent home to the Netherlands or else where, including the Cape of Good Hope. Four different journal transcriptions survive, three in the Rijksarchief in The Hague and one in Brussels; in addition there are 3 maps showing the area where the *Zeewijk* was wrecked. Obviously, in making multiple copies of a original journal, transcription errors are likely to creep in. One example is the reference to a hand grenade found when the survivors first came ashore on the reef. This has been shown to be in fact a dead sea lion, the two words being extremely close in spelling. However, there are several examples where the survivors referred to things associated with another shipwreck, some around Wreck Point, on Pelsaert Island.

In addition, in 1830, Commander John Wickham in HMS *Beagle*, found traces of wreckage at the southern end of an island which they named Pelsaert Island, together with Wreck Point and Batavia Roads as a result of their discoveries, mistakenly thinking that this was the site of the wreck of the *Batavia* that was in fact lost in the Wallabi Group in 1629 (Stokes, 1846).

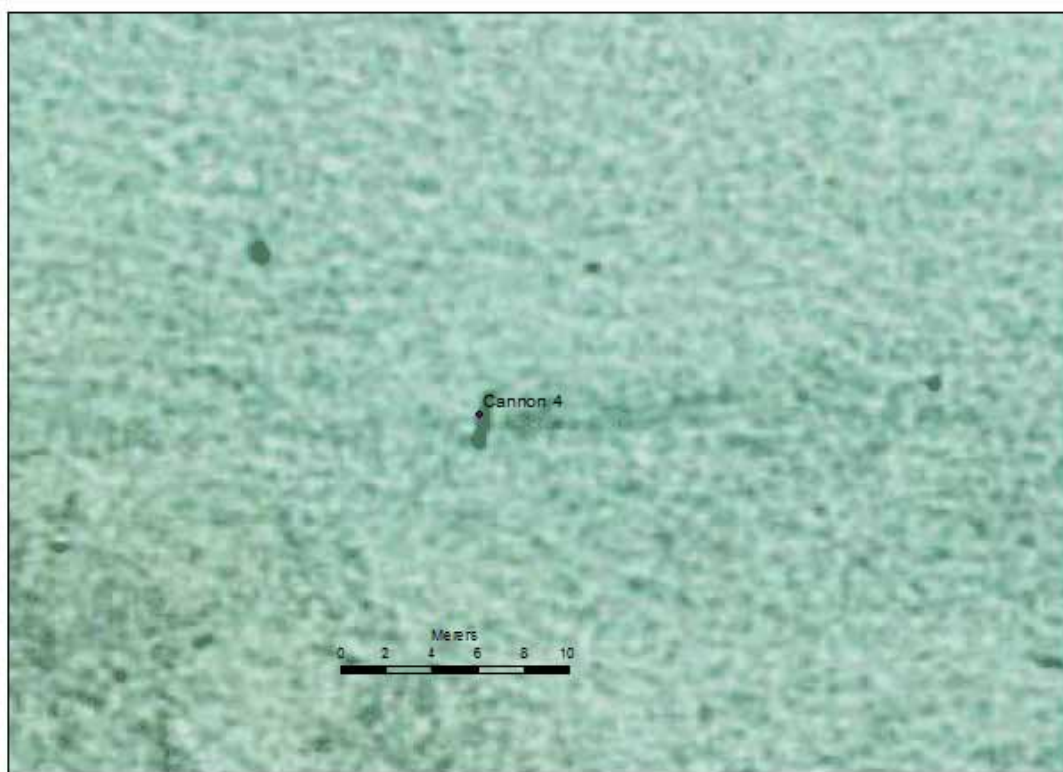


Figure 3. A view of the GIS in the Cannon 4 Area showing the cannon lying exposed on the sand.

The 2014 survey

The problem with the early Museum plan was that it could not be georeferenced (given a precise latitude and longitude) because it was created before GPS. Thus the positions of magnetic targets on the Fugro survey could not be correlated with the cannon and anchors on the Museum plan. This led to a great deal of confusion in interpretation of the Fugro magnetic data. Additionally, the possibility of obtaining GPS positions for the cannon and anchors on the outside reef, would require a major expedition that would have to wait for suitable conditions to relocate and obtain the GPS coordinates. It was decided, therefore, to make a brief trip to the inside reef area and obtain GPS positions of some of the cannon and other features in an attempt to georeference the Museum plan.

In July 2014, a small team of people from the fishing community on Post Office Island of the Pelsaert Group, assisted this author in locating some of the large objects on the inside reef. The first, and simplest task, was to locate the large coral lump, a prominent feature on the plan and well known to everyone familiar to the *Zeewijk* site. This object appears clearly on the Landgate (the Western Australian department responsible for land information) aerial mosaics of the Pelsaert Group taken in 2008 and 2013. The GPS coordinate of the centre of the lump was obtained to verify that

the GPS and the Landgate plans were in accordance. From the lump, Jane Liddon, a local crayfisher, then took the boat through the shallows to the location of Cannon No. 3 (see Museum plan Figure 2 on page 3) and a group of iron billet boxes. It should be noted that the crayfishery industry in this area of Half Moon Reef relies on shallow-draft jet boats that can work in the shallows where there is often a large swell. The boats can operate in a few centimetres of water, often grounding and then waiting until a swell comes through to lift the boat up and enable it to move on. Using this technique the site, in a few centimetres of water, was reached and a good GPS position was obtained for Cannon No. 3.

The boat then went to an area where the Fugro survey indicated that there was a magnetic target, possibly related to the two Cannon, No. 11 on the 1978 site plan. However, after a brief visual search, no visible signs of the cannon were seen and the search was abandoned.

It was then decided to search for Cannon No. 4, recorded on the 1978 site plan 350 m to the east of the coral lump. Using an ArcMap GIS, linked to a GPS, it was possible to track the position of the boat on the 2008 aerial mosaic. On approaching the area, Cannon No. 4 was seen on the sand seabed. Surprisingly, at the same time, the cannon was observed on the aerial photograph on the GIS (see Figure 3 on page 5).



Figure 4. Aerial close up of *Zeewijk* site showing three primary georeferenced points.

This meant that we now had three accurate positions, or control points, for artefacts or features on the Museum plan (Cannon Nos 3 & 4 and the coral lump). These points were ideally located for georeferencing as they were at right angles to each other and approximately 300 m apart (see Figure 4 on page 6). This then enabled the original 1978 survey plan to be georeferenced for the first time using these three control points.

Conclusions

The 2014 survey resulted in some interesting discoveries:

1. Examination of the Cannon No. 11 area on the 2013 aerial photograph revealed two objects resembling cannon about 35 m south-west of the Fugro

- anomaly and outside the area of the visual search (see Figure 11 on page 11).
2. The Fugro survey recorded the outline of the main *Zeeewijk* wreck site on the outside of the reef. This exactly corresponds with the Museum survey of the main wreck site after georeferencing, confirming the validity of the Fugro survey in this area (see Figure 8 on page 10).
 3. No magnetic target was discovered on the Fugro survey that corresponded to Cannon No. 4 (see Figure 7 on page 9).

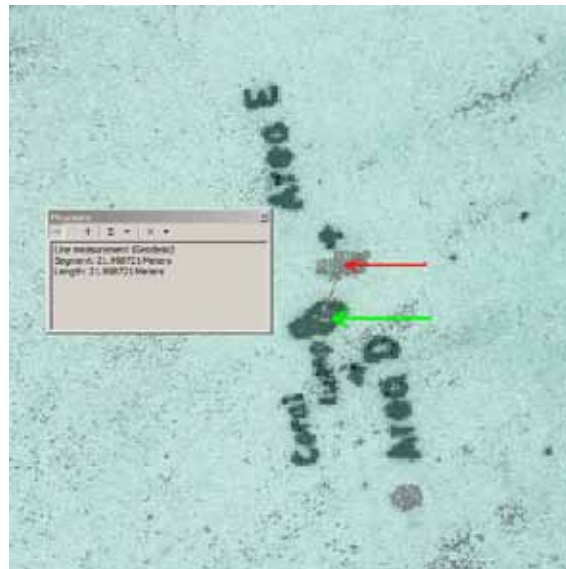


Figure 5. Coral lump at east of site after first 3-point georeference, showing lump outline lower on 1978 plan (green arrow) and 2006 photomosaic with lump (red arrow). The 1978 plan is slightly transparent so that the underlying mosaic can be seen. ArcMap indicates position of lump on plan is 22 m south of true position.

4. A coral lump was recorded at the very eastern end of the Museum survey area, in Area E, about 1300 m east of the main coral lump (see Figure 5 above). Examination of this area on the 2006 photomosaic showed a coral lump about 22 m south from that recorded on the Museum plan, indicating that the georeferencing was remarkably accurate. This point was then used to further georeference the plan.
5. The large magnetic anomaly recorded in the Fugro survey to the north of the main survey area (see Figure 7 on page 9) was discovered to be a collection of iron railway lines of unknown origin.
6. Examination of the outside reef area on the Landgate 2008 aerial mosaic showed features that could represent cannon and anchors corresponding to the 12 cannon area (see Figure 9 on page 10)

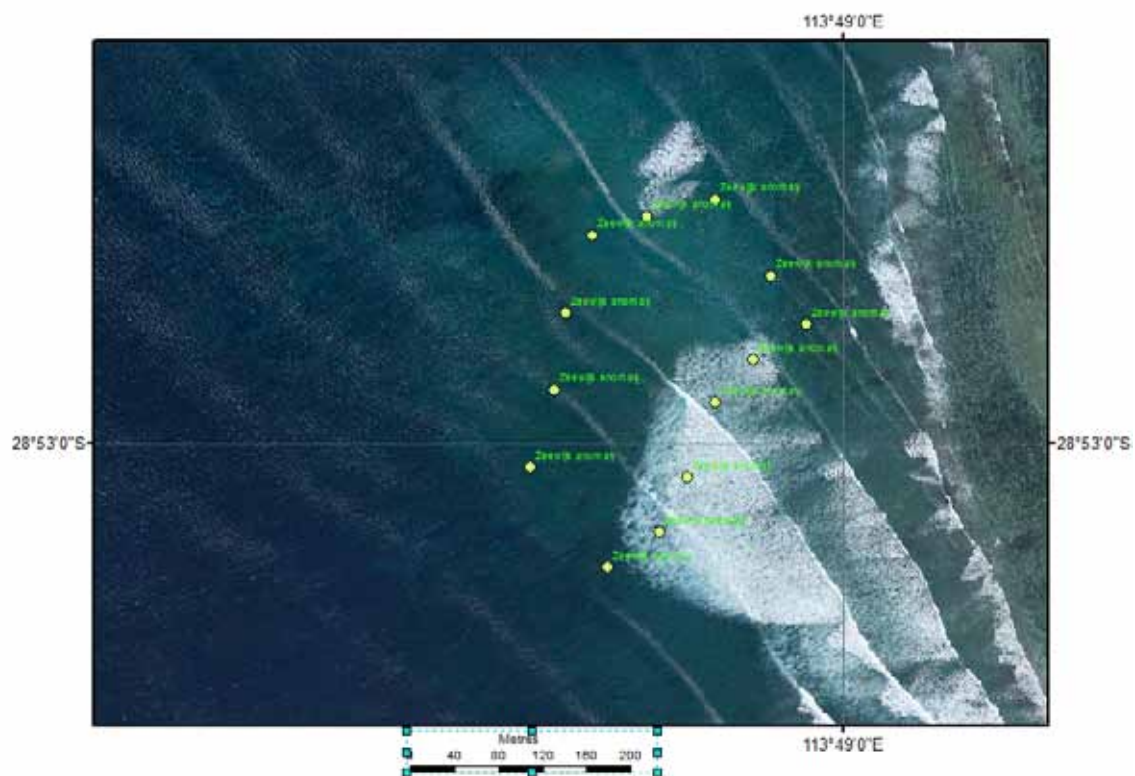


Figure 10. The whole of the Fugro points showing the main outside reef area.

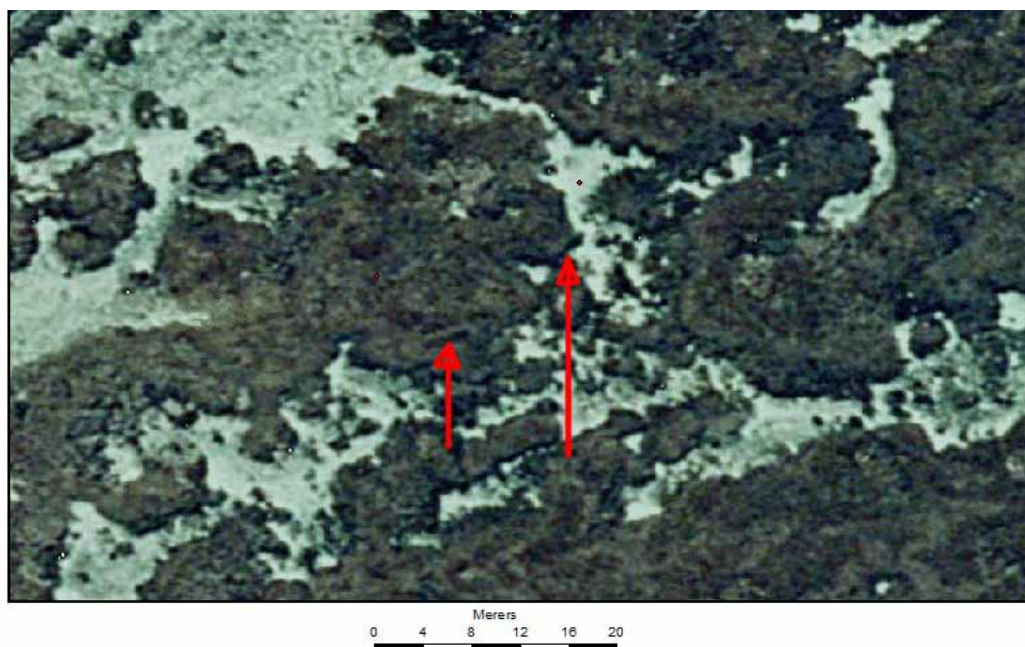


Figure 11. The 2 cannon site with Fugro target (green dot), Museum plan positions red dots and the possible cannon on the Landgate 2008 mosaic (red arrows).

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