THE ROWLEY SHOALS SHIPWRECK SITE : A PROGRESS REPORT

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1983

Report - Department of Maritime Archaeology,
Western Australian Museum, No.20

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FIGURES

ACKNOWLEDGEMENTS

My attention was initially drawn to the Rowley Shoals by Ron Coleman, who pointed out the reference to the Lively on the 1829 chart. Ron has continued his interest in the site and has given me numerous valuable leads.

It was John Barnett, with his ABC radio programme Always on Sundays, who first brought me into contact with the finders of the wreck.

Dr. Frank Broeze of the University of Western Australia organised with colleagues in Holland for a search to be made of Dutch newspapers covering Java.

My colleagues in the Departments of Maritime Archaeology and Conservation have all helped in the work. My particular thanks to Scott Sledge who had the onerous task of leading a weather bound section of the 1982 expedition; Mike McCarthy who led the inspection expedition of 1981 and prepared many of the illustrations in this report; Patrick Baker who did the on-site photography; Geoff Kimpton, who organised the workboats; Myra Stanbury, who organised the drawing equipment; and Nick Sander, who organised the field conservation facility.

Dr. Ian Crawford (Head of Division of Human Studies), and Robin Reid and his staff, gave valuable management support.

Volunteers who suffered the consequences of bad weather in good spirits were Dr. John Williams, Daniele Voinot Dr. David Miller and David Pike. John Izzard and Gavin O'Sullivan of Channel 9's Film Unit One, found time between filming to help with many aspects of the work in the field.

The work could not have been done by the Western Australian Museum without the support of several generous sponsors. Channel 9 gave a donation of $5000. Swanline Transport returned the heavy plant from Port Hedland to Perth at cost. Airlines of Western Australia flew personnel to the north and back at half price. Stateships gave the Museum a concessional rate for shipping equipment to Port Hedland. B.P. offered to transport heavy equipment from Port Hedland to the Rowley Shoals, and were only prevented from doing this by bad weather. The Port Hedland Port Authority made its dinghy available to the Museum at no cost. Harbours and Rivers at Fremantle assisted with boat movements.

A number or correspondents have spared the time to research and answer questions about the vessels which might have been lost on the Rowley Shoals.

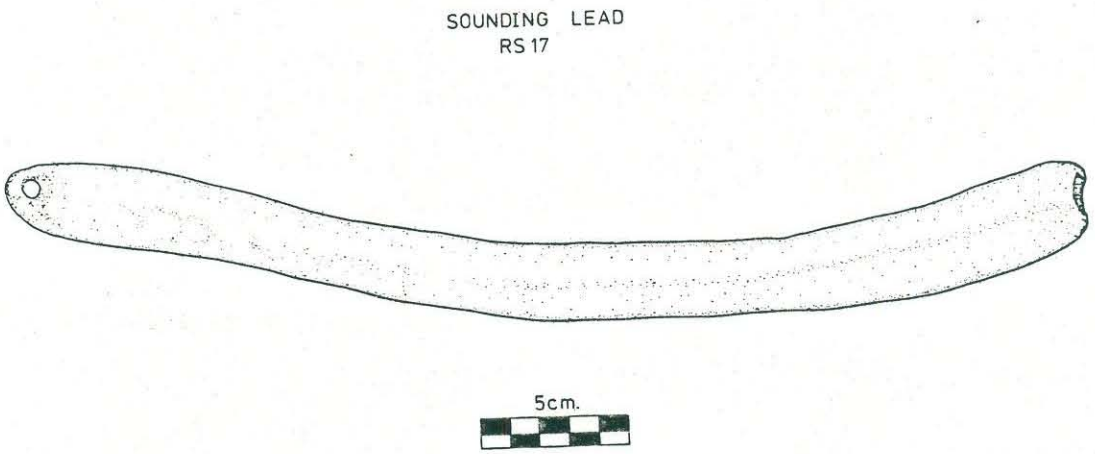


Figure 17. Sounding lead, drawn by M.McCarthy.

These items serve to re-inforce the observations made about the earlier samples, in terms of the construction of the hull and its size. The extra one or possibly two guns seen on the site brings the armament closer to the 10 guns to be expected if the vessel is indeed the 240 tons Lively listed in Lloyds. More importantly, the gun measurements taken on site indicate 4pdr cannon, as listed in Lloyds for the Lively. Adye's tables of 1802,1813 and 1827 indicate a weight of about 11cwt. for 4pdr guns, of 1.65m (5 feet 5 inches) (22).

8. The Significance of the Site

It is clear that more clues will have to be gleaned from the site if a positive identification of the wreck is sought. This implies a complete archaeological excavation.

What are the justifications for this unavoidably costly work? The history of the western third of the Australian continent has been well documented from the time of the first settlement in 1829. But for the period leading up to the first settlement - the 1780s through to the 1820s - very little is known about the activities of the various European nations in the waters off Western Australia. The exception is the official scientific expeditions sent out by Britain and France. Thus, every shipwreck for that period has the potential to fill some of the wide gaps in our knowledge of European activities and contacts. The other example of a wreck site falling into that period is the wreck of the Rapid, an American China trader lost near North West Cape in 1811. The recent finding of that site has led researchers to more fully appreciate the regularity with which Americans sighted the coast at the beginning of the nineteenth century.

If the Mermaid Atoll wreck does prove to be an English whaler then the site will provide information about a little known industry - the British South Seas Whale Fishery. The part played by the Americans in South Seas whaling is well known, but there has been little published on the English contribution, and the available archival sources are sparse. The whaling equipment, the ship's armament, the construction of the vessel, navigational equipment, the crew's possessions - all of these will, upon excavation, provide research material for the British South Seas Whale Fishery.

Apart from the immediate research potential of the material excavated from the site, it will constitute an important display collection. Contrasting with the American industry little has survived from British South Seas whaling. The Maritime Museum of Western Australia has access to a large display department and is geographically well placed for a display on this theme.

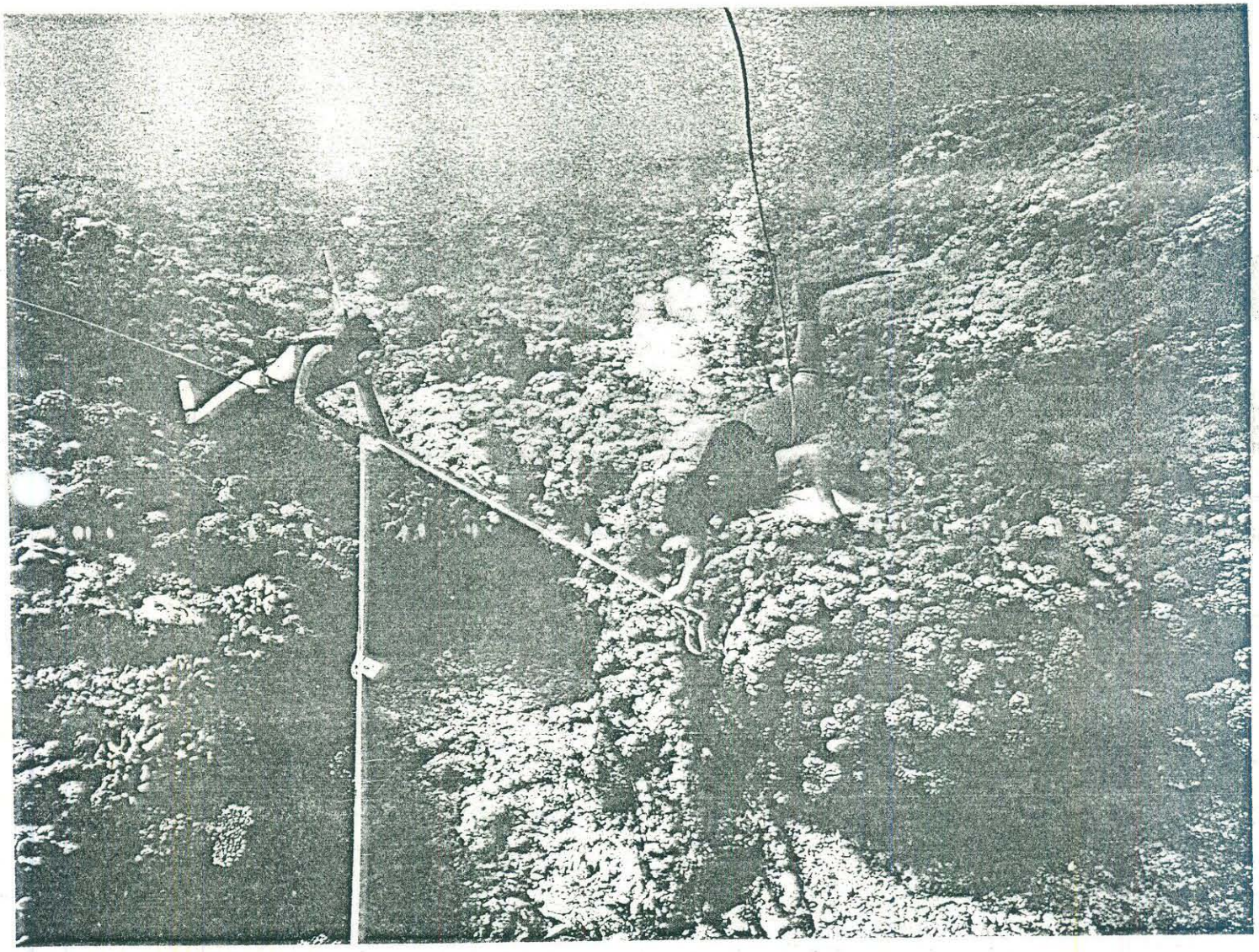


Figure 15.b) The wreck site underwater: divers measure between two cannon. Photo P.Baker.

ROWLEY SHOALS UNIDENTIFIED
1982

[not including reeftop wreckage found]

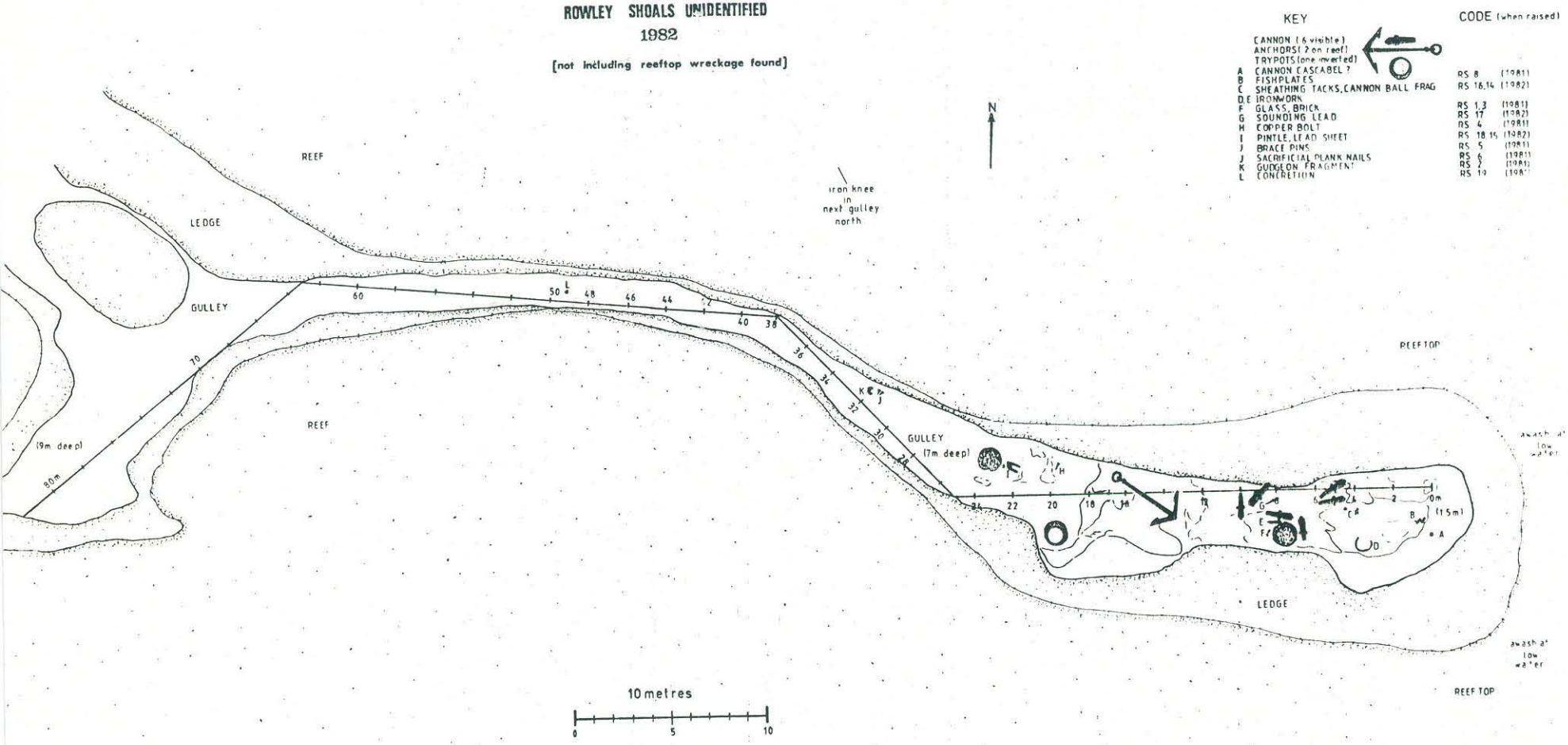


Figure 16.b) Site Sections, drawn by M. McCarthy.

Piscean returned to Bedwell Island at 1345 hours. The first direct radio communication with Beagle was established.

13 July. At Bedwell Island.

14 July. At Bedwell Island. The news arrived that the heavy excavation plant could not be brought across by 17 July and that personnel would return to Broome on that date. The team started to pack up the camp.

15 July. Personnel completed packing and Piscean arrived at the wreck site at 1120. One cannon was cleaned of coral growth sufficiently to ascertain a length of 1.65m with a 35cm diameter base ring. Estimated to weight 11 cwt it was too heavy to be raised with available equipment, so the survey grid was removed, loose items picked up, and Piscean departed for Broome at 1430.

16 July Piscean arrived at Broome at 0300, and was unloaded by 1000.

b) Items Raised

R.S.14. A semi-circular piece of iron, possibly part of a cannon ball, found adjacent to the 4 metre mark on the site plan. If it is a cannon ball then its diameter would originally have been between 9cm (3½") and 10cm (4"), with a weight of between 4 lbs and 9lbs.

R.S.15. A piece of lead sheet, perhaps leading from around one of the external extremities of the hull, found adjacent to the 22 metre mark.

R.S.16. Three copper sheathing tacks, found adjacent to the 4 metre mark.

R.S.17. A sounding lead 40cm in length and weighing 2.5kg, found adjacent to the 8 metre mark. The surface is worn and bears no obvious markings (see Fig.17).

R.S.18. A bronze pintle 55mm in diameter with arms 69cm in length and 76mm broad, and a jaw gap of 26cm, found adjacent to the 22 metre mark. One of the bolts which held the jaws to the rudder remained with the pintle (see Fig.18). The bolt was 15mm in diameter. Steel assigns 1 7/8" (48mm) diameter pintles to his 201 ton and 330 ton ships. He assigns 3" (76mm) broad straps to his ships of 201 tons and 330 tons.

R.S.19. A concretion containing small fragments or rope and iron, found adjacent to the 50 metre mark.

THE ROWLEY SHOALS SHIPWRECK SITE : A PROGRESS REPORT

SYNOPSIS

An unidentified shipwreck of the early nineteenth century has been found on a remote coral atoll off the North West coast of Australia. A party from the Western Australian Museum inspected the site in September 1981. Further work was done on the wreck in July 1982 with the aim of positive identification.

1. Introduction

A British Admiralty chart dated 1829 and showing a non existent coral reef some 150 miles off the North West coast of Australia has led to the finding of an early shipwreck site. The chart is entitled General Chart of Terra Australis or Australia from the surveys of Capts.Flinders and King with additions from Lieuts. Jeffreys and Roe, also from Admi. D'Entrecasteaux, Capts. Baudin and Freycinet of the French Marine to the year 1829. Included on the chart are the words 'coral reef on which the Lively was lost' at a position of latitude 16°20'S, longitude 119°35'E, some 45 miles due north of Mermaid Atoll in the Rowley Shoals (See Fig.1).

Modern charts for the Rowley Shoals area show deep water where the 1829 chart indicates the coral reef, but cartographers during much of the first half of the nineteenth century gave credence to its existence. A reef is marked 'Lively Shoal' on an 1846 chart of Australia by John Arrowsmith and is mentioned in a sailing directory of 1852(1). It is shown on an 1826 chart by Adrian Brue, who took part in Baudin's expedition of 1801-03 as a seaman on the Naturaliste, and it appears on Phillip Parker King's Chart of the Intertropical and West Coasts of Australia, surveyed between 1818 and 1820. King refers only very briefly to the wreck in his published work:

> "A ship called the Lively was wrecked on a coral reef in about 16°20'S, and 119°35'E(2)".

King's lack of specific attention to the subject would suggest that the information had been passed on to him from earlier sources. On one occasion, having just passed through the area of the Rowley Shoals and the Trial Rocks, he wrote:

> "The deceptuous appearances that are frequently observed at sea, such as the reflections of the sun, ripplings occasioned by the meetings of two opposite currents, whales asleep upon the surface of the water,

Figure 1. The 1829 Admiralty Chart

> shoals of fish, fog banks, and the extra-ordinary effects of mirage, than which, as an optical illusion, nothing is more deceiving, have doubtless given birth to many of these non-existing shoals and islands. Were charts to be published (one does exist in manuscript, in the Hydrographical Office at the Admiralty) with all the shoals and dangers laid down that have been reported by good and respectable authorities, the navigator would be in a constant fever of anxiety and alarm for the safety of his vessel. The charts of the present day teem with examples of this sort, and many islands and reefs are laid down which have not been seen since their first discovery, and which, perhaps, never existed at all, unless, like Sabrina Islands, they were thrown up by a submarine volcano, and disappeared immediately afterwards[3]".

It seems very unlikely that King saw the Lively wreck, or he would not have given it the same erroneous position as the 1829 chart.

The 1829 Admiralty chart was shown to this author in 1980. The indicated wreck position was some 45 miles due north of Mermaid Atoll in the Rowley Shoals. The problem was that no other available records indicated that a vessel named Lively had been lost off the North West coast, and the modern charts show a depth of 120 fathoms where the coral reef was supposed to be (see Fig.2).

These discrepancies were mentioned during a radio interview and this sparked the memory of Broome charter boat operator Peter Sartori who had seen curious shapes on the top of the Mermaid Atoll when he was steaming past at low tide.

2. Inspection

The boat Piscean, skippered by Peter Sartori, was chartered by the Western Australian Museum from 16th to 20th September. On board were an inspection team (including the author) from the Department of Maritime Archaeology, led by Mike McCarthy, who was at that time in charge of Wreck Inspection; the Head of the Division of Human Studies, Dr. Ian Crawford, interested in Indonesian fishermen who sometimes visit the Shoals; and the Head of Division of Natural Sciences, Dr. Paddy Berry, who was interested in the marine life on the Shoals.

The Piscean arrived at Mermaid Atoll at the time of a spring low tide so the maritime archaeologists on board were quickly able to distinguish the reef-top shapes as two Admiralty pattern anchors. Closer observation showed that two

Figure 2.Comparison between 1829 chart and modern chart north of Mermaid.

other pieces of iron lying nearby were deck supports from a wooden sailing vessel. Considered together these relics showed that a large wooden sailing vessel had struck the atoll nearby and had broken up.

On the following day (the 17th) the main wreck site was found lying just off the outer edge of the atoll adjacent to the anchors. A brief trilateral survey was undertaken to plot major objects. On the 18th a quantity of isolated sections of rigging and deck fittings were found in shallow water inside the lagoon during a dinghy based search. On the 19th Piscean was taken to Clerke Atoll some 15 miles to the south to check on the feasibility of using a sand cay named Bedwell Island as a base camp for future excavation seasons. The party then returned to the mainland.

a) The Rowley Shoals

The Rowley Shoals consists of three independent coral atolls, each roughly 10 miles across, and together extending 60 miles (see Fig.3). The Shoals are roughly 180 miles west of Broome and 200 miles north of Port Hedland[4]. The rim of each shoal is nearly dry at low water and awash at high water. The sea breaks heavily on the shoals. Mermaid Reef, the most north-easterly of the three reefs, has a 60 yard wide passage leading into the lagoon (see Fig.4). The wreck site lies on the north-west edge of the reef. Clerke Reef lies 16 miles south-west of Mermaid Reef. Near the north end of the reef is a sand cay (Bedwell Island) which is two metres high but devoid of vegetation. A narrow passage in the north-east side of the reef is navigable by a boat under favourable conditions. Imperieuse Reef lies about 20 miles south west of Clerke Reef. A small sand cay, four metres high, supports a light on a metal tower.

b) Concentrations of Wreckage

i) The Main Site

The bulk of the wreck lies just off the outer lip of the Atoll in a run-off gully which appears to have been created by water spilling from the lagoon as the tide goes down (see Fig.5). The tide range would appear to be at least 5 metres. At spring lows some of the wreckage is less than a metre deep, while the deeper sections are three to four metres deep. The principal items seen during the inspection were a 3.8 metre long anchor; five iron cannon, each

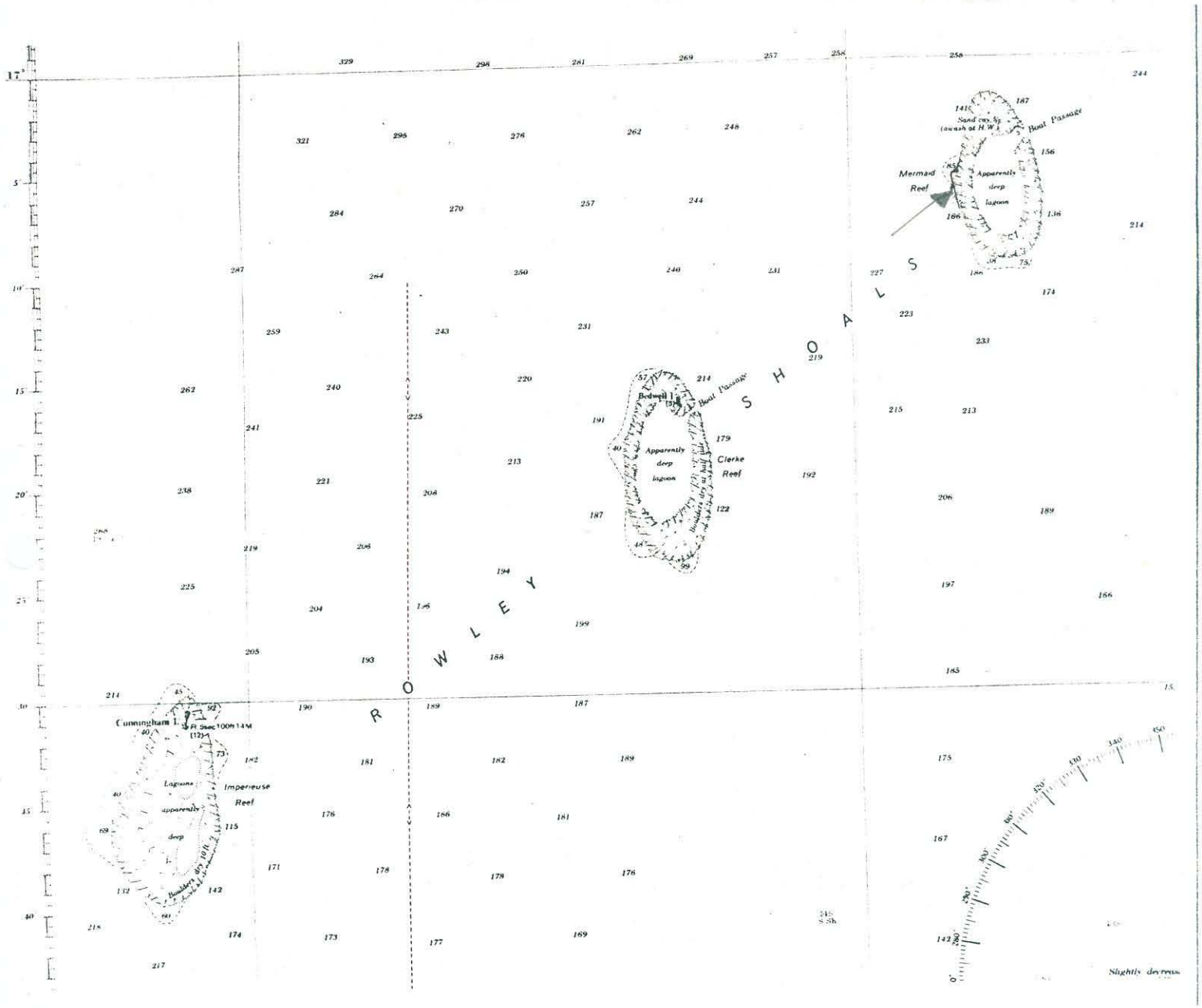


Figure 3. A section of the modern chart Aus 325.

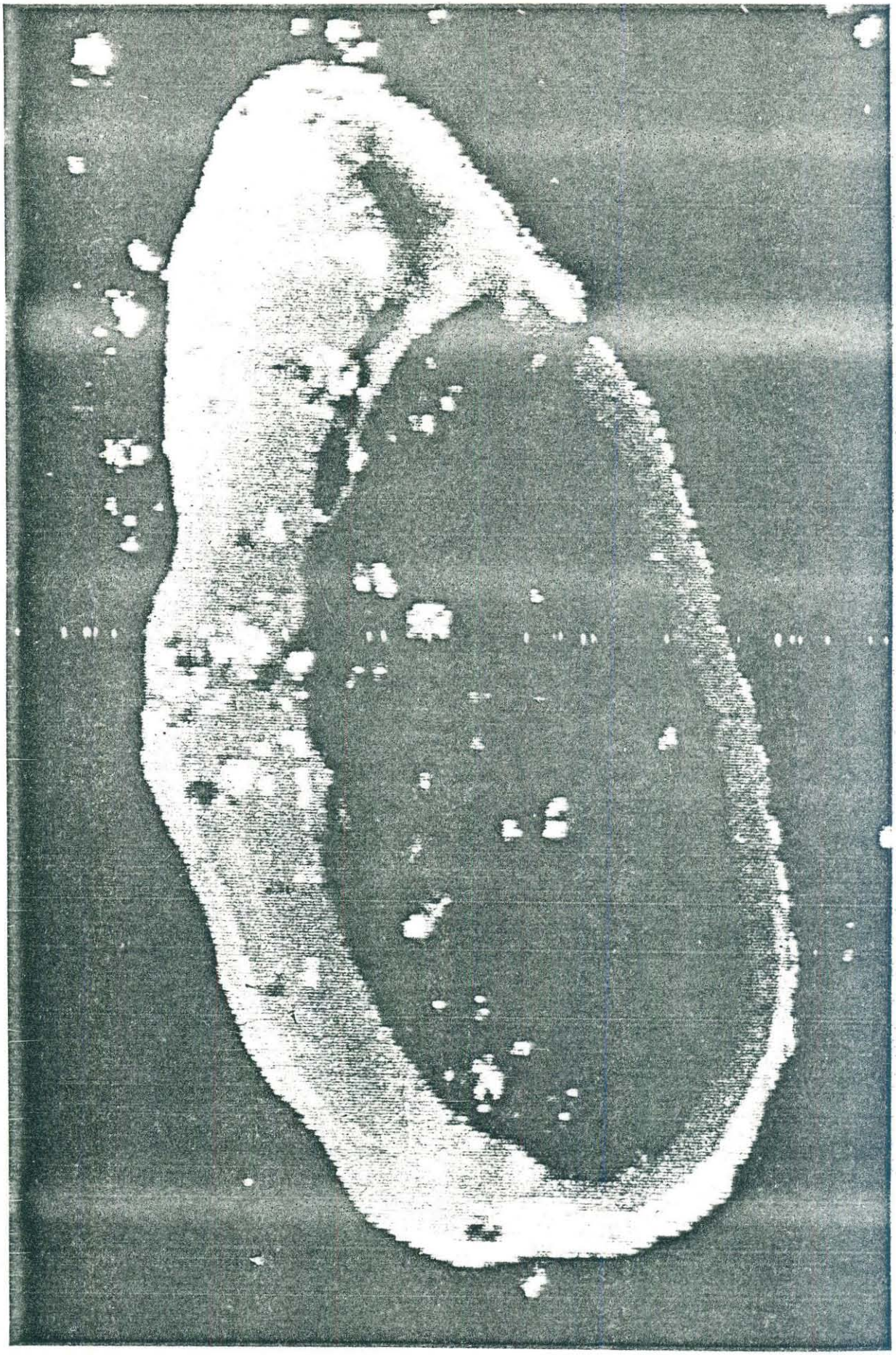


Figure 4. Satellite photograph of Mermaid Reef, showing entrance passage.

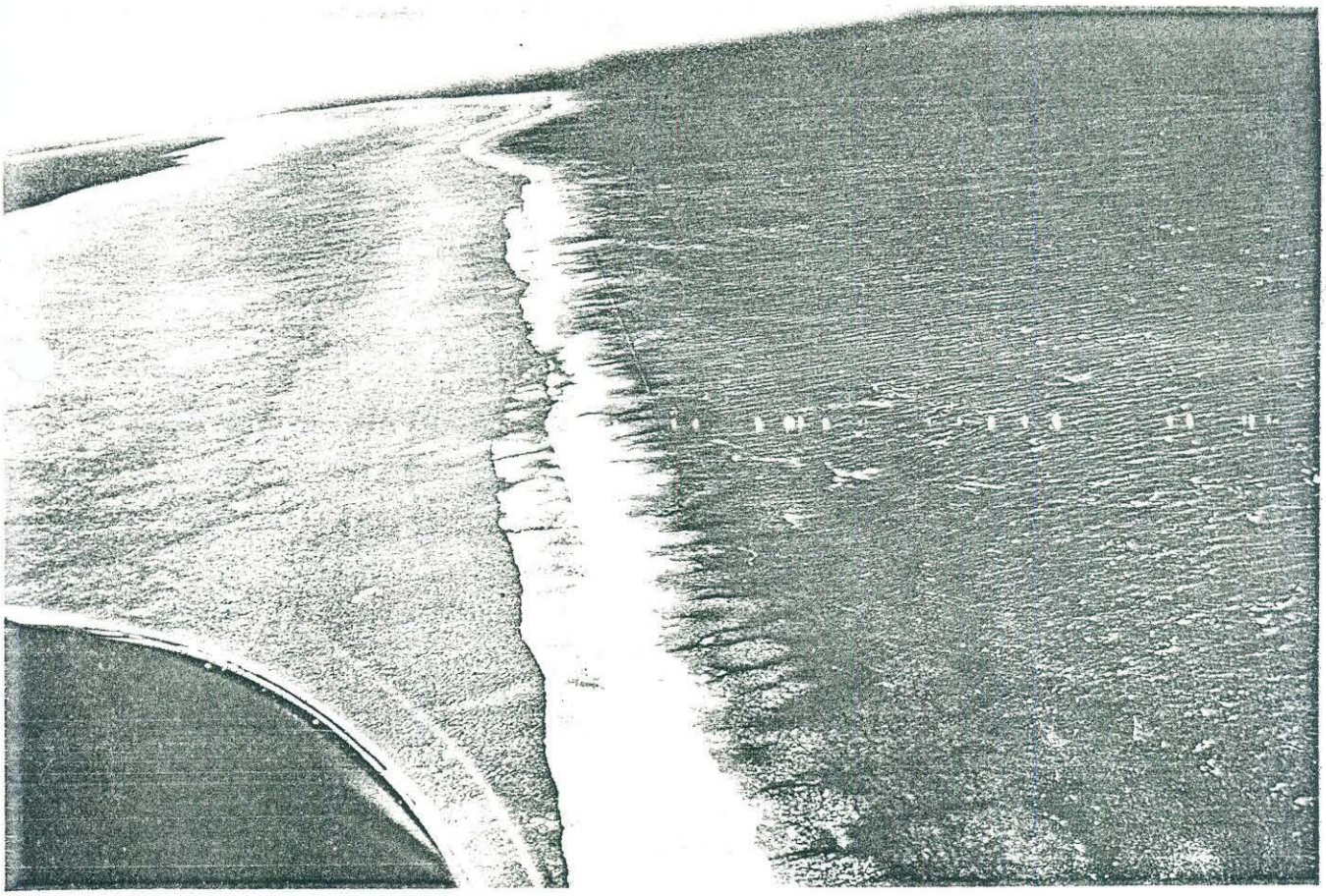


Figure 4. b) Aerial photograph of Mermaid Reef. Photo G.Henderson.

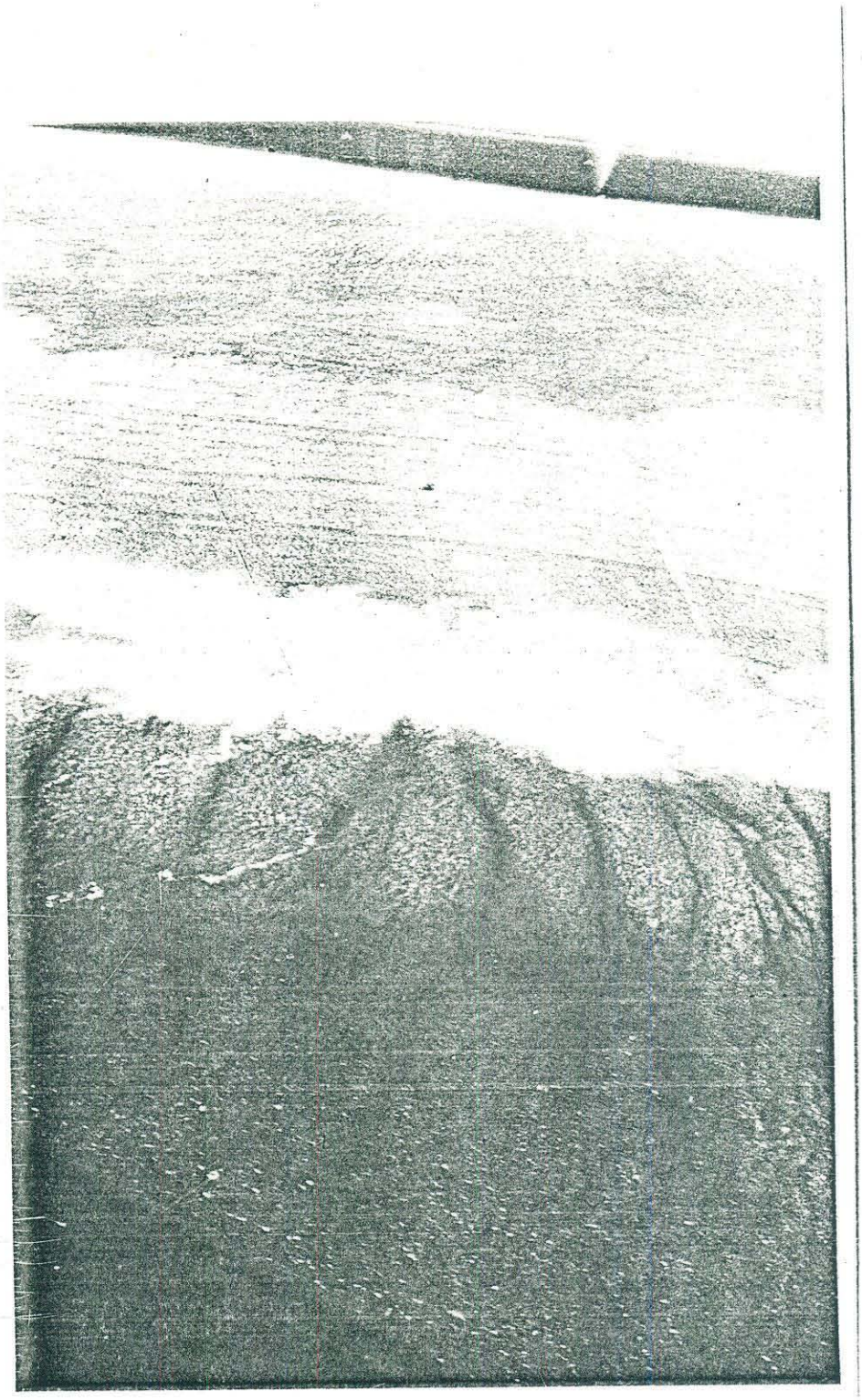


Figure 5. The wreck site from the air. The upper centre black dot is the two shallow anchors. The red dot at lower centre is a buoy marking the main site. A mooring line runs off to bottom left. Photo G. Henderson.

approx. 1.5 metres long; and two whalers trypots, each approx. 1.3 metres in diameter. Other items included two bronze rudder gudgeons; several copper rudder spikes and rudder bolts; a quantity of sheet lead; several glass fragments; a brick fragment; several copper nails for securing sacrificial planking; a number of copper sheathing tacks; and a copper dovetail? fitting.

Most of the wreckage lay in a broad section (about 7 metres wide) of the gully over a length of 20 metres (see Fig.6). The distribution of material indicates, as is to be expected, that the wreck was subjected to heavy turbulence at the time that it was breaking up. The two bronze rudder gudgeons were separated by over 10 metres, and the two trypots by 13 metres. It seems likely nevertheless, that the group of five iron cannon lie on top of a substantial mound of wreckage. The Batavia (1629) lies on a somewhat similar reef edge heavily affected by surge. On the Batavia site a number of sandstone blocks lying in the hold of the ship formed a protective covering for a large quantity of ship's structure. A similar situation may be expected on this Mermaid Atoll site. The bottom of the 'U' shaped gully may be composed of a thick deposit of wreck material weighed down by the five cannon. As the iron guns oxidised, an iron concretion would have formed, producing a protective layer which will have sealed the underlying objects from the hostile environment above.

The distribution of material would seem to imply that the vessel ran bow first on to the reef. Rudder fittings remain at the deep end of the site.

ii) The Reef Top Anchors

Two Admiralty pattern anchors have been carried some 250 metres across the high reef and then deposited together. The anchors are 3.2 metres and 3.6 metres in length. Both have rings (rather than shackles), showing that they would have been used with hemp cables (see Fig.7). Some 10 metres from the anchors lay part of an iron deck support. This suggests that the anchors were borne to their present position on a section of the ship's wooden structure, which subsequently disintegrated. A second deck support was noticed further inside the Atoll.

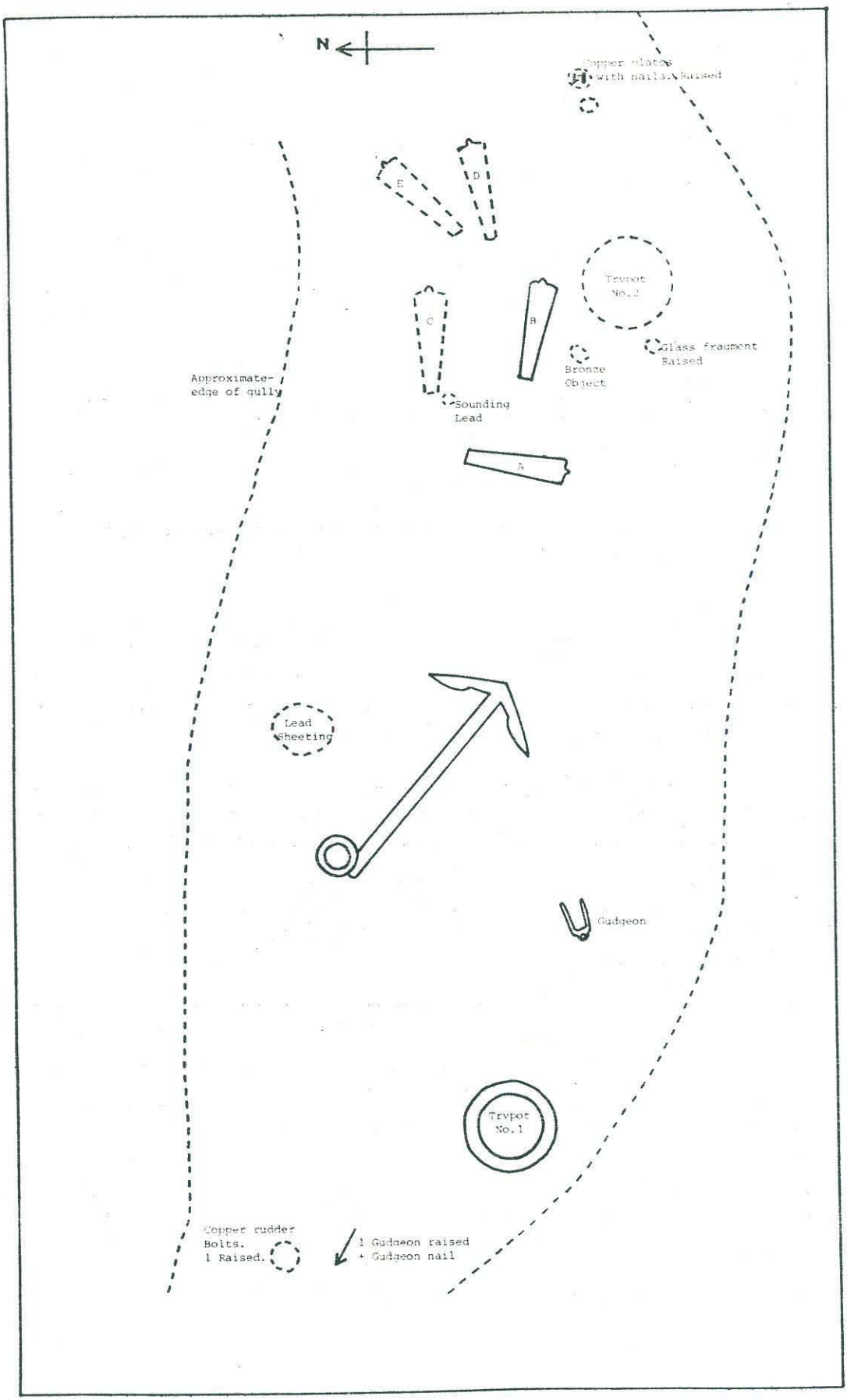


Figure 6. Inspection Site Plan 1981, drawn by G. Henderson. Note picked line indicates incomplete survey data.

ROWLEY SHOALS UNIDENTIFIED WRECK

17th SEPTEMBER 1981

PHOTOMOSAIC by PATRICK E. BAKER

Figure 6.b) 1981 Site Photomosaic, by P. Baker.

similar tonnage to Bennett's Lively. Lloyds give no indication of how many guns were carried on her.

A volume published in 1840 about shipbuilding in India refers to a 200 ton vessel, built in 1804 as the Alfred but afterwards re-named the George[19]. This vessel was, according to the account, lost on the coast of New Holland. The name New Holland has generally been applied to the western part of Australia before the establishment of the colony at the Swan River. Thus, it is possible that the vessel was wrecked on the West Australian coast some time between 1804 and the 1830s. Collinge does mention a whaler named George having been wrecked, over 300 miles out from the coast, in 1839, but that was a New London registered vessel[20].

6. Other Research

The existence of a chart with the words 'coral reef on which the Lively was lost' seems to imply that there were survivors who reached civilisation. Otherwise it is unlikely that any other ship would have known where the vessel went down. The tides would have quickly removed all surface indications for a vessel passing the reef at a safe distance.

Survivors would have been picked up by another vessel, such as a consort whaler, or would have sailed north in one of the ship's boats to Indonesia. If they were rescued by another vessel then some record of the loss would probably have been made at that vessel's next substantial port of call. But that port of call could have been almost anywhere on the globe.

If, on the other hand, survivors sailed north to Indonesia, then there is a likelihood that some record will survive of their visit. Mr. Arjen van der Kuijl of Leiden was asked to do a search of Dutch newspapers covering Java for the period 1806-1811, seeking references to the Lively or the Santa Anna. He reported as follows:

> "Firstly I consulted the weekly Bataviasche Koloniale Courant for the year 1811 in the Royal Institute for Ethnology at Leyden. The files of the Institute, however, only contained the first 33 issues of that year (4 January to 20 August) and they yielded no results. According to the catalogue of the Institute the Royal Library at The Hague had a complete run for the year, but on inspection this turned out to be wrong, as only the first 24 issues were extant. A search through the first four months

of 1812 of the Java Government Gazette (published at Batavia from 1812) also failed to produce any mention of the ship. With regard to 1806 I was totally dependent on manuscript sources. With the kind assistance of Mrs. E.S. van Eyck van Heslinga, M.A. (assistant lecturer in maritime history, University of Leyden), I continued by search in the Public Records Office at The Hague. Basing my investigations on the 'Preliminary Inventory, East Indies and Cape of Good Hope' (ARA 01/27) I perused of the Collection Ministry for the East Indies 1806-1810 the following items:

146 - shipping arrivals and departures Batavia, 1 January to 31 December 1806; of the Province Holland (the Netherlands formed a part of France in this period), East Indies, 1810-1813, the items:

14 - general and sent letters from the Governor General and Council of the Indies to the Council of Asiatic Possessions and Establishments and to the Ministers of the Navy and Colonies of the Kingdom Holland and the French Empire, 7 March 1806 to 30 August 1809.

16- the same, 31 January 1811 to 30 April 1811

21- Alphabetical register to the same, 30 August 1801 to 30 April 1811.

22- The same, 10 January 1808 to 30 April 1811.

24- letter from Governor General H.W. Daendels to the Minister of the Navy and Colonies of the French Empire with enclosures 21 February 1811 to 24 November 1811.

Unfortunately, this research remained fruitless. A telephone call to the Insitute for the Tropics at Amsterdam, finally confirmed that also there were no further issues for 1811 of the Bataviasche Koloniale Courant present[21]".

Further work needs to be done on the English newspapers of the period in the future.

Indonesian fishermen were regularly visiting the Rowley Shoals until quite recently. Men would dive from canoes to collect beche-de-mer. It seems likely that such fishermen would have seen the wreckage on the Rowley Shoals and perhaps even raised whatever they could. However, it is not likely that they will have left any records of their observations which would have survived.

7. The First Excavation Season, July 1982

Consideration of the archival and inspection data led this author to conclude that further information would have to be gleaned from the wreck site if the ship is to be identified. Such work will also have the advantage of building up a valuable research and display collection of early whaling material. One month seasons were planned for 1982 and 1983. For the 1982 season July was chosen as a month when weather conditions in the area were most favourable and the chances of a cyclone were negligible. The Piscean was chartered for 18 days and it was intended that Bedwell Island, some 15 miles from the wreck, be used as a base camp and a dump for heavy excavation equipment and artefacts. The intention was that diving on site be conducted principally from Piscean, with support from the Museum workboat Beagle, and that darkroom procedures, registration, field conservation, sleeping quarters, maintenance, meals etc. be carried out on Bedwell Island.

Seven personnel left Broome on the Piscean with the survey equipment on 1st July. The heavy excavation equipment was shipped by State Ships to Port Hedland, the intention being that B.P. would then take it and 2 accompanying personnel across to the Shoals some time during the first week of July on an oil rig tender. The State Ship Pilbara's arrival at Port Hedland was unfortunately delayed from 29 June until the evening of 5 July. B.P.'s busy drilling schedule meant another week's delay, and for some time after 12 July strong wind warnings were given daily. This meant that B.P. were unable to transport the heavy equipment to the Shoals by 17 July, when Piscean was due to return to Broome. Because the Beagle was not at Bedwell Island, personnel had to accompany Piscean back to Broome, and so the expedition was shortened. Thus, the expedition carried out its survey objectives, but no heavy objects were raised.

a) The Survey

The programme of activities on the Shoals was as follows:

1 July. The Piscean arrived at Bedwell Island at approximately 1300 hours. First tasks were establishing the camp on the Island, marking a passage in from the channel, and selecting a mooring area (see Fig.14).

2 July. The entry channel was marked, and further equipment was brought ashore.

3 July. Piscean was taken to Mermaid Shoal and, after a period of searching, the wreck site was located. Personnel walking on the reef-top observed some damage to the wreck anchors. The site was buoyed. Piscean remained overnight on Mermaid Shoal.

4 July. A photographic record of the site was obtained, then a base line was established through the length of the site with short survey posts hammered into the seabed and connected with a stainless steel wire (see Fig.5). The surge increased by mid-day, preventing further work on site. During the afternnon reef-top walkers found a hawse-pipe 200-300 metres east of the anchors. Piscean remained overnight on Mermaid Shoal.

5 July. On site features were tagged, and major features triangulated. The depth and width of the site gully was measured. A trial trench was started at the mouth of the gully. The Piscean returned to Bedwell Island at 1500.

6 July. Piscean left for Mermaid Shoal at 0800 hours, arriving at the wreck site by 0950. Repairs were made to the on site mooring. Multimeter readings were taken of iron lead and bronze objects, and water samples and water temperature data collected. Site profiles were attempted but abandoned because of an increasing swell. Piscean returned to Bedwell Island at 1415.

7 July. Piscean unable to leave Bedwell Island due to weather.

8 July. Weather bound.

9 July. Weather bound.

10 July. Piscean arrived at wreck site at 0930. Contact by 2-way radio was established with Bedwell Island. On-site labelling was completed. Width and depth measurements of the gully were taken and positions of major artefacts plotted in for the site profile plan. A test hole was started midway along the gully to determine the depth of loose coral rubble. A third trypot was located. Piscean remained overnight at Mermaid Shoal.

11 July. An intended reef walk was prevented by the tide. The on-site mooring was re-arranged. The on-site survey wire was re-established after being hooked by Piscean's anchor dragging during the night. The test hole near 3rd trypot was continued. At a depth of 20cm a pintle was uncovered. A makeshift airlift was experimented with but proved to be too weak to lift the coral rubble. An iron concretion was located in the next gully north of the wreck site. Piscean anchored off the wreck site overnight.

12 July. A reef top search line re-located the chain plate material observed in 1981. Later multimeter readings were taken on the newly exposed pintle and it was removed from the site. Coral rubble was removed to a depth of 40 cms to free the pintle, without finding hard bottom. The survey was continued (see Fig.16).

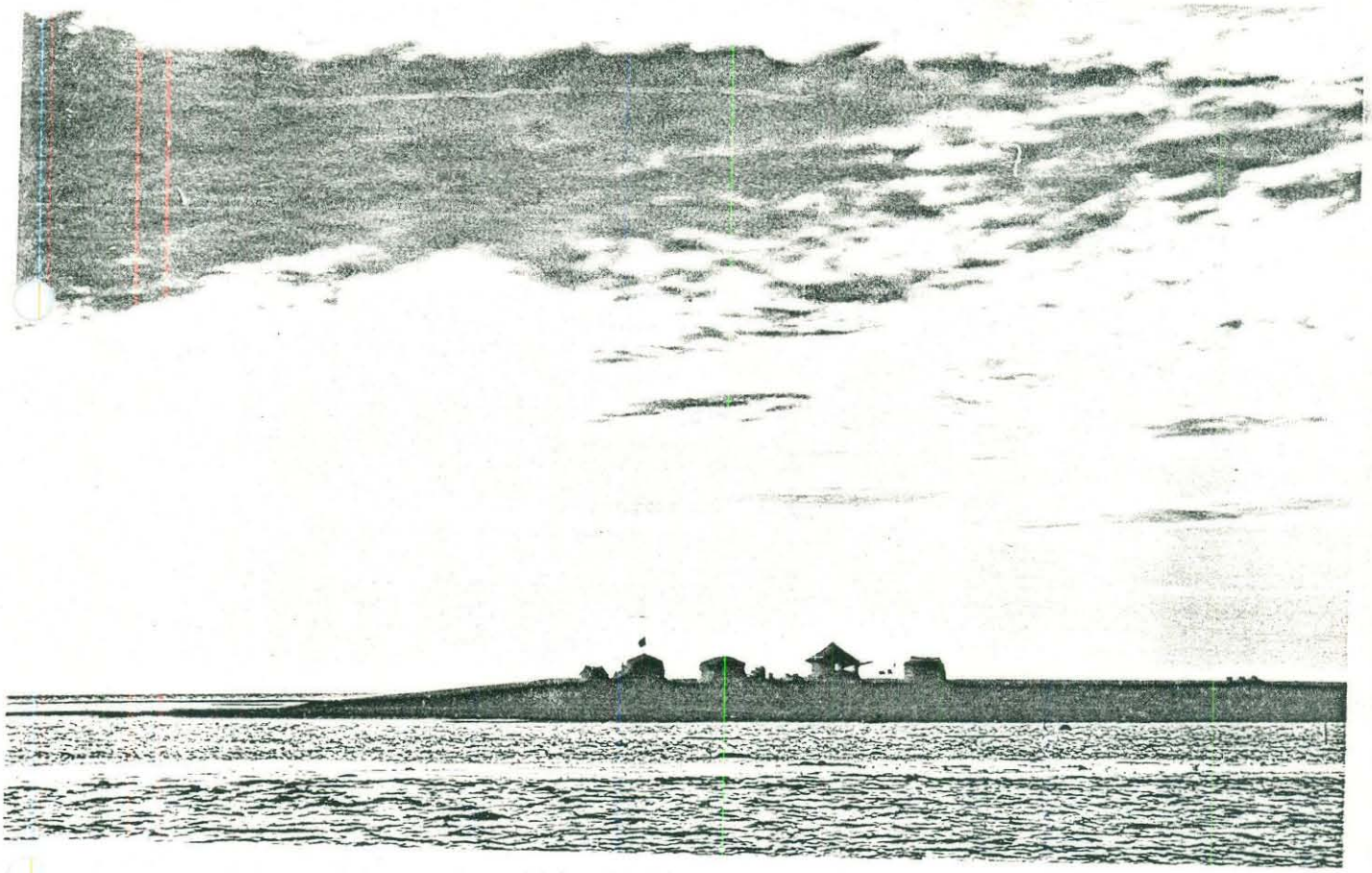
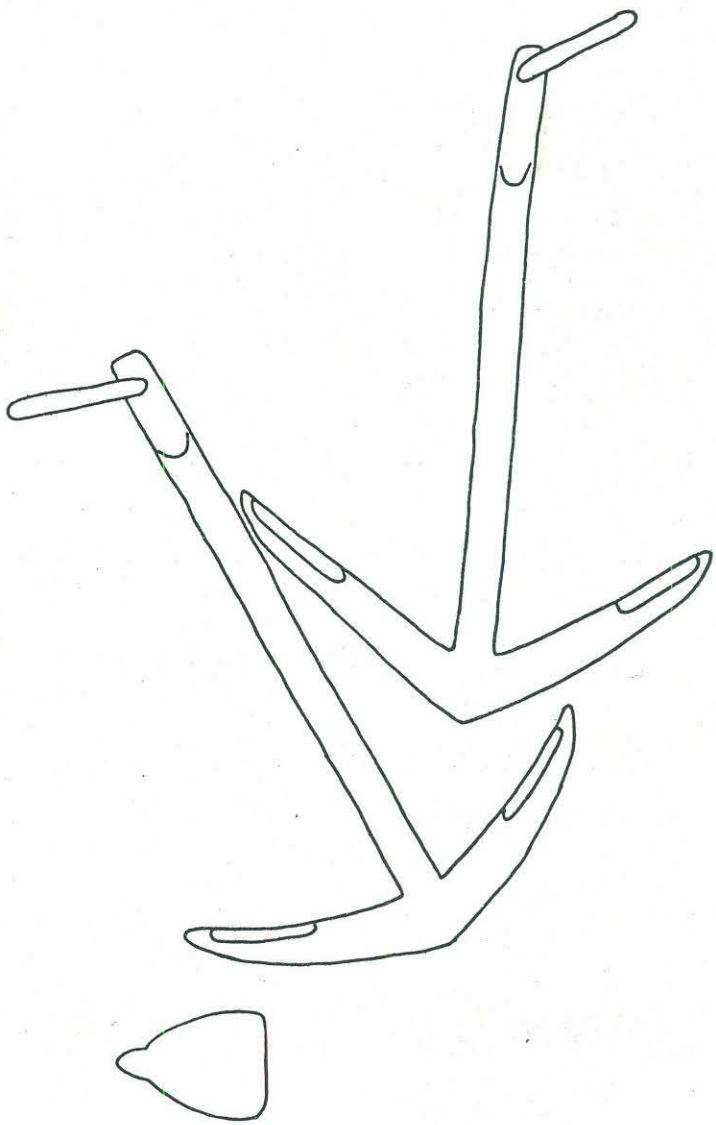
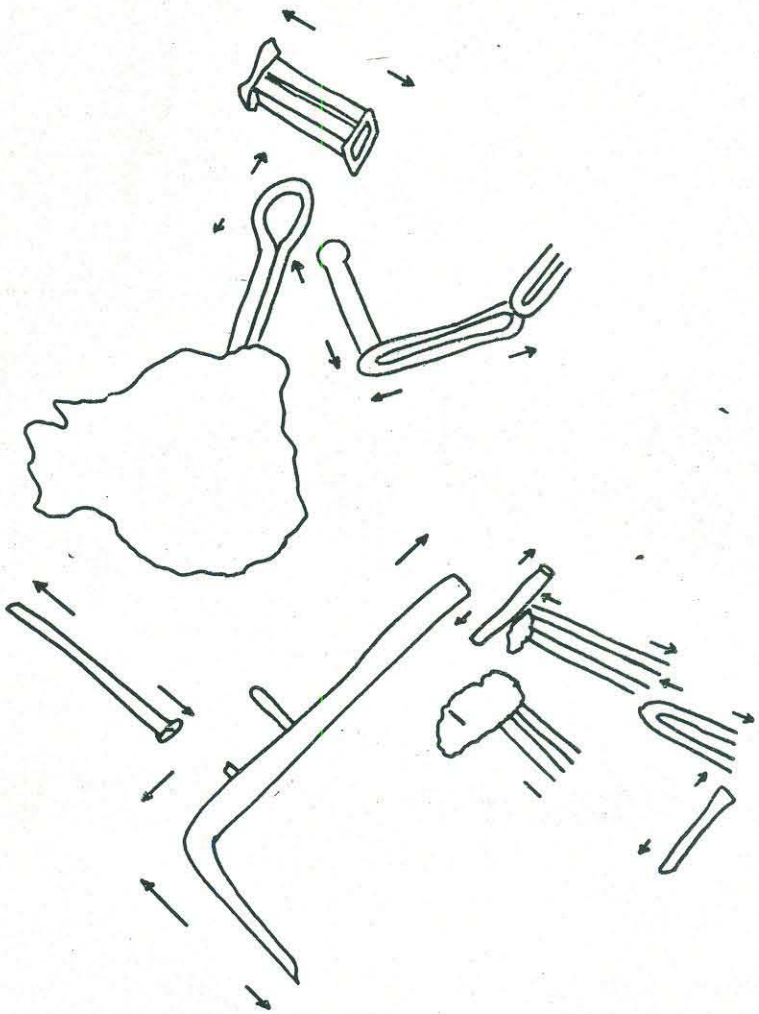
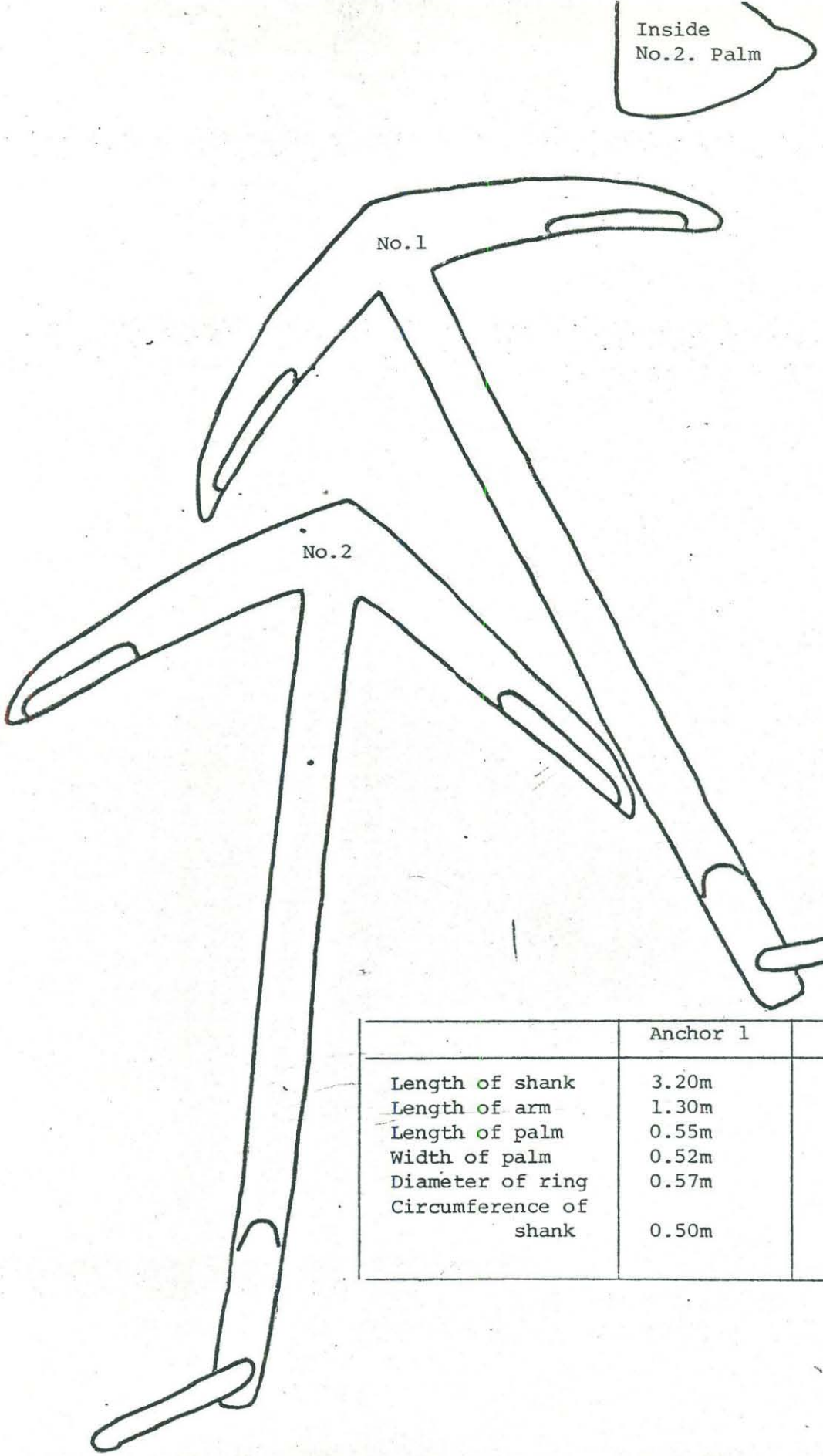


Figure 14. The camp site on Bedwell Island. Photo P.Baker.

Figure 15. a) The wreck site underwater: a diver examines a trypot.
Photo P.Baker.







	Anchor 1	Anchor 2
Length of shank	3.20m	3.60m
Length of arm	1.30m	1.30m
Length of palm	0.55m	0.50m
Width of palm	0.52m	0.50m
Diameter of ring	0.57m	0.59m
Circumference of shank	0.50m	0.61m

Figure 7. On site sketch by G. Kimpton of anchors with dimensions

iii) Lagoon Wreckage

Mermaid Atoll consists of an elliptical coral reef, the outer lip of which dries at low tide. The inner lip gradually deepens into a lagoon. A quantity of material has washed over the lip from the wreck and been deposited in the coral gardens on the slope into the lagoon. One of these deposits was examined and proved to consist of a number of chain plates and associated fittings, a lead deck scupper, and several substantial iron concretions. The material indicates that the upper works of the ship were washed over the reef and settled in the lagoon, where any exposed timbers would have rapidly disintegrated. It may be expected that more such finds will stretch in a line through the wreck site and the reef-top anchors (see Fig.8).

c) Samples Retrieved

A small number of artefacts were collected in the hope that further examination might give information about the ship.

R.S.1. One case bottle fragment, found near trypot 2. The sample was a 3cm long, 2mm thick, fragment of one of the sides. The glass was green. The bottle would have formed a part of the provisions of the crew. Case bottles were commonly used as gin containers. Other fragments were seen on the site.

R.S.2. Section of a bronze rudder gudgeon, found at the seaward end of the narrow section of the gully. The pintle hole was approximately 65mm in diameter and the gap between the arms (indicating the thickness of the sternpost) appears to have been approximately 20cm. Both arms have been broken off, one at the shoulder of the gudgeon (see Fig.9).

R.S.3. Brick fragment, found at the seaward end of the narrow section of the gully. The brick was orange in colour. Its dimensions were 105mm wide and 40mm thick. Such bricks were normally used on whalers to build a foundation to support the iron trypots and act as an oven. This assembly was known as the tryworks.

R.S.4. Copper fastening bolt found at the seaward end of the narrow gully section. This consists of a 15mm diameter, 26cm long copper rod with both ends hammered into a head. Its function has been to fasten the arms of the pintle to the rudder. Steel in 1805

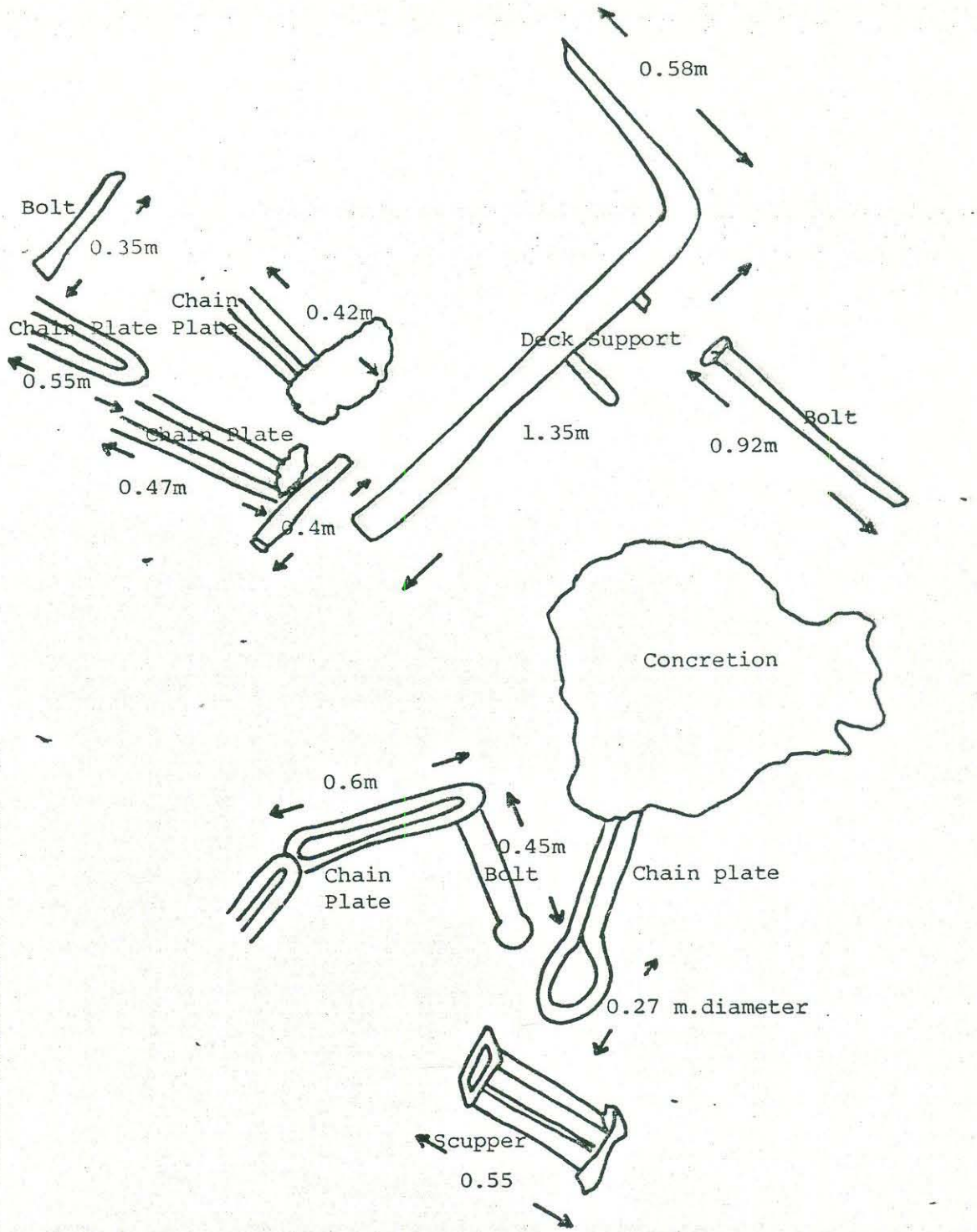


Figure 8. Material found inside the reef. Sketched on site by G. Henderson

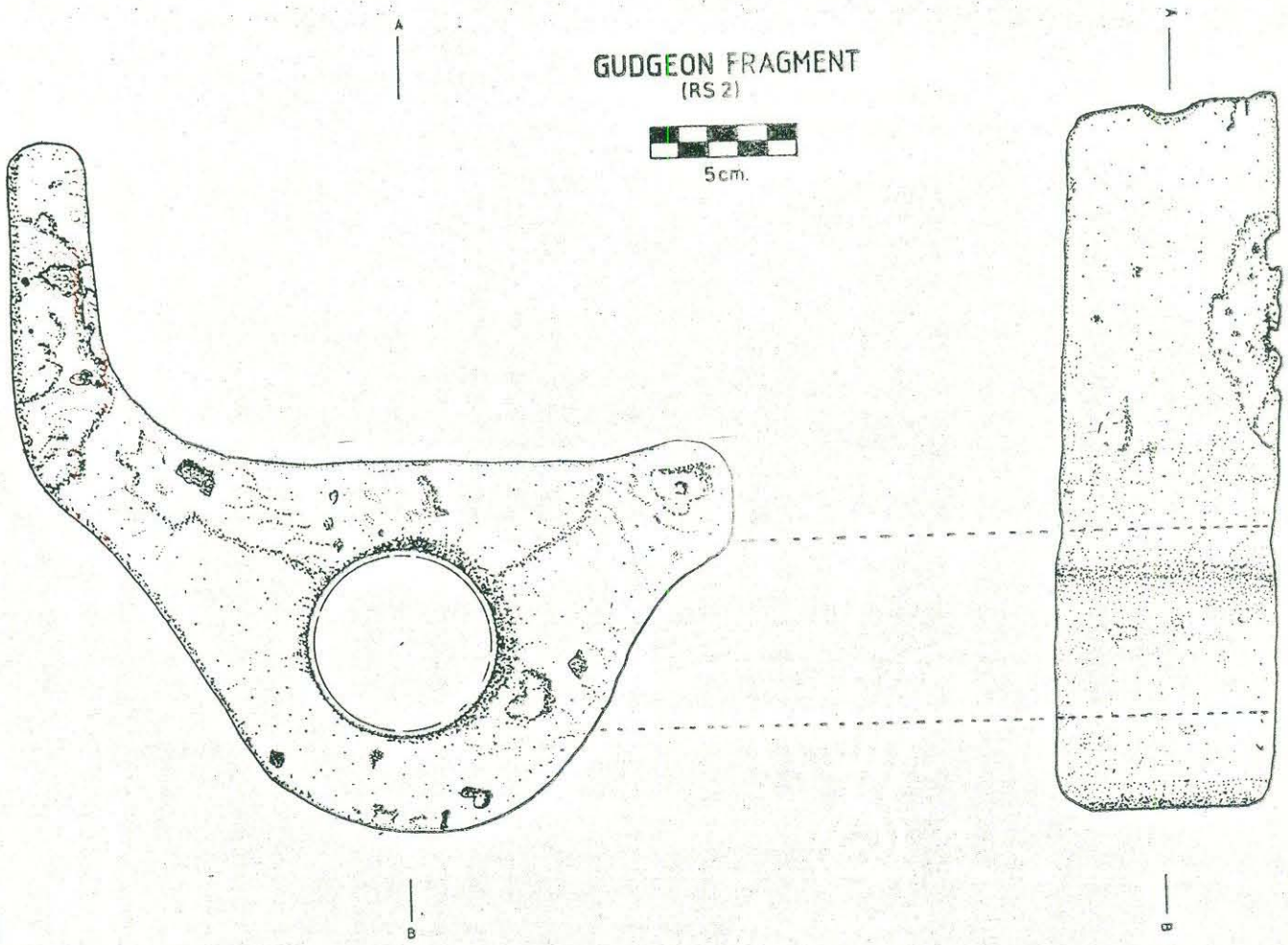


Figure 9.Bronze rudder gudgeon. .

suggests that rudder fittings of that diameter would have been used on a vessel of less than 200 tons. However, the bolt from the wreck site was worn and would originally have had a larger diameter.[5]

R.S.5. Two copper gudgeon nails, found in the narrow section of the gully. These consist of 13cm long copper rod tapering down from 15mm to a flattened point (see Fig.10). Steel's specifications (fol.53) would use gudgeon nails of this diameter on a vessel of over 400 tons. The heads have been beaten out to 35mm diameter. These nails are used to fasten gudgeons to the stern of a vessel. Similar nails from other vessels sometimes have ragging for a firmer grip on the timbers.

R.S.6. Two copper sacrificial planking nails, found in the narrow section of the gully. The shanks of these 55mm long nails are square in section and come to a flattened point. One has a semi-square flat head. This sort of nail has been observed on the Rapid site, where they were used to fasten a thin layer of pine boards outside the bottom planking to act as an alternative to copper sheathing in protecting against teredo infestation.

R.S.7. Six copper sheathing tacks, found in the narrow section of the gully and at the shallow end of the site. The shanks of these 3cm long tacks are square, and they taper to a point. The flat heads are off round and up to 1cm in diameter. Such tacks were used to fasten sheets of copper (sheathing) to the bottom timbers of a ship as a protection against teredo infestation. The presence of both sacrificial planking nails and sheathing tacks is an indication that the vessel was either sheathed with copper over boards or part sheathed in copper and part sheathed with sacrificial boards.

R.S.8. Part of a pair of copper dovetail? fittings, found at the reef end of the site (see Fig.11). Two flat sections of copper, 15mm thick and 125mm wide are held together by two sharpened copper pins. Attached coral concretion holds the two copper pieces 80mm apart, but it is not clear that the gap between the two pieces was originally thus. The pins are of 1.8mm diameter copper rod, with heads flattened to 30mm and ends sharpened to a flat point. The copper plates may have been from dovetail fittings, which are used to strengthen scarphs in the keel. However, the keel would

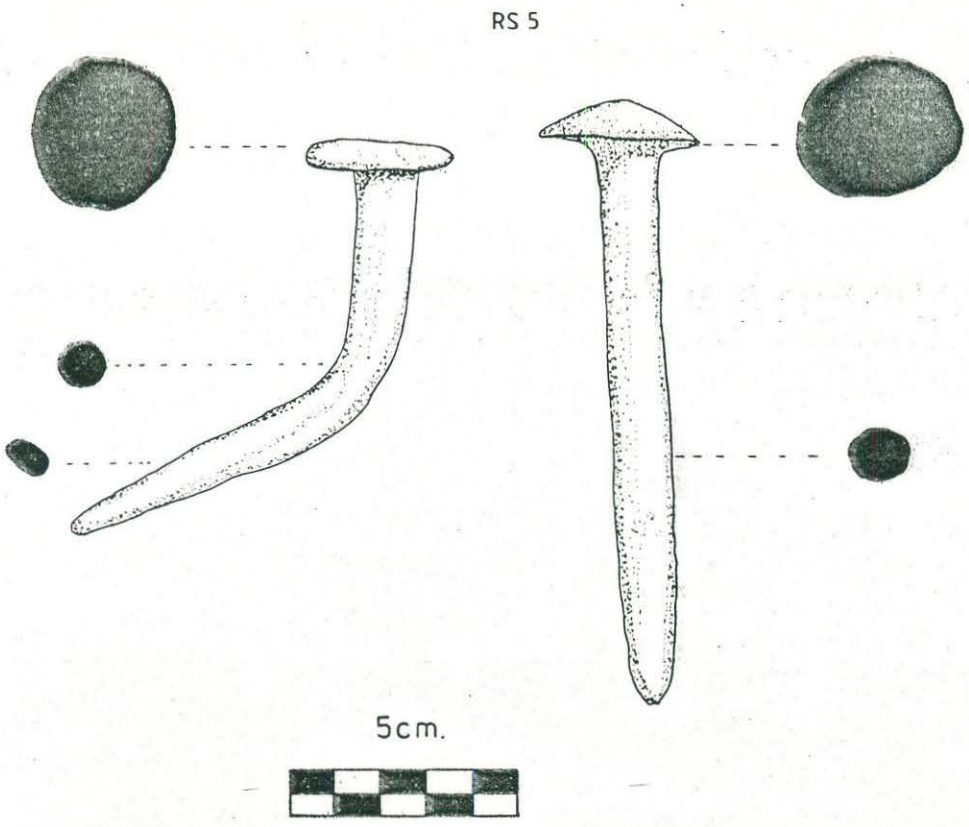


Figure 10. a) Gudgeon nails Drawn by M.McCarthy.

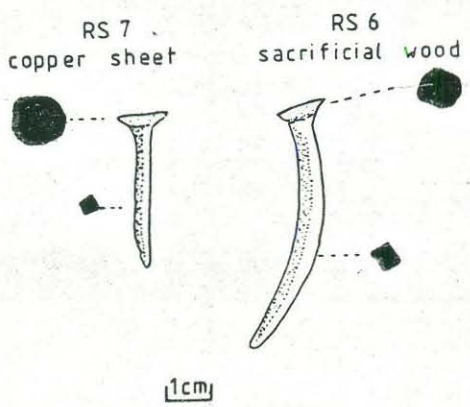


Figure 10. b) Sheathing tacks

c) Sacrificial planking nails.

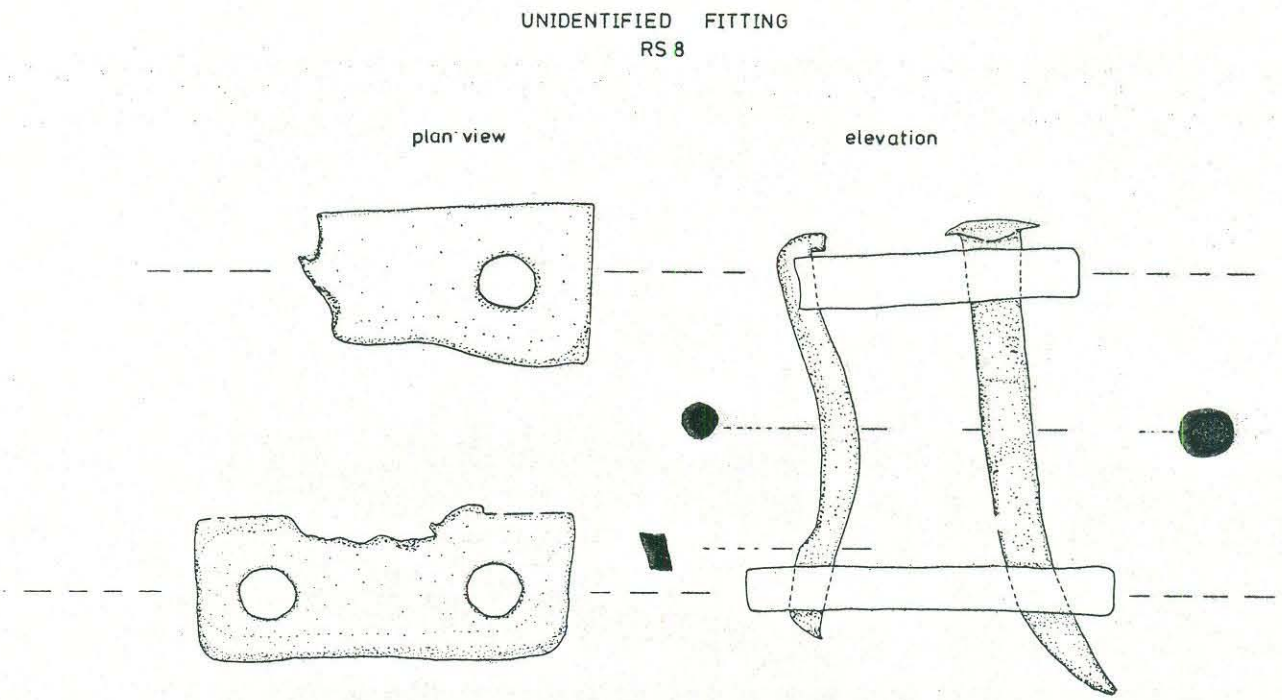


Figure 11. Unidentified fitting. Drawn by M.McCarthy.

have measured substantially more than 80mm moulded.

R.S.9. Iron ring with concretion, found inside the lagoon. This ring is 15cm in diameter, and the metal itself is 25mm thick. It is attached to an unidentifiable iron concretion. The ring was found in context with a number of chain plates and a deck scupper, indicating that a section of the deck and sides of the ship disintegrated in that position.

R.S.10. Lead deck scupper, found inside the lagoon. This piece is 62cm in length. In section it is rectangular, being 14cm x 7cm. The piece has been fashioned from a single sheet of lead wrapped into a rectangular tube shape (see Fig.12). The joining edge has been neatly sealed with a strip of what appears to be pitch, and each end everted to form a seal with the timbers.

R.S.11. Lead musket ball, found on the site by divers from the Piscean and registered in October 1981. The ball is 17mm in diameter.

R.S.12. A small (16cm long) piece of blue-grey stone, possibly sedimentary, was found on top of the reef near the anchors. Some ballast is to be expected on any vessel of the period. Geological analysis has not yet been done, but such analysis would be of limited value because the vessel may have picked up stone discarded by another ship.

R.S.13. Part of a wooden pully sheave, found on Bedwell Island. This piece is not necessarily associated with the wrecksite.

Examination of the samples retrieved and the other material left on the wreck site enable a number of observations to be made about the ship which originally came to grief on the reef. It was a large wooden sailing vessel engaged in whaling. The presence of iron deck supports indicates that it was a British or European built ship rather than American, because American shipbuilders used wooden knees in preference to iron.

The vessel was sheathed with copper over sacrificial boards, or part sheathed in copper and part sheathed with sacrificial boards. The frame itself was held together with iron bolts rather than copper.

Several of the items observed give indications about the age of the vessel. Copper sheathing was introduced into the British Navy in the 1780s but took some time to be used in the merchant fleet. Similarly the iron guns suggest a vessel of the late eighteenth century or later. The

very presence of whalers' trypots also suggests such a date. The lack of 'yellow' metal fastenings implies that the vessel was built not later than the first half of the nineteenth century. Similarly, the anchors, with the rings to take hempen cable, and their long shanks and relatively straight arms suggests a vessel considerably earlier than 1850.(6) The presence of at least five cannon on a whaler suggests a vessel of the troubled first quarter of the nineteenth century.

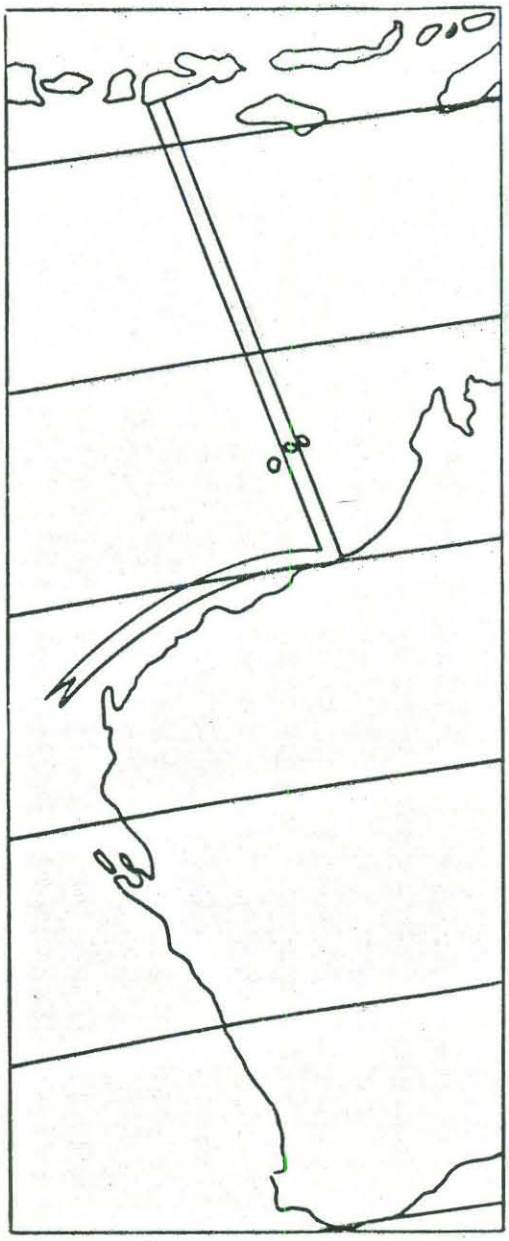
The question of the tonnage of the vessel is more difficult to establish from the sample artefacts. Clearly, it would have required a vessel of several hundred tons to mount five or more cannon, two or more whalers' trypots, and three anchors ranging in length from 3.2 metres to 3.8 metres. The largest anchor on the 366 ton Rapid (an American China trader built in 1807) was 4.23 metres long. Falconer, in his Marine Dictionary of 1815 assigns a 3.7 metre (12 feet) anchor to his 240 ton vessel, which could be taken to imply that the 3.8 metre anchor from the wreck site came from a slightly larger vessel(7). However, a whaler might be expected to carry a heavier supply of anchors than other vessels, because of the variety of anchorages which might be resorted to.

The rudder and sternpost fittings also give some indication of the tonnage of the vessel. The pintle hole on the gudgeon section raised was 65mm in diameter. This compares with pintle holes of 80mm on the gudgeons of the Lancier, a 285 ton barque built in 1834. The Janet, a 211 ton schooner built in 1878, had gudgeons with hole diameters of approximately 70mm. The gap between the arms of the gudgeon raised from the Rowley Shoals site was approximately 20cm, compared with 25cm on those from the Lancier. The Janet is not a good comparison because the system of tonnage measurement changed during the nineteenth century. The Lancier can however be used as a rough comparison. These fittings then might be seen as suggesting a vessel of some 200-350 tons.

3. Shipping

Since Brouwer's route was established at the beginning of the seventeeth century vessels had been sailing eastward across the southern Indian Ocean from Cape of Good Hope until they neared Australian waters, and then turned northwards for the straits of Indonesia, coming to within about 300 miles from Rowley Shoals. Some must have come considerably closer. Samuel Dunn wrote the following in the 1780 edition of his New Directory for the East Indies:

> "A ship bound through these (Lombok) straits must be sure to make the coast of New Holland as before mentioned, and take their departure from it in latitude 19°20' or thereabouts, to make the Coast of Cumbava,



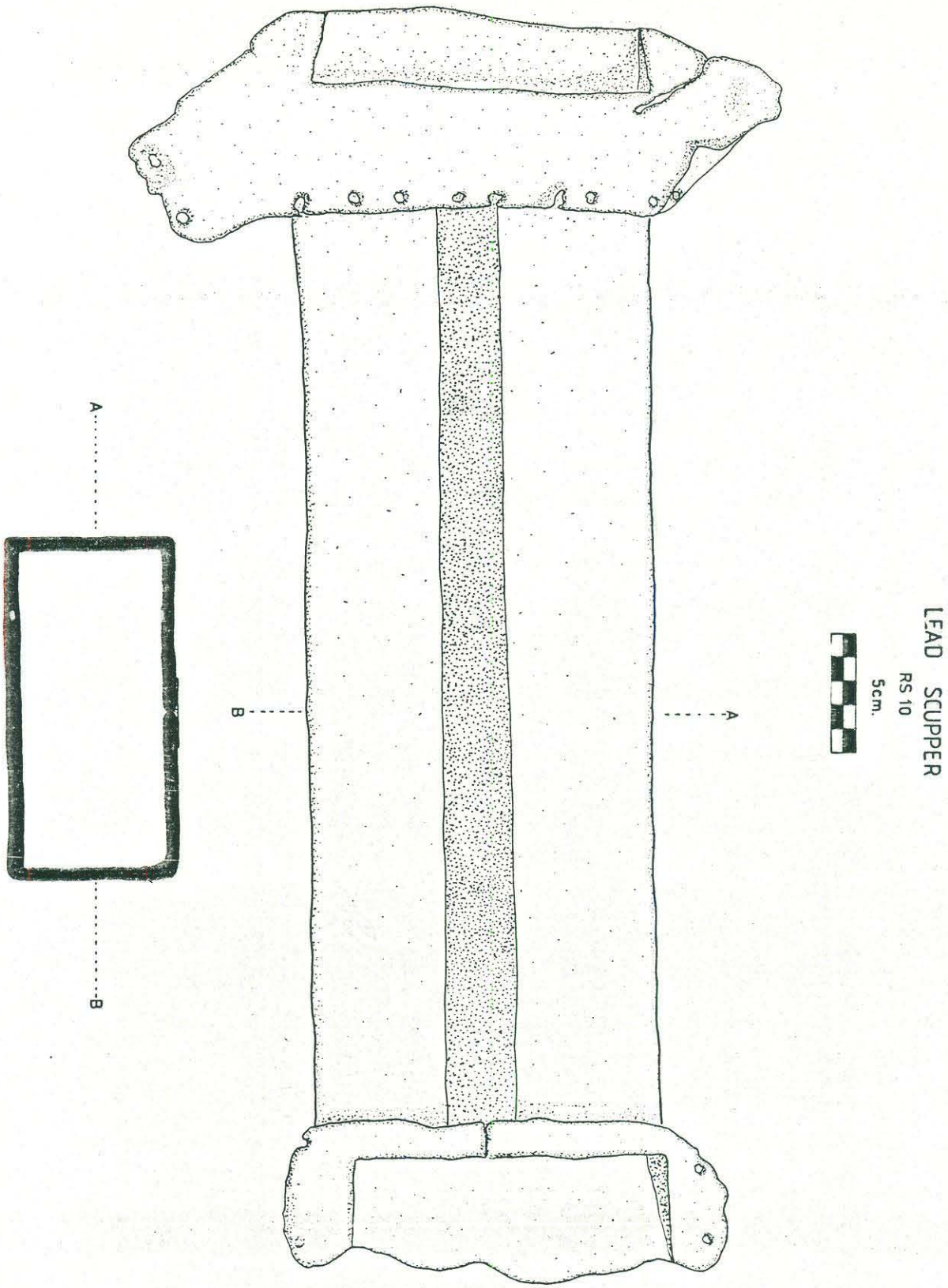


Figure 12. Lead scupper. Drawn by M.McCarthy.

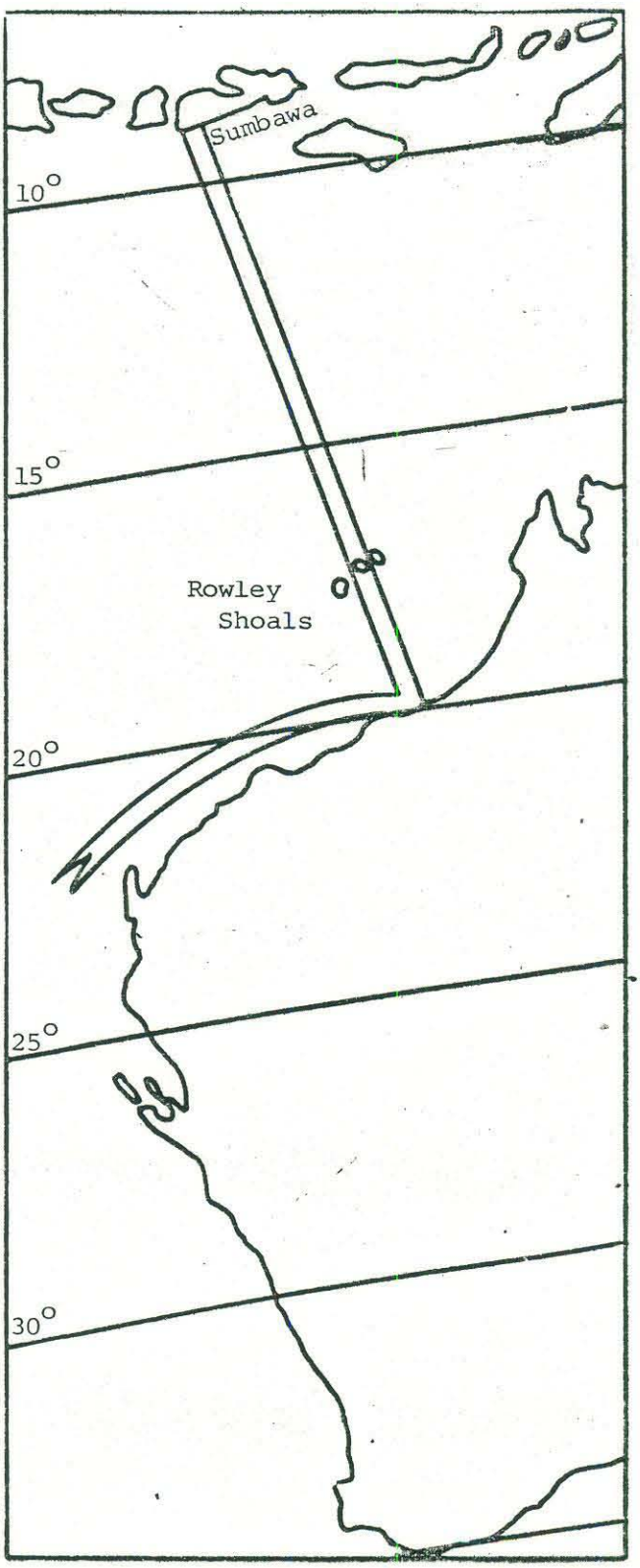


Figure 13. Dunn's Route of 1780, passing through the Rowley Shoals

a little to the eastward of the Straits of Allas[8]".

Dunn's route, if followed precisely, would have meant that a ship would depart the Australian coast at the western end of the Eighty Mile Beach and run directly on to Clerke Shoal (see Fig.13). Dunn was unaware of the existence of the Rowley Shoals. It is not yet known whether any vessels were lost on the Shoals prior to 1800, but given Dunn's sailing directions it must be considered a strong possibility. Published sailing directions by other authors during the early nineteenth century brought vessels close to, but not over, the Shoals.

The first report of sighting of the Shoals came in 1800. Captain Josias Rowley wrote in the Journal of his vessel, HMS Imperieuse on 30 December when in latitude 17°48' south, longitude 118°01' east:

> "P.M. Moderate breezes and cloudy weather with much swell. From the weather as at 3, Fresh breezes and cloudy.
> A.M. Do weather at ½ past 5 saw a shoal with breakers to the NW, hauled down the studding sails, wore ship and hove too, sounded with 90 fathoms no bottom at the extremes of the shoal, from NW by W ½ N to N by E ½ E distance about 2 miles and a half, the shoal appeared to extend about 3 miles from SW to NE, the SW end shoal water with high breakers, the NE part a low sand partly covered with water and several small rocks, discoloured water and breakers as far to the Nthward as we could see with glasses from the main top, at ½ past 6 filled and made sail, at ½ past 7 the SW end of the shoal bore north, at noon variable and cloudy weather[9]".

Captain Rowley had discovered the south-west shoal, which was named Imperieuse Reef.

Another reference to the Shoals is to be found in the 1809 edition of James Horsburgh's Sailing Directions. Horsburgh, after referring to Captain Clark seeing Rosemary Island (the Montebellos) in a whaler, states:

> "The same navigator says, a dangerous shoal bears N.49½°E from the N. part of Rosemary Island, distant about 230 miles. When it bore E.3 or 4 miles, he had observations which made the N. part of this shoal in latitude 17°28'S, longitude 119°02'E. This is probably the shoal discovered by Captain Rowley in 1800; or Imperieuse Shoal[10].

Horsburgh's Captain Clark gave his name to Clerke Reef (Minstrel Shoal). Different cartographers during the first two decades of the nineteenth century

varied the spelling of Clark[11]. It is unfortunate that Horsburgh does not give the name of Captain Clark's ship, or the date of his sighting. This author has not established any relationship between Horsburgh's whaling Captain Clark and a vessel named Minstrel. Horsburgh does mention that a vessel named Minstrel under the command of a Captain Barnes made the mainland coast in 1820, and King concludes that Minstrel's Shoal, reported in approximately the same position as Clerke Shoal, is indeed part of the same reef[12].

Horsburgh reviewed the situation in his 1841 edition:

> "Clark Reef (Tryal Rocks?) is in latitude 20°18'S and bears NW by compass distance about 9 or 10 miles from Rosemary Island (Montebello Islands).... by the account of Captain Clark who discovered it..... Imperieuse Shoal, discovered by Captain Rowley, December 30, 1800 in HMS Imperieuse. At day break saw a shoal extending about 3 miles from NE to SW; on the SW end shoal water with high breakers; the NE part a low sand, in some places covered with water; and several small rocks appearing above the surface. As far as could be seen from the main-top, when the shoal bore from N.by E.½E.to W.N.W. distant 2½ miles the water appeared discoloured, and in many parts high breakers were observed. Noon observations made it in latitude 17°35'S, longitude 118°27'E by account; no ground with 90 fathoms line. By observations of sun and moon eight days afterwards, the ship was about 10 miles to the westward of account.
>
> Captain King, in his survey of the NW coast of New Holland, marks these shoals under the name of Rowley Shoals; the first, Mermaid Shoal, in latitude 17°16'S, longitude 119°36'E; the second Minstrel and Clarke Shoals, in latitude 17°20'S, longitude 119°14'E; and the third, Imperieuse Shoal, in latitude 17°35'S, longitude 118°53'E. There is also a coral reef in latitude 16°30'S, and longitude 119°36'E, on which the ship Lively is said to have been lost. One of these shoals seems to have been seen by the ship Good Hope, from Banda bound to Batavia, 14 February, 1813; when under a close reefed main top-sail and foresail, with a NW wind and heavy sea, head to the SW, saw, at ½ past 11 p.m., breakers ahead and on the lee bow, instantly wore and set more sail. At 4 a.m. the weather more moderate, wore, and at 8 saw the breakers from the mast head, bearing west. At 9½ a.m. tacked within 1½ miles of this shoal, no ground 150 fathoms, it then bearing from NNW to SW ½S, the North eastern extreme being distinctly seen, but breakers were visible to the SW as far as the eye could reach from the mast head. Several spots of dry sand appeared, and in the North end of the shoal were black rocks, on which the sea broke very high. At noon, observed in latitude 17°47½'S,

the North extreme of the shoal bearing West about 5 miles, and we made that part of it in longitude 119°18'E by chronometer, and 119°21'E by an observation of the moon and Aldebaran taken 8½ hours afterwards. The chronometer was found to be very correct, when we made Christmas Island, 7 March following.

Minstrel Shoal (probably one of those called Rowley Shoals, by Captain King) is said by Captain Clark (who discovered the reef described above under this name) to bear N49½°E from the North part of Rosemary Island (Montebellos), distant about 230 miles; when it bore East 3 or 4 miles, he made the North part of the shoal in latitude 17°28'S, longitude 119°2'E by observations of sun and moon.

This shoal was seen by the Minstrel, Captain Barnes, at 4 p.m., 7 May 1820, and at 5½ p.m. she tacked within 1½ miles of the NE part of the shoal, had no ground 60 fathoms; a very white sand bank, about 4 or 5 feet above water, was observed near the northernmost end of the shoal, with several black rocks to the northward and eastward of the sand bank, and the breakers from thence extended to the SSW as far as visible from the mast head. The NE point of the shoal, by noon observations, brought up to 5 p.m. is in latitude 17°14'S, longitude 118°57'E; or 5°28'E by chronometer, measured from the coast of New Holland, in latitude 23°10'S; and by lunar observation, taken yesterday, made the same part of the shoal in longitude 118°59'E. This must certainly be the shoal mentioned by Captain Clark, but these observations taken in the Minstrel, make its northern extremity 14 miles more northerly than that navigator's position of the same part of the shoal[13]".

The northern shoal was named Mermaid Reef after the visit of the Mermaid under the command of Phillip Parker King in May 1818. Bedwell Island, on Clerke Reef, was named after one of King's crew.

Little is known about the activities of early whalers in the area of the Rowley Shoals. Whalers from the Atlantic seaboard nations ventured beyond the Cape of Good Hope during the 1780s, and in 1792 two American vessels, the Asia and the Alliance stopped for a time in Australian waters at Shark Bay. Horsburgh's references show that whaling captains were aware of the Rowley Shoals before 1809. Visits by American and British whalers to the waters off Western Australia are known to have been very numerous in the 1830s, when their numbers were observed by colonists, but prior to 1826, there is little data available.

Alan Collinge has examined the movements of some of the later vessels from their logs:

> "In what I would call the Western New Holland grounds, whalers appeared to follow a triangular pattern once reaching the coast. North West Cape, past the Rowley Shoals, to the Islands of Timor, Lombok or Java for wood and water, across to Christmas Island, sometimes to the Cocos and back to North West Cape, down to Leeuwin, along the South Coast and often to the latitudes of the roaring forties and back again. This triangulation of course is a very rough guide as they worked every possible nautical mile of water for whales. North West Cape was a popular landfall, as it was central for a north or south sweep along the coast and - just as important, a good place to correct their chronometers against an established longitude after the long run across the Indian Ocean[14]".

4. Daniel Bennett and the 'Lively'

Daniel Bennett was perhaps the most important of the English South Seas whaling firms of the early nineteenth century[15]. He was born in 1760 and in 1786 he owned one ship; the 150 ton Lively. Over the next four decades he increased the number of his ships and over the period up to 1811 owned at least 50 ships, including at least two bearing the name Lively.

The Bennett owned vessel which currently appears most likely to be the wreck found lying on the Rowley Shoals was first listed in the 1800-1801 issue of Lloyds Shipping Register. It was a two decked, ship rigged vessel of 240 to 241 tons, and carried ten 4 pounder guns. It had a draught of 14 feet when loaded and was built of wood, iron bolted and sheathed with copper over boards. The Lively was built in France in 1787 but was taken as a prize by the Royal Navy in 1796.

Clowes lists 23 French prizes which were not destroyed or taken into the Royal Navy in 1796[16]. Some of these can be eliminated on the basis of size along, but the following need consideration:

Alerte (14 guns)	Abeille, cutter (14)	Eliza (10)
Alerte (16)	Cygne, cutter (14)	Volcan (12)
General Leveau (16)	Aspic, cutter	Trois Coileurs, brig(10
Blonde, brig (16)	Cerf Volant (18)	Aurore (10)
Mutine brig	Africaine (18)	

When the vessel was last listed, in Lloyds Register of 1812-1813, the master's name was Whitehouse. Lloyds lists the vessel's destination as the Southern Fishery every year from 1801-1813, so little indication is given of the vessel's

whereabouts. It is last listed in Lloyds Red Book in 1810-11, and last listed in Lloyds Green Book in 1812-13[17]. Lloyds gives no indication of whether the vessel was wrecked, sold or broken up after that time.

Another Lively is listed in Lloyds 1810-11 Register. This vessel left for the Southern Whale Fishery and does not appear in later years of the Register. It was a 49 ton schooner sheathed with copper, fastened with iron bolts and carrying one deck.

However, it is the 240 ton Lively owned by Bennett which best suits the specifications data retrieved from the wreck site:

Lloyds 240 ton 'Lively'	Indications of wreck site samples
Iron bolted	Iron bolted
Sheathed with copper over boards	Sheathed with copper over boards or part sheathed and part boards.
10 x 4 pdr guns	5 short guns seen in 1981.
240 tons	size of anchors and number of guns suggests a substantial vessel.
Whaler (Southern Fishery) French Prize	3 trypots indicates a whaler. Iron deck supports suggest a British or European built vessel rather than American built.
Most likely date of loss, if lost, 1810-13	Date of loss 1790-1830 (approx.)

5. Other Wrecks in the Area

It is possible, given the nature of the sailing directions which were published during the latter half of the eighteenth century, that outward bound East Indiamen could have come to grief on the Rowley Shoals. Because whalers spent time working in the area in the early years of the nineteenth century it is possible that some whalers were also lost in the area.

If, for the sake of argument, we assume that the wreck site found on the Shoals is not the Lively, what other vessels could it be? The first point to be borne in mind is that the trypots make it almost certain that it is a whale ship. The nature of the industry at the beginning of the nineteenth century was such that records of losses have not always survived. Thus, the wreckage could be from a vessel whose name will never be ascertained.

Two named vessels require some consideration: the Santa Anna and the George. Lloyds List of 21 February 1812 states "the Santa Anna, from the South Seas to London, is lost on the Coast of New Holland. Crew saved[18]". Lloyds Register of 1811 shows the vessel as a 225 ton ship built in Brazil and owned by the Captain (W. Dagg) and others. It was ship rigged, a whaler, built with iron knees, sheathed with copper over boards, and was of

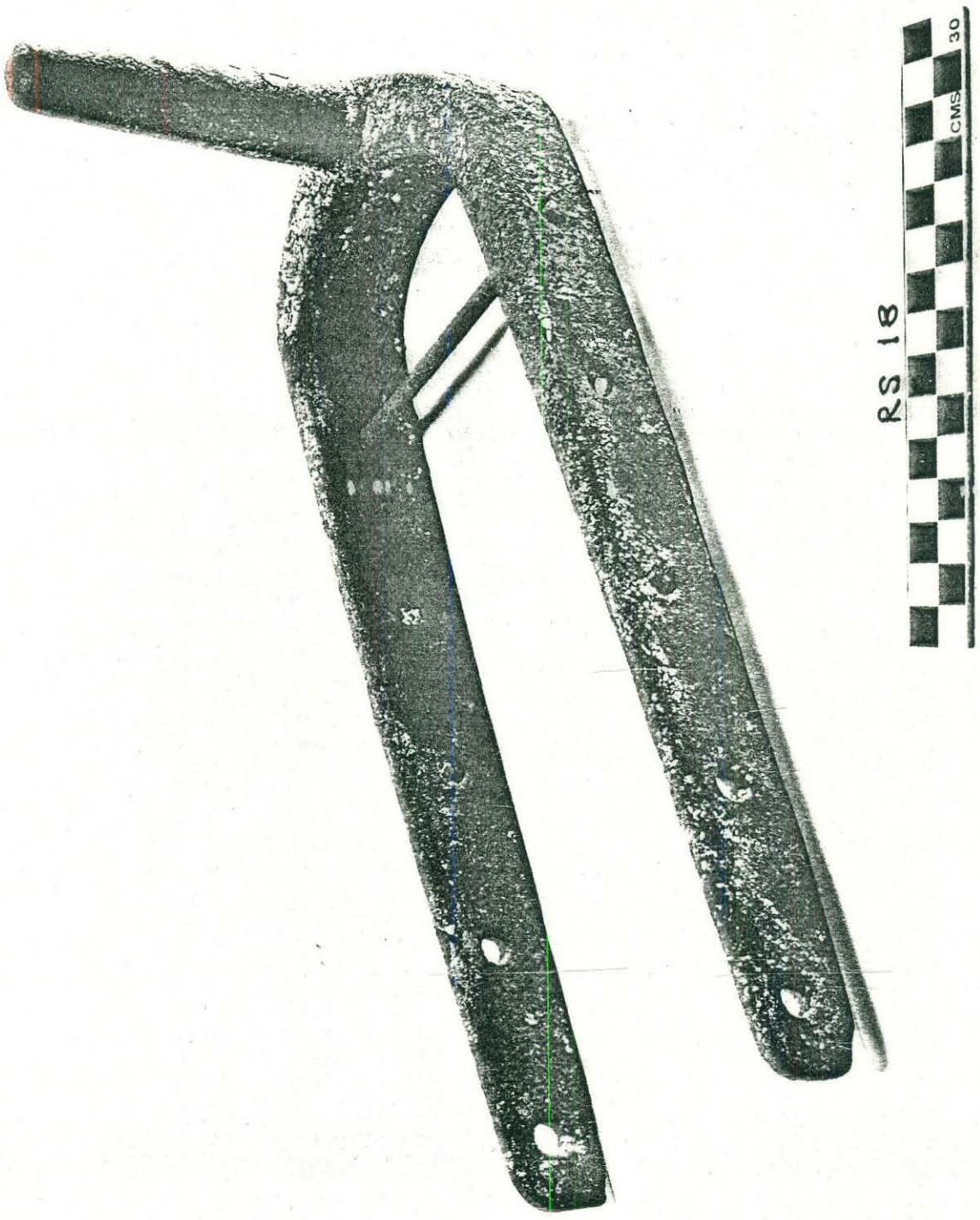


Figure18. Rudder Pintle. Photo P.Baker.

Broome, the closest town to the wreck, also has a Museum and if some material were to be displayed there it would increase local awareness of a hitherto almost unknown aspect of the history of that region.

One of the research themes which has been considered by the writer is a long term study of whaling off the Western Australian coast through the medium of maritime archaeology. The Mermaid Atoll site will probably prove to be the earliest whaler wreck yet found off the Western Australian coast (indeed the earliest in Australian waters) and can be considered an ideal site on which to commence a programme which will later involve other whalers of American, French and Australian origins.

Taking a more localised viewpoint it may be said that the remote Northwest of Australia is only now being opened up, because the value of mineral resources, both on and offshore, has now outweighed the logistical barriers presented by the environment. The history and archaeology of the Northwest have to some extent been neglected in the past, but must be recorded now as industry and population surge into the area. The Mermaid Atoll site lay undisturbed when the Museum party inspected it in 1981, and if excavation is to exploit its full archaeological potential then that excavation must be done before the site is damaged by souvenir hunters. The Museum party has already seen evidence of vandalism of the reef-top anchors.

a) Research Objectives

The most immediate problem requiring resolution is that of positive identification of the site. Many of the other research objectives hinge directly upon this issue. Positive identification of the site should lead in time to the compilation of a background of the ship, its activities in these waters, the circumstances of the casualty, the fate of the survivors if any, and details of any salvage operations undertaken by the crew or others.

An excavation will be undertaken to establish how the ship broke up, where material not now remaining in the central wreck core has been spread, and what sorts of material are favoured (in terms of survival) by this particular underwater environment. Work on another shipwreck (the Batavia of 1629) lying in a shallow, turbulent environment

on a coral reef has revealed to archaeologists' surprise a large quantity of ship's structure. However, the large tidal range on the Mermaid Atoll is an additional destructive element to be considered. The survival of the various metals in a warm water environment is being examined. Also interesting will be the examination of the extent to which in a 'U' shaped gully an apparent surface crust of iron concretions and deep coral rubble will protect the wreck material trapped below. No substantial underwater archaeological excavations have previously been undertaken so far north on the Australian coast, so it may be that the examination of the site will provide information which can be used in a predictive fashion when considering aspects of other as yet unexcavated sites in Northern Australia.

The most important longer term research objectives relate to British whaling in the South Seas. An analysis of the exact nature of the whaling equipment used will provide data for comparison with the American, French and Australian industries. Information about the quantity and nature of the ship's guns, shot etc found on the wreck will provide more information about the defence needs of the industry. Many of these items (whaling equipment and armament) will have been made of iron and so will be both heavy and delicate. How did the crew live on a British South Seas whaler? Examination of this issue is one of the objectives of the excavation, but the extent of information to be found will depend on both the condition of the site and the circumstances of the crew's departure. Another object is to study the structure of a whale ship. But this objective will perhaps yield less fruitful results because;
a) there is likely to be little left of the hull structure; and
b) considerable information on the structure of whaleships can be obtained from other sources.

While on the Rowley Shoals the opportunity will be taken to search the perimeters of the three atolls for other historic shipwreck sites. An underwater survey of the favourable anchorage positions in the lagoons is another objective. Indonesian craft have traditionally visited the Shoals fishing for beche-de-mer. Some are known to have been wrecked on the Rowley Shoals.

9. The Planned Second Excavation Season, August 1983

A four week excavation season is planned for August 1983. It is intended that Bedwell Island be again used as a base camp, and that two charter boats be used. Earthwatch will provide some of the personnel and part of the funding.

APPENDIX 1. SURVEY TECHNIQUES USED ON 1982 EXPEDITION

The October 1981 wreck inspection team (McCarthy, Henderson, Baker and Kimpton) were forced in the turbulent conditions then prevailing to limit the site survey to photography and a trilateration based on known and relocatable site features.

The results including a photomosaic were most satisfactory, given the short 'on-site' time, and the large swell breaking over the site.

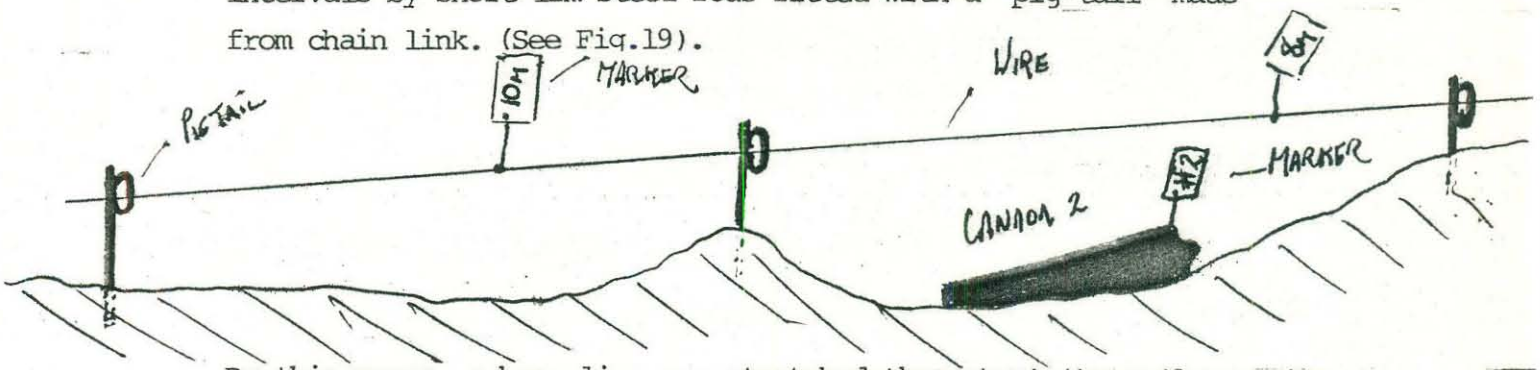
In contrast, the July 1982 pre-excavation survey team (McCarthy, Baker and Sledge) was blessed (on occasions) with almost ideal sea conditions but was still presented with enough site problems to severely hamper the completion of a satisfactory pre-excavation survey.

Most notable of these problems were severe turbulence with lowering tides, a broken 1:6 slope over the main artefact distribition area, a winding coral and rock filled gulley of widths varying from 1.5 to 7 metres and of equally different cross section varying from a gentle slope to vertical walls. (see Sections).

A stepped overhead grid located on the reef top itself was considered but rendered impossible by the necessity to drill through the hard reef to satisfactorily fix the supports. In like manner, a grid system located on the gulley floor itself was deemed impractical. Safety considerations also rendered such systems undesirable with the obvious chance of diver injury. The possibility of tangles and the danger of violent wave action uprooting any system with substantial drag also influenced the decision. Thus, any high metallic projections and transverse gridding within the gulley were seen as a safety threat in turbulent conditions and the following system was adopted.

A stainless wire (4mm diameter with marked lead sleeves crimped at 50cm intervals) was used as the site datum. This was strongly anchored to the sea bed at the shallow and very turbulent eastern end of the site. It was then strung in a straight line from there through the main artefact distribution area to a point 25 metres away on the gulley wall (at the entrance to the first bend). Here, it was secured to the wall with a 20cm x 1.5cm diameter 'piton' hammered into a suitable niche in the wall.

The drop over this section was 6 metres and the wire supported at intervals by short 12m steel rods fitted with a 'pig-tail' made from chain link. (See Fig.19).



By this means, a base line was stretched throughout the gulley system The wire was then marked for photographic and easy recall purposes at two metre intervals with blue 8cm x 10cm plastic tags marked accordingly with a waterproof felt pen.

Artefacts were similarly marked to enable easy recognition and relocation both on site and back in the laboratory, At a known time/date and hence tidal state a series of depths were taken at two metre intervals over the site and at right angles to the baseline. Baseline depth itself and reeftop readings were also taken. The tidal change of circa 1.6cm/minute was taken into consideration. Right angle offsets were also taken to the gulley wall and by this means the longitudinal and transverse site sections were produced.

The site plan was produced by a combination of trilateration from known points along the baseline and right angle offsets to artefacts and geographical features.

A cross check was also made with the 1981 trilateration site photographs, and photo mosaic.

The methods used to present the various views of the site must be considered at best a compromise forced by the site's physical characteristics and the variable conditions.

19. J. Phipps, A collection of papers relative to ship building in India. (Calcutta, 1840).

20. Collinge, Provisional list.

21. Communication from Arjin van der Kuijl to Dr. F. Broeze, 10 December 1981.

22. H.L. Blackmore, The Armouries of the Tower of London (London 1976), p.402

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1. James Horsburgh, Directions for Sailing to and from the East Indies, (Seventh Edition, London, 1852). See also E. and E. Kunz, A Continent Takes Shape, (Collins, Hong Kong, 1978) p.100

2. Phillip Parker King, Survey of the Intertropical Coasts of Australia, Vol.2. (London, 1826) p.391,

3. King, Vol.1., p.445.

4. See Australia Pilot, Vol.5 (Hydrographer to the Navy, 1972) p.122.

5. David Steel, Steels Naval Architecture (Lond 1977 reprint of 1805 work) Fol.53.

6. George Cotsell, A Treatise on Ship's Anchors (London, 1856).

7. Quoted in P. Hedderwick, Marine Architecture (Edinburgh, 1830) p. 376

8. Samuel Dunn, A New Directory for the East Indies. (Fifth Edition, London 1780) p. 367.

9. A Journal of the Proceedings of His Majesty's Ship Imperieuse, Josias Rowley Esq. Captain, from 1 January 1800 to 31 December 1800, ADM51/1405 Public Record Office, London.

10. Horsburgh, 1809 edition, p.92. King thought that it was the Montebellos that Captain Clark saw.

11. See R.V.T. Tooley, The Mapping of Australia, Vol.1 (London, 1978)

12. Horsburgh, 1841 edition, p. 136. See also King, Vol.2, p. 390.

13. Horsburgh, 1841 edition, pp. 128-129.

14. Alan Collinge, Provisional list of whalers which operated in Western Australian waters and the Indian and Southern Oceans between 1790 and 1890. Typescript, 1976, Battye Library.

15. A.G.E. Jones, The British Southern Whale and Seal Fisheries, Part II, The Great Circle, 3:2(1981) pp. 90-102.

16. W.L. Clowes, The Royal Navy. A History. Vol.IV. (Lond.1899) pp 554-5 Information provided by Ron Coleman, Queensland Museum.

17. Lloyds at that time published two separate Shipping Registers, referred to as the Red and Green Books.

18. Lloyds List, 21 February 1812. Scott Sledge located this information at the National Maritime Museum in England. If the Santa Anna was wrecked on the coast of New Holland while on her way from the South Seas fishery to London, then perhaps the south coast is a more likely location. The explorer Edward John Eyre reported a wreck on the south coast of Australia during his historic trans-continental journey of 1841. See Graeme Henderson, Unfinished Voyages: Western Australian Shipwrecks 1622-1850 (University of Western Australian Press, Nedlands, 1980) pp. 73-74.