1978–2009 Shipwrecks of the Ningaloo Reef Jeremy Green

Shipwrecks of the Ningaloo Reef: maritime archaeological projects from 1978–2009

Edited by Jeremy Green

Special Publication No. 14, Australian National Centre of Excellence for Maritime Archaeology
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Shipwrecks of the Ningaloo Reef: maritime archaeological projects from 1978–2009

Jeremy Green (Editor)
with contributions by:
Ross Anderson
Patrick Baker
Jon Carpenter
Kalle Kasi
Michael McCarthy
Lyndon O'Grady
Vicki Richards
Corioli Souter
Myra Stanbury
Jim Stedman

The 2004 Expedition Team. Left to right standing: Geoff Kimpton, Jon Carpenter, Steve Trowbridge, Susan Green, Jeremy Green, Jim McGinty, Daniel Glazier, Carolyn Glazier, Geoff Glazier, Ed Punchard, Mack McCarthy; front sitting: Corioli Souter, Leighton De Barros, Matthew Gainsford, Annie Boyd, Graeme Henderson, Rhian Skirving, Patrick Baker.

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We also owe a debt of gratitude to Fugro Survey, who through the generosity of Gert-Jan Kramer, the then President and CEO of Fugro, authorised an aerial magnetometer survey of the Ningaloo reef, *pro bono*, that lead to the discovery of the *Correio da Azia* and another, as yet, unidentified site. Fugro has also assisted us over the years, through the agency of Geoff Glazier, with an OmniStar differential global positioning system.

In 2000, Ed Punchard, director of Prospero Productions, a Western Australian documentary film company, assisted the Department of Maritime Archaeology in approaching Fugro to search for the then unlocated *Correio da Azia* site; and, following the survey, funded the Museum operation to investigate the finds. Prospero had intended this project to be one of the six documentary films that were made on the work of the Maritime Archaeology Department, entitled *The Shipwreck Detectives*; however, other more exciting subjects, precluded this particular subject from being finalized.

The Commonwealth Government, currently the Department of Sustainability, Environment, Water, Population and Communities, is the department responsible for the *Historic Shipwrecks Act 1976* which protects all shipwrecks that are older than 75 years. This department provides annual funding to the WA Museum to administer the Historic Shipwrecks Programme. It was through this project grant that much of the work in the Ningaloo area has been funded.

The WA Government, through the Museum, provides resources for the Department to operate. Through the generosity and support the maritime archaeological heritage of the Ningaloo region has been revealed. The WA Department of Environment and Conservation and the WA Fisheries Department have assisted on a number of occasions with the work in the Ningaloo area.

The Maritime Archaeological Association of Western Australia has conducted work and assisted the Department over a number of years and has investigated a number of sites. Over a number of years they utilised a grant from the late Monte Sala.

The Department of Materials Conservation of the WA Museum has had a continuing involvement in the work of the Department, as is reflected in this publication. Their help in on-site conservation, timber analysis and conservation of maritime archaeological artefacts is greatly appreciated.

Foreword

The study of the Ningaloo Reef area has been a focus of the Department of Maritime Archaeology for a number of years. The initial major involvement followed the discovery of the American China trader, *Rapid* in 1978 and the subsequent excavations. This work is described here briefly, as it will be the subject of a major excavation report in the future. Following the excavation of the *Rapid* (between 1978 and 1982), Point Cloates was the subject of a series of searches for the *Correio da Azia* (1987 and 1999). In 1997, during the search for the *Correio da Azia*, the wreck of the *Stefano* was fortuitously discovered. Following these early searches, a more sophisticated system of searching was introduced. With the support from Fugro Survey, an aerial magnetometer survey was undertaken of the whole of Ningaloo Reef south of Point Cloates to about 22° 40'S. This was a huge undertaking and revealed, almost immediately, two wreck sites, one of which was the *Correio da Azia*. What was interesting, is that the second site was a completely unknown site, which to this day is still to be identified. This has underlined the problems of identification of sites that are relatively modern, and which, at least in the case of the unidentified site, dated to the second half of the 19th century, should, in theory, have records of its loss. However, one must remember that this area of coast was relatively remote and there was always the possibility of vessels being lost without trace.

This report, therefore, is a compilation of area studies, archaeological and conservation studies of wreck sites and the investigation of records relating to known, but yet to be discovered sites. It is divided into three parts: general studies; known shipwrecks; and, for the sake of completeness, all the known losses in the area up to the modern day.

Editing a multi-authored publication is never an easy job. However, following the 2009 expedition to Point Cloates and the Ningaloo Reef, it was decided it was time to put all the work that had been done up to that time, into a single publication. As the work progressed, it was realised that other issues should be included, and what started out as a simple report of the post-*Correio da Azia* discovery work, grew in size and complexity. The result, however, has exceeded our expectations. It has helped to identify what has been done and what still needs to be done; through archival studies, it has resulted in the discovery of a number of hitherto unknown wrecks; and, it has gathered together all the information available about underwater and maritime cultural heritage from Quobba Point to North West Cape.

It is interesting that the Point Cloates region has one of the largest concentration of wrecks on the Western Australian coast, after the metropolitan area. Point Cloates, once thought to be an island, is the point of departure for ships heading for China through the Straits of Lombok. At this point, ships took a north-easterly course, whereas ships heading for the Straits of Sunda would take a north-westerly course. It is hardly surprising then that many of the vessels wrecked in this area were China traders, and their demise was largely due to, what appears to be, 'cutting the corner'.

The history of the mysterious Cloates Island, is connected with the difficulty navigators had in determining longitude. In the days before chronometers, vessels departed from the Cape of Good Hope, plotting their course by dead reckoning. Each day they calculated their position by taking the course they had steered, and estimated their speed through the

Figure 1. The 1997 WA Museum expedition team with Billy and Jane Lefroy and the *Stefano* bell. Left to right: Geoff Kimpton, Billie Lefroy, Jeremy Green, Bob Richards, Jane Lefroy and Mack McCarthy, insert Edgar Lefroy (Jeremy Green).

water—notoriously difficult to estimate—and then calculated the distanced travelled. Their latitude could be determined relatively accurately, and was simply a matter of measuring the altitude of the Sun at midday and using the Ephemeris Tables to calculate the latitude they were in. However, there was no way of measuring longitude and this had to be estimated from the dead reckoning: so that over the time taken to cross the Indian Ocean, errors would creep into the longitude, resulting in the plotting of land in inaccurate longitudes. So Cloates Island, as it was first thought to be, like many other Western Australian features, was plotted in a variety of different places. One can read of the frustration of the early hydrographers as they struggled to sort out the bewildering confusion of sightings. It was not until Parker King, in 1822, explored Exmouth Gulf and determined that Cloates Island was not an island, but part of the mainland coast.

Since this work deals with maritime heritage, the pastoral industry (as with other non-maritime subjects) has not been covered, except where it is inexorably linked with the movement of wool, cattle and supplies of the coastal agricultural stations. Many of the wrecks in this area relate to this trade and industry; and the stories relating to their loss make fascinating reading.

In June 2011, the Ningaloo coast was given World Heritage listing. This represents an area almost exactly covering the study area of this report and emphasises the overall significance of the area to Western Australia.

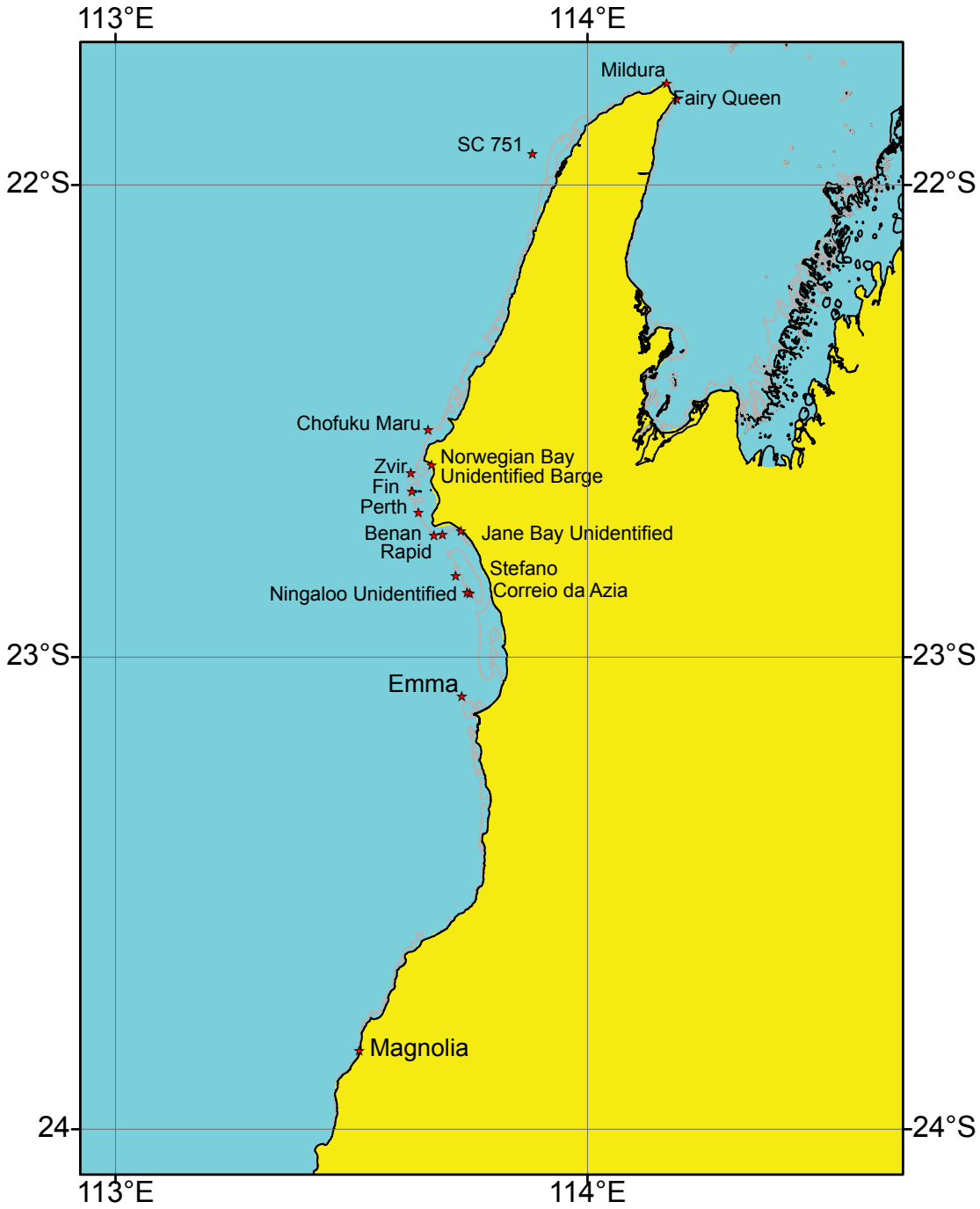


Figure 2. Map of the study area showing wreck sites (Jeremy Green).

PART 1

General studies in the Point Cloates Ningaloo Reef area

Figure 3. Sunset at Ningaloo beach with museum workboat *Seaspray* (Patrick Baker).

History of Point Cloates and Cloates Island

Jeremy Green

At the beginning of the 19th century, we find a variety of islands appearing in the charts showing the North West Cape. The Delarochette chart (Figure 4) shows Cloates Island, the

Figure 4. Chart of Louis Stanislas d'Arcy Delarochette *A chart of the Indian Ocean [cartographic material]: improved from the chart of M. D'Après De Mannevillette; with the addition of a part of the Pacific Ocean, as well as of the original tracks of the principal discoverers, or other navigators to India and China; and in which it has been attempted to give a chronological indication of the successive discoveries*, 1817. Published by W. Faden.

erroneous position of Trial Rocks (see Green, 1977 for a discussion of longitude from 17th to 19th century in NW of Western Australia) and the obvious erroneous Danish Rock 1774. This chart was published by William Faden, Geographer to the King, in 1817 and entitled, *A Chart of the Indian Ocean*, Cloate's Island is shown SW of NW Cape and in longitude 8° E. of Java Head, with a note: 'Discd. by Capt. Nash 1719 and observed by Capt. C. Christie of the *Belvidere*[*sic*], 1796 but still doubted'. The printed charts of Johann Matthias Christoph Reinecke in 1801 (Figure 6) and also Mortier Covens en Fils 1808 (Figure 5) show Cloate's

Figure 5. Chart of Mortier Covens et fils *Carte Générale de la Polijnesie Australe ou des Îles Éparses de la Mer Pacifique,* 1801 showing Cloates Island and Bally Island.

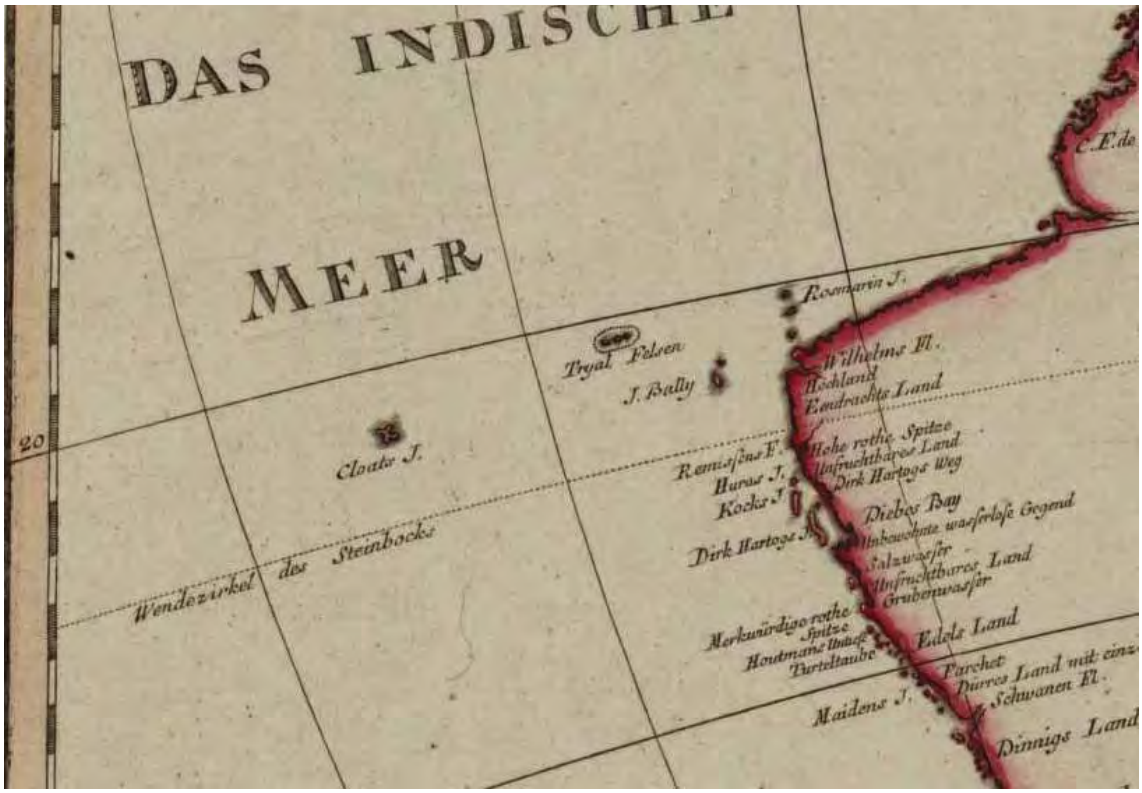


Figure 6. Chart of J.M. Reineke *General charte von Australien: nach den neuesten entdeckungs-reisen und astronomischen bestimungen*, 1801 Showing Cloates Island and Bally Island.

Island in about latitude 21° S, SW of Trial Rocks, which are shown in the meridian of the western point of Java. Another 'mystery' is Bally Island in about latitude 22° S.
It seems, therefore, that Point Cloates, or Cloates Island was discovered by Captain Nash (possibly an Englishman) in 1719 who was in command of the Flemish ship the *House of Austria.* In *A New Nautical Directory for the East-India and China Navigation* by Gabriel Wright (1804), Directions for Sailing Towards the China Seas p. 458 states:

> In latitude 22° 6' S. longitude 110° E from London, lies Cloate's Ifland. The firft account we have of this ifland is from Mr Nafh, of the fhip *Houfe of Auftria*, from Oftend for China, in 1719. They faw it firft, being very clear weather, about 3 AM on which they immediately brought to and founded, but had no ground with 100 fathoms, though not above 4 miles off fhore (fome accounts fay, they had no ground within 2 miles of the ifland). The day before, and feveral days after, they obferved an incredible quantity of fea-weeds, like thofe from the Gulf of Florida, and fmall birds like lapwings, both in fize and flight. This ifland cannot be feen far, even in clear weather, and lies NE by N and SW by S about 32 leagues in length, with terrible breakers from each end, running about 3 miles into the fea. It lies in latitude 22° 6' S and about 92° E longitude from the Cape. From hence they made 3° 6' eafting to the Ifland Bally, and 7° 26' wefting to Java Head. As they did not find any account of it in their books or charts, they gave it the name of Cloate's Ifland, in honour of a Flemifh Baron, probably one of their owners.
> The *Haeflingficld* fell in with it in 1743; they faw it at day-light, bearing from SE½S to E by S about 6 leagues. They report it lies NE and SW 7 or 8 leagues in length, of a moderate height, and pretty level, with a gradual flope to each end, from whence they faw the breakers. By their accounts, they make it in latitude 22° 7' S and longitude 32° 49' E from the Ifland St. Paul, and in 84° 26' E longitude from Cape Lagullas; their variation the morning before was 6° 17' N wefterly. From this ifland they fleered nearly North for feven days; then they made the land of Java, in latitude 8½° and 44' W meridian diftance, and in 3½ days more made Java Head, in 7° 12' W longitude from Cloate's Ifland.
> By comparing thefe accounts together, we may obferve the variation does not alter very much hereabout; and although they differ about 70 of longitude in their reckonings from the Cape (which is not to be wondered at in fo long a run, when fometimes they fhall differ half as much on board the fame fhip) yet they agree as near as can be expected in their run from thence to Java Head; fo that we may conclude the difference of meridians between this ifland and Java Head to be about 7° 20'.
> That it does not lie above 3 or 4° at moft, from the Coaft of New Holland, appears from the following reafons. The fhip *Prince of Wales*, in 1738, the evening before they made this coaft, in the latitude of Cloate's Ifland, obferved the variation 5° 55' N wefterly, being then at the largeft computation about 38 leagues from the land; alfo the faid fhip made but 4½° meridian diftance from thence to the Weft end of Cambava, lying, according to thefe charts, much about 12° to the eaftward of Java Head, which agrees nearly with the other two fhips runs; for by deducing the 4½° eafting, there remains 7½° wefting to Java Head.
> I infert here fome account of this land from Captain Pelly. At firft fight it made like fmall iflands, fo very low that it could not be feen off the deck: he faw only a great fmoke arifing from it, and fet it only at 5 or 6 leagues diftance. He alfo founded, but had no ground

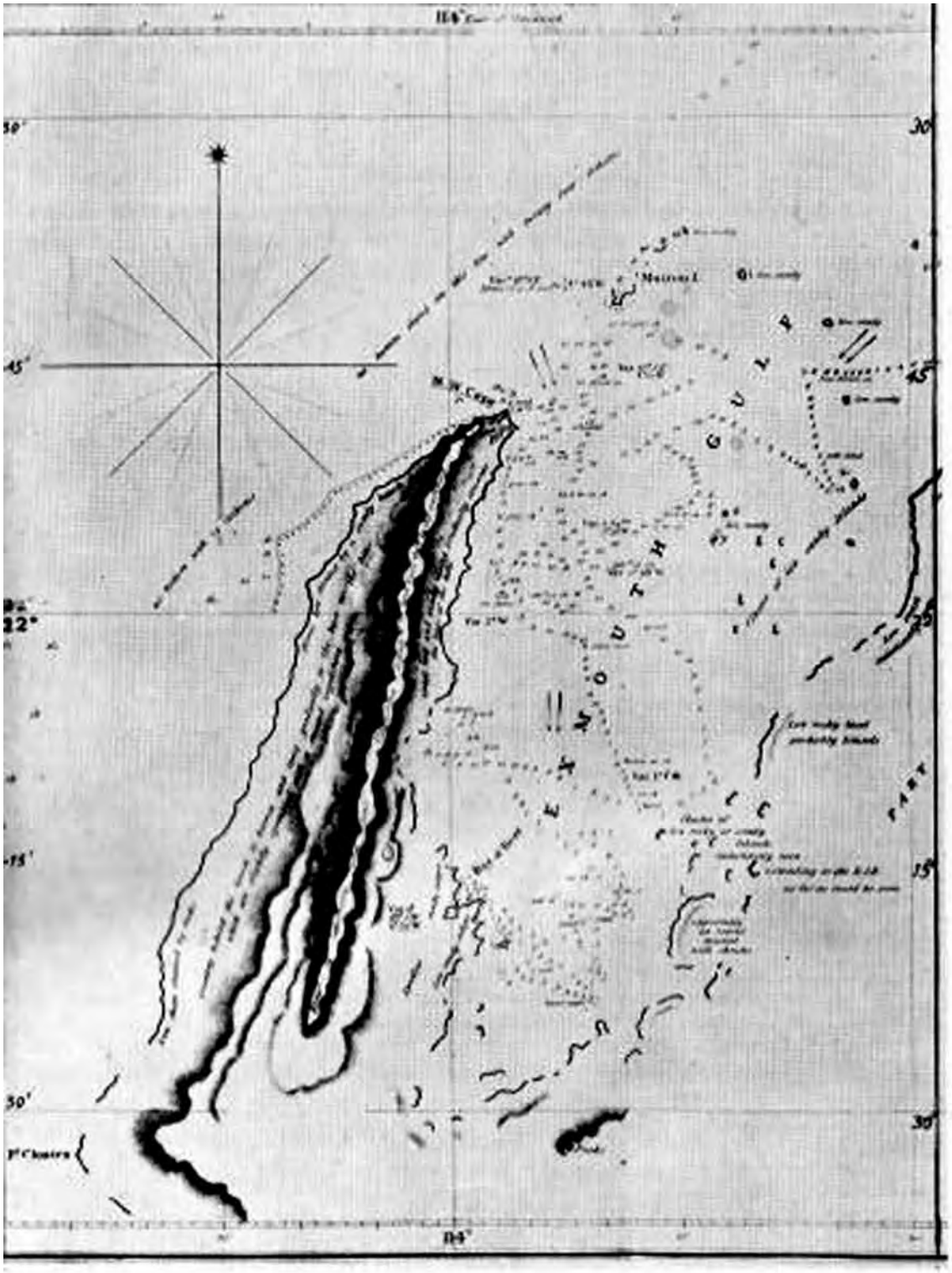


Figure 7. Philip Parker King's map of Point Cloates.

> with 160 fathoms; nor did he find any fign of foundings as he ran in toward it, the water being not at all difcoloured. Standing in ENE he raifed the land, found it long and level, about the height of the Lizard, that might be feen 8 or 10 leagues, and believed that the land like iflands joined to the reft. He made about 39½° Eaft longitude from the Ifland St. Paul home to this land. It was discovered by Captain Nafh, who reported that it extended about 10 or it leagues NE by N and SW by S and that it might be feen 10 or 12 leagues at fea.

Horsburgh (1852: 126) states:

> CLOATES ISLAND (doubtful) is said to have been seen in 1719, by Capt. Nash, in the Imperial ship, *House of Austria*, who gave it this name. The day before, and several days after, much sea-weed and some small birds like lapwings, both in size and flight, were observed. He made this island in lat. 22° S., and from it he made 7° 26' westing to Java Head. This island is said also to have been seen in 1743, by the *Haeslingfield*; and according to the description of both ships, it is about 8 or 10 leagues in extent, N.E. by N. and S.W. by S., of moderate height, level, with a gradual slope at both ends, and high breakers projecting about 3 miles from them. The *Haeslingfield* made it in lat. 22° 7' S.; they steered from it nearly North, for seven days, made the land of Java in lat. 8° 30' S., and in three days more, made Java Head 7° 12' W. from Cloates Island.
>
> The longitude made by these two ships from this island to Java Head, agrees within 14 miles of each other; and allowing Java Head in lon. 105° 11' E., Cloates Island will be in 112° 30' E., by mean of the longitude made by both ships, or 1° 46' W. from the coast of New Holland; this coast in lat. 22° S., being in about lon. 114° 16' E.
>
> Cloates Island, has also been supposed to lie very near the coast of New Holland. The *Belvedere*'s Journal states, January 12th, 1796, at ½ past 8 a.m., steering E. ½ S., saw Cloates Island on the lee bow, bearing E. by N. 5 or 6 miles, hauled up N.N.W.; at 9 the Island E. ½ S., to S. E., breakers off each end from East to S.E. by E., in 25 fathoms. Steered N. ½ W. 3 miles to 10 a.m., a bluff point of land seen from the mast-head S. E. ½ E., distant 8 or 9 leagues in 25 fathoms. Steered N. E. by N. 4 miles, N. E. 6 miles to noon: the observed lat. 21° 10' S., the body of Cloates Island seen half-way up the mizen shrouds bearing S. by W., distant 4 or 5 leagues, in 38 fathoms. Wind at N.W. and westward. From noon, steered N. E. 9½ miles, saw the coast of New Holland from the deck, hauled on a wind N.N.W., being in 17 fathoms red coarse sand at ½ past 1 p.m., January 13th. At 2 p.m., the southern extreme, a bluff point, with high breakers, extending out to a great distance, S. 78° E., the northern extreme N. 50° E., the nearest land N. 70° E. distant 5 leagues.
>
> This was evidently not Cloates Island seen in the *Belvedere*, but some of the low islands in the bight to the eastward of the N.W. Cape of New Holland, as the island and land she saw are to the northward of the Cape. Cloates Island has probably no real existence, some of the islands near the coast of New Holland having been mistaken for it, when ships were navigated by dead reckoning.

However, the matter was finally laid to rest by Phillip Parker King, who in *Narrative of a Survey of the Intertropical and Western Coasts of Australia* (1827), states:

> The existence of Cloates Island also, of which there are so many undeniable and particular

> descriptions, has been for a long time questioned by navigators; I think however there is no doubt that it does exist but that it is no other than the mainland to the southward of the North West Cape. The descriptions of this island by Captain Nash of the ship *House of Austria*, as well as that of the *Haeslingfield* in 1743, and subsequently by Captain Pelly, accord exactly with the appearance of this promontory; nor is the longitude much in error when we consider the strength of the currents which set to the north-west, during the easterly monsoon, in the space between New Holland and Java. Captain Nash places Cloates Island 7 degrees 26 minutes East of Java Head, and the *Haeslingfield* 7 degrees 12 minutes; the mean of the two accounts is 7 degrees 19 minutes; the true difference of the meridians of Java Head and the North West Cape is 9 degrees 3 minutes, a difference only of 1 degree 44 minutes.
>
> To the honourable the Court of Directors of the United Company of Merchants trading to the East Indies, Steel's new chart of the Indian and Pacific Oceans.

Horsburgh (1852) writes: 'Cloates Island has probably no real existence, some of the islands near the coast of New Holland having been mistaken for it, when ships were navigating by dead reckoning'.

Strangers on the Ningaloo shore

Michael McCarthy

There are a number of 19th-century Indigenous reports of shipwrecks in the Ningaloo region. For example, the following appeared in the press of 1876 referring to three wrecks, one near the North West Cape, where men and women got ashore but were killed, and of two others, one possibly a whaler and the other a smaller vessel, possibly the *Brothers* (page 250), near the same place.

> An account of a shipwreck has reached us which, if followed up, would probably prove beyond any further doubt the fate of the schooner *Emma*, which left Port Walcott for Fremantle, with a large number of passengers on board, ten years ago, and has not since been heard of. The narrative is told by an intelligent native whose tribe inhabits the country in the neighbourhood of the alleged disaster. Coming from such a source there may be some hesitation in giving the story credence, but it is accompanied by such detail and circumstance that some truth at least appears to attach to it. On a voyage from Port Walcott to Fremantle recently the native referred to related the following circumstance to the master (Mr C. Tuckey):—A long time ago (about ten years he described) a ship was wrecked near North West Cape; the passengers landed, at night, in the boats, and as they had no means of defending themselves the natives had no difficulty in making them prisoners. There was a large number of persons, and amongst them were some females. The natives were not 'sulky' with them, but nevertheless they killed and ate all of them, the narrator partaking of some of the flesh. Two other vessels were also stated by the native to have been lost about the same spot—a large vessel and a smaller one, and he was able to point out where the wrecks lay. The crew of the larger vessel took to their boats and proceeded southward, probably the ship's company of a whaler who were rescued at Sharks Bay by the Schooner *Favourite* about 1857. The smaller vessel was probably the *Brothers*, which was lost about the same time as the *Emma*, but no account is given of the fate of her crew. To ascertain if possible whether the wrecks really existed Mr Tuckey took his vessel in as far as he considered prudent after rounding the Cape and with the aid of a telescope made out distinctly the ribs of a vessel lying on the beach. The place is situated about 100 miles to the south of the Cape, between Point Cloates and Cape Cuvier where a reef of fifteen to twenty miles in length and generally undefined on the charts, runs, out seaward (*Inquirer*, 19 January 1876 reproduced in Honniball, 1961; Smoje, 1978)

Because contemporary accounts made no reference to women on board the *Emma*, the possibility that the above account referred to the *Emma* was discounted (page 66). Many researchers also doubted the account since the Museum's *Unfinished Voyages* series—in effect a comprehensive database of known losses on the Western Australian coast—did not contain any reference to the loss of a ship carrying women on the Ningaloo Reef or adjacent coast (Henderson, 1980; Henderson and Henderson, 1988; Cairns and Henderson, 1995).

However, there were other Indigenous accounts of women surviving shipwreck. One,

again from 1876, is attributed to an Aboriginal man known to the Europeans as 'Tony'. He was with Pemberton Walcott during his examination of wreckage on the beach south of Ningaloo Station, believed to be from the barque *Stefano* wrecked in 1876 (page 115). Walcott recorded that 'about two winters ago, a very large steamer had been wrecked down at his country [Cape Cuvier] and all hands lost including a woman' (Henderson and Henderson, 1988: 178). Another reference to women surviving a shipwreck appears in a work by 19th-century ornithologist Thomas Carter, founder of Ningaloo Station, entitled *No Sundays in the Bush* (Carter, 1987). In the context of skeletons of the *Stefano* crew being seen in a cave near the beach on Warroora Station (for location of geographical places see Figure 61 on page 47) Carter wrote that

> …some of the elderly natives [at Cape Farquhar between Point Cloates and Cape Cuvier] spoke of a white man, woman and little girl who landed in a boat (dinghy) years ago, evidently having been shipwrecked, and after living quietly with the natives for a long time had started to walk south along the coast. No one ever knew who they were or how they died, and there was no water procurable between Boolbarty and Beejaling, a distance of about one hundred miles. Some of the natives at Boolbarty [a large encampment], especially three of the young women, were quite light coloured, with regular features and light brown hair, and doubtless they had a strain of white blood in them derived from Europeans shipwrecked at the time (Carter, 1987: 123).

Until recently these three Indigenous reports were not linked to each other and, especially because of the references to women survivors, like many other Indigenous accounts were considered, at best to be an agglomeration of many stories unable to be fixed in time. In April 2004, however, the remains of both the Portuguese dispatch vessel, *Correio da Azia* (page 83) and another as-yet-unidentified wreck (page 102) were found within a few hundred metres of each other and less than a kilometre south of the wreck of the *Stefano* (page 115). These wrecks all lay opposite Cardabia Station, between the Ningaloo and Warrora Stations. The unidentified site consisted of anchors, rudder fittings (one with a piece of coal lodged in the pintle aperture), an uninscribed bell and some fastenings, indicating that it was a late 19th-century wooden-hulled sailing vessel of around 400 tons.

This find posed several questions: Did men and women get ashore from this previously unknown wreck? Is it the one referred to by Tuckey and by 'Tony' in 1876 (*Inquirer*, 19 January 1876)? Or, are there more, as yet unrecorded, wrecks where, in one case, survivors headed off south after spending some time with the local Aborigines and in the other to land and be killed? Either way, in this instance Indigenous accounts referring to unrecorded wrecks on the Ningaloo Reef have been proven correct, at least in one instance. Thus Indigenous legend is shown to not only add to the European records, but also in some cases to help close the gaps, and possibly to provide a different perspective or insight. Knowledge of this possibility led to 'Strangers on the Shore: the Australian contact shipwrecks program'. Part-based on the Museum's *Zuytdorp* and *Stefano* experiences, it was designed to examine all known interactions between Indigenous people and shipwrecked sailors. Supervised and assisted by the author, Lesley Silvester, a student on internship in the Department of Maritime Archaeology, then conducted a comprehensive search of the Department's records and those of the State Archives, to produce a three-volume, hard-copy database (Silvester, 1998). This was followed by an electronic database produced by Michael Murray. While there subsequently proved to

be many entries examining indigenous contact with shipwreck survivors, to all involved, the *Stefano* 'contact' vied with the United Dutch East India Company (*Verenigde Oostindische Compagnie* or VOC) ships *Zuytdorp*, *Vergulde Draeck* and a pre-settlement wreck on the south coast just east of Eyre as the most intriguing from a European perspective <http://www.museum.wa.gov.au/maritime-archaeology-db/strangers-on-the-shore>. Stage one in Western Australia was completed and reports published (McCarthy and Silvester, 2000; McCarthy, 2008). Other states then followed suit and their reports appear in the *Bulletin of the Australasian Institute for Maritime Archaeology* under a variety of authors (see McCarthy, 2008). The study shows that the shipwreck can provide many insights into Indigenous groups and their attitudes to shipwreck survivors who land with none of the trappings of power usually associated with European and Macassan landings.

The wreck can also provide other unexpected insights. One example, that of the loss of the *Benan* (page 162) on the Ningaloo Reef in 1888, is the rapidity with which news travelled through tribal boundaries in order to alert the authorities. In this case news filtered through to Carnarvon in only a matter of days. Thomas Carter, who later owned the Ningaloo Station, and who at the time of writing, in 1889, was at Wandagee Station inland wrote:

> About this time some of the Wandagee natives said that the natives on the coast had signalled across to them—presumably by means of smoke—that a 'flock of white men were walking about the beach at Point Cloates', which would be about 120 miles distant in a straight line. We all took little heed of what they said, considering it to be only a nigger's yarn, but some days later word came from Julius Brockman that the barque *Benan,* bound from Cardiff to Hong Kong with a load of coals, was wrecked on Point Cloates reef, and the crew of twenty-nine had landed there. They then walked, and sailed in the ship's boat to Yalobia, forty-five miles south, where they camped with a man in his employ, attending to some sheep there, and eating the sheep wholesale (Carter, 1987: 120).

Another feature is the ability of the events surrounding a particular wreck to fix certain Aboriginal groups in time and place. For example, when the *Shunsei Maru* (page 213) became stranded on the Ningaloo Reef in 1931, the crew refused to come ashore for fear of the Aborigines who were gathered on the beach opposite. Yet it was believed by some, that the Indigenous inhabitants of the North West Cape were extinct, or had been driven out in the early 20th century. The unequivocal, dated evidence, for their presence in this particular region appears in a transcript of a lecture given in Augusta by former Norwegian Bay Whaling station chief engineer Maurice MacBolt (1976: page 213). In the lecture, which was essentially about the salvage of *Shunsei Maru* and the loss of another ship the *Chofuku Maru* in 1931, MacBolt recalled that an Aboriginal man the Europeans called 'Long Tommy' and his wife 'Mary Ann' reported the stranding to the whaling station. On boarding the ship MacBolt found that the crew of around fifty men were, in his own words, 'not happy about coming ashore as they could see about twenty Aborigines—they had spears as they had been fishing and getting turtles'. When MacBolt went ashore and related this to the Aborigines, they treated the fears of the Japanese as a 'huge joke'. When *Chofuku Maru* also got into difficulties, it was again 'Long Tommy' and his wife 'Mary Ann' who reported the event to the whaling station. In another important observation MacBolt records that their group was led by a man known as 'Dingo Charlie' and that all twenty in the group were 'full-blood' and all could speak English (MacBolt, 1976).

Other instances to an extent fixing and referencing Aboriginal groups in time and place occur with the wreck of the *Stefano* (page 115). The first search for survivors was that conducted by the Brig *Alexandra,* commanded by George Vinal in May 1876. Concerned that Aborigines were trying to lure them ashore and might be hostile, they left for Roebourne to break news of the wreck. The schooner *Victoria* was then chartered by the Resident Magistrate, Robert Sholl, and he sent Pemberton Walcott, mentioned earlier, in charge. On 7 June he landed in the bay under Point Cloates and there he reported seeing

> …a mass of wrecks…I came to the conclusion that not less than four—probably five vessels of considerable tonnage had been wrecked within seven or eight months. The wreck of *Stefano* was pointed out by the natives, and the camp of survivors, where sundry articles belonging to her were found such as boards with written particulars—torn charts, stools, etc. etc. (Henderson and Henderson, 1988: 175–182).

Walcott's account (and the map he subsequently produced, see Figure 122 on page 138), referred to the wreckage of five ships on the shore and that the 'natives' were either, pointing out the wreck site of the *Stefano* on the reef, or as one of the five vessels on the shore. The 'natives' referred to included the Aboriginal man 'Tony' who had earlier advised Walcott that 'about two winters ago a very large steamer had been wrecked down at his country [Cape Cuvier] and all hands lost including a woman'. According to Walcott, 'Tony' had also earlier camped with the *Stefano* survivors, themselves providing an important link to their story.

Stefano, also represented the commencement of Stage Two of the 'Strangers on the Shore' program, which aimed to seek Indigenous perspectives (in this case Yinikutira, Thalanji and Payungu peoples who inhabited the region adjacent the wreck) on the 'contact' events either before or after Stage One had been effected Australia-wide. One contributor in the early seminars and reports, soon after the *Stefano* wreck was found, was Phillip Moncrieff, a descendent of the Payungu people. At the time he was the first to put an Indigenous perspective to us. Another perspective was received as a result of the publicity surrounding the subsequent finding of both the *Correio da Azia* and the unidentified site nearby, and in the presentation of an exhibition featuring the wrecks at the Shipwreck Galleries in Fremantle. In August 2005, Leone Ferrier, a Murdoch academic, together with Ann Preest and Maureen Dodd, who both traced their ancestry to the North West Cape people, viewed the *Stefano* exhibition. They were adamant that Thalanji people had a role in saving the two castaways. The two Aboriginal women sought an explanation why the exhibit contained no mention of the Thalanji people. They were advised that this was what we had been told by our earlier informant. Given the disagreement between the two sources (i.e., between Moncreiff and the two women), it was believed that the issue most likely lay in where the Payungu and Thalanji tribal boundaries lay. As a group, we then examined the records, including Tindale's maps (now outdated) of Tribal Boundaries, a modern map of the Aboriginal and Torres Strait Islander Commission (ATSIC) centres and regions and maps appearing in Horton's *Encyclopedia of Aboriginal Australia* (1994: 803). The differences between the two were quite marked, not so much in the spelling of each of the Indigenous groups, which varies considerably across time and place, but in the 'boundaries' themselves. In Horton's work, and allowing for scale, it is evident that the *Stefano* wreck lies almost directly opposite the Paiyungu–Thalandji boundary. In essence this short visit, and Phillip Moncrieff's earlier contribution, represented the much-awaited commencement of

Stage 2 of the 'Strangers on the Shore program'. Stage 2 was designed to correct, or at least augment, the Stage 1 European record of the study by adding the Aboriginal perspective and insights (McCarthy and Silvester, 2000). Before leaving, Maureen Dodd observed that as far as she was concerned, in respect of the *Stefano,* the Thalanji must have been primarily responsible, because unless escorted 'crossing a boundary was not possible, as the intruders would have been killed and eaten'. This was a crucial point, one repeated and confirmed by her ancestors. References to this, and to the safe landing of men, women and children from a wreck, only to be killed, appear in some European accounts. A prominent source for the study region are the diaries of Julius Brockman (as quoted by his relative Joan Brockman) which contain accounts of cannibalism, of Aborigines dressed in European clothes (including dresses), of broaching casks of rum and food, and of encountering strange objects such as boots, shoes and gold doubloons. Few modern-day scholars would give the details in this account any credence, bar the fact that the reference to women and children, mirrors the contemporary Indigenous source (Brockman, 1987: 120).

In an exchange of correspondence in late 2005, Maureen Dodd and Ann Preest provided many new insights, allowing the *Stefano* story to be viewed from their perspective. Maureen Dodd, having Paiyungu, Thalandji and Yinigudura ancestry; Phillip Moncrieff, having Paiyungu; and, Ann Preest, being part of the West Thalanyji Families, and with all now willing and able to begin sharing their insights and stories, it is evident that it will be possible to further examine, highlight and celebrate the role of the various Indigenous peoples in saving the *Stefano* boys.

Point Cloates whaling station, Norwegian Bay: a reappraisal

Myra Stanbury, Corioli Souter, Jennifer Rodrigues and Jim Stedman

Introduction

In January 1982, a team of archaeologists, students and volunteers carried out a field survey of the Point Cloates whaling station at Norwegian Bay. The four-day project, undertaken during the final season of excavation of the American China trader *Rapid* (1811) aimed to map the site; and, identify and record the various physical components of industrial activity and their relation to one another. Results of the survey were combined with subsequent archival and other documented evidence, to compile the history of the whaling station from its construction, in 1915, through its various periods of operation (see Figure 8 and Figure 9 on page 17), until its closure in 1957 (Stanbury, 1985).

The construction of the whaling station at Norwegian Bay at the beginning of the 20th century represented a landmark in the transition from the 'old' to the 'modern' methods of whale processing. Built by Norwegian whaling interests at a time of rapid expansion in Norwegian whaling technology, the equipment installed was the most up-to-date of its time. It was designed to maximise the processing value of the raw material, to fully exploit the whale products more quickly and efficiently. This resulted in better quality oil, and useful products, such as fertiliser and bone meal, from the whale solids (Stanbury, 1985: 57).

The technological expertise, biological knowledge and practical skills of the Norwegian whalers were fundamental to the establishment of modern whaling in Western Australia. Even when Australian companies ventured into the industry, Norwegian skill in terms of manpower and technology continued to play an important role in their achievements. The remains of the whaling station at Point Cloates are a significant reminder of a once lucrative, albeit capital-intensive, risky economic industry.

Background history

A summary of the operational history of the whaling station at Norwegian Bay, (based on Stanbury 1985) is given below. A more recent documentary account is to be found in the Heritage Council of Western Australia's Assessment of the place for registration onto the State Register (Sauman and Gray, 2004, Register of Heritage Places—Assessment Documentation. Heritage Council of Western Australia, <http://register.heritage.wa.gov.au>, accessed 1.12.09).

Table 1. Chronology of main events at Point Cloates (Norwegian Bay) whaling station (from Stanbury, 1985).

Date	Company	Event
1911	Spermacet Company (Esperance to Cape Leeuwin) Fremantle Company (Leeuwin to Steep Point) Western Australian Company (Steep Point to Cape Lambert) General Managers: Christian Nielson and Co. of Larvik	Norwegian companies apply for exclusive licences to commence whaling on the Western Australian coast from Esperance to Cape Lambert.
1912	Western Australian Company	Machinery for the shore station at Norwegian Bay ordered from Norway; survey and charting of the navigable waters of the bay; positioning of automatic light buoys. Whaling commenced using factory ship and four whale chasers
August 1915	Western Australian Company	Construction of shore station commenced. Cost £20 000–30 000.
1915	Western Australian Company	Outbreak of WWI; West Australian Company sells its ships and closes down the station.
1922	North West (Aust.) Whaling Company	Purchase station from the Norwegians; buy 3 whale chasers: SS *Fynd,* SS *Fin* and SS *Frey*; commence whaling with limited success: undercapitalised, limited knowledge of whaling; unable to procure services of competent Norwegian gunners.
1923	North West (Aust.) Whaling Company	Steamships *Fin* and *Frey* break moorings in cyclone; blown onto Fraser Island. *Frey* refloated, *Fin* a total wreck.
1925	North West (Aust.) Whaling Company	Forced into liquidation with loss of £24 000. In return for royalty, leased the station and ships to the Norwegian Bay Whaling Corporation.
1925	Norwegian Bay Whaling Corporation	Manager, Captain Gustav Bull expresses concern for humpback whale population in the face of over exploitation. New licences had restrictive clauses.
1925–1928	Norwegian Bay Whaling Corporation	Spent over £18 000 on improvements and replacements. Four steam whalers in operation: SS *Fynd*, SS *Ingeborg*, SS *Hauken* and SS *Havorn.*
1929	Norwegian Bay Whaling Corporation	Norwegians cease operations, possibly due to declining oil prices and preparation of very stringent Whaling Act. Left over £8 000 of machinery and materials at the station to maintain it as a going concern.
1930s	Australian Whaling Company Ltd	Attempt to float a new Australian company at Norwegian Bay unsuccessful. Shore-based whaling discontinued until after WWII.
1936–1938		Pelagic whaling continues along coast from factory ships *Frango*, *Anglo-Norse* and *Ulysses.*

1939–1949		Full protection of humpback whales in the Antarctic, except for brief period in 1940–41. Post-war quotas allotted to each whaling station.
1944		Station at Norwegian Bay devastated by cyclone.
1948		September —The Council for Scientific and Industrial Research (CSIR) research vessel *Warreen* visits Norwegian Bay with Commonwealth Director of Fisheries, F.F. Anderson, accompanied by Capt. Melsom, Norwegian whaling expert, and Ken Coonan, Australian observer with the Japanese whaling fleet in the Antarctic, seeking to select a suitable site for the re-establishment of whaling in Australian waters after a lapse of 21 years. Photographs taken during the visit show the rotten planking of the flensing deck, with its open digesters and rusty winch; and, the blubber elevator surmounted by a sea eagle's nest that 'had been there for at least two years'. Heavy oil barges were said to have been 'lifted by a hurricane [in 1946] over 5 feet posts in the water and thrown ashore well above the normal highwater mark' (see *Fisheries Newsletter*, Dec. 1948, **7.**6).
1949	Robert Moore and Associates	Station resurrected and modernised to deal with 600 whales (its allocated quota). Ex-Fairmile launches (renamed *Norwegian Bay* and *Point Cloates*) converted and used as whale catchers.
1950	Robert Moore and Associates	*Norwegian Bay* lost in a storm on 'Wedge Reef'.
1951	Moore family interests incorporated into public company: Nor'-West Whaling Co. Pty Ltd.	Major additions made to the plant, e.g. Swedish De Laval separators installed; Hartmann and Kvaerner whale cookers purchased and steam and electricity generating units updated; personnel quarters improved; refrigeration installed.
1952	Nor'-West Whaling Co. Pty Ltd.	Roadway laid through the sand-hills.
1955	Nor'-West Whaling Co. Pty Ltd.	First Cleaver-Brooks distiller unit in Australia installed to distil salt or sea water into fresh water as boiler feed. Whale quota reduced to 500.
1956	Nor'-West Whaling Co. Pty Ltd.	Company took possession of federal Government's whaling station at Babbage Island, near Carnarvon and maintained joint operations of the two stations.
1957	Nor'-West Whaling Co. Pty Ltd.	Decision made to close station at Norwegian Bay. Ships, equipment, men and quotas moved to Carnarvon.

Significance of the place

From the time of the 1982 survey, when the historical and cultural significance of the site was recognised, it has been intermittently monitored via informal reports from visitors, members of the Maritime Archaeological Association of Western Australia (MAAWA), museum staff involved in other fieldwork activity in the area and heritage consultants. Over the years, the once infrequently visited site has gradually become a regular tourist attraction for campers and other visitors to the Point Cloates/Ningaloo area. However, in addition to natural

environmental impacts—cyclones, storm, wind and wave regimes and mobile dune systems; and, on-going corrosion and degradation in an exposed, coastal environment—human impacts have also taken their toll.

In July 1986, Nuala Randall, a post-graduate diploma student in maritime archaeology, visited the whaling station and prepared a report as part of her course work (see Randall, 1987). She commented that:

> Although no management proposals are linked to the site at present [1986], the whole of the area of the coastline and reef areas are under a future management proposal as an environmentally sensitive area as suggested by the National Parks Authority in 1983. The proposed Ningaloo Marine Park was put forward by the National Parks Authority in conjunction with the Fisheries and Wildlife Department and the WA Museum. Included in this wider proposal Norwegian Bay [was] designated a 'sanctuary' area. This sanctuary will serve as a baseline from which other reef areas and marine life can be measured. To enter the bay by boat a permit will be required and these will only be given to those people conducting scientific research. Land access to the coastline will only be allowed on foot and *the removal of any material, not for specific research purposes, will not be allowed* [author emphasis] (Randall, 1987: 35).

At the time, the proposals were in an initial form and subject to amendment by the overall governing body. However, should the proposals go ahead it was anticipated that they would 'enable the relics of the whaling station to be protected from vandalism and theft' (Randall, 1987: 35). Randall had observed that the site was 'deteriorating rapidly, and much [had] changed' since the archaeological survey and report of 1982 (see Stanbury, 1985). Nevertheless, she envisaged that interpretive signage and a walk trail might tie in with the WA Museum's Wreck Trail Programme, and 'may be a possible management proposal for the future' (Randall, 1987: 35).

Randall was also quite surprised to find that she and her companions were not alone on this lonely coastline; other visitors appeared, walking over the dunes and in small boats. This led her to note that:

> The site is obviously of public interest and although far from any habitation gives people the potential for exploration and discovery…The remains are of considerable historic significance in the development of Western Australia as they are representative of a transitional stage in the development of the whaling industry. The site also reflects the enterprise and determination of both Norwegians and Australians working under extremely difficult conditions (Randall, 1987: 35).

In 1987, Jack McIlroy prepared a report on 19th-century bay whaling stations in Western Australia, including a short section on the Point Cloates station (with notes and photographs from Stanbury 1985) for the Australian Heritage Commission (McIlroy, 1987: 116). McIlroy had hoped to visit the site during the North-West survey but local advice was that 'the access track was impassable by a two wheel drive vehicle' so he did not attempt to reach it. His report emphasised that the whaling sites along Western Australia's coast were under threat from development, and from natural deterioration due to exposure to wind, sea and air. Vandalism in various degrees was also a further constant threat, especially where the location of sites was widely known.

Figure 8. View of the Norwegian Bay Whaling Station from the Manager's House, 1952 (R.G. Chittleborough).

Figure 9. Aerial photograph of the Norwegian Bay Whaling Station in 1946 (from the Stanley Fowler Collection, courtesy of R.G. Chittleborough).

At the time of this report, State heritage legislation in Western Australia was pending, and any nomination of an area by the National Trust as a Historic Site, or classification of an area had no legal status. Therefore, McIlroy's recommendation that the Point Cloates site should be 'classified as an Historic Site by the National Trust' was made on the presumption that it would be reviewed once the *Heritage of Western Australia Act* was passed, which took effect in 1990. (In 1991, the Heritage Council of WA (HCWA) was established to administer the Act, initially with a small support staff.) McIlroy advocated that the site should be part of a broad heritage trail including other whaling sites along the coast; and, that a pamphlet should be produced giving the location of each site along the trail together with a brief history. These should be made available to the public through various outlets—heritage bodies, local museums, tourist facilities etc.—and emphasise the need to protect sites where standing ruins exist.

Subsequent to the 1987 report, in March 1988, the WA Museum submitted a nomination for protection of the site to the Australian Heritage Commission (Stanbury, 1988). The statement of cultural significance read as follows:

> Whaling was an industry which played a significant role in the economic, social and cultural lives of Western Australians, from the time of first settlement of the colony until 1978 when the whaling station at Albany finally closed down. The whaling station at Norwegian Bay was the first modern shore station to be constructed in Western Australia, and represents the beginning of the modern era of whaling, utilising new forms of technology both for catching and processing whales. Built in 1915, by Norwegian whalers, the site is a reminder of the overseas cultural influences that assisted in the development of many of the State's early economic enterprises. Situated in a remote area, it further emphasises the isolation and hardships experienced by early pioneers in the North-West.
> The station was used intermittently from 1915 to 1957, the original Norwegian company (the Western Australian Company) being sold to a group of Australians after WWI (the North West (Aust.) Whaling Company). They were succeeded by the Norwegian Bay Whaling Company and finally the Moore family's concern, the Nor'-West Whaling Co. Pty Ltd.
> The site is a focal point of historic interest on an otherwise rather barren stretch of coast and has generated interest from tourists to the area.

The main impetus for the nomination was that reports from local informants and photographs taken by interstate visitors indicated marked deterioration of the site since 1982. In part this was due to natural erosion and degradation of the iron structures resulting from environmental conditions and local weather patterns, but also from human interference.

In 1994, as part of the 'Ports and Port Related Structures' project funded by the National Estate Grants Program (NEGP), administered by the Australian Heritage Commission (AHC) and the HCWA, Dena Garratt compiled a report on the whaling station at Norwegian Bay and its port-related structures (Garratt, 1994). She assessed the site's significance as follows:

i. Historical: The site is a focal point of historic interest on an otherwise barren stretch of coast and has generated interest from tourists to the area.
ii. Technological: The whaling station at Norwegian Bay was the first modern shore station to be constructed in Western Australia, utilising new forms of technology both for catching and processing the whales.

Figure 10. Brick fire-box, 1982 and 2007 (Colin Cockram).

Figure 11. Chain 1 (Colin Cockram).

Figure 12. Chain 2 (Colin Cockram).

Figure 13. Early Norwegian digesters (Colin Cockram).

Figure 14. Flensing deck winches (Colin Cockram).

Figure 15. General view of storage tanks, brick fire-box and boilers from the south-west (Colin Cockram).

Figure 16. Horizontal medium pressure boiler (Colin Cockram).

Figure 17. Looking north from Station 1 (Colin Cockram).

Figure 18. View of the whaling station from the 'new' Manager's residence (Colin Cockram).

Figure 19. Oil storage tanks (Colin Cockram).

Figure 20. Remains of steam winches at seaward end of flensing deck (Colin Cockram).

Figure 21. Seaward approach (Colin Cockram).

iii. Scientific:
iv. Educational: Heritage remains have the potential of being a focus for educational activity if properly marked and documented. Because of the wealth of material still evident on the site, it has enormous potential for interpretation and education.
v. Recreational: The site is ideal for passive recreational activities such as walking and swimming. However, the remoteness of the site and the difficulty of access limits this potential. The site lies within the boundaries of the Ningaloo Marine Park and has been designated as a marine sanctuary Cloates Sanctuary Zone.
vi. Cultural: Built by Norwegian whalers, the site is a reminder of the overseas cultural influences that assisted in the development of many of the State's early economic enterprises. Prior to the construction of the access road, the jetty served as the only link between the whaling station and the outside world for the isolated community of whalemen.
vii. Archaeological: The site is part of a thematic archaeological resource that will enable researchers to document the evolution of whaling technology in Australia.
viii. Rarity: The Norwegian Bay [Point Cloates] whaling station is probably the only site in Australia with an archaeological resource that demonstrates three distinct phases in the modern technological development of the whaling industry between 1912 and 1956.
ix. Representativeness: The whaling station at Norwegian Bay was the first modern shore station to be constructed in Western Australia, and represents the beginning of the modern era of whaling (Garratt, 1994: 20).

Based on the above significance assessment, recommended options were:

i. Recommend that the site be gazetted as an Historic Site.
ii. Erect a marker on the site that will include interpretive material.
iii. Consider an archaeological survey of the site, with provision for the rehabilitation of the excavated areas and the conservation, display and interpretation of any artefacts recovered from the site (Garratt, 1994: 21).

Furthermore, it was recommended that

> …the Norwegian Bay [Point Cloates] Whaling Station be more widely publicised as a reminder of an important era in the development of WA's whaling industry. Further to this, local residents should be encouraged to seek a grant to research, document and present the history of the site (Garratt, 1994: 21).

The site was referred to HCWA for consideration as a nomination for inclusion in the *Register of Heritage Places*. A reply received on 2 September 1997 acknowledged that 'the place may have some heritage value' and that the Register Committee nomination would be reviewed in 1998 (Letter from Ian Baxter to D. Garratt dated 2 September 1997, WAM File MA-2/93).

In September 2000, the Heritage Council advised the Shire of Exmouth that

> …the portion of coastline which includes the *Norwegian Bay Whaling Station* has recently been transferred from the Shire of Carnarvon to the shire of Exmouth.
> The Heritage Council has recently received a referral, pursuant to section 9 of the *Heritage of Western Australia Act 1990*, in respect to the above property.
> The referral was considered by our Register Committee at their meeting on 30 June 2000.

> It was determined that the place is likely to have cultural heritage significance, and is to be programmed for assessment…We note that the place has not been included in your Municipal Heritage Inventory and suggest that you consider its inclusion when the Inventory is next revised…In the meantime, we would appreciate any information you may have about the place…(Letter from Heritage Council to CEO Shire of Exmouth dated 18 Sept. 2000, copy on WAM File MA-209/80).

Subsequently, the Shire of Exmouth requested information from the WA Museum for submission to the Heritage Council in support of the registration which was duly provided (Letter dated 1 December 2000, from CEO Shire of Exmouth to M. Stanbury; Letter from M. Stanbury to Kerry J. Graham CEO Shire of Exmouth, dated 7 December 2000: WAM File MA-209/80).

Based on the criteria adopted by the Heritage Council in November 1996 to determine the cultural significance of a place (see 'Assessment Process', Heritage Council of Western Australia, <http://register.heritage.wa.gov.au/explanation.htm>), a heritage assessment of the whaling station was undertaken in October 2004 by Irene Sauman, Historian, and Laura Gray, Conservation Consultant (Sauman and Gray, 2004). An Interim Entry was placed on the Register on 26 August 2005 followed by a Permanent Entry on 22 August 2006. The comprehensive assessment incorporated most of the significance criteria identified in previous reports under the headings: Aesthetic Value, Historic Value and Scientific Value; and the degrees of significance under the categories: Rarity, Representativeness, Condition, Integrity and Authenticity (Sauman and Gray, 2004, Section 12. Degree of Significance). Included in the 'Historic Value' is a previously neglected reference to the three Scandinavian (2 Swedish and 1 Norwegian) whalemen who died and were buried in the sand dunes *c*. 500 m south-east of the site, a single grave headstone commemorating the three people. (The grave was not located during the 1982 survey.)

Importantly, are the statements regarding the condition and integrity of the site, which was found to be 'in poor condition with all remaining elements rusted and weathered beyond restorative opportunities' and 'a low degree of integrity' (Sauman and Gray, 2004, Section 12.4). This was clearly demonstrated in a series of photographs taken in 2007 by Colin Cockram during a visit to the site by members of the Maritime Archaeological Association of Western Australia (MAAWA) (see from Figure 10 to Figure 21).

The 2009 inspection of the site

The principal aims of the 2009 inspection of the whaling station at Norwegian Bay were:

1. To locate and re-position, using Differential Global Positioning System (DGPS) and Total Station survey techniques, the major components of the site as surveyed in 1982;
2. To locate and position archaeological deposits and/or features not included in the 1982 survey;
3. To locate and position the grave site of the three Scandinavian whalers;
4. To plot the main features of the site on a georeferenced aerial photograph using the above data; and
5. To locate and photograph structures, machinery and objects documented in 1982 for comparison and assessment of their degradation and/or continued existence.

Following the 1982 survey, museum staff and members of the MAAWA have regularly

visited the site during the period of its *Stefano* expeditions (1993–98) and noted significant changes, mainly through photographic record and/or field notes. In 1993 MAAWA noted that the Department of Conservation and Land Management (CALM, now Department of Environment and Conservation [DEC]) had placed signs at the site warning of asbestos fibres on the site (Field Diary, WAM File MA-117/91). In July 1996, MAAWA members attempted to reach the whaling station via the northern track from Yardie Creek but were 'stopped dead by a large dune' and forced to 'attack the southern track' (Cockram, 1996). This proved more successful but others had to walk in from the east. They particularly noted the following:

> There has been considerable erosion of the beach which has revealed a great deal of debris which has been buried for a considerable time, including the remains of a copper sheathed whale boat.
> On the way back to the cars…came across a memorial cross dedicated to 3 Norwegians who died in the years 1912 to 1915 (Cockram, 1996).

In 2007, Cockram prepared a set of photographs replicating shots of the various prominent structures published in the 1985 report, taken as near as possible from the original viewpoints (see from Figure 10 to Figure 21). He noted in the accompanying letter that:

> During [the 10 years that members of MAAWA had been visiting the site] the gradual deterioration of the structures has taken place, particularly with the loss of almost all the timber structures and the collapse of the oil storage tanks.
> Souvenir hunters have contributed to the site degradation, most notably the disappearance of the brick firebox and almost all of the fire bricks from which it was constructed—fragments can be seen along the 4 wheel drive access track (C. Cockram, 2007, pers. comm., n.d.).

Survey procedure

Using the 1982 survey plan of the site, the key survey stations (Nos 1, 2 and 3) were identified and/or their positions approximately located (Figure 22). The steel nail used as the datum for Station 1 was still *in situ* on the concrete slab in the central area of the site. This provided good visibility of the main structures (Figure 23 and Figure 25). A second station was selected as a back-sight in the dune area to the south-east of Station 1 (in the vicinity of the 1982 Station 3, Figure 26). This also provided a good vantage point for the remains to the south and west. Finally, a third station was selected in the fore dune in the region of the former Station 2, to provide sights to the soaks and equipment in the north part of the site (Figure 27 to Figure 29).

At all Stations DGPS positions were recorded and the Total Station calibrated accordingly. Readings were then taken of the remains using the principal landmarks of the 1982 survey. In addition, DGPS readings were taken of site features not previously surveyed. These included the large deposits of bottles, ironwork and other miscellaneous material to the south of the 'Kitchen and Mess' area shown on the 1982 plan; the grave site to the south-east; and, a signpost with no information on the track leading south. To the north-east, an additional soak; and, along the track leading north, remnants of an old truck, side-tipping rail trolleys, and various sections of boilers and unidentified iron equipment were recorded. Remains along the beach, running south-east, were also surveyed.

From a high vantage point close to Station 2 (2009), a series of photographs were taken to provide a 180° panoramic view of the site (Figure 30). A photographic record was also compiled of equipment and site features recorded in 1982, and features not recorded in detail during that survey. These included the large bottle site in the south-east of the site (Figure 31), and the grave of the three Scandinavian whalemen (Figure 34).

Site observations

As commented by earlier visitors to the whaling station, there has been considerable deterioration of the iron and steel structures since the initial survey of the site in 1982. Remains of the heavy steam winches on concrete mounting slabs at the seaward end of the flensing deck are still a prominent feature on the shoreline (Figure 33 and Figure 36). A few timber posts are all that remain of the lower flensing deck and jetty leading to the former guano factory (see Stanbury 1985, fig. 23). The beach to the south-east is strewn with large slabs of concrete foundations and fallen pillars, cemented barrels, iron debris (Figure 37) and remains of a roughly cemented red and yellow clay brick structure (see Stanbury 1985: 42) (Figure 38). Further south are the rusted remains of the oil storage tanks that were previously set in a row in the fore dune (Figure 39). Beyond these, four concrete posts, noted on the 1982 site plan, remain *in situ*, set in rusted 44-gallon oil drums (Figure 32).

Behind the fore dune in this area are several extensive deposits of brown beer bottles, close to the former kitchen and mess building (see 1982 Site Plan). In some locations, as identified in 1982, the bottles have been stacked in an orderly manner (see 'Beer bottle stack' on 1982 Site Plan). Elsewhere, the bottles are widely dispersed, some being intact, but most being broken. The scattered fragments of glass and bottles are mixed with rusted remains and fragments of ironwork, occasional fragments of ceramics, and a few personal items, for example a copper alloy belt buckle and mother of pearl button (Figure 35 and Figure 40). Intermingled with the above are broken fragments of asbestos.

Very little remains of the Metters stove (see Stanbury 1985: 37; Figure 42), and the brick structure that housed the ovens has also been demolished. Some of the red clay bricks, marked 'ARMADALE', are still cemented together and lay scattered around (Figure 43). The Zamia palm, noted as the 'only obvious introduced planting on the site' (Sauman and Gray, 2004, Section 13.2) still exists, though is barely alive (Figure 44).

As reported by Cockram in 2007, the brick fire-box shown in Stanbury (1985: 36, figs 16 and 17) is now reduced to a loose scatter of bricks, the latter being eagerly sought by transient campers and/or regular visitors to the area for the construction of barbeques. While undertaking the survey, parties in 4-wheel drive vehicles arrived looking for piping to build clothes lines at their temporary camps, and were somewhat surprised when told the site was protected as a historic site. Evidence of visitation was most noticeable by the graffiti on two of the digesters to the north-west of the central workshops area (Station 1) (Figure 45 and Figure 46), and inside one of the old Norwegian type digesters (see 1982 Site Plan, Figure 47).

The three large oil storage tanks (over 6 m high and 9.7 m in diameter), formerly one of the prominent landmarks of the site, have deteriorated significantly. In 1982, two of the tanks still had their timber roofs in place, and wooden barrel staves were still present on most of the cement-filled barrels supporting the perimeters of the tanks. Now, the walls of the tanks are badly corroded and collapsing (see Figure 48 to Figure 50). In mild windy weather, such as

we experienced on the site, the collapsed walls of the tanks were observed to be continually moving. This constant movement would undoubtedly be one cause for the gradual separation of the walls from the base of the tank (Figure 51).

A search was made for items of equipment documented in 1982, particularly those clearly identified by manufacturers' markings (see Stanbury 1985). The following were re-located and photographed:

1. Part of a steam winch marked 'STAFSJÖ MEK WERKST'. This appeared to have undergone little change from 1982 (see Stanbury 1985: 28, fig 7; Figure 52).
2. Rail trolley, formerly with a wooden platform (see Stanbury 1985: 33, fig. 14; Figure 53). This has corroded badly and the wooden planks forming the platform have totally disappeared.
3. Rail trolley—previously with remains of a bucket elevator (see Stanbury 1985: 30, fig. 9; Figure 524). The bucket elevator remains were no longer evident.
4. Remains of an old army vehicle on the east side of the oil storage tanks (Figure 55).

The following were not located:

1. Buffalo blower marked 'No 4 BUFFALO FORGE CO, BUFFALO N.Y.' (Stanbury 1985: 30, fig. 9);
2. Steel pulley block marked 'SELF OILING LOVERIDGE LTD., CARDIFF' (Stanbury 1985: 29, 31, figs 11 and 12); and
3. Steam engine marked '9301' (Stanbury 1985: 32, fig. 13).

Items not previously recorded included the following:

4. Remains of a boiler marked: 'CLARKE CHAPMAN GATESHEAD ON…' (Figure 56 and Figure 57). Clarke Chapman is a British engineering firm based in Gateshead. The Company was set up in 1864 at South Shore, Gateshead by William Clarke (1831–1890), engineer and Edward Benning. In 1865, Clarke took in a partner, Able Chapman, and the two of them developed the business into one of the largest manufacturers of cranes and other mechanical handling equipment in the world (Clarke Chapman, <http://en.wikipedia.org/wiki/Clarke_Chapman>, Accessed 14 December 2009). From 1875 they became boiler makers, designing and manufacturing locomotive cross tube vertical and vertical return type multi-tube boilers. Towards the end of the 19th century they turned to water tube boilers, beginning in 1895 with an improved 'Petersen' type which was sectional with cast iron headers. They later developed and patented, in 1901, the vertical straight tube type, moving on with improved feed water treatment and increasing steam pressure to a bent tube type used widely for power stations (Clarke Chapman, A Brief History, <http://www.pharoah.co.uk/groups/history-cc.htm> Accessed 14 December 2009).
5. Unidentified equipment marked 'RUSTON LINCOLN ENGLAND' (Figure 58 and Figure 60). The mark probably related to the place of manufacture rather than a company name.

Conclusions

Using the 1982 survey plan of the whaling station, the main features of the site could still be located, even though the majority of the former buildings, jetties, flensing deck and other structures were little more than 'ruins'. The iron and steel whale processing equipment and oil storage tanks have naturally corroded in the exposed, coastal environment, subject to

extreme weather patterns during the cyclone season. Many are on the point of total collapse, if not already a heap of rusting metal. Particularly vulnerable are the three large storage tanks that have been a focal point of the site, tall enough to be visible both from the ocean and mainland approaches. Heavier, cast iron equipment, such as the winches and parts of some of the boilers, steam engines and so on, has survived better, even though heavily corroded.

From the number of tourists now visiting the Ningaloo area on an intermittent and/or regular basis it is clear that the site is a local attraction for a variety of reasons, not the least being as a source of material for camping purposes—bricks for barbeques, timber as a source of barbeque fuel, piping for clothes lines and so on. Four-wheel drive vehicles were able to approach from the northern access track during our visit, while four-wheel 'quad bikes' appeared to provide easier access across the dunes and through the site to the beach, close to the former flensing deck. Some visitors were interested in seeing the grave site, but from conversation with others there appeared to be little awareness of the heritage status of the site.

Given that there is no interpretive signage at the site, its potential as a tourist attraction is significantly diminished. However, an interpretive plan with a brief history of the site would enable visitors to gain some insight into this aspect of Western Australia's whaling heritage despite the low integrity of the site.

Of particular concern is the lack of signage warning visitors of potential risks—of submerged jetty remains at the ocean approaches to the site that could present a problem for small craft coming ashore; large areas of broken glass, iron, asbestos and other industrial remains; and, structures that are liable to collapse and move in strong windy conditions.

On a more positive note, the site still has sufficient remains and potential for archaeologists interested in the development of the whaling industry, and the construction and operation of a large processing plant, to gain further useful information. The manufacturers' names, still visible on many pieces of equipment and small artefacts are a good example. Indicative of several overseas origins and Australian sources they provide a rare source of technical information about industrial developments, both internationally and locally, during the first half of the 20th century.

As the final panorama illustrates, the site still forms a 'picturesque composition on the Ningaloo coast in Norwegian Bay' (Sauman and Gray, 2004, Section 11.1 Aesthetic Value) (Figure 60).

Appendix 1: Historical images of Point Cloates Whaling Station
(Held in the Department of Maritime Archaeology collection)

Black and White Negative File No.	Description	Collection
MA-1091/6	View of Point Cloates Whaling Station *c.* 1924	John Morrissy Collection
MA-1091/7	View of Point Cloates Whaling Station *c.* 1924	John Morrissy Collection
MA-1091/8	Flensing deck at Point Cloates Whaling Station *c.* 1924	John Morrissy Collection
MA-2360/2	Aerial view of Point Cloates Whaling Station *c.* 1946	Stanley Fowler Collection

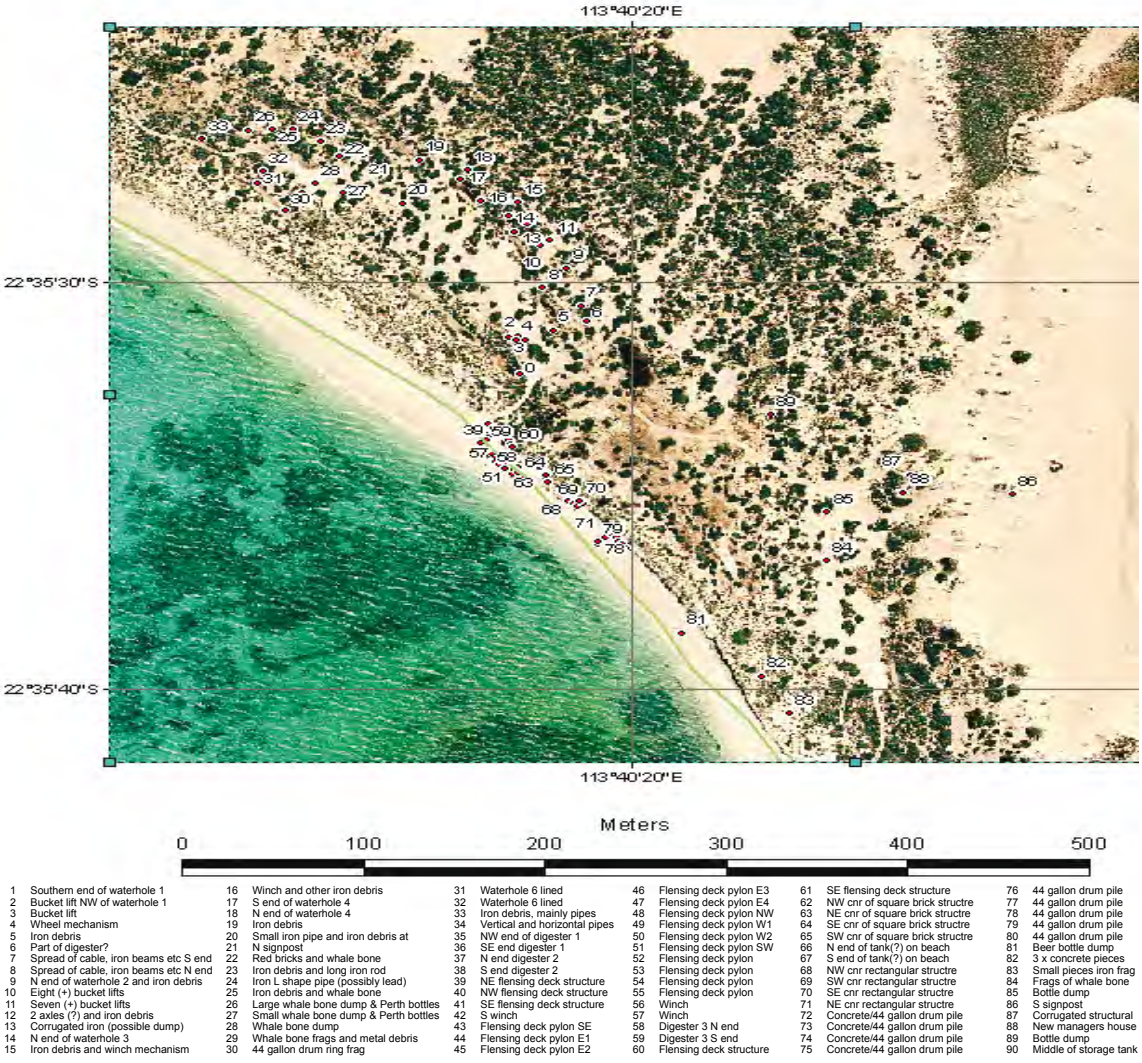


Figure 22. GIS showing the locations of the main objects on the site (Jeremy Green).

MA-2360/3	Aerial view of Point Cloates Whaling Station *c.* 1946	Stanley Fowler Collection
MA-2051/5	View of Point Cloates Whaling Station from the Manager's house, 1952	Bill Stephens Collection
MA-2052/8–10	View of Point Cloates Whaling Station from the Manager's house, 1952	Bill Stephens Collection
MA-2051/1	Whale alongside flensing platform. Point Cloates Whaling Station *c.* 1950	Bill Stephens Collection
MA-2052/20–22	Whale alongside flensing platform. Point Cloates Whaling Station *c.* 1950	Bill Stephens Collection
MA-2051/3	Flensing a whale. Point Cloates Whaling Station *c.* 1950	Bill Stephens Collection
MA-2052/29–31	Flensing a whale. Point Cloates Whaling Station *c.* 1950	Bill Stephens Collection
MA-2051/2	Baleen	Bill Stephens Collection
MA-2052/32–34	Baleen	Bill Stephens Collection
MA-2051/4	Whale chasers	Bill Stephens Collection
MA-2052/35–37	Whale chasers	Bill Stephens Collection

Figure 23. Setting up the Total Station at Station 1. View to the south-south-west showing remains of a vertical marine boiler (see Stanbury 1985: 38, fig 19) and to the right, the engine of the now demolished brick fire-box (Myra Stanbury).

Figure 24. Corioli Souter setting up the OmniStar and DGPS (Myra Stanbury).

Figure 25. Total Station survey from Station 1 based on 1982 landmarks. Looking south (Myra Stanbury).

Figure 26. View from Station 2 back to Station 1 (Myra Stanbury).

Figure 27. Setting up the DGPS at Station 3 (Myra Stanbury).

Figure 28. View from Station 3 back to Station 1 (Myra Stanbury).

Figure 29. Total Station set up at Station 3 (Myra Stanbury).

Figure 30. Panorama of the whaling station at Norwegian Bay, May 2009 (Myra Stanbury).

Figure 31. Bottle site (Myra Stanbury).

Figure 32. Concrete posts set in 44-gallon drums and other cemented drums half buried in the sand 2009 (Myra Stanbury).

Figure 33. Steam winch at seaward end of former flensing deck 2009 (Myra Stanbury).

Figure 34. Memorial cross marking the grave of three Scandinavian whalemen, with iron object marked 'WESTRAL' (Myra Stanbury).

Figure 35. Copper alloy belt buckle (Myra Stanbury).

Figure 36. Steam winch at seaward end of former flensing deck 2009 (Myra Stanbury).

Figure 37. Concrete foundations, cement barrels and iron debris on beach 2009 (Myra Stanbury).

Figure 38. Brick structure, iron debris and fallen concrete pillars on the beach to the south of the former flensing deck, 2009 (Myra Stanbury).

Figure 39. Rusted remains of oil receiving/storage tanks 2009 (Myra Stanbury).

Figure 40. Mother of pearl button (Myra Stanbury).

Figure 41. Blue and white transfer printed earthenware (Myra Stanbury).

Figure 42. Remains of the Metters stove in the former kitchen and mess facility (Myra Stanbury).

Figure 43. Red clay bricks marked 'ARMADALE' in the frogs (Myra Stanbury).

Figure 44. Zamia palm (Myra Stanbury).

Figure 45. Graffiti on an upright digester to the north-west of the central workshops area (Station 1) (Myra Stanbury).

Figure 46. Graffiti on an overturned digester (Myra Stanbury).

Figure 47. Graffiti inside a Norwegian type digester. The digester appears much as it did in 1982 (Myra Stanbury).

Figure 48. One of the few cement-filled barrels with evidence of timber staves. Note the severe corrosion around the base of the tank (Myra Stanbury).

Figure 49. Oil storage tanks supported on cement barrels, viewed from the north-east (Myra Stanbury).

Figure 51. Wall of oil storage tank separated from the base (Myra Stanbury).

Figure 50. Collapsed wall of an oil storage tank (Myra Stanbury).

Figure 52. Part of a steam winch marked 'STAFSJÖ MEK WERKST' (Myra Stanbury).

Figure 53. Rail trolley, formerly with a wooden platform (Myra Stanbury).

Figure 54. Rail trolley—previously with remains of a bucket elevator (Myra Stanbury).

Figure 55. Remains of an old army vehicle on the east side of the oil storage tanks (Myra Stanbury).

Figure 56. Remains of a boiler marked: 'CLARKE CHAPMAN GATESHEAD ON…' (Myra Stanbury).

Figure 57. Remains of a boiler marked: 'CLARKE CHAPMAN GATESHEAD ON…' (Myra Stanbury).

Figure 58. Unidentified equipment marked 'RUSTON LINCOLN ENGLAND' (Myra Stanbury).

Figure 59. Unidentified equipment marked 'RUSTON LINCOLN ENGLAND' (Myra Stanbury).

Figure 60. Panorama of whaling station site at Norwegian Bay, 2009 (Myra Stanbury).

MA 2051/6	Hoisting up a whale	Bill Stephens Collection
MA-2052/11–13	Hoisting up a whale	Bill Stephens Collection
MA-2051/7	Harpoon gun on whale chaser	Bill Stephens Collection
MA-2052/14–16	Harpoon gun on whale chaser	Bill Stephens Collection
MA-2052/17–19	Whale on flensing deck	Bill Stephens Collection
MA-2052/23–25	Cutting up	Bill Stephens Collection
MA-2360/1	Flensing a whale. Point Cloates Whaling Station, 1952	R.G. Chittleborough Collection
MA-2360/4	Flensing a whale. Point Cloates Whaling Station, 1952	R.G. Chittleborough Collection
MA-2360/5	Flensing a whale. Point Cloates Whaling Station, 1952	R.G. Chittleborough Collection
MA-2360/6	Flensing a whale. Point Cloates Whaling Station, 1952	R.G. Chittleborough Collection
MA-2360/7	View of whaling station from the north. Point Cloates Whaling Station, 1952	R.G. Chittleborough Collection
MA-2360/8	View of Point Cloates Whaling Station from the Manager's house, 1952	R.G. Chittleborough Collection
MA-2360/9	View of the guano factory and digesters. Point Cloates Whaling Station, 1952	R.G. Chittleborough Collection
Digital image: Series 138 LA -213.11	Aerial view of Point Cloates Whaling Station from the west *c.* 1945	© CSIRO Collection
Digital image: Series 138 LA-213.18	Aerial view of Point Cloates Whaling Station from the east *c.* 1945	© CSIRO Collection

Appendix 2: Comments on Point Cloates Whaling Station

Comments made by Gilbert Whitley on 8 September 1945, during a cruise of the M.V. *Isobel:*

1635 hrs. Anchored about ¾-mile off Whaling Station and went ashore.

I had visited this place a year ago, when it was largely falling into desuetude [*sic*] but since my last encounter, a willy-willy had done further damage. The jetty, incomplete then, has now quite disappeared and two sea-eagles which used to nest on it appear to have built afresh on top of a dredge-conveyor over the flensing platform. Most of the iron girders are skewed or twisted, very rusty, and a crane has crashed from platform to beach. Hardly a wall or roof is left anywhere and the big dining hall is flattened to the ground.

A small well is sanded up but there is some water in the main water-holes, also dead sheep. Two out of three large gasometer-like tanks are buckled. The digesters are still in order and the platform, for the most part, sound, but a double-ender boat has been lifted bodily on to the slipway. Much machinery and tools, ropes, chains, etc., have disappeared and there are banks of seaweed and cuttlebones 100 yards inside the remains of the buildings. The two launches on the beach will never go to sea again. The smoke-stacks and boilers seemed to be undamaged but their rivets might be rusted. MacBolt's old home on the hill was full of sand but might be repaired (Maurice MacBolt, former engineer at the Norwegian Bay Station under the North West (Aust) Whaling Company, was employed as a caretaker by the Australian Whaling Company Ltd in the 1930s to keep the Station maintained and in operational condition: see Saumon and Gray, 2004, Section 13.1).

Even white cockatoos, which spilt the air with their cries when I was here last year, have

deserted this desolate place now. Two sea eagles and two kestrels and some swallows were the only birds seen (Whitely, 1945).

Early port related structures

Michael McCarthy

Introduction: the first Europeans and the Point Cloates country

In 1885 G. Julius Brockman arrived at Minilya Station which belonged to his brother Charles; and, according to his diary, found his brother with 12 000 sheep, a million acres of pastoral lease, but in ill health and anxious to sell. Three years after purchasing the lease, Julius Brockman decided to open up 'the Point Cloates country, a strip of land stretching some sixty miles along the coast'. There he had seen what he called 'milk bush' a species that served to nourish sheep without needing as much water as required on the Lyndon and Minilya River country inland (Brockman, 1987: 118). Before doing so, he first needed to tap into the lenses of fresh water lying above the saline water table in depressions behind the fore-dunes on the coast. The best of these 'beach wells' were the natural soaks, often referred to as 'native wells', in places where depressions were quite deep and where water regularly pooled, especially in winter. Some had been in use for generations and had often become native encampments, that served as a ready source of labour for the pastoralists. When 'developed' with liners of wood or metal these wells often proved a good source of water. In later years many were fitted with windmills, tanks and troughs.

Access to the shore was difficult, however, and in order to carry the equipment needed for the beach wells, Brockman went south to Shark Bay where he purchased a cutter from a bankrupt pearler and named it *Ada May.* In an apt description of the difficulties he was to face in opening up the coastal lands, Brockman described *Ada May* as 'just the thing—iron bound and suitable for a rough coast, for I had no place we could land for many miles' (Brockman, 1987: 122).

En route to Point Cloates, Brockman, Robert Miller (the 'Inspector of Sheep' whose task was to control 'scab' and other diseases and had joined the party for a break from his pastoral duties) and two 'Manila men' hired in Singapore, landed at Warrarroo (Warroora) Well (see Figure 61 on page 47). Then part of Minilya Station, it was described as a 'soak, in a sort of basin surrounded by rocks—and where water had to be carried up to the horses in a bucket and emptied into a trough above' (Carter, n.d.: 109, 123). After transferring his 'cargo' ashore in the dinghy, Brockman went to the shearing shed that had been erected there, to be joined by an Aboriginal man the Europeans called 'Friday'. He had apparently travelled overland from Minilya with what Brockman described as the 'well sinking tools for Point Cloates'. They then left for the new country intending in Brockman's words, to 'lie at Maud Landing for the night, a distance of about twenty-five miles'. After entering what they called Tuckey's Passage, a gap in the reefs leading into Yalobia (Yalobra) Well—another of the existing Minilya Station coastal water sources—they were pooped and the boat sank (Brockman, 1987: 120-5; Green, this volume). Friday and Miller drowned and Brockman was very badly injured. Soon after, and still in quite bad health, he sold what became the Wandagee Station to his friend George Gooch. In the same year, 1889, Brockman sold the coastal blocks around Point Cloates and 4 000 sheep to a friend of Gooch's, the ornithologist Thomas Carter. Carter, an Englishman,

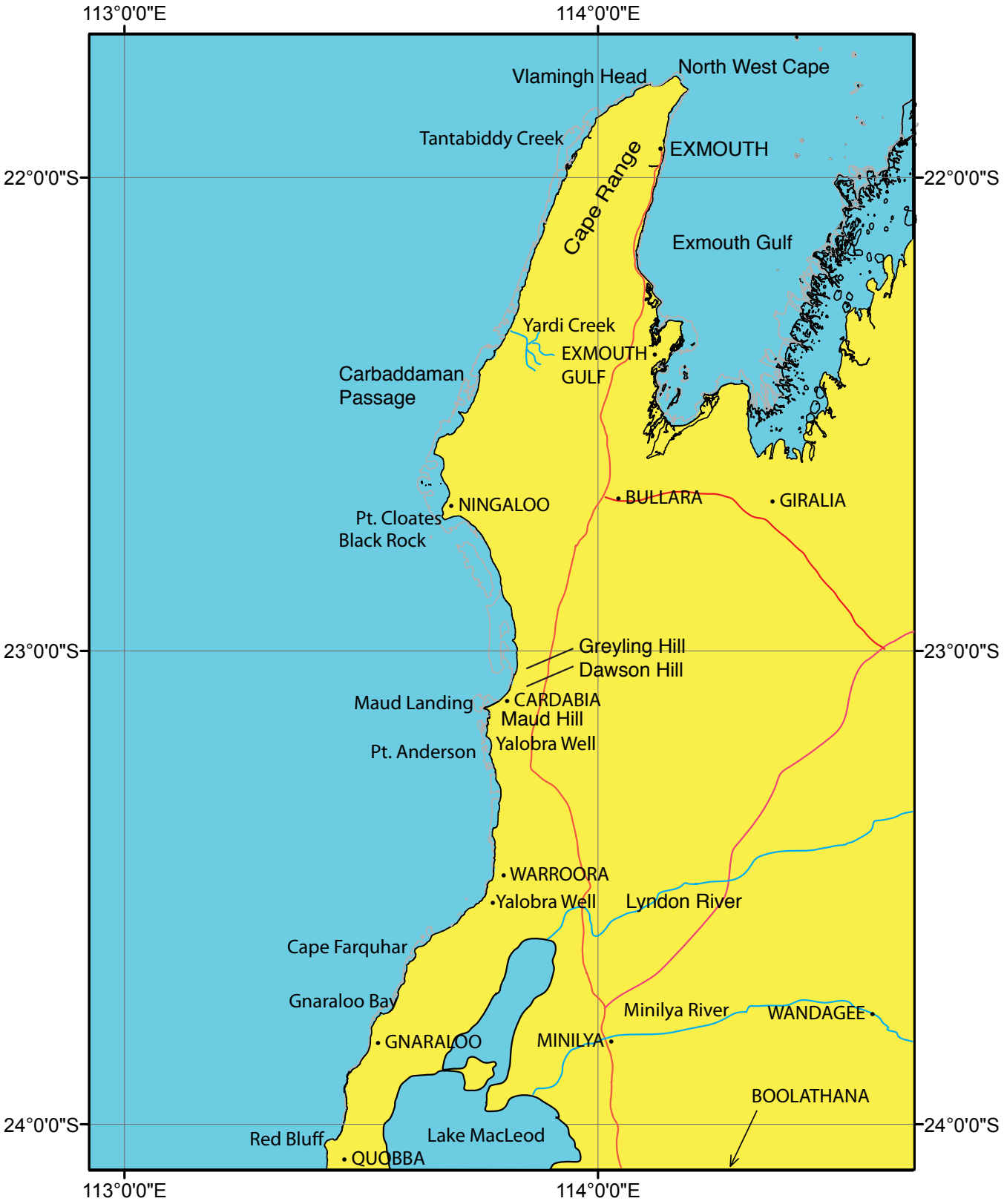


Figure 61. The wells and stations in the study area (Michael McCarthy after Mack, 2003: 9; Brockman, 1987: 121).

had learnt his trade as a jackeroo on Boolathana Station near Carnarvon and from Gooch. In commenting on his ability to pay the asking price of £3 000 for the Point Cloates country, Julius Brockman stated that 'Carter had funds—he had a contract with the millionaire Rothschild's to pursue inquiry into ornithological and wild life research for a foundation set up by these wealthy European Jewish magnates'. Brockman described Carter finding 'a haven of research' on the Point Cloates Station, as it came to be known (Brockman, 1987: 128–9). According to the entry in the *Australian Dictionary of Biography* (now available on line) and in a biography prepared for the Royal Western Australian Historical Society focussing mainly on his distinguished career as the region's first ornithologist, Carter was described as: 'the first to hold a lease in the area…his Crusoe-like existence was emphasised by his house built from wreckage of two ships [SS *Perth* and the iron barque *Benan*] lost near by'. According to Vines (who prepared both the biography and the Dictionary entry), while on his ornithological and pastoral travels up to the Cape Range, Carter also discovered the Jacob Remmessens River referred to by Pelsaert who landed there in 1629 while searching for water for the *Batavia* survivors (Vines, 1968: 11–12). Today it is known as Yardie Creek.

The first maritime infrastructure

Stock were generally driven overland from the port of Carnarvon which had been founded in 1883, via wells, soaks and existing stations. Where it proved possible to forge a track, wool and other goods were trans-shipped overland by bullock dray—camels and horses were also used—or by sea in small boats like the ill-fated *Ada May* which sank on its first voyage. Others proved more successful, with the *Gypsy* and the *Bernan* both regularly mentioned in Julius Brockman's diaries.

While at some places, such as at Warroora Well, loading wool bales through the surf initially proved 'so difficult that boats would not call there again' (Carter, n.d.: 123), at other places navigable gaps in the reef led to good holding ground and quite sheltered bays. Cape Farquhar further south was one successful landing, for example, where a 'wool team' travelled from Gooch's Wandagee to also use the place (Brockman, 1987: 131). Maud Landing, named after the schooner *Maud* called there first in 1884, was another natural harbour and it became prominent after a shed was built close to the water and a 'commonage' (public land) was declared around it. Later, as the wool clip and the equipment and stores needed grew in size, the pastoralists used professional seamen and cargo handlers working out of lighters (smaller vessels that transferred cargo to and from the shore out to larger vessels). Jim Robinson, former manager of Cardabia Station, provides a description of the practice as it evolved in later years at a number of stations in the area:

> The lighter would stand in as close to shore as it could then they'd put trestles on the beach and planks on the trestles and they'd roll the wool up the trestles and the bales would go plonk! into the dinghy. The dinghy would carry about six bales of wool and was either rowed or sailed out to the lighter which was only a couple of hundred yards off (Jim Robinson quoted in Mack, 2003: 16).

The bales were winched on board the lighter by hand and later 'by means of a kerosene engine and derrick off the mast' and stored below deck ready for transhipment either to a larger vessel waiting even further offshore or on to the nearest port, usually Carnarvon.

Substantial moorings were needed for these lighters and one example appears at

Gnaraloo Station where the remains of a heavy mooring was reported to the Museum by Kevin Marshall. These lay about 4–500 m out in the bay in around 5 m of water, comprising two Admiralty anchors between 2–3 m long, joined to each other by a short chain and linked to approximately 20 m of chain. This would then have had a 'riser' to the surface, attached to a buoy. There were others along the coast. At Tantabiddy Creek, for example, Lloyd Jones reported a single Admiralty anchor around 500 m south of the main passage approximately 100 m from the reef and in about 8 m of water. This would have been an ideal mooring place for a small lighter serving the North West Cape station country. South of Point Cloates, Yalobra (Yalobia Well) near Point Anderson was another place where sheep handling and shearing facilities were established; as was Cape Farquhar. There, offshore in a small bay, a length of concreted chain was reported by R. Baron. Apparently the anchors were either removed or were buried in the sand. As the wool clips grew the number of visitors increased, as did the infrastructure. An example is Cape Farquhar where the former owners recounted there was once also a 'pub' (McCarthy to P. and J. Michael, 5 May 1988, WAM File MA-209/80).

Though temporary 'trestles' were regularly used to load wool in the manner described above, the 'clip' from a number of stations using some landings became so large that better facilities became needed. This lead to the establishment of Maud Landing (see Figure 62) as a recognized port for the region. In 1897, J. and J. Wishart built a jetty described as 1 500 feet (457 m) long and 12 feet (3.6 m) wide, with a head 100 feet (30. 5 m) long and 20 feet (6.1 m) wide into 9 feet (2.7 m) of water. It was fitted with a two-foot gauge tramway linked to a woolshed-store measuring 100 feet (30.5 m) by 30 feet (9.1 m) at a cost of £7 989. Strangely it was not universally well received. Brockman records, for example—perhaps severely jaded by the fact that the drought broke in June of that year with the first rain for 730 days—that on 10 September of that year:

> Went to Maud's Landing. The jetty is just finished and a fine piece of work, also the warehouse, but are both worthy of a much better place. I consider the whole expenditure thrown away. Any teams will have great difficulty in getting even light loads along, and the last eighteen miles are very heavy and stony (Brockman, 1897: 167).

It is perhaps for that reason he loaded 54 bales of wool onto the *Gypsy* at Cape Farquhar in November of the following year. As it became more frequented Maud Landing was described in the *Australian Pilot* (Vol. 5 Sixth edition, 1972–82):

> Maud Landing: entered 4 miles N of Point Maud, affords anchorage for vessels of shallow draught, but there are many coral pinnacles and shoals in the inner part. It is approached through a break in the barrier reef nearly two and a half miles wide, with depths of not less that 14.6 m (48 ft) over the greater part of it.

In its heyday the wool shed at the landing was a conspicuous marker for ships entering the port, though the Greyling, Dawson and Maud Hill beacons erected at prominent points onshore to assist mariners were considered unreliable sighting points due to possible damage by cyclonic winds. Suitable for larger vessels, and though there were other landings still in use, such as Cape Farquhar, Maud Landing became the pre-eminent port for the region and for many years it was the natural focus for the local pastoralists. As a result, improvements continued to be made to the facility and a wharf crane was erected at the end of the Jetty in

1903.

In that same year, apparently more concerned with losing his childhood sweetheart as a prospective wife than his trials and tribulations in the North-West, Thomas Carter sold his station and in 1903 went back to England and married Annie Ward. The next year she returned with him to the colony, settling at Broomehill in the south. Before returning permanently to England, where he later died, Carter re-visited his old station in 1913, apparently in a coach drawn by six camels, a far cry from his arrival in 1889 when he arrived with one pack horse (Vines, 1968). Around the time the Station's name was changed to Ningaloo.

According to a series of oral histories compiled by Peter Mack, at the same time the Point Cloates Station lease was split into two: the southern portion, now known as Cardabia Station on which Maud Landing is situated, was sold to the Matheson-French family consortium. They then moved down from Ningaloo where they were staying to the landing and established themselves at the Point Maud shed and commonage. From there they moved a short distance back north to establish the infrastructure and buildings at what is now Cardabia Station.

Ningaloo Station subsequently passed through a number of hands until purchased by Maurice MacBolt, chief engineer of the Norwegian Bay Whaling company (see *Chofuku Maru* entry, page 213) in partnership with Frank Lefroy, former overseer on Minilya Station. His relatives also held the Exmouth Station. Later the Lefroy family brought MacBolt out and they own the Ningaloo lease to this day (Mack, 2003: 14). After Carter's time the homestead was moved north to its present location overlooking the shearing shed, close to the beach adjacent a normally very calm bay.

Smaller anchorages such as that at Ningaloo did not have sophisticated aids such as beacons, and nor did they appear in the *Australian Pilot* and entry depended purely on local knowledge. Most would have had moorings, however, albeit much smaller than that described at Gnaraloo. Billie Lefroy, present owner with her daughter Jane of Ningaloo Station, advised that their shearing shed was once connected to the beach by a light rail. Bales of wool would be wheeled from the shed and loaded aboard a small boat for transhipment to the lighter *Nickol Bay* which could carry three hundred bales and was owned by the Cossack Lightering Company. Today nothing remains of the rail line, bar a few sleepers, though the shed is still intact and in regular use. Billy Lefroy also advised that the master was often under the 'influence' and she recalled that on one occasion, she and her husband, the late Edgar Lefroy, were advised that the lighter was lucky not to have been lost as the inebriated skipper took the vessel over the reefs to deeper water.

This situation mirrored that at Maud Landing where larger vessels still needed to moor offshore. According to Peter Mack:

> At the landing there was originally a horse and dray driven usually by an old Aborigine, and each day he would be continually taking dray loads of six or eight bales to be stored in the goods shed…then one of the State Ships would arrive to remove it. The ships would come inside the gap in the reef and drop a pick [anchor] and stand off about a mile from shore. One at the time, I remember, was the *Kybra*. That was the smallest State Ship of the time…There was a light railroad all the way from the goods shed to the end of the jetty, and trolleys were loaded with six bales, then three, then two and finally one on top, and manhandles out to the end of the jetty where the wool was stacked. There was an old winch at the shed but we never actually used that…(Mack, 2003: 15–17).

Though the records are scanty, ships also known to have called in to Maud Landing include the SS *Penguin* and SS *Una* in 1907. The jetty was leased by G.H.S. Burton between 1911 and 1921, by F. Meager in 1922–3, by J.G. Cooper in 1923, and by C. French and Company of Cardabia from 1927 onwards. Jim Robinson who provided these descriptions was manager of Cardabia. The Maud Landing Shipping and Trading Company worked the jetty between 1924 and 1926 when motor vehicles were being used to move the trucks and at that time the *Nickol Bay* did the lightering duties. The SS *Kybra* called in 1935 and handled 102 tons of cargo and 140 rams, but normally the Onslow Lightering Service collected cargo for transport up the coast. According to Robinson, by then the jetty was falling into 'serious disrepair' and about 1937 the seaward end was removed. It was shortened to less than half its length, that is around 175 m, and a new 18 m head was erected. Competition from road transport soon saw the jetty become uneconomic; a decade later it was abandoned soon after the last shipment from Cardabia. This was described by the then Manager Jim Robinson:

> Cardabia sent two and half thousand wethers to Singapore and the *Gorgon* came in and picked them up, and it was a two day operation to get them on board because they had to go on the deck of the lighter, then from the lighter to the steamer, man-handled all the time (Mack, 2003: 15–17).

From then on the facility gradually deteriorated and as road transport improved repairs quickly proved uneconomic. Again Robinson

> …the lighter would not call in any more. What had happened was that, after the war, road transport had improved, the roads got better and Boof Morgan—he was the mail contractor—he actually offered the station a price for carting wool which was cheaper than the lighter and it was taken up and subsequently the lighter didn't come this way any more and the goods shed and jetty were removed in 1947…The goods shed was put up for sale in 1949 and Minilya Station bought it and dismantled it and took it back to Minilya with the idea of building another shearing shed on the northern part of their run…Then the Pt. Cloates Whaling Station had started up again and they bought the jetty and dismantled most of it and took it up to Pt. Cloates. All of the piles were left—they brought four or five fellows down with a barge and dismantled it —they took all of the decking and all of the main twelve by twelve karri stringers…but all of the piles and cross bracings were left there and they slowly toppled over and were lost. Any that were washed onto the sea shore—every last piece of timber— was chopped up for firewood when the tourists started to come around (Mack, 2003: 13)

Now demolished, only a few piles remain visible on the seabed and above water. Despite this the remains are an historic structure representing the days of wool lightering in the late 19th and early 20th centuries and the heyday of the sheep station in the North-West.

Figure 62. The jetty piles at Maud Landing (Patrick Baker).

Cannons, hoaxes and cairns

Michael McCarthy

The Dutch inscriptions

The first Western Australian Museum expedition to the Ningaloo region occurred in 1971 following the receipt of advice from Anthony (Tony) Bell, a schoolteacher and journalist at Carnarvon, that he had found 'a cairn with a Dutch inscription dated 1630 or 1680'. On a map and sketches of his 'find', Bell located the site somewhere south of Point Cloates. The Museum's then Head of Human Studies, Ian Crawford, had the sketches examined by maritime historian Frank Broeze. Fluent in Dutch and in the interests of objectivity, Broeze argued both for and against the premise that the report was a hoax. In the case for, Broeze found Bell's sketch to contain reference to the 'Jaght *Sardam*, Jan Pelgrom de Bye van Bemmel and Wouter Loos' two sailors marooned by Francisco Pelsaert in 1629 and their ages. Though it was illegible in parts, Broeze found that the spelling was correct for the period. Broeze also noted that Henrietta Drake-Brockman had referred to a 'bushman's tale (now more than nine or ten years ago) that on the cliffs above or near Yardie Creek an inscription on a rock had been seen'. Drake-Brockman had linked that particular inscription with 'the unknown and rather uncertain voyage of Jacob Remmessens 1615–1616', Broeze referred to the possibility that the report was correct and despite the differences in location and apparent content they could refer to the same materials (Point Cloates area file MA-209/80/ 2).

Broeze also put the contrary view that the report was most likely a hoax, noting that all the details and the contemporary spellings were readily available. Although it was acknowledged that the Bell report was probably spurious, it might equally be of great significance, so the Director of the WA Museum, Dr W.D. Ride, requested Crawford to examine the area and investigate further. As a result, in February 1971 Crawford and Broeze made contact with Bell and, though he could not accompany them, they proceeded to Ningaloo Station and joined with Edgar Lefroy, the owner. According to Crawford, they 'checked every rock outcrop' between Maud Landing and Point Cloates without success. Another expedition was mounted, again after having been in contact with Bell, this time involving Crawford, Graeme Henderson and Exmouth historian Doug Bathgate. After they examined the country and also a site recommended to them by the owner of Warroora Station, Henty Hall, with no result, Crawford advised that 'the area between Point Cloates and Maud Landing was thoroughly searched—we believe that we looked at every rock pile whether there was a track to it or not'.

He concluded that either the cairn never existed, or it was in a different location, and advised that until there was more positive information forthcoming, there was 'no point in further action by the Museum' (Point Cloates area file MA 209/80/ 2). Later, Bell was to prove the source of a number of other wreck-related hoaxes and illegalities along the Zuytdorp cliffs, in Tasmania and on the Nullarbor.

Reports of an ancient cannon

Allied to the report of a cairn there is another reference to the location of a small cannon. In

July 1977, Underwater Explorer's Club diver, Dennis Parker, wrote to shipwreck enthusiast Bruce Melrose who was compiling details of all reports of wrecks on the coast, advising of an article appearing in the *Sunday Times* entitled '1000 wrecks off the WA coast'. This article prompted George Lovell to report that he saw a cannon and cairn when he was on the Cardabia Station in 1931. These he described as being 'on a high coastal knoll between Maggue (Maggie) Cliffs 2–3 km north of Warroora Station and Pelican Point' which lay further north again. The cannon was described in some detail as 'a muzzle loader, with elevation knob at end and only one pivot lug [trunnion] left; about 3'6" [1.06 m]] in length made of iron and could be picked up. The cairn was of rock, but nothing more could be remembered'. Despite the amount of detail, which would tend to support the claim, the local station folk were unaware of either find. An indirect reference was also made to the Crawford/Broeze fieldwork mentioned earlier (Parker to Melrose, 21/7/71, in Point Cloates area Wreck file MA-209/8/1). In a personal communication in January 1989 Carnarvon identity Bruce Teede advised that Lovell was a stockman on the Station and that he had recovered the cannon which was found 'washed on a rocky ledge' (File MA-209/80/1).

Another report was by engineer, W. McFarlane, of Como, who apparently saw a large cannon while on a post-war fisheries and research flight in a converted Beaufort bomber from Rottnest Island to the Monte Bello Islands with fisheries inspector Stan Fowler. He wrote, 'as we passing Point Maude [*sic*] I could see a cannon lying just above the water line, it looked to be about twelve feet long. I was looking out the back hatch door and could get a good view of it'. They subsequently landed at Carnarvon and he advised Fowler of the sighting, who believed it was 'from a Dutch ship and had floated in on its gun carriage'. Years later while he was working with the local MacRobertson Miller Airline, McFarlane was contacted by shipwreck author Malcolm Uren and he advised that 'the cannon had been sighted by station hands from Ningaloo in 1927, in the same location and he was confident it was the same one'. He was also of the opinion that the only time the cannon would be sighted again would be when there was sufficient magnitude to wash sand away. McFarlane also wrote that: 'Neither Fowler or Uren had ever met to my knowledge but each one had written up the earlier sighting in their records…at the time of the cannon sighting Stan Fowler pointed out that the beach erosion was the deepest he had ever seen. One of Stan's pet subjects'.

Quobba Point Lighthouse

Lyndon O'Grady

Figure 63. Quobba Point Lighthouse (Department of Maritime History).

Originally constructed in 1950, with the lantern and the stairs from Point Cloates Lighthouse, it had an acetylene light on a white round concrete tower 18 m high. The light supports a red cupola with a white flashing light at an elevation of 64 m. It was converted to solar electric (FA 251) lantern in 1988 and subsequently converted to Vega VRB25. The lens for the 13 000-candlepower light was originally installed in 1861 on the Cape Wickham Lighthouse on King Island in Bass Strait, Tasmania. When, in 1946, this lens was replaced, it was found to be in good enough condition to be adapted for Quobba Point (Cumming, *et al.*, 1995). When the lens was removed in 1988 as part of the upgrade, it was stored at the Western Australian Museum. In 2009 it was returned to the Australian Marine Safety Association (AMSA) and now has a new lease of life on display on King Island.

Point Cloates Lighthouse

Michael McCarthy

Figure 64. Point Cloates Lighthouse in 1917 (National Archives of Australia).

About 100 miles south of North West Cape and 138 feet above sea level, this lighthouse, with a white revolving second order dioptric light, was built of local sandstone 47 ft high and 19 ft 8 in diameter at the base, and was completed in 1910 (Cumming, *et al.*, 1995). With quarters for two light-keepers and a two-foot gauge tramway two miles long, it cost £13 265. Its operation ceased in 1936 and the light was transferred to Fraser Island soon afterwards (page 58). The facility including the light-tower and quarters was sold to the local Ningaloo station owner (Edgar Lefroy) for the sum of £5.00. After the demise of the Fraser Island light a new light on a 4-m white cabinet was erected in 1966. It was converted to solar power in 1983. When the Point Cloates Lighthouse was visited in September 1995, the tower appeared in imminent danger of collapse and the quarters were in an advanced state of decay with few of the walls standing. The structure was entered onto the Register of the National Estate at the Australian Heritage Commission on 16 June 1995.

Billy Lefroy recounts that:

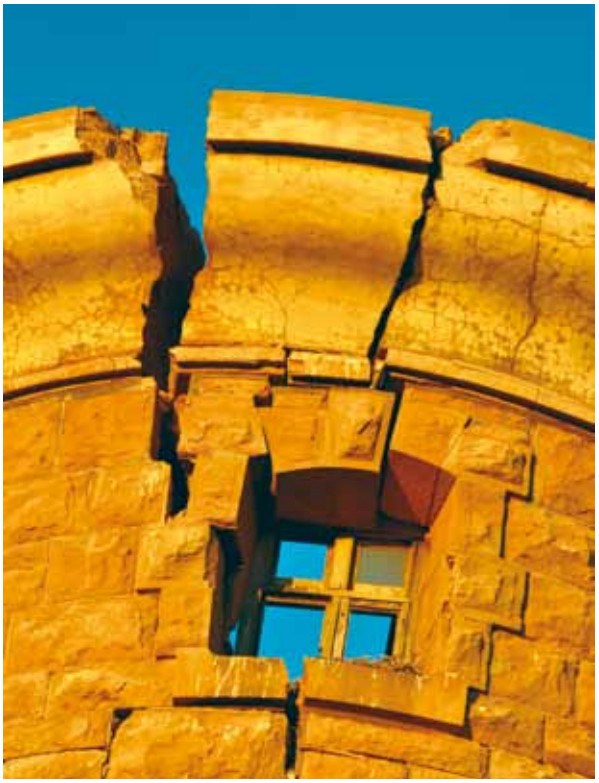


Figure 65. Point Cloates Lighthouse showing structural damage to top of tower (Ross Anderson).

…the sandstone [for the lighthouse] was quarried on the beach near the shearing shed and it was transported by trolley line and an old cart and a horse across the flat. I don't know how they got it up the hill…It's all faced with cement and it took them three years to build it…The old lighthouse closed down about 1932 or 1933 and then they built the one at Fraser Island after that…when they came to service the light they found that something had happened and the two legs on the south side were just hanging in space. They were undermined and just hanging in the breeze so they had to think about pulling it down. They came up with a team and camped at our shearing shed and got the light off the tower and brought it all in and they left the tower in the water. But gradually over the years the island [Fraser Island] was completely washed away and now all that's left is a sand spit, and it's quite a long way north from where the island actually was, so the old tower just lies in the water…we had an earth tremor about nine o'clock one night. It came from the north-west—you could hear it coming—and when it hit it was like a thump and everything shook a bit. Then it all went away and you could hear it travelling south-eastward. After that things seemed to happen…and started the sand shifting and it just went from there. It was a pretty solid sand-hill. It was thirty feet high and was grassed up with the porcupine grass we call coastal spinifex, and where the actual tower was, and the humpy house they had their gas bottles in, it was completely grassed over (Quoted in Mack, 2003: 56).

Fraser Island Lighthouse

Jeremy Green

The Fraser Island Light was built in 1936 to replace the Point Cloates Lighthouse. After Fraser Island and her light disappeared in 1966, a temporary light was displayed until a new Light was positioned back on the coast on Perth Hill, a short distance from the original Point Cloates Lighthouse and began operation on 16 July 1966. The Lights were originally important for the whaling industry that was located in Norwegian Bay and for the passing pearling luggers and transport ships along the NW coast to Singapore.

The building of Fraser Island Light was undertaken by lighthouse vessel *Cape Otway*, which departed from Fremantle in April 1936 with material and equipment to build a new unattended light on Fraser Island. The light which was described as being of a new type of French design was 23 ft (7 m) high (Figure 66) with the acetylene gas fuelled light exhibited

Figure 66. Fraser Island Lighthouse (Meakins Collection).

Figure 67. Fraser Island Light in the process of being undermined (Meakins Collection).

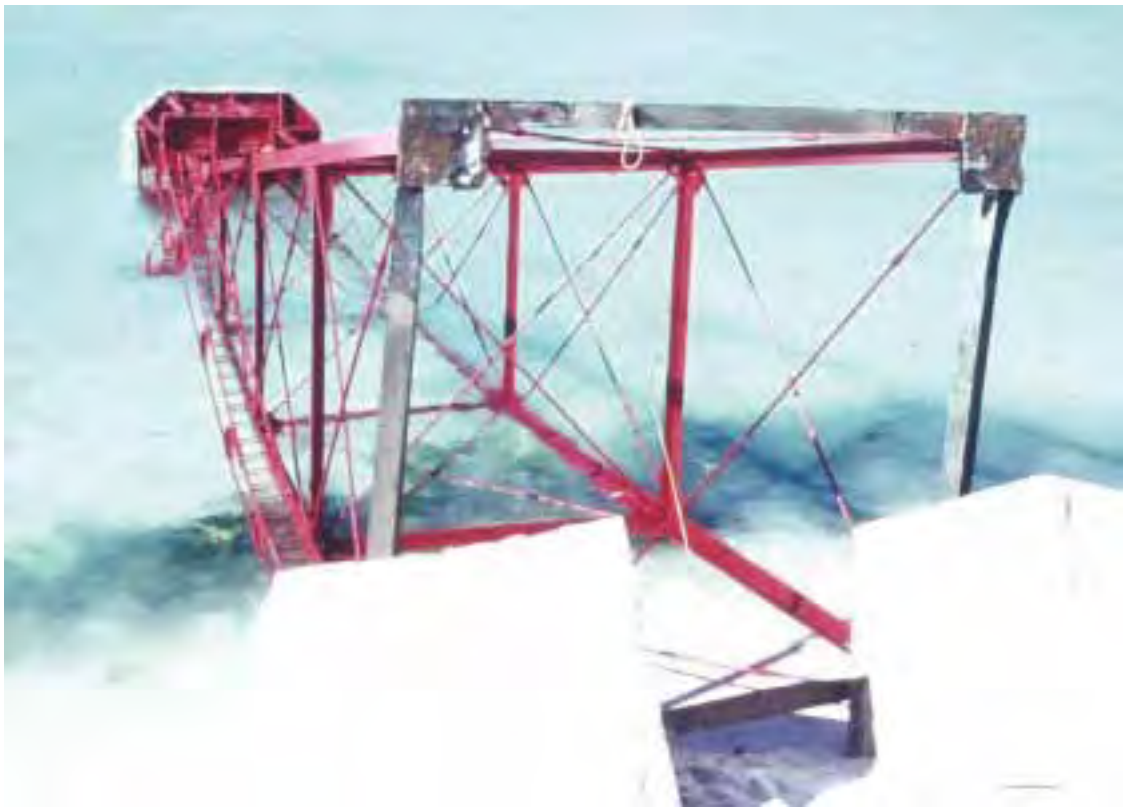


Figure 68. Fraser Island Light collapsed (Meakins Collection).

Figure 69. Remains of Fraser Island Light in 2009 (Jeremy Green).

Figure 70. Plan of the Fraser Island Lighthouse drawn from Photomodeler and superimposed on a Geographical Information System (GIS) with aerial photograph (Jeremy Green).

at an elevation of 97 ft (30 m) from a framework tower 74 ft (22.5 m) high (Cumming, *et al.*, 1995). The tower was repaired in 1949 but was swept away by a storm in 1966, blowing the island away from the base of the lighthouse tower as can be seen in Figure 68 from the Ralph Meakins Collection. The tower has gradually disintegrated over the years. It was visited and photographed in 2009 (Figure 69).

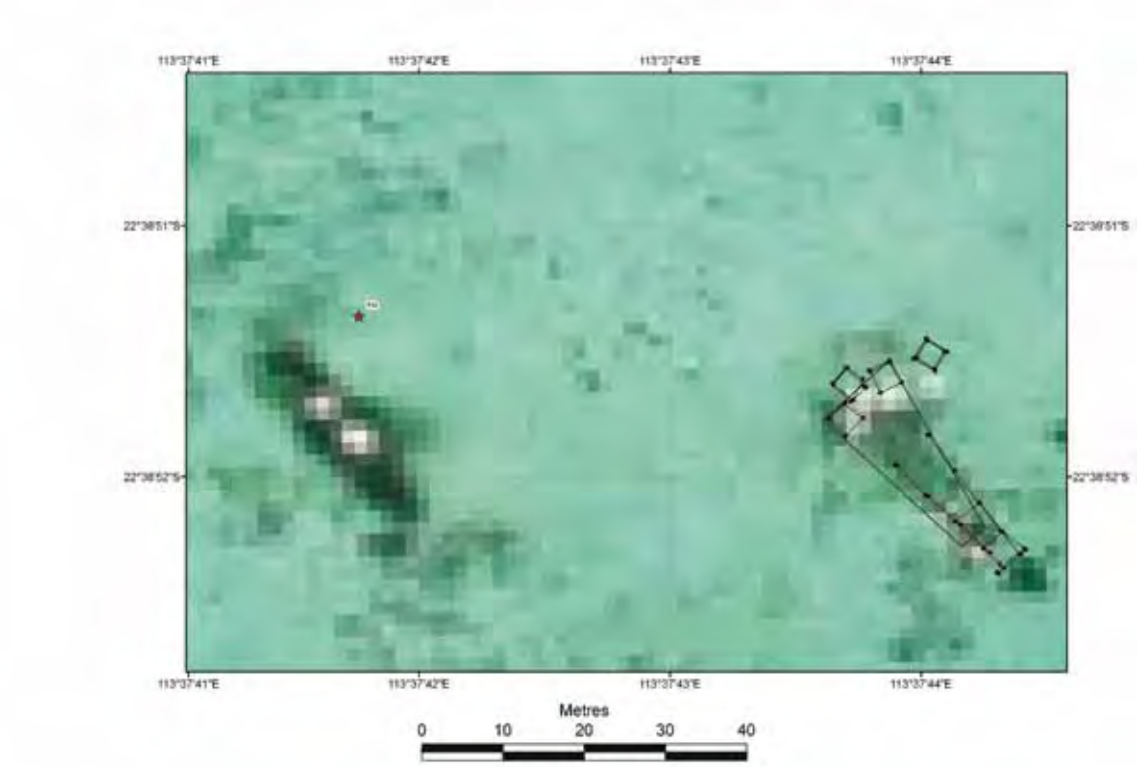


Figure 71. Plan of the Fraser Island Lighthouse and the *Fin* wreck site drawn from Photomodeler and superimposed on a GIS with aerial photograph (Jeremy Green).

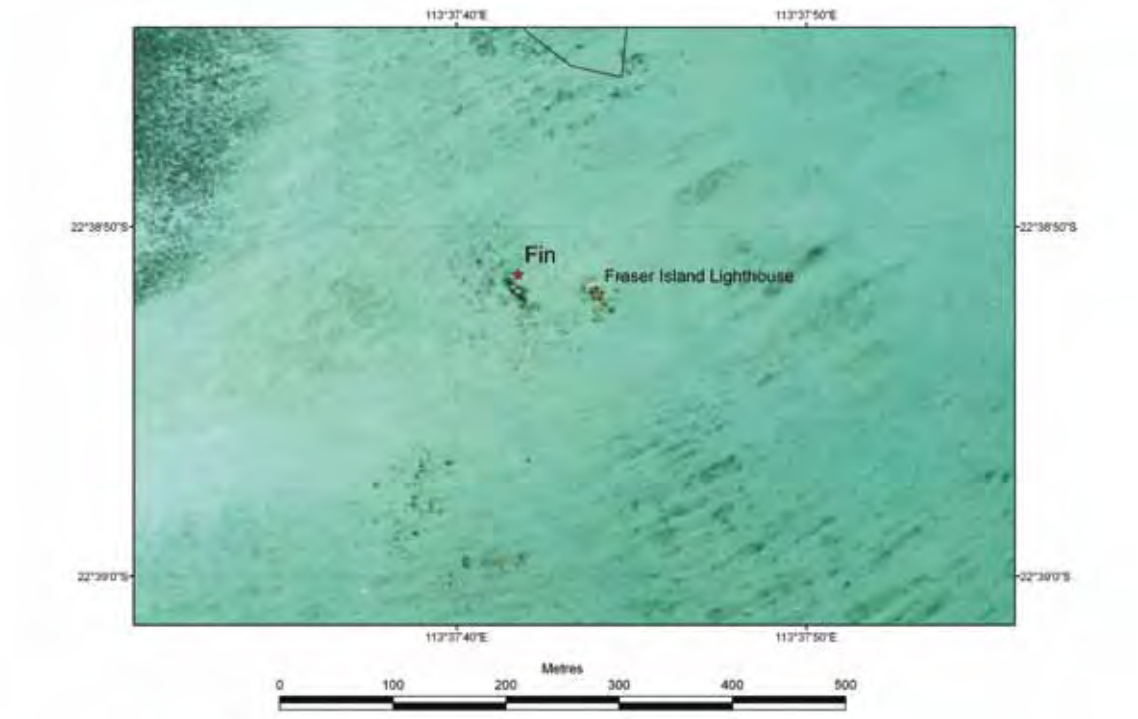


Figure 72. Aerial photograph on GIS showing *Fin* and Fraser Island Lighthouse (Jeremy Green).

Vlamingh Head Lighthouse

Michael McCarthy

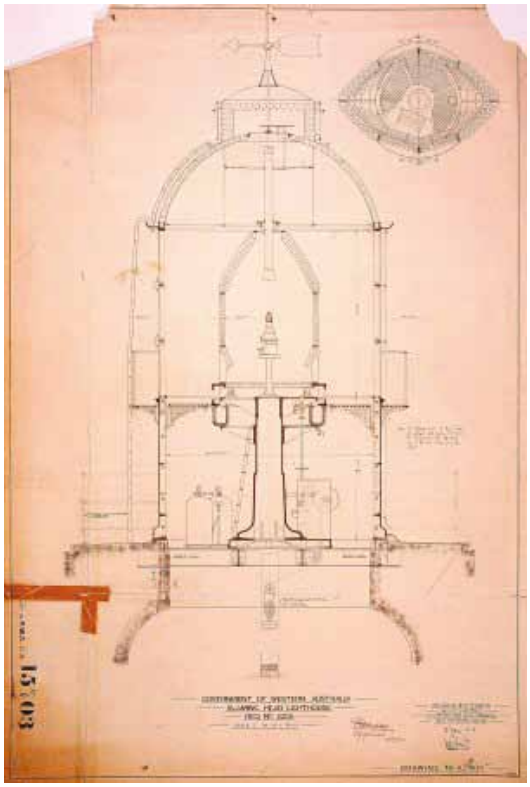


Figure 73. Chance Bros drawing of Vlamingh Head Light (National Archives of Australia: A9568 7/15/7).

After the loss of the SS *Mildura* in 1907 it was decided to erect a light on the north-western tip of North West Cape. The tower was built of concrete, 30 ft high and 17 ft 8 in diameter at the base, on a site 200 ft above sea level. It was completed in 1912 and housed a dioptric light made by Chance Bros and Co. of Birmingham. The quarters for two light-keepers were below the hill near the station homestead, and a tramway, with horse-drawn trolleys was provided for bringing stores from the beach landing to the south-west. The light was described in 1923 as being at an elevation of 240 ft (73.2 m) on a grey concrete tower 40 ft (12.2 m) high on Vlamingh Head. The light was discontinued in 1967, and a new light was established on one of the radio communication towers near Point Murat (Cumming, *et al.*, 1995). The ruins of a World War II radar tower are a short distance (100 m) north of the light tower, and are very significant. The structure was entered onto the Register of the National Estate (RNE) at the Australian Heritage Commission (AHC) on 21 March 1978 It also appears in the Register of Heritage Places at the HCWA.

PART 2

Found wreck sites between Quobba Point and North West Cape

Figure 74. The 2009 WA Museum team at Ningaloo Station, left to right: Geoff Kimpton, Corioli Souter, Annie Boyd, Jon Carpenter, Susan Green, Matthew Gainsford, Jeremy Green and Patrick Baker (John Mokrzyci).

Magnolia 1938

Michael McCarthy

After being reported by Peter Fox, in October 1980, a then unidentified wreck located about 9 km south of the Gnaraloo station homestead was inspected by M. McCarthy assisted by Colin Powell and Geoff Kimpton (see Figure 75). The position, fixed in the pre-GPS era was recorded as 23° 50'S, 113° 31'E. When he reported finding the wreck Fox delivered to the Museum one glass burner top, a red glass fragment, assorted plank spikes (95 mm by 11 mm square) and assorted brass bolts 12.5 mm in diameter. The inspection team recovered two lead pipe lengths 60 mm diameter, a small sounding lead (160 mm) and two fish-plates.

In the inspection report, the site was described as small, lying in 1–2 m of water depending on the tide, and consisting of iron keel sections, iron ribs, chain, two small Admiralty type anchors (one 1.15 m by 1.75 m), one with a folding stock, a small windlass (1.15 m long), a section of another windlass and two sections of lead keel out to sea. The main section of wreckage consisted of two keel sections with brass bolts (600 mm by 25 mm) measuring approximately 15 m along the main axis.

Of all the known wrecks on the coast, the finds and these scantlings best fit the fishing boat *Magnolia,* which, according to A.C. Burns (1978) who compiled a history of early fishing boats in the region, 'ended her illustrious career when caught in a strong current during the night and went ashore at Red Bluff, north of Cape Cuvier' on 17 March 1938 (Burns, 1978; McCarthy, 1980a).

Though Red Bluff is further south, it is the most prominent feature on the relatively featureless coast south of Point Cloates and it is often used to describe the entire region in the vicinity of the Bluff. Further, the tentative identification of the wreck as the *Magnolia* was confirmed by A. Fleming, whose family had owned the Gnaraloo station until a few years prior to the inspection in 1980. Fleming advised that the wreck had been salvaged by Carnarvon identity 'Tito' Reynolds.

Considering this, and the then relatively modern nature of the site, the inspection report noted that 'the site does not fit any of the criteria laid down for consideration as an historic wreck'.

According to Burns (1978):

> The sea which was not unduly rough, was breaking heavily over the reef, and at the point where the boat went aground was comparatively calm, compared with the areas on either side. The skipper and two crewmen did not leave the boat until she was practically broken up, and getting away in the dinghy they were able to save the sails and some of the gear. After reaching shore they walked to Gnarloo Station the property of E.K. Roberts, about 7 miles away and acquainted him of the mishap to the boat. Mr Roberts then drove the men in his truck to the scene of the wreck *Magnolia*, and with the dinghy and gear loaded in the truck were conveyed to Carnarvon, then to Geraldton. At the time of the loss of the *Maggie* she had in her ice box 800 to 900 lb of lady schnapper.
>
> The *Magnolia* had an interesting history and had been the property of a local firm Winter

Figure 75. The *Magnolia* wreck site (Michael McCarthy).

Brandt and Co. for 30 years. She was 58' long with a beam of 12'6" and a draft of 10'6". She was originally built in England and was brought out in sections to Botany Bay, where she was put together. For many years she was a crack sailing yacht in Sydney and Melbourne waters before being acquired for fishing.

In 1989, Bruce Teede of Carnarvon donated to the Museum fastenings he had recovered from the wreck '20–25 years ago'. He also advised that in salvaging the wreck, the Reynolds brothers made a ramp for their Land Rover from the shore out to the site and drove out to it at low tide, recovering what they could (Teede to McCarthy, January 1989, WAM File MA-209/80/1). With the 75-year rolling date for protection of shipwrecks under the *Historic Shipwrecks Act 1976*, the *Magnolia* will automatically become historic in 2013.

Emma 1867

Michael McCarthy

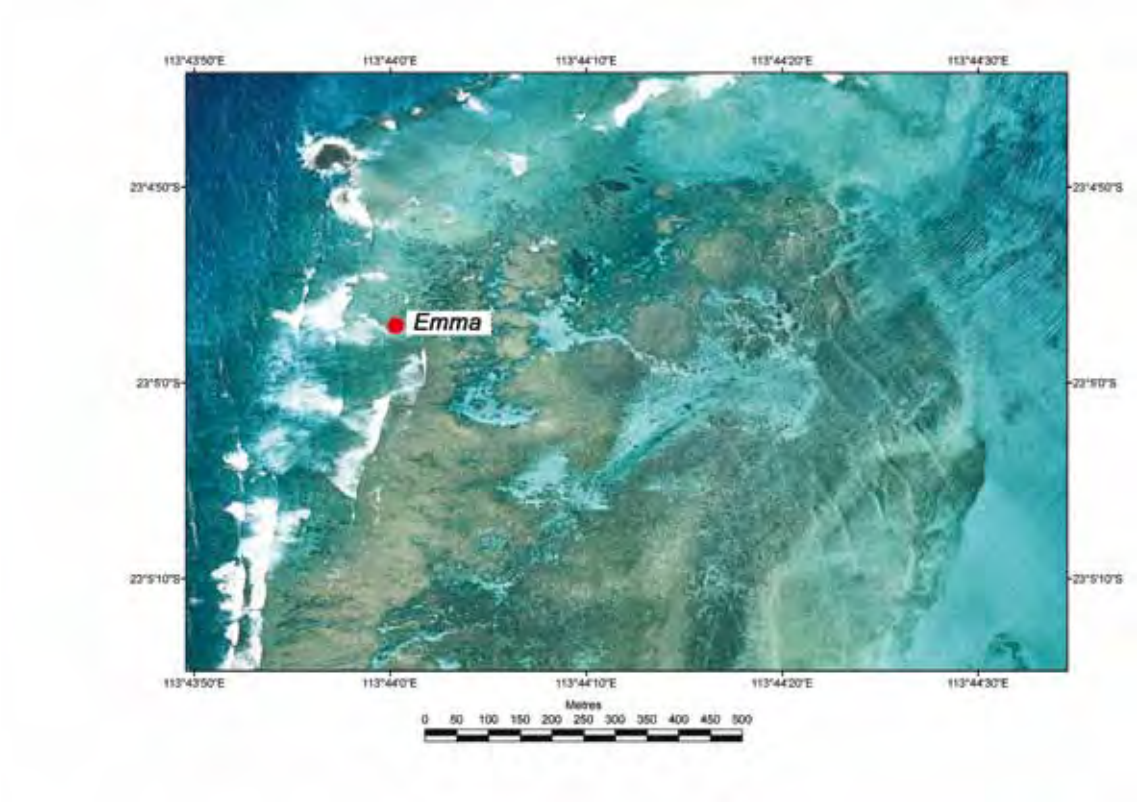


Figure 76. Aerial photograph of the reef area showing approximate position of the *Emma* (Jeremy Green).

The *Emma*: a North-West coastal trader

The 116-ton, two-masted, wooden-hulled schooner *Emma* was built at Lowestoft in Suffolk England in 1859. It was 26.1 m long by 6.2 m broad, drawing 3.4 m and had one deck, a round stern and a 'shield' head. Its registry was transferred to unknown owners at Fremantle in September 1865 and it was purchased by local shipowner and entrepreneur, Walter Padbury, in the following year. In its subsequent short career on the Western Australian coast the *Emma* was involved in many incidents under its first two Captains: losing a man overboard on its first voyage; an anchor off the DeGrey River; colliding with a jetty at Champion Bay (Geraldton); going aground at the Abrolhos and also at Butcher Inlet (Cossack). One of these incidents was blamed (by an experienced traveller on board) on its being fitted with a compass taken from the ship *Calliance* which was wrecked at Camden Harbour a year or so before. The *Calliance* was three times the size of the *Emma* and, to some, the compass would have proved completely unsuitable. The *Emma* was also dismasted near the South Jetty in

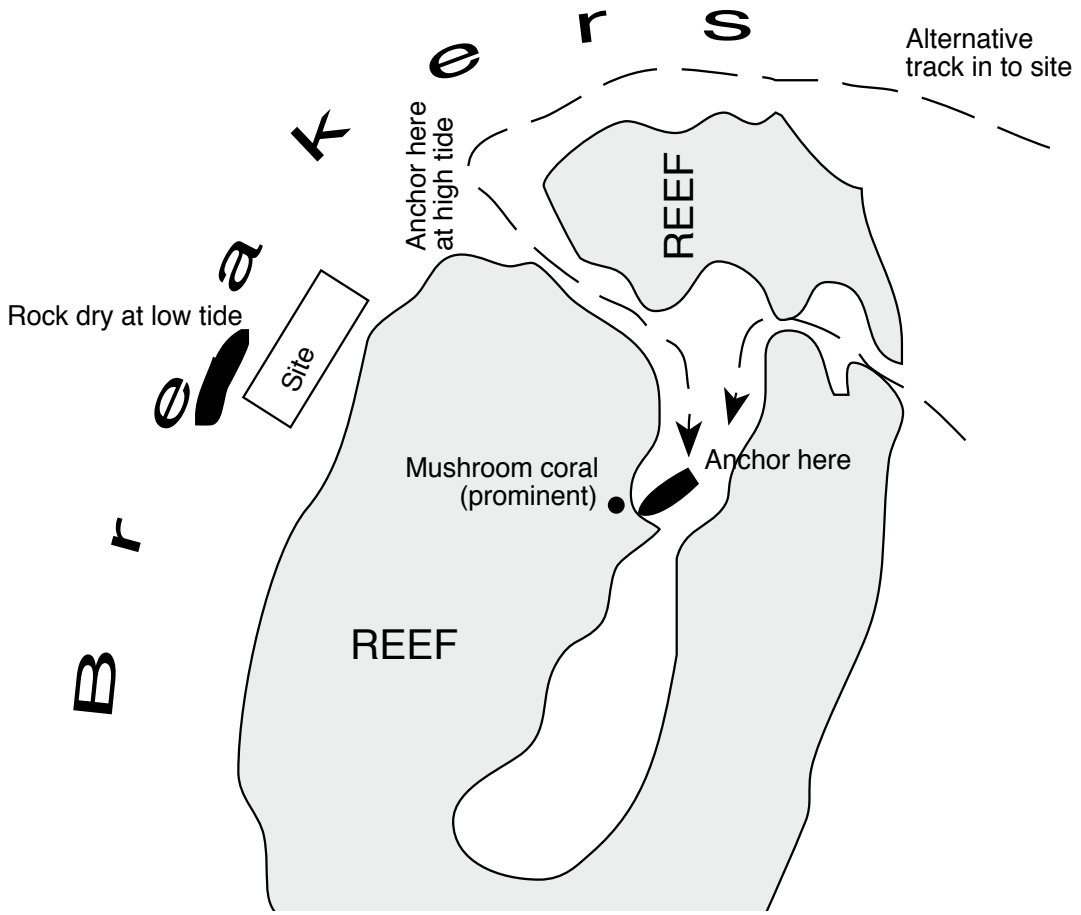


Figure 77. Sketch plan of the *Emma* site (Michael McCarthy).

Fremantle after striking a sand-bar. After being refloated the vessel was driven back onshore and Figure 78 is possibly a depiction of *Emma*, or a very similar vessel, ashore at this time. After being refloated, the *Emma* underwent a refit and had new rigging before returning back to the north (Halls, 1984; Henderson, 1988: 67–71).

Early link to the North-West

In 1865, soon after the first of the European settlers had landed in the northern district of Western Australia, the West Australian merchant and pastoralist Walter Padbury purchased *Emma* to service his business interests, and as a transport for his new pastoral lease in the North-West. He was an influential shipowner and had been one of the main agitators for settlement of the 'North District'—the name given to all the lands north of the Murchison River. The subject of a very positive report by F.T. Gregory in 1861, it contained not one known European inhabitant at the time. In the following year, Padbury landed at Butchers Inlet in Nickol Bay, and then sent a party, under his manager and brother-in-law Charles Nairn, overland to establish a pastoral 'run' on the De Grey River. He then returned to

Figure 78. Fremantle Harbour 1862. By Sir Edmund Yeamans Walcott Henderson (Art Gallery of WA, Courtesy Mr and Mrs P.A. Cudmore).

Fremantle and was greeted with great enthusiasm and accolades as the pioneer of what was seen as a land of great promise.

Padbury had been quickly followed into the region by many other hopefuls, including John and Emma Withnell, who established the aptly-named Mount Welcome Station. As two examples pertinent to the *Emma* story, John Wellard's party chose a block later called Pyramid Station some 25 miles from Withnell's, and a group from Portland, Victoria, established 'Indernoona' station further inland. Other than these small private concerns, three 'large' companies in the North District also formed to take advantage of the very generous land regulations designed to foster European settlement. These were the Western Australian-based Roebuck Bay Pastoral and Agricultural Association, and two Melbourne-based groups, the Camden Harbour Pastoral Association and the Denison Plains Pastoral Company. They intended to settle in the Kimberley region, further to the north, but were beset with so many difficulties that soon after landing, many of their settlers and staff left and landed at Nickol Bay where they joined those already in residence there. The government, in the form of the newly appointed Resident Magistrate, R.J. Sholl, with his son and secretary Trevarton also transferred south from the failed Camden Harbour settlement, arriving in the barque *Tien Tsin* in February 1865. In May he was followed into Nickol Bay by C.E. Broadhurst and his family with what were be the advance guard of the Denison Plains Pastoral Company, many with family and some with very young children. They then settled in the region only to find it slowly sink into the depths of a severe and prolonged drought causing great personal suffering to all in the district. The desperate circumstances were only partly eased by the gradual development of a *de facto* township, a cluster of huts surrounding Withnell's homestead. In August 1866 this became the township of Roebourne. Also relieving the shortages and some

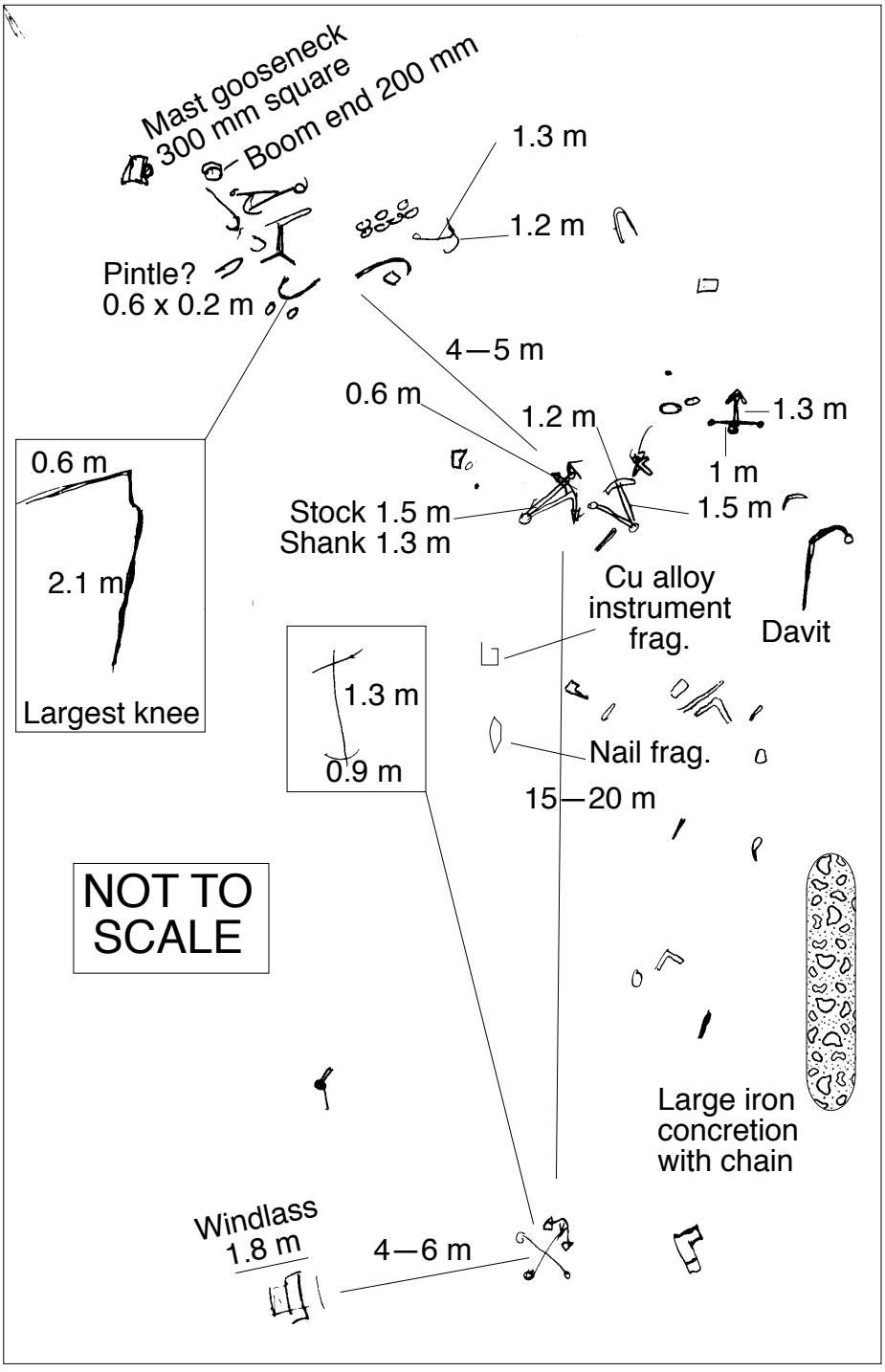


Figure 79. Sketch plan of the *Emma* wreck site in 1988 (Geoff Kimpton).

of the suffering were the arrivals of Padbury's cutter *Mystery*, under Peter Hedland, and his schooner *Emma*, with stores and news from the south (McCarthy, 1990).

In preparation for the *Emma*'s voyage to Fremantle in March 1867 (under Captain Badcock), wool from the defunct Roebuck Bay Pastoral Association was loaded, together with eight tons of pearl shell, belonging to a former Denison Plains Company man, W.F. Tays. It was to be amongst the first shipments of wool and certainly the first large shipment of shell from the region, heralding a new era in the north and rendering Padbury's *Emma* doubly important in the history of the North-West (McCarthy, 2002).

The *Emma* and the pearling industry

Initially 'dry' pearling (or harvesting by beach-combing or wading in the shallows) was the fashion at Nickol Bay. By this means, the shallow beds adjacent to the shore were exploited at low tide. Apparently, having prior knowledge of methods used elsewhere, for example in Ceylon (Sri Lanka), Tays and his partner Augustus Seubert, obtained a boat by entering into a partnership with a pastoralist who had obtained a boat from an American whaleship in exchange for fresh meat. Tays and Seubert had also located productive beds in shallow water close to shore, apparently with the aid of local Aborigines. These two factors were keys to success in this phase of the industry. Many followed their example and, in November 1866, Padbury sent a large boat up in the *Emma,* for use in the pearl fishery, and he too proved successful. The record is very incomplete and a great deal of the activity at Nickol Bay at this time would not have been recorded. All the officials, diarists and commentators, such as the Robert and Trevarton Sholl, were stationed some kilometres inland. It also needs to be noted that many pearlers would have been secretive, desirous of anonymity or keen to establish a commercial advantage at this time.

With 12 tons of shell hidden on the coast, worth around £100 per ton landed in London (then the equivalent of a mid-level government servant's annual wage), Tays informed Trevarton Sholl and apparently Charles Broadhurst, then the acting Resident Magistrate, that he had thoughts of going to Victoria to purchase a small craft and form a pearl fishing company. He then took passage on board the *Emma* with much of that catch (McCarthy, 1995).

The loss of the *Emma*

The schooner left Mystery Landing in Butchers inlet (later renamed Cossack) and cleared Tien Tsin Harbour (Port Walcott) with its cargo and with 42 souls on board including seven crew. On board were Tays; seven military pensioners from the Roebuck Bay Pastoral and Agricultural Association; Padbury's brother-in-law Charles Nairn; and, the Resident Magistrate's son T.C. Sholl. According to Chris Halls (1984), there were also 'four policemen in charge of two or three Aboriginal prisoners and three free natives'. Also on board were the master and one of the crew of the *New Perseverance* a 105-ton schooner that had run aground the shores of Butchers Inlet while carrying stock and dismantled buildings from the Roebuck Bay Company (*Perth Gazette*, 12/7/1867). Being lightly loaded for its tonnage with only the shell, luggage and the wool in its holds, *Emma* also took on board an estimated 25 tons of iron ballast (R.J. Sholl diaries and Occurrence Books, 16/8/1867, CSR 603/ 92;108. Battye Library, Perth).

Given that a sailing voyage down to Fremantle took an average of 50 days and that the return trip back north around 30, Badcock had expected to be back at Tien Tsin at the very

latest after two months, with the much-needed supplies for the struggling settlers (*Government Gazette*, 20 February 1872 quoted in Henderson and Henderson, 1988: 69). After leaving Cossack on 3 March 1867, the *Emma* disappeared with all hands, leaving the struggling settlement at Nickol Bay despondent at the loss of over a quarter of their number, near to starvation and without any means of communication.

With the drought deepening and famine setting in, Sholl sent a party overland to Champion Bay for a relief ship. In his private diaries and in his official dispatches from this time, Sholl records both his grief at the loss of his son, some of the speculation surrounding the disappearance of the *Emma* and that of the cutter *Brothers*, which was also missing at the time (Green, page 250). Sholl noted in his reports that the *Emma* had a 'defective mainmast' and that Badcock had planned to sail around Ritchies Reef (the Trial Rocks off the Monte Bello Islands) before heading in to travel closer to shore. He believed that *Emma* may have been dismasted in strong winds to then float helplessly at the mercy of the wind and seas. In effect the ship, if it had not foundered at sea, could have fetched up on any part of the mainland, or on outlying reefs between Cossack and Fremantle.

The schooner *Flying Foam* was subsequently dispatched and two days after its departure the *Perth Gazette* graphically illustrated the prevailing thoughts:

> If she was wrecked on one of the island lying off the coast, some of the people would have probably have safely gained the shore, but were that the case we shudder at the thought of the miserable lingering torture they must have gone through; allowing that all the stores of the vessel were saved, four months must have brought starvation, and perhaps perishing from want of water; death from immediate drowning on being wrecked is the more preferable death we could wish them (*Perth Gazette*, 12 July 1867).

The schooner *Heather Bell* which arrived with a cargo of guano at Sydney in August reported seeing wreckage on Bedout Island north-west of the DeGrey, sparking a search. Nothing was found. Though all hope of there being survivors faded with the passing of time, speculation about the fate of *Emma* and its contingent continued for well over a century. It appears that parts of the wreck may actually have been sighted; however, nearly a decade after the disappearance, Charles Tuckey followed up a report from a local Aboriginal man of three wrecks, including one describing survivors from a wreck getting ashore only to be killed (McCarthy, page 8). The report read:

> To ascertain if possible whether the wrecks really existed Tuckey took his vessel inshore as close as he considered prudent after rounding the Cape and by the aid of a telescope made out distinctly the ribs of a vessel lying on the beach. The place is situated about 100 miles to the south of the Cape [North West Cape], between Point Cloates and Cape Cuvier, where a reef of fifteen to twenty miles in length and generally undefined on the charts, runs out to seaward.

Here the correspondent is describing the area north of Coral Bay. According to Halls, in concluding his examination of what he described as 'one of Western Australia's most puzzling mysteries of the sea…nothing was done nor, it seems, were any steps taken to confirm his story by an official examination of the supposed wreck site' (Halls, 1984: 23). Three years later there appears to have been similar official inaction after the *Inquirer* carried another more gruesome report:

> Captain of the Schooner *Nautilus,* Mr John Tapper, found on the beach between Shark Bay and Cossack, a portion of a vessel, evidently wrecked many years ago, the remains of which were strewn upon all parts of the shore. Close to the stern Tapper discovered no less than 5 human skeletons, but no indications of the name of the vessel or her destination (*Inquirer*, 5 November 1879).

As a result no trace of the *Emma*, or any clues to its fate, were ever found until recent times. Finally, reports of small cannon being found by pastoralists on sheep stations in the Coral Bay region were not confirmed despite a recent inquiry by the Museum.

A wreck believed to be the *Emma* is found

In the late 1970s and early 1980s, the Museum received three separate reports of a possible wreck off Point Maud, in the vicinity of Coral Bay. These were from local diver Serge Katarski, and two Perth-based divers, Jim Sellers, and Dean Whiting. All three reports were believed to refer to the same site. Eventually, objects were brought in to the Museum for identification by Sellers which led Scott Sledge, the then Inspector of Wrecks, to conclude that the report 'suggests very strongly that the wreck is that of a lugger [referring to] (YM [yellow metal] sheathing, tacks, small bolts…and part of YM hard-hat diving dress collar with the word "FRONT" stamped into it)'. Given this tentative, and at the time quite reasonable, assessment, the report was not given a high priority.

In August 1987 an informal report was made by Brian Ingram of Esperance of a site off False Hill and Whaleback Hill that he had been shown by a local spearfisherman. Ingram described it as being in 10–12 ft of very rough water, with 'forks' and cannons in slightly deeper water to the south, heavily encrusted timbers and anchors, approximately 10–15 ft long about 20 ft apart, one an 'Admiralty type with ring on end'. After being contacted with a request to file a report of finding, Ingram indicated that he felt that the wreck was closer to Coral Bay than he had earlier indicated, most likely at the Katarski/Sellers/Whiting site. Nothing further transpired as a result, though later he was written to on the possibility he had seen another significant site.

In May 1988, utilising a sketch made from Sellers' description, a team led by the author, who was then Inspector of Wrecks, located and examined a wreck now thought to be the *Emma.* The remains were found on a flat coralline reef north of Coral Bay, which at mid-tide is covered by *c.* 2–3 m of water but as the tide lowers becomes completely undiveable in the current and broken waves (Figure 76). The site was heavily encrusted in growth and concretions and was so shallow that at low water spring tides some of the anchors became visible. The wreck was found to lie on an E–W axis with the position of the bow indeterminate due to the location of anchors and hawse-pipes at either end (Figure 79). There were seven anchors visible, some with stocks stowed (Figure 80). The subsequent inspection report reads thus:

> Iron stocked anchors ranging in size from 1.0 to 1.2 m overall. Two of these have stocks set and a further two have each lost a fluke and appear to have been cargo or ballast. A substantial chain mound and heavily concreted ballast or cargo mound appears in three distinct sections, each to a height of *c.* 1 m. Broken or distorted knees are visible throughout, fastened with copper through bolts to timbers once around 4 inches thick. One iron knee rider 7 by 5 mm in section, measured 2 m from deck beam to the end

> which terminated in the bilge. Two davits…were recorded, as were iron pump sections, piping, 2 hawse-pipes one at each end of the site, and the remains of a crushed diving helmet (Figure 83). This was seen concreted to what appears to be a pump section. Ballast stones are in evidence throughout. The concretions appear very rich with 1 lead ingot 25 x 13 x 7 mm visible, 2 book presses [one a 400 mm x 250 mm press, Figure 82], copper sheathing, one piece being a wool bale stencil with the letter 'P' clearly visible. Iron bolts in much corroded form are also visible (*c.* 20 x 2.5 mm). A diaphragm pump appears overgrown by coral close to a windlass 1.8 m in length. At a bearing of 210° from the cargo anchors and at a distance of 50 m a small boat gudgeon, fastenings, a diving helmet, wing nut and other assorted brass materials were recovered.

The site plan (Figure 79) shows the major features and the objects raised for security, conservation and diagnostic purposes. These were the crushed diving helmet (Figure 84), sheathing fragment, a deck light, assorted fastenings and fittings, a ballast sample, bottle, sherds, the small boat gudgeon, the stencil letter, a length of chain with 4 in x 3 in x ¾ in links and a bottle. In examining the evidence, it was concluded that the wreck is that of a mid-to late 19th century vessel, iron fastened in the deadwood, keel and keelson, and part copper and brass fastened elsewhere. Iron knees and in some places knee riders were also used in the construction of the vessel. The two anchors, with stocks set, are more an indication of vessel size than those apparently being carried as cargo. The chain and fastenings sizes point to a substantial vessel of the 100–200 ton range, most likely European built. The presence of the davits, small boat gudgeon, diving helmet, wool bale stencil?, lead ingot and two book presses are significant and make a NW destination or point of origin likely. Of the vessels lost in that trade only the *Emma* (1867) and *Occator* (1856) fit the size and temporal range.

With only *Occator* and *Emma,* of all the known losses, fitting the remains inspected, and with *Occator* known to have been lost further north, it was concluded that this was the *Emma.* On the basis that it was one of the most significant of all colonial wrecks in this State, the two book presses on board were considered vital artefacts, with documents in the possession of T.C. Sholl possibly sealed within. As a result it was recommended that the site be protected as the *Emma*, and that a further inspection or excavation be carried out with a view to removing the book presses. The wreck was subsequently declared historic and a reward of $1 500 shared between Dean Whiting, Serge Katarski and Jim Sellers. In September 1992, a team led by Jeremy Green, including photographer Pat Baker and diving conservators Ian Godfrey and Jon Carpenter, returned to the site fixing it at 23° 05.08'S, 113° 44.15'E. The strong seas and swell conditions at the time prevented any work on the site although a further site plan was made (Figure 79). A number of loose items including part of a navigation instrument were raised; the site conditions were assessed and a number of objects including the presses further examined by the conservation specialists and were found to be 'well preserved with minimal structural damage' (J. Carpenter, Conservation report: 14/10/1992). A timber sample attached to a copper alloy fastening was also recovered and was later identified by Godfrey as *Eucalyptus* species.

Research subsequently conducted into the pearling and pastoral industries in the north-west showed that the '25 tons of iron ballast', referred to by the Resident Magistrate in his report about the *Emma*, was in the form of the anchors and ground tackle from the *New Perseverance*, which had been wrecked at Mystery Landing in Butchers Inlet just prior to the

departure of the *Emma*. Apart from ballast for the *Emma*, the ground tackle was intended as a 'return freight' or 'paying ballast' on consignment to Fremantle (R.J. Sholl, 16/8/1867, CSR 603/92; 108. Battye Library, Perth). With seven anchors found on site, two (presumably *Emma*'s) with iron stock set and with chain ranged both along the keelson and in a chain mound, the evidence rendered the hitherto tentative identification of the *Emma* conclusive.

The *Emma* diving helmet

The location of the 'diving helmet', or 'hard hat', on the wreck (Figure 83) poses an, as yet, unanswered question about the chronology of the use of 'diving apparatus' in the pearling industry. The find also reinforces the understanding that *Emma* is an extremely significant wreck.

Discussion with the Padbury and Nairn descendents continues as to who owned the helmet and the significance of the letter 'P' from the wool bale stencil. One possibility is the 'P' represents Walter Padbury's interests, or alternatively, that of Pyramid Station.

The type of diving helmet was identified by George Wookey (a well-known 'hard hat' diver of the post-war era) as a Siebe Gorman variety, which initially cast doubt on the identification of the site as the *Emma* (R. Anderson to S. Katarski, 26 May 2010. *Emma* File MA-60/88). However, subsequent research showed these types of helmet were manufactured by Augustus Siebe from 1837 and exhibited at the Great Exhibition in London in 1851. In 1871, after the death of Siebe in 1872, the firm became known as Siebe Gorman which continued to 1999.

The possibility that there might also be two wrecks at the site, has also been raised by one of the original finders, Serge Katarski, who refers to there being brass ingots, crockery, forks and spoons nearby, including the outline of the hull in the reef (S. Katarski 2010, pers. comm., 25 May, *Emma* File MA-60/88). More research is required before being able to rule this out conclusively. What is almost certain is that, given the depth of water over the site and the location of the helmet on the wreck, it was being carried on board a vessel at the time of wrecking and was not lost during a subsequent salvage attempt, as happened on the wreck of the SS *Macedon* (1883) off Rottnest Island. It is interesting that Tays, Padbury or others in the region, may have been experimenting with the apparatus earlier than the acknowledge pioneers of the 'hard hat' in the pearling industry, although why the helmet was on board, given the vessel was headed for Fremantle is a puzzle.

Background to the appearance of a diving helmet on the *Emma*

Realizing that Tays had died in the wreck of the *Emma*, Seubert arranged for the collection of their 'catch' of shell, hidden on beaches, sold it and used the profits to set himself up as a publican, in the wreck of the *New Perseverence*, which lay as a hulk at Butchers Inlet. Though he departed the scene to serve liquor to the pearlers and settlers, others had seen the benefits of using 'large' vessels (i.e. displacing more than 5 tons) and quickly sent them into the area. In April 1867, only a month after the departure of Tays, the first of these, the *Morning Star,* began preparations to sail out of Butchers Inlet for the pearling grounds. Charles Broadhurst then developed plans to utilise a far larger boat and to introduce 'diving apparatus' to the industry. The application of such technology to under water work was by then well established elsewhere in the world and it was an expected, and most logical development, in Western Australia. The *Perth Gazette* reported that:

> At present it can scarcely be called a fishery as at best all that is done is to prowl along the coast and gather as many [shell] as can be seen at low water…It is evident that a vessel fitted with proper diving apparatus would make a good thing of this fishery as it is said very large shells are to be seen lying in deep water. A vessel so fitted was expected at Nicol [*sic*] Bay (31 January 1868, *Perth Gazette)*.

While with his family in Melbourne towards the end of that year, Broadhurst entered a partnership with James Dempster and the firm of Barker and Gull of Guildford, Western Australia. Dempster bought the Tasmanian-built, 26.5 m-long two-masted schooner, *Mary Ann* in Melbourne. He brought it over from Melbourne, arriving at Fremantle in June 1868 with a Heincke diving apparatus. They then left for the Flying Foam Passage, in the Dampier Archipelago, an extremely rich source of pearl shell. Both the vessel and the equipment proved unsuited for use in the North, especially at the Flying Foam Passage, where neither could be adapted to handle the swift currents, even when they added more weights to the diver's feet. They also failed to locate productive beds. The need for experience in locating the submerged shell banks and the dangers in attempting to use diving gear from such a large vessel in strong currents, or when the tide was running, were effectively brought home to Broadhurst and his associates. Despite the failure of this, the first recorded attempt to use diving apparatus on the Australian pearl fishery, Broadhurst realized that the gear had possibilities. He left the partnership with Dempster, Barker and Gull and was soon on his way back north with the diving apparatus he had on board the *Mary Ann* intending to us it in concert with 'naked divers' who by August 1868 were regularly diving to great depths.

> The powers of the natives in diving, especially the females, are spoken of as something wonderful. They go down to depths of 7 fathoms and remain below a time that astonishes their white employers (*Perth Gazette*, 25/9/1868).

Broadhurst also joined forces with a Hughan, who had recently arrived from the east in the schooner *Pilots*, and who was using, what Robert Sholl described as, a 'French arrangement', again in concert with his naked divers. It was possibly the Scaphandre, the equivalent of the British Siebe and Heincke systems, but equally it could have been the famous Aérophore, forerunner to the modern SCUBA apparatus. Either way, they both proved unsuccessful with the apparatus and soon gave up. In hindsight, it can now be seen that their attempts were unnecessary at this time, especially as the Aborigines were by then diving without assistance to over 10 m with good results. Although the diving system allowed a clear look underwater, provided a protective suit and allowed a longer period underwater, it also had a number disadvantages. It was expensive to purchase and to operate, and required a number of men, some European and on a wage, to operate. It was bulky, and restricted the movement of the diver underwater and the boat above. In strong tides, it proved especially impractical and even dangerous, especially when compared with the ability of the naked divers to use the current to advantage, and to enable them to cover large areas of seabed with ease. Almost all these problems can be seen from a close examination of the following illustration, showing a diver, the tender, two men operating the air pump and the subsequent lack of space on board (Figure 85). In the early phase of the pearling industry these disadvantages proved its downfall. It was not until the early 1880s, in what has been characterized as the 'Broome Era', where the 'hard hat' and the specially designed 'pearling lugger' came into their own. First

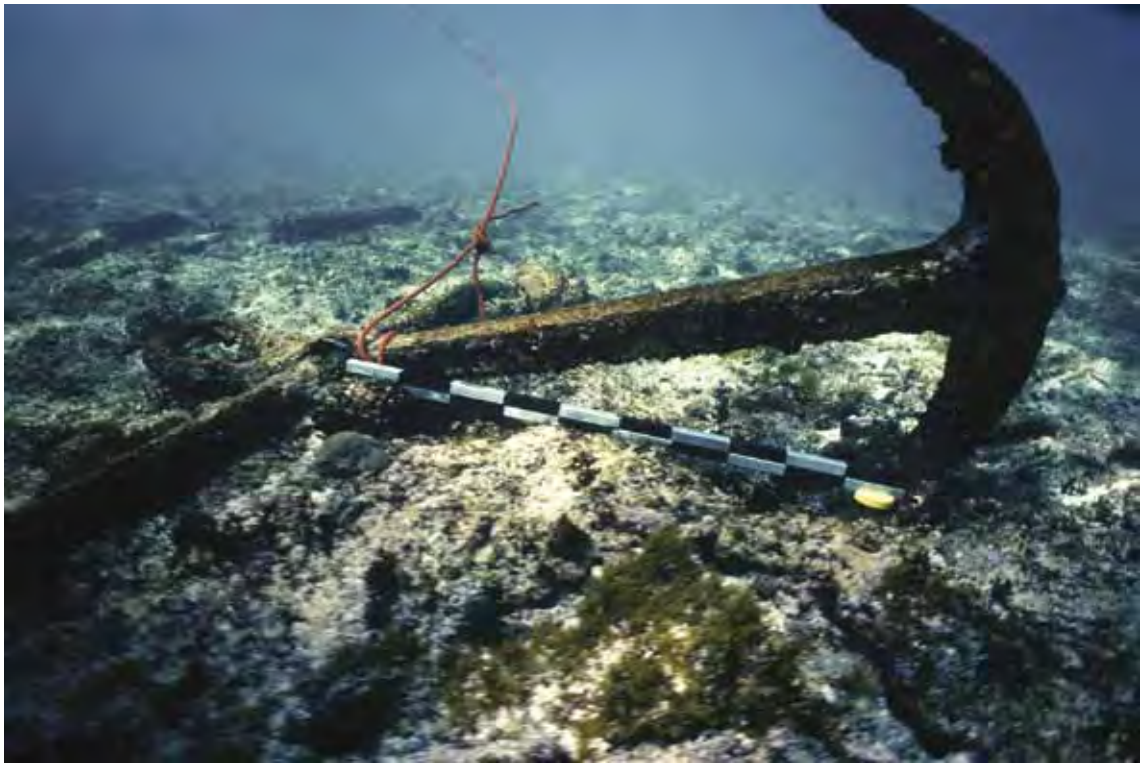


Figure 80. The *Emma* anchor 1988 (Michael McCarthy).

Figure 81. The windlass on the site 1988 (Michael McCarthy).

Figure 82. Document press on the site in 1988 (Michael McCarthy).

Figure 83. Diving helmet *in situ* in 1988 (Graeme Henderson).

Figure 84. The *Emma* helmet before and after treatment (Patrick Baker).

with naked divers and then, as they progressed into far deeper waters, almost exclusively 'hard hat' (McCarthy, 1995 and 2009).

The question who owned the *Emma* helmet remains unresolved, although what is certain is that it would have needed to be someone with access to a boat, a diver and to the necessary funds and workforce. Tays could possibly be eliminated on the basis that he had yet to realise the profits on his 'dry shelling' with the local Aborigines. Walter Padbury, owner of the *Emma* and some of the more successful local pastoralists, such as John Hancock and John Withnell, who had boats and would have all sought to keep their activities secret remain possibilities; however, with Padbury the more likely.

Conservation report 1992

Jon Carpenter

Date of Inspection: 6–7 September 1992
Sea Conditions: Sea conditions inside the reef were generally good with minimal swell and a slight chop. On entering the water a strong, almost constant flow of water over the reef accompanied by wave action made it very difficult to swim to the site and remain there.
Underwater Visibility: Good but reduced by foam from breaking waves.
Water Temperature: 20° C.
Site Description: Where the wreck lies the seabed comprises a flat, hard coral limestone surface in which small and comparatively large (1 m^2) depressions are occasionally present. The seabed gradually slopes towards a northern passage which passes through the main reef. Coral outcrops occur at the inner reef approaches to the site, which itself has few natural projections above the seabed. A flat rock platform to seaward of the site was exposed at the time of the visit. The wreck lies on a seabed area, which has very little sessile fauna or algal growth. Sea urchins are present but not in large numbers. A few reef fish were seen and the occasional shark. The exposure of the site and minimal concretion will inhibit more extensive colonization by marine life. Fresh water is not anticipated to affect the wreck site but it is interesting to note that warm ground water was felt to issue from the sandy bottom of the Coral Bay boat launch area.
Wreck Description: See the *Emma* sketch plan (Figure 79 on page 69) in this report. The wreck site consists of a dominant mound (approx. 2 m^2 by 1 m high) of iron objects, corroded and concreted together and a number of isolated iron objects at varying distances around this focal point. Wreck material is concreted to the seabed and/or held there by its own weight. Anchors (Figure 80), a windlass (Figure 81) and two iron presses (Figure 82) are easily recognized. A number of other iron fittings will need to be identified. One of the presses is held by concretion to the main mound; the other sits atop a pedestal of coralline concretion a short distance away. It would appear that this press must have formerly been held in this elevated position (approx. 300 mm off the seabed) by parts of the ship that no longer exist.

Artefacts are not heavily concreted due to the turbulent nature of the site. Note that the

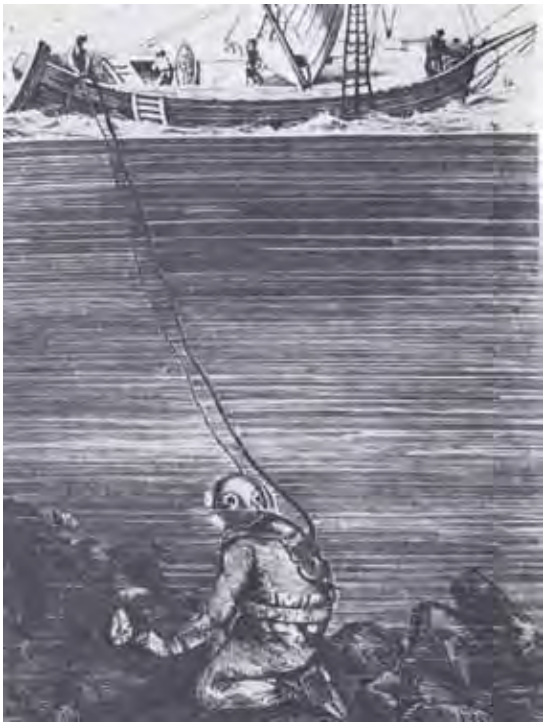


Figure 85. The deck of a small vessel with diver below showing the space occupied by the equipment and the men operating the gear. From J. Michel, 1980, *Trois Inventeurs Méconnus. Benoit Rouquayrol. Auguste et Louis Denayrouze. De prestigieuses découvertes et L'Histoire du premier Scaphandre Autonome une invention bien Française 1865*. Editions Musée Joseph Vaylet: 99.

Figure 86. An illustration from the 1880s showing standard dress and breath-hold divers working side-by-side as they gather shell (Maynard, 2002: 32).

main mound of material occasionally breaks the surface in the wave troughs but is difficult to see from water level. A small number of copper alloy fastenings are scattered about the site. Most are surface etched, corroded and worn. Some glass fragments were seen including the base of a bottle.
Iron Artefact Condition: The iron artefacts appear to retain their original form and dimensions. The exposed, turbulent and therefore, well oxygenated environment implies that all iron is actively corroding. The only possible exception may be the collection of iron objects buried in the mound. In some circumstances iron objects may be cathodically protected by others made of the same material but different composition. An assessment of the extent and rate of corrosion of the iron artefacts will be required to accurately determine their present condition and to enable predictions to be made on survival potential. On-site data acquisition was not possible at the time of inspection due to the rough, unworkable site conditions.
Wood Sample (EM 3793): A small piece of wood still attached to a copper alloy fastening was the only wood seen on the wreck site. Since the identity of the vessel has yet to be confirmed this sample of wood was recovered for identification. The survival of the wood is attributed to its impregnation by copper corrosion products, which acts as a biocide.
Additional Material Collected: Copper alloy fragment (EM3794), two pieces pinned together possibly part of a navigation instrument.

Wood identification

Ian Godfrey

The wood was separated from the copper alloy bolt and then polished to 1200 grit finish.
End grain analysis (microscopic examination x 10) revealed the following features:
Rays = narrower than pores.
Soft tissue = surrounding pores.
Pores number = moderately numerous; size = intermediate; arrangement = oblique flares, tyloses abundant.
CSIRO card key indicates wood is a *Eucalyptus* species.

Correio da Azia 1816

Jeremy Green

Historical background

In 1987, a journal entitled: *INSTRUCTIONS for sailing in the vicinity of the NW coast of New Holland, in the brigantine* Emillia *Prepared for LUIS ANTONIO DA SILVA BELTRAO, PRIMEIRO PIOLOTO DE CARTA PATTENTE*, dated 1818, was drawn to the attention of the Department. It gave information relating to the location of the hitherto unknown loss of the *Correio da Azia* in 1816. The journal recounts how Beltrao was sent in the brigantine *Emillia* to examine the coastline where the *Correio da Azia* was wrecked and chart the area around Point Cloates in order to better understand the dangers. An examination of the document showed a number of references to the position of the *Emillia* (including celestial navigation information), features on the coastline and to the general site of the wreck. In the Beltrao account, it is obvious that the *Emillia* carried on board the master and some crew of the *Correio da Azia*. Beltrao states on 7 June 1817:

> The boat went to the shore, in it my commander who, because of the misfortune which had happened to him, would be able to recognise the position of the mishap. In the same boat were some of the sailors who had been with him when he was wrecked. They encircled the reef and recognised the position, the exact site of their misfortune, with a bottom of rocks and a circle of rocks similar in appearance to a salt marsh. They [the commander and crew sent to the shore] were then sure that this was the position they sought.
> At 22 h 00 I took a large number of observations and my commander, an equal number, from which we deduced the calculated Longitude E of Greenwich as 113° 52' 47.07"… so that in this Latitude, the Longitude of the coast should be 114° 00', due to the distance we were off it in my estimation; this should be accurate to plus or minus one minute. The extremity of the reef on which the vessel *Correio da Azia* should be in Longitude 113° 52' 00" and the land on this parallel in 113° 55' 30" (Beltrao, 1818).

It is interesting to note that Beltrao records his navigational position to a very high degree of accuracy, usually quoting latitudes and longitudes to seconds and even in two decimal places of seconds! Although he does qualify the accuracy to ±1'. When his positions are plotted on a modern chart, although the latitudes look approximately correct, the longitudes appear to be about 30' (13 nautical miles) too far East (Figure 87). This is obviously some systematic error; Beltrao refers to using the longitude East of Greenwich, so the error is not related to his use of a different meridian. Additionally, the translator comments that: 'the '4' is repeated several times in this manuscript in bearings and is surely a corruption by the typesetter for 'b' or 'by' in Portuguese'. This appears to be incorrect. The 4 is more likely to refer to one quarter. Note the document has SE4E, SE4S, S4SE, N4NE, NE4E, N4NW, NW4N and even N4½NE. So in any quarter the compass readings would be (for example) E, E4SE, ESE, SE4E, SE, SE4S, SSE, S4SE, S.

Figure 87 shows the coastline of Western Australia in the region where Beltrao operated.

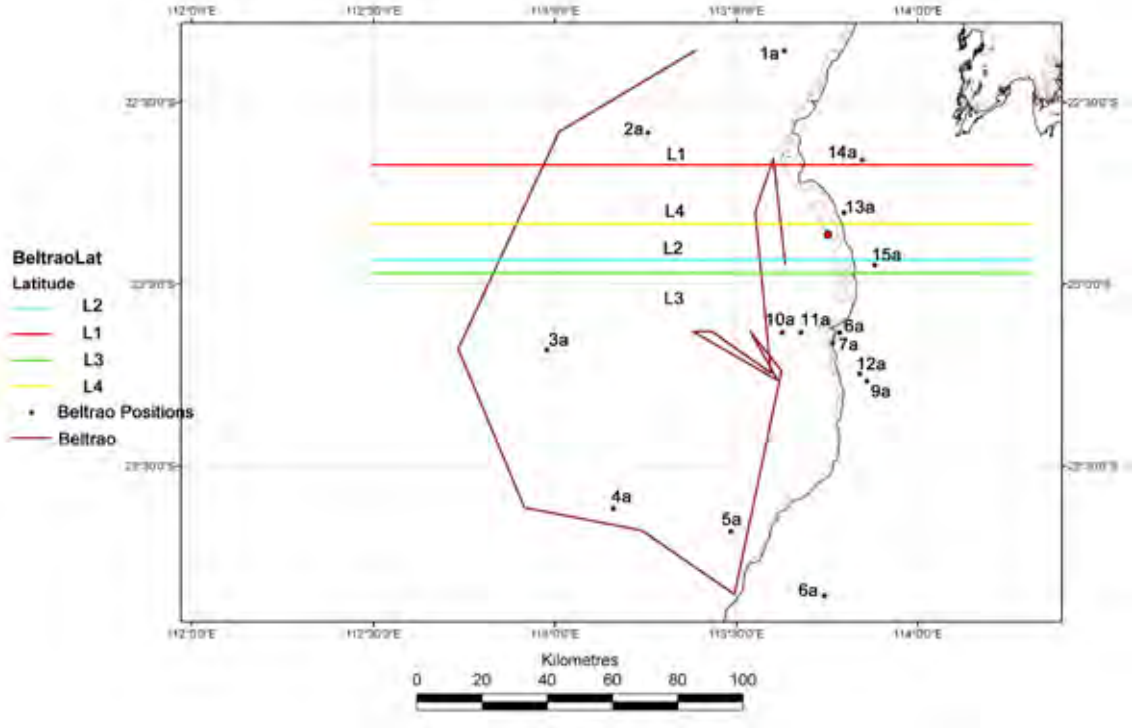


Figure 87. Plan of the Point Cloates area showing the coastline, together with Beltrao's plotted positions (points 1a–15a), positions corrected (brown line) and latitude observations (L1–L4) referred to in the text. The actual wreck site is shown with a red dot (Jeremy Green).

The numbered positions 1a to 15a are the positions given by Beltrao. The brown line shows the positions moved about 30° westwards on the basis that position 6a refers to a feature on the coastline. The horizontal lines L1 to L3 refer to latitudes given by Beltrao.

Beltrao was using celestial navigation to determine his longitude and he refers to lunar distances to the stars Regulus and Antares. Erskine (1998) analysed the celestial navigation issues and attempted to rework the lunar distances that Beltrao obviously got wrong. Erskine concluded that there was some unexplained error in the Moon sights.

On 31 May, Beltrao turned towards the shore and encountered a small island 'which had been said to exist by some mariners'. This occurred some time after plotting his position at 2a and before 3a. There are several contenders for this. Since he refers to a 'small' island, it is obviously not Cloates Island (Point Cloates was thought to be an island for a long period of time) as that could not be considered 'small'. This is possibly Black Rock or Fraser Island.

On 1 June the *Emillia* was somewhere in the region of Red Bluff or Cape Farquhar and he refers to Sandy Point on Flinders' chart giving it latitude 24° 10'S which is probably Red Bluff (24° 02'S) or Point Cuvier (24° 13'S). Note Flinders' Chart gives Sandy Point 24° 40'S and Flinders obviously used some other source, as he did not visit or survey this section of the coast. He probably based his charting of the coastline on de Vlamingh's chart (who named Roode Hoogte in 23° 50'S although that is more likely to be Point Quobba). At midnight their position was Position 5 and they observed patches of vegetation at Position 6 which Beltrao refers to as an important landmark (Beltrao refers to the full Moon being so bright they could only see a few stars). The actual position lies between Red Bluff and Cape

Farquhar.

On 2 June he heads north and refers to a hill 'the highest along the whole coast' together with other hillocks. This is likely to be Stanley Hill, the highest of the hills in the region (79 m), together with Yalobia, Pearson, Dawson, Airey and Whaleback hills (see Figure 61).

At midnight Beltrao refers to their current latitude as 23° 09' 40" and that the large patch was bearing 37° SE (assumed to be bearing 127°) at an estimated distance of 6 miles and thus calculates the position of the patch (7b) as 23° 14' 28" S and longitude 113° 52' 20" E. This information can be used to calculate of the length of the mile Beltrao was using. Since we know the latitude of the point of observation and the latitude of target and its bearing, the distance can be calculated as ((Lat 7b–Lat 7a)/Cos(127))= 0.13239312° which is 6 miles according to Beltrao giving the mile = 0.02206552° =1.3239312 nautical miles or 2.452 km and the longitude of the point of observation (7a) as 113.78606°. Beltrao later (3 June) recalculates the position of the large patch as Position 9a referring to the reef at Position 8a. It should be noted that again the longitude seems to be erroneous, but that the reef he is referring to is around Point Maud and the patches are further to the south between Pelican Point and Yalobia Hill.

On 3 June they encountered a large reef extending seawards from the coast (probably Point Cloates). Beltrao refers to other vessels that encountered Point Cloates including the *galias ollicles* [*sic*] L1 in Figure 87 and the American *galias Caledonia* between L2 and L3 in the figure.

On 4 June reference is again made to the reef (Position 11a) and another calculation of the patch (Position 12a). Later they sighted some rocks

> …and on approaching them we saw one which appeared as a large column rising about 3 fathoms, more or less, above the surface of the sea; and close to it, on its west side, another similar rock but much smaller than the first. Thee rocks are encircled by a large rocky reef, almost awash and breaking.

This could be Black Rock (22° 45.527'S 113° 38.875'E) which until recently has a large pinnacle in its centre, or alternatively, and more likely because it is further south, the pinnacle around the area where the *Stefano* was lost (Figure 88). A number of observations were taken which Beltrao gives as Position 13a where he states that rock bore 18° NE at a distance of 9 [miles] Position 14a and the reef on which it is believed *Correio da Azia* was wrecked 48° SE. The latitude of the large rock, seaward of the coast should therefore be 22° 39' 30" (Position 14a).

Unfortunately, Beltrao does specify the latitude of the wreck site although on the 6 June he states:

> 24 h 00 the Latitude was observed to be 22° 56' 50" (Position 15a), with depths of 40 to 37 fathoms, sand and gravel with the whole of the area awash or composed of shallows in view, but of the wreck not a sign was seen.

7 June Beltrao states:

> The boat went to the shore, in it my commander who, because of the misfortune which had happened to him, would be able to recognise the position of the mishap in the same boat were some of the sailors who had been with him when he was wrecked. They encircled

Figure 88. The pinnacle near the *Stefano* site (Patrick Baker).

> the reef and recognised the position, the exact site of their misfortune, with a bottom of rocks and a circle of rocks similar in appearance to a salt marsh. They were then sure that this was the position they sought (Beltrao, 1818).

Taking Beltrao's latitudes, the nearest latitude to the wreck is Position 13, approximately 4.5 nautical miles north-west of the true position.

Following the discovery of the Beltrao Journal, the Museum contracted an American anthropologist from Brown University, Steve Lubkemann, who was familiar with Portuguese archives and manuscripts of this period, to see if he could find any further information about the *Correio da Azia*. In 1995 Lubkemann found an account of the shipwreck itself by the pilot and captain of the *Correio da Azia*—João Joaquim de Freitas. The translation of the relevant section is as follows:

> …this declaration made by João Joaquim de Freitas, Lt. Captain of the Naval Dept of Goa, Commander of the ship (*galera*) that wrecked named *Correio da Azia*, owned by João Nunes da Silveira, coming from Lisbon to Macau against weather, sea and wind, fire, shallows and coastal dangers and errors of Maps. On the 25th day of November of the Year of our lord Jesus Christ 1816, the aforementioned Galera running with sail, continuing along the Western coast of New Holland, at the distance from the same of seven to eight miles, having the said Commander and other Pilot officers affirmed the Sun on the 24th Astronomical day at the median terms of 3 latitudes South 24 degrees and 16 minutes, having lost sight at 21 hours of Bamin [exact name unclear, could also be Barrin] Island which had been the first land sighted at 19 hrs 20 minutes of the same day and having been observed until 6 hrs of the afternoon of the aforementioned day [i.e.

the 25th], the appointed way was by day NE quarter of N to N quarter of NE, always 32 miles of distance, the Coast 6–8 miles, denoting at that hour land from N and of the same to NE quarter of N and further from S to SW quarter and 1/2 to S, the said Commander continuing to navigate in the direction N quarter of NE to N, 28 miles, when at 10 hrs the bow lookouts and the other officials on the upper deck, saw a white barrier [shoal?] on the same coast at the distance of little more than 8 or 9 miles, the adj. commander immediately ordering to haul up to NNW, having the wind blown always from West South East [*sic*] to the Coast and continuing thus until mid-[unclear] night 5 miles, and in that same hour the Coast could no longer be designated [seen], the adj. commander ordered to make way N quarter of NW for 1/2 hour, the ship travelling 16 miles per hour, and from that hour until 1, to N, at the same 16 miles per hour, and at that same hour fire breaking out in the binnacle, persisting for a space of 1/4 hour, making it impossible to steer by the compass the course determined by the Commander, and as soon as it became possible to steer the determined way by the light of a lantern, in the space of 1/2 hr it was denoted from the top deck by the Ensign [unclear], Jose Antonio Pinto, to the countermaster Pedro Fransisco a turbulence off the starboard of the prow, without the lookouts that had been designated by the Commander having taken notice of it, and the adj. Commander ordering the hauling up of the balina [sail] all the wind it would give, it being [the wind] at the same time W, and determining at the same time to place the anchor immediately since it continued with its flukes overboard and a cable of 20 lengths extended from stern to bow, and seeing the said turbulence to continue off the prow and just about to come about to the side [unclear], the ship hit twice, continuing however always to make some way without hitting, and wanting to turn the ship aside and starting again to make way, we, making the due maneuvers as also setting out [unclear] the prow sails, felicitously denoting [unclear—perhaps 'clear water'] to starboard and beginning even to make some way without there being seen any rough water off the prow, it once again hit and at the second [hit] its rudder failed and immediately the ship crossed in the sea and turned on its port side and filled with water, bursting with such great force that [unclear] the ship from starboard to port, immediately puncturing [unclear] from starboard to the [unclear-possible certain type of masts '*matarcas*'], these falling, and thus finally the Commander deciding for the best to launch the Launch in the sea so that we could save ourselves, all of us embarking immediately, and so we stayed until the breaking of day, tied off to the masts of the same, unable to cast off to the side due to the many rocks that appeared out of the water, unable during this time to save anything except 3 barrels of biscuits and three [unclear-some form of measurement maybe 'almodas' perhaps] of water that were in one of the Commanders jars and which was tied to the Gatta mast, that mast not having failed [unclear], casting off to sea, affirming all 3 pilot officials that we were 7–8 miles from the coast and that between the coast and the shallows there was a channel, since the tide was low and nothing like rocks or sand banks or rough waters could be seen there, but yes everything from bow to stern were rock heads out of the water, extending out to sea for over 1 mile, and at 21 hours of the same day all three pilots worked to save us from the great danger in which we were in, given the breaking of that same day that in this fashion we saved ourselves from the shallows [unclear] people, launch, [unclear] and as already declared navigating along the coast to the N until noon, observing the sun all 3 pilots found it to be 22 degrees latitude, 46 minutes S at the same

time it was observed from the Launch that 11 to 12 miles having been navigated, it was still possible to divine the top of the 'Gatta' [fore] mast, that by this same navigation the aforementioned 'baixo' [Note: this could mean two different things and which is not exactly clear—it could refer to the fact that the ship is 'down' [*baixo*] or else to the shallows [*baixo*] on which the ship is down—the point may be academic since in context, in either case, they seem to be trying to pinpoint as best they could the location] is at Latitude 22 degrees and 50 minutes S, with very little difference at the same time a large turbulence was seen to the NW of the 'Agulhas' [Note: this probably refers to the 'compass', although it is in the plural which is sort of odd and thus might refer to some topographical feature known as the 'needles'] with a small island and several rock heads out of the water at the distance from the Launch of 9–10 miles at the same time at a distance from the Coast of 6–7 miles such that the Commander and other Pilot officials were left certain that it was the Island of Cloates and from the said coast ['was seen'?-unclear] a stretch of rock under the water with a large turbulence that extended out to sea for over 4 miles, and the said island found on all charts at latitude S 21 degrees 45 minutes and latitude east of London 108 [very unclear] degrees, 23 degrees and the aforementioned stretch of rock was marked East of the 'Agulha' [compass or 'needles' see previous note] and the Island to West quarter of NW, and the launch [unclear] between the two dangers [unclear] Channel which was supposed to have water enough for a big ship, and continuing to navigate until midnight with the prow NNE, wind SW, and at that same hour we stayed stopped until the break of day, when we continued along the same coast at a distance of 5–6 miles and at 23 hrs of the 26th [the day] we rounded the cape from NW and went along the Coast searching for an inlet, in this way to be able to arrange fix the launch in a state to be able to cross the passage between the coast of New Holland and the Manchurian straits.

The following three pages describe the repairs made to the launch, the fact that no natives were found on the island despite crew apprehension, and the departure of the launch without two men who were supposed killed by animals or natives and could not be found, and the fact that they were picked up almost immediately by an American ship from Philadelphia named the *Caledonia*. [Translation is picked up at point describing a conversation that took place between the two captains]:

…that same Captain [of the *Caledonia*] stated that 5 or 6 years previously on that same [place] an American ship from Boston, named the *Rapid* had wrecked on that same shallow, and the same captain was going to Canton in the year 1815 on the 2 October coming from Philadelphia to Canton in the ship *Caledonia* having observed at the time the Sun was found at Latitude S 24 degree and navigating at a distance from the Coast of New Holland of 8–10 miles of the North way, N quarter and 1/2 NE 26 miles and to the N quarter of NE, 18 miles until 15 hrs and 3 minutes he sighted an island of white sand on the coast, denoting it to NE, NE continuing more or less [unclear], there was a sailor atop the tri-mast who sighted a turbulence of the sea from N quarter of NE, to NE quarter of N a little more than a mile distant from the ship, he the said captain ordered hauling up on the prow, to NW quarter of W, with wind from SW to S navigating 16 miles, and to NE half N until 17 and 1/2 hrs. So that he found himself at the distance of 6–7 leagues from land which was seen from [unclear] N to NW and to S, SW, showing us his charts on which none of them was marked any such shallow and for observing the distance and

> at the Latitude affirmed by day he found himself at Latitude S 22 degrees 50 minutes, all the charts done of the coast of New Holland showing it further to the N 40 minutes than in reality it is, and 2 degrees 25 minutes West by the London Meridian and that he the Captain on one of his charts on this same voyage to Canton had situated the coast truly as his own Latitude observations denoted…

Interestingly, de Freitas noted at noon the day after the loss of the ship that they were in 22° 46' S (L5) 11 to 12 miles North and that the wreck lay in 22° 50' S (L4). De Freitas also refers to 'a large turbulence was seen to the NW of the 'Agulhas' (a topographical feature known as the needles, again possibly Black Rock) with a small island and several rock heads out of the water at the distance from the launch of 9–10 miles at the same time at a distance from the Coast of 6–7 miles. This would seem to indicate that de Freitas was North of the wreck and SE of Black Rock (the Agulha being a small island surrounded by rocks). It is interesting to note that de Freitas' latitude of the site is only 3.2 km north of the true position.

The 1987 and 1988 searches

Following the discovery of the Beltrao journal, examination of the translation indicated there was specific information relating to the loss of the *Correio da Azia*. From an initial perusal of the information in the journal it was decided to a search for the site in the southern area of Ningaloo Reef, north of Maud Landing, a hard topped reef area; some of the reef area to the north of this; and, around Black Rock. These were visual searches, undertaken by towing a snorkel diver behind a boat, and looking for evidence of wreck material. However, the searches, undertaken in March 1987 and in May 1988, were unsuccessful.

The 1997 and 1998 searches

Following the study of Erskine (1998), and additional research by Green, the location of the site of the wreck was further refined. It was concluded that the wreck lay in the area between Point Cloates and the northern end of hard top reef that extends from Maud Landing (22° 46'S to 22° 55'S). Searches were carried out in 1997 and 1998, concentrating in this area, using towed snorkelers and a proton magnetometer. It was thought, from the descriptions of the loss by both Beltrao and de Freitas, that the wreck was somewhere there were coral bommies which they referred to as 'with a bottom of rocks and a circle of rocks similar in appearance to a salt marsh'. Because of the bommies in this area it was not possible to search in a systematic manner, thus making the search very difficult. Fortunately, it was possible to track the course of the search using a GPS, so that the track of the search could be overlaid onto a map and any areas that had been missed in the search identified (Figure 89 and Figure 90). It should be remembered that in 1998–99 Selected Availability (SA) for GPS was on, so that a purposely applied inaccuracy was applied to the GPS signal, which gave an accuracy of a fix to ±100 m (SA was switched off in 2000).

While the search for the *Correio da Azia* was again unsuccessful in these two seasons, during the 1999 search, the site of the *Stefano*, an Austro-Hungarian brig lost in 1875, was discovered (page 115).

It was realized as a result of the four seasons of work that it was going to be very difficult to find the site of the *Correio da Azia* using conventional techniques. In 2000, the Department of Maritime Archaeology was invited by Prospero Productions, a Western

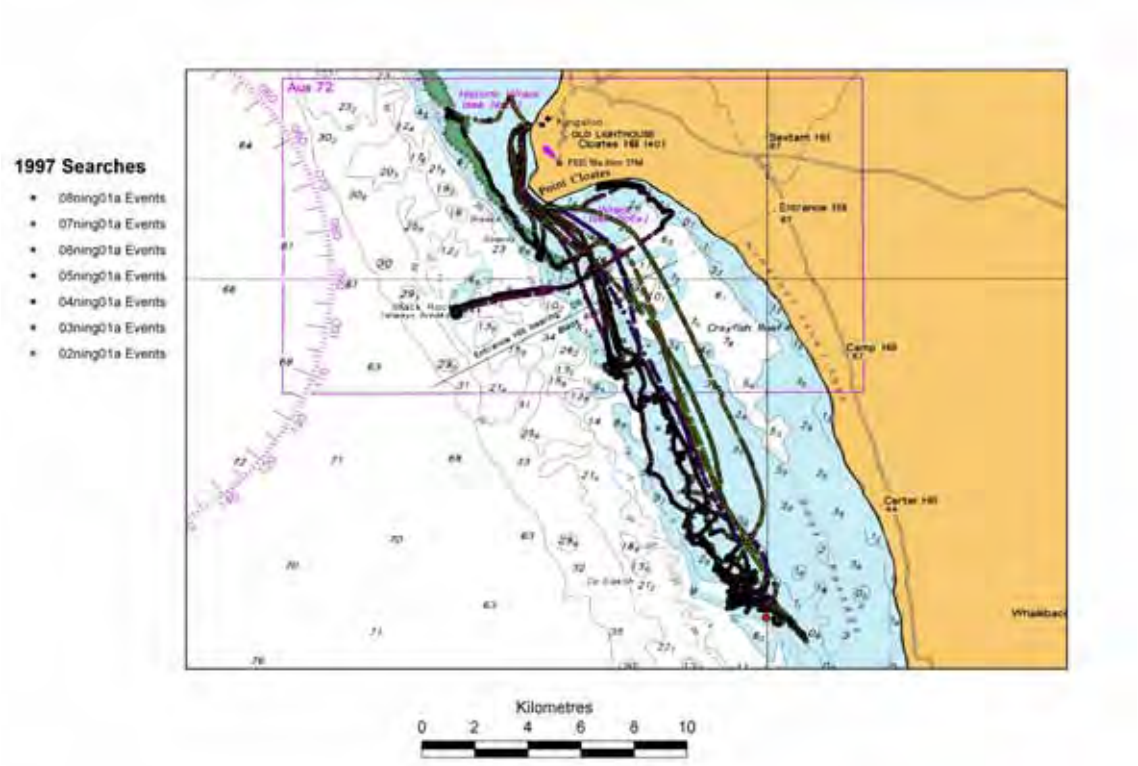


Figure 89. The 1997 search tracks (Jeremy Green).

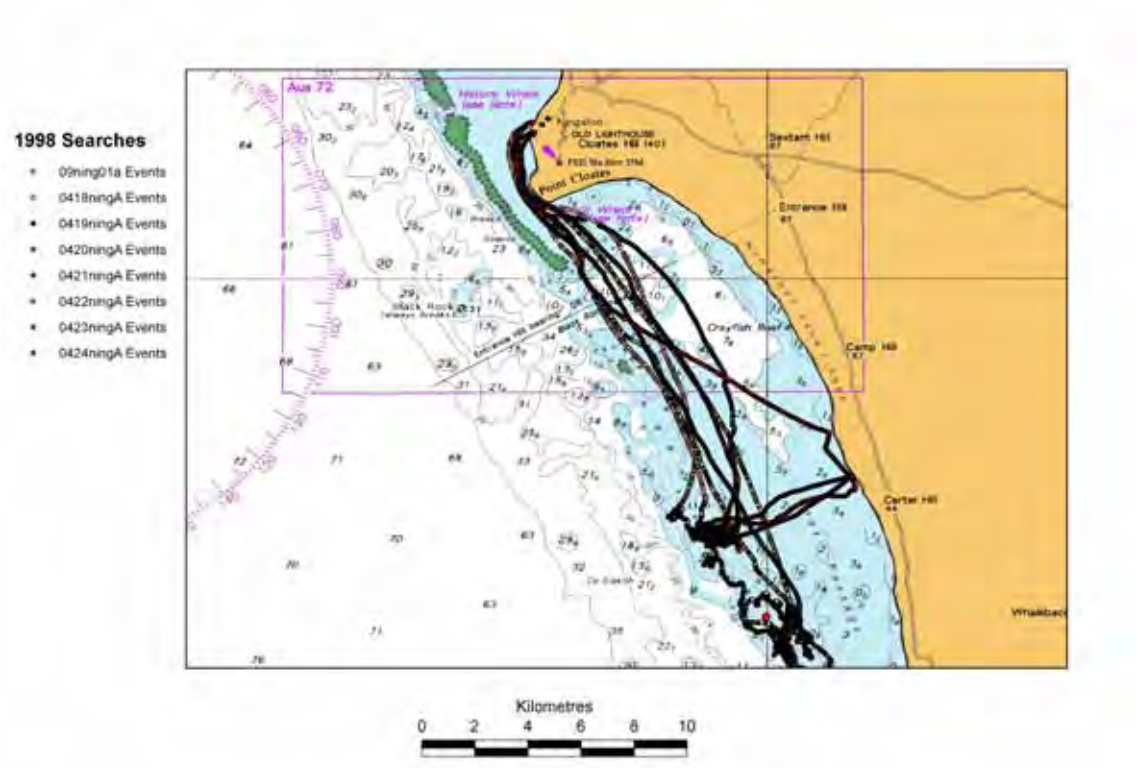


Figure 90. The 1998 search tracks, note discovery of *Stefano* (Jeremy Green).

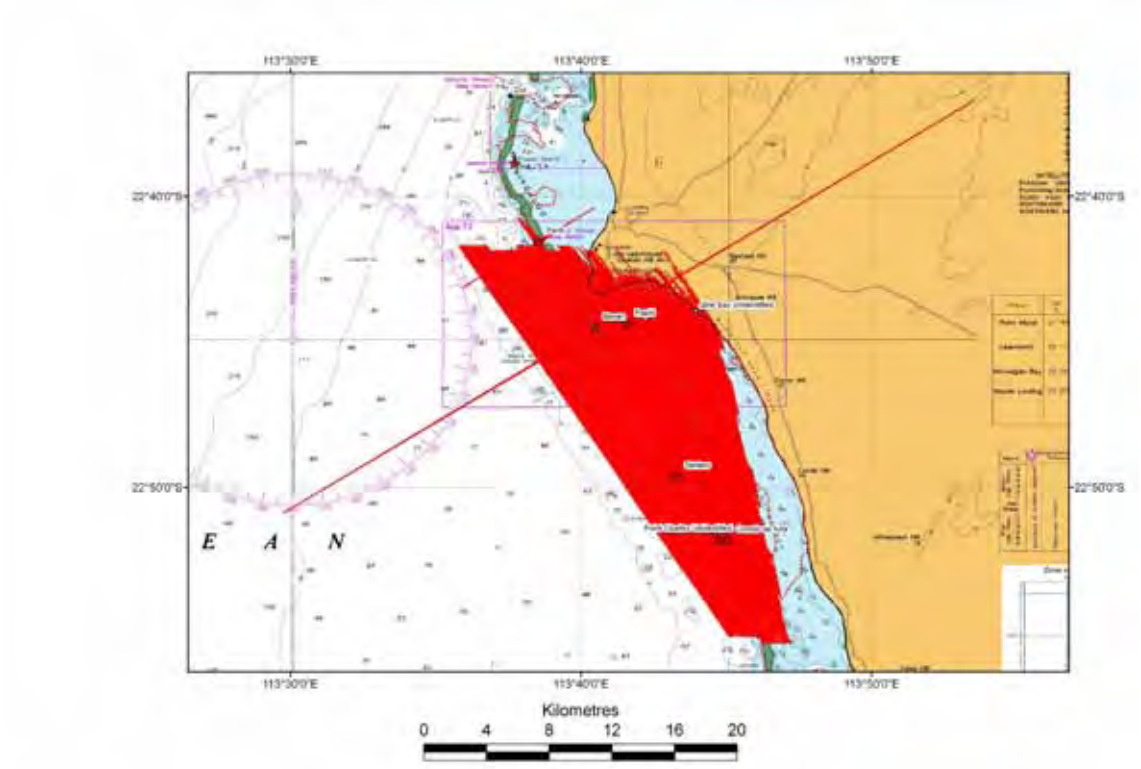


Figure 91. The 2004 Fugro aerial magnetic survey (Jeremy Green).

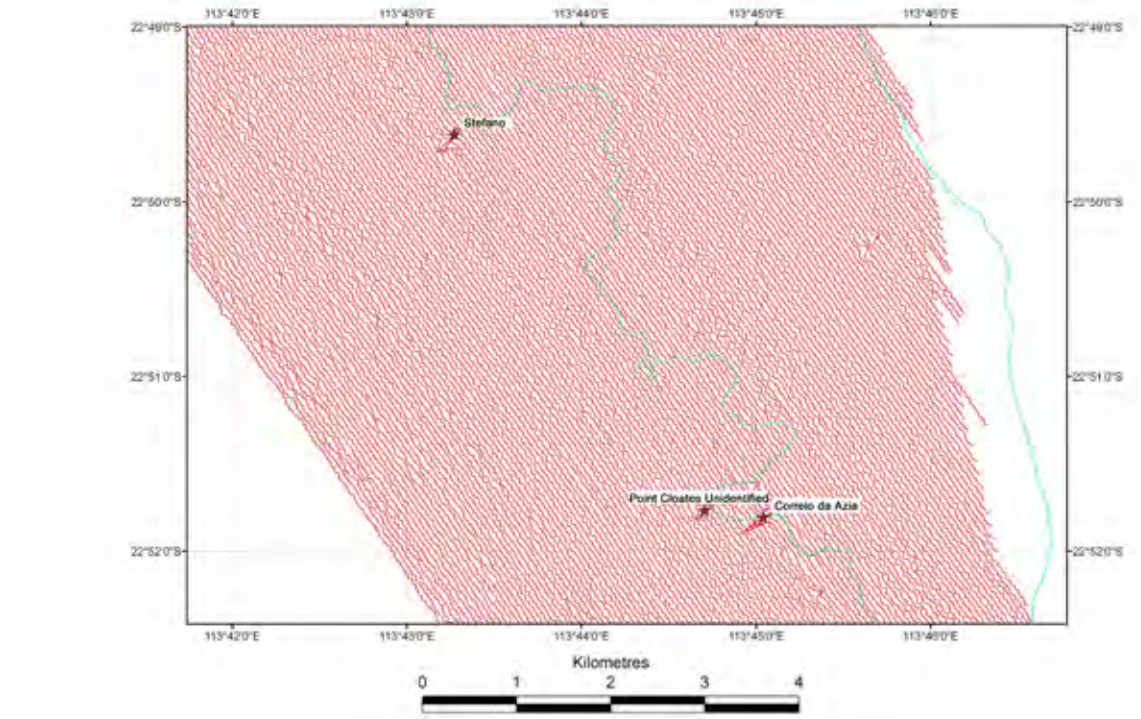


Figure 92. Detail of the magnetic targets of the *Stefano* and two new sites (Jeremy Green).

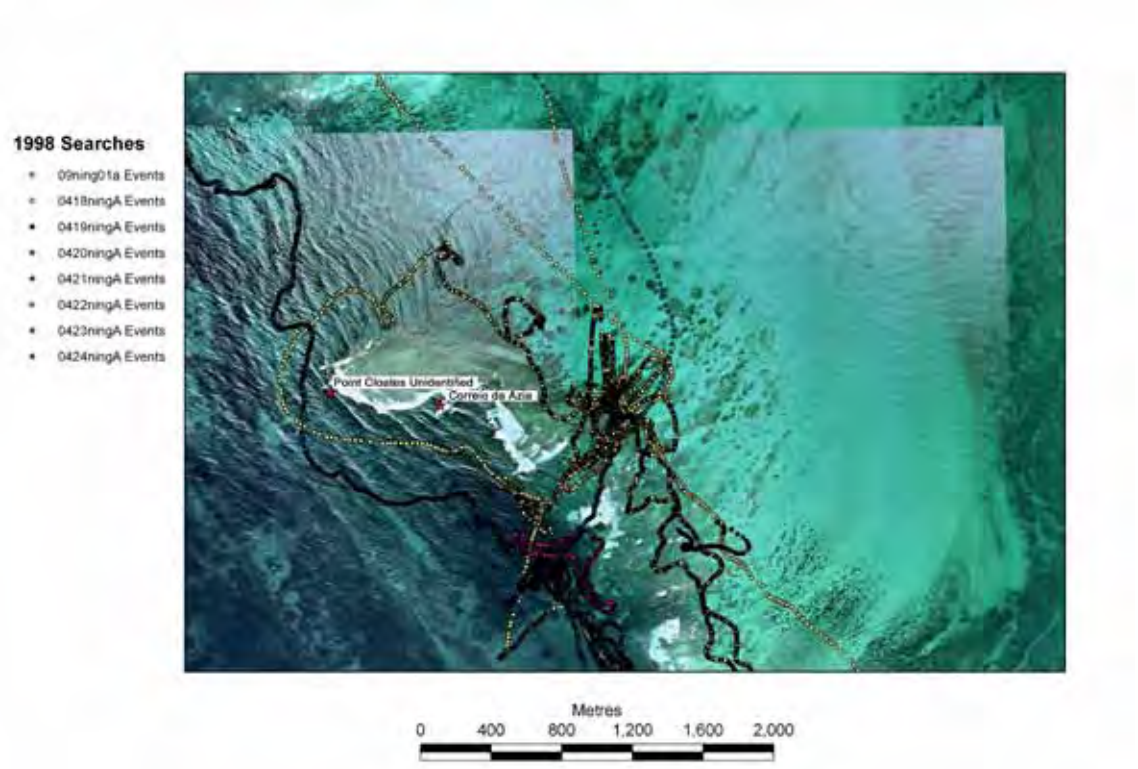


Figure 93. Aerial photograph showing two new sites with the track of the 1997 and 1998 searches (Jeremy Green).

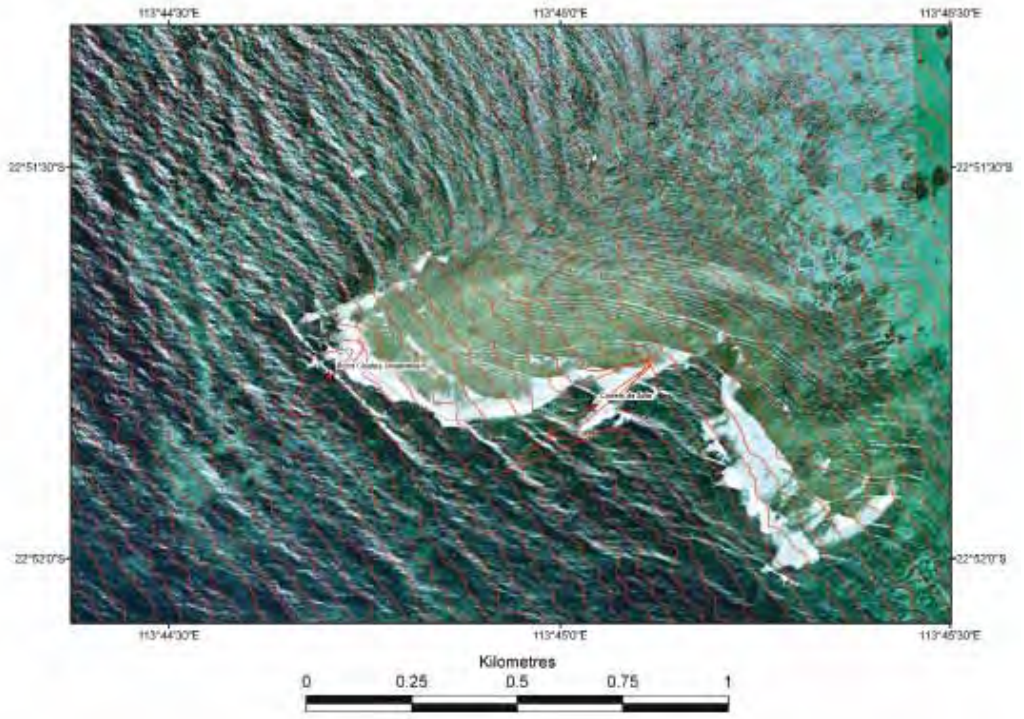


Figure 94. A detail of the magnetic trace showing two large anomalies, the one on the left is the unidentified late 19th century site, the one on the right was identified as the *Correio da Azia*, note small anomaly to the north, possibly iron debris from one of the sites (Jeremy Green).

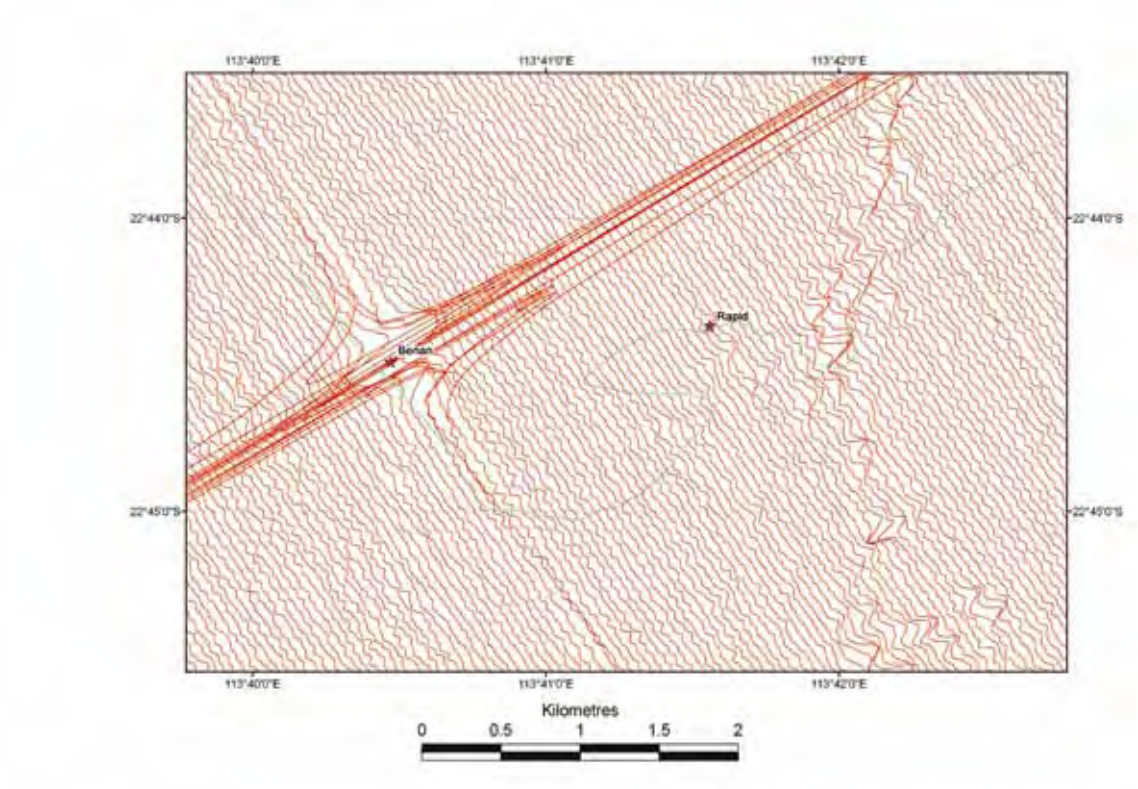


Figure 95. The magnetic signature of the 1 400-ton iron ship *Benan* showing the very large signal compared to that of the *Rapid* (centre) a wooden ship with only iron anchors (Jeremy Green).

Australian documentary film company, to suggest a series of projects that might be the subject of a proposed documentary series entitled *The Shipwreck Detectives*. One of the proposals that was adopted by Prospero was a search for the *Correio da Azia*. Discussions were held to examine the options for a new approach to the search. In 2001, as part of *The Shipwreck Detectives* series, Prospero and the Department of Maritime Archaeology had carried out a successful survey of the Deepwater Graveyard, off Rottnest, using an aerial magnetometer. This survey had located a number of iron shipwrecks in depths ranging from 80–100 m of water. It was thought that a similar aerial magnetic survey might locate a wooden shipwreck in shallow water, since the vessel would have several iron anchors and possibly other iron material. In 2003 the Department and Prospero approached Fugro Air Borne Services to fly an aerial magnetometer survey over the Ningaloo Reef area. In 2004 Fugro flew the magnetic survey and while identifying a number of known sites, including the *Stefano*, the survey revealed two magnetic anomalies close together that suggested the *Correio da Azia* had been found (Figure 91 and Figure 92). On the 28 April 2004, the two magnetic targets were inspected (it took 15 minutes to find each of the sites) and were found to be two separate wreck sites. One had coins dating no later than 1816, confirming it was the *Correio da Azia*. The other site is a still unidentified site dating from the third quarter of the 19th century (Figure 94).

The magnetic survey was interesting because it showed a number of other anomalies, some of which were known sites, others were uncertain. The most obvious anomaly was that

Figure 96. Photomosaic of the *Correio da Azia* site (Patrick Baker).

of the *Benan* (see page 162), a 1 400-ton vessel wrecked on Point Cloates in December 1888 (Figure 95 and page 162). The anomaly was extremely large indicating the ease with which such a vessel could be detected using this system. Further to the north, at the northern extremity of the survey area, was the 499-ton steamship *Perth* (see page 180), lost in September 1887. Interestingly, the wooden wreck of the *Rapid* (page 142), lost in 1811, only just showed up on the survey at the edge of what appears to be an area of geomagnetic disturbance (Figure 95). This disturbance is a geologically old, possibly Pleistocene, river bed or beach. The *Rapid* shows up as a very small anomaly due to the iron anchors still on the site. It is doubtful if the site of the *Rapid* could have been identified had it not been known. Fortunately, further to the south, this geomagnetic disturbance dies out and the *Stefano*, *Correio da Azia* and the unidentified site show up quite clearly. The *Stefano* has two very large anchors together with a quantity of chain which provides enough ferrous material to produce a reasonably strong signal. Similarly the unidentified site has several large anchors providing a similar sort of response. The *Correio da Azia* had iron ballast and two small guns and an anchor. Two very small anomalies, one to the south and one two the north of the *Correio da Azia* site were thought to be associated with wreck. In particular, the magnetic anomaly to the south (page 91 lower left) was thought to correspond to the anchor which the vessel dropped when it attempted to wear around when faced with the reef ahead. Thus de Freitas:

> …it was denoted from the top deck by the Ensign [unclear], Jose Antonio Pinto, to the counter master Pedro Fransisco a turbulence off the starboard of the prow, without the lookouts that had been designated by the Commander, having taken notice of it, and the adj. Commander ordering the hauling up of the *balina* [sail] all the wind it would give, it being [the wind] at the same time W, and determining at the same time to place the anchor immediately since it continued with its flukes overboard and a cable of 20 lengths extended from stem to bow, and seeing the said turbulence to continue off the prow and just about to come about to the side [unclear], the ship hit twice continuing however always to make some way without hitting, and wanting to turn the ship aside and starting again to make way, making the due maneuvers as also setting out [unclear] the prow sails, felicitously denoting [unclear perhaps clear water] to starboard and beginning even to make some way without there being seen any rough water off the prow, it hit and at the second [hit] its rudder failed and immediately crossed in the sea and turned on its port side and filled with water…

However, both a visual search and later sea-borne magnetometer survey failed to find anything, so it is likely that this target is a spurious anomaly. A search for the northern magnetic anomaly was more difficult because it was in an area of very shallow coral and therefore it has, so far, not been possible to conduct a thorough search.

The wreck site

The *Correio da Azia* site lies in water ranging from 1.5–2.0 m near the reef to approximately 2.5–3.0 m further out. The seabed is covered in coral growth and is made up of reef platforms and bommies, separated by gutters that run perpendicular to the reef. Swell and waves are the major factors that influence the site and limit diving operations. The site (Figure 104) is relatively small, with a large anchor in the centre, three small iron guns and some other ship's fittings. In the gutter area to the west of the site, a large conglomerate of silver coins was found,

Figure 97. A real of eight dated 1816 from the wreck site (Patrick Baker).

this was recovered intact in one piece and was subsequently dealt with by the Department of Materials Conservation in Fremantle. In addition a sounding lead and a rudder gudgeon were recovered from the site. Large quantities of iron ingots, presumably ballast, were also noted on the site (Figure 98 and Figure 100). While there is no absolute evidence to confirm the identity of the site, the overwhelming indication is that it is the *Correio da Azia.*

What is curious is that there is no evidence of the anchor deployed during the attempt to wear the ship around. It is possible that further investigations of the magnetic anomalies will resolve this issue.

Coins from the *Correio da Azia*

Walter Bloom

A total of 893 coins from the *Correio da Azia* have been entered on the Western Australian Museum numismatic database. These are mostly Spanish American or Spanish pillar dollars of Carlos III, Carlos IV and Fernando VII, but there are a few of the equivalent denominations 20 and 8 reales of Joseph Napoleon, when Spain had a puppet king with Fernando VII in exile. All of these crown-sized coins were minted in silver, the preferred currency of the Far East (in particular, China). There is also a single United Netherlands half rijksdaalder dated 1620, the only non-Spanish coin recovered to date.

The dates range from 1773 through to 1816, the year the *Correio da Azia* sank. The majority of the coins are in the middle range grades Very Good to Fine with a dozen or so in the nicer grade of Very Fine. While most of the coins are from Spanish America there are 120 from mainland Spain. This mix is dictated by the substantial minting that took place in Mexico and South America, and reflects the circulation-mix of these pieces in Europe.

There are just three pieces positively identified with the date 1816 (Figure 97) and two of these are from Madrid, whereas the third is unknown. It would be unlikely that a coin minted in Spanish America with the date 1816 would find its way to Europe and then to Western

Figure 98. Photomosaic of the *Correio da Azia* site showing the iron ballast (Patrick Baker).

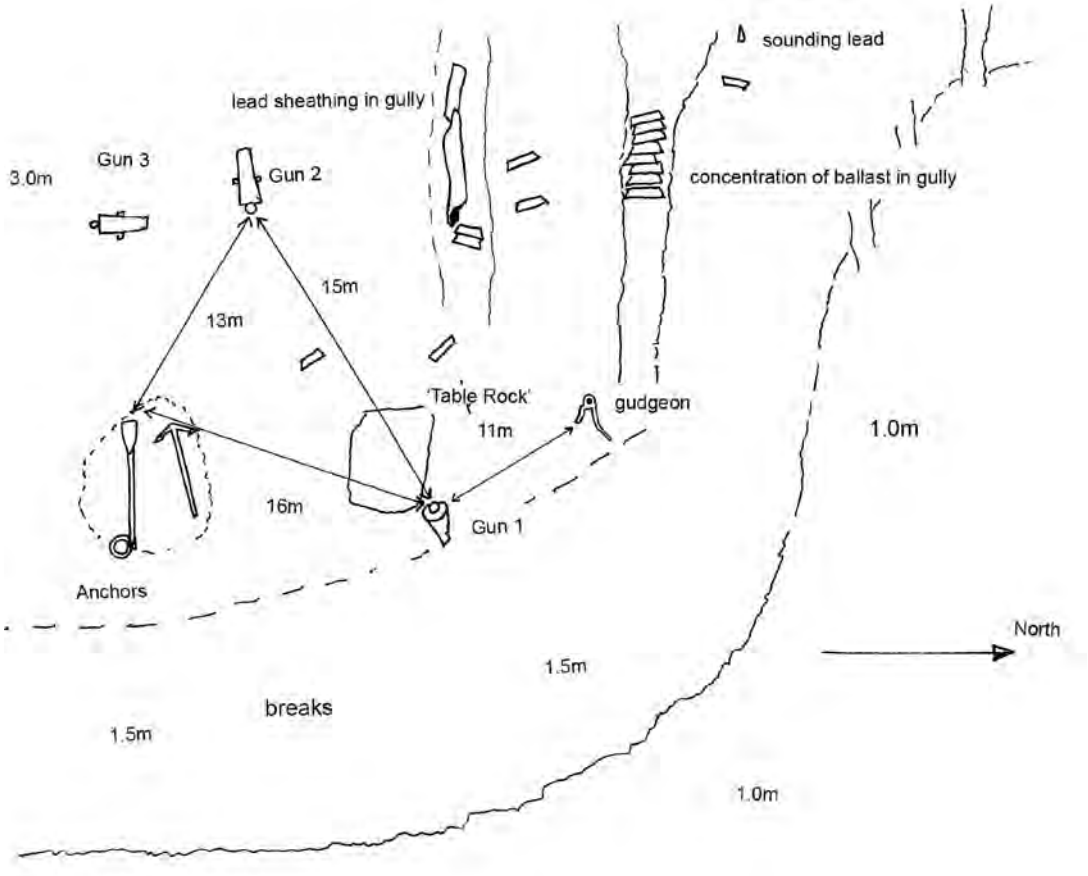


Figure 99. Sketch plan of the *Correio da Azia* site (Ross Anderson).

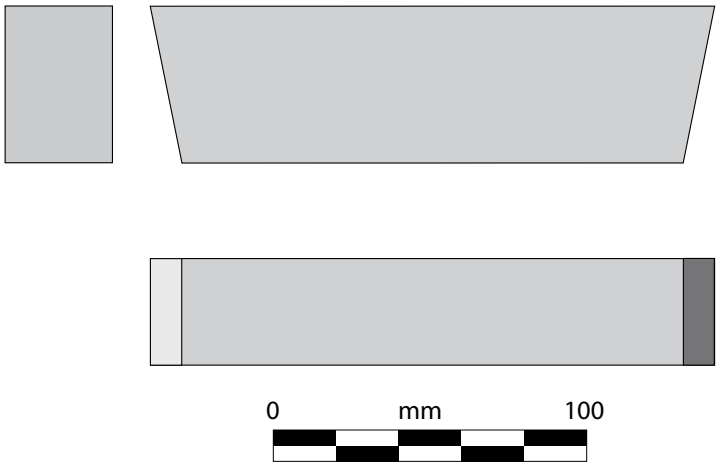


Figure 100. Drawing of one of the iron ingots (Jeremy Green).

Figure 101. The *Correio da Azia* coin lump prior to conservation extraction of the coins (Patrick Baker).

Figure 102. The *Correio da Azia* coins in lump prior to extraction, note coins appear in stacks, suggesting they were originally in rolls (Patrick Baker).

Figure 103. Silver coins located in the gully of the wreck site (Jon Carpenter).

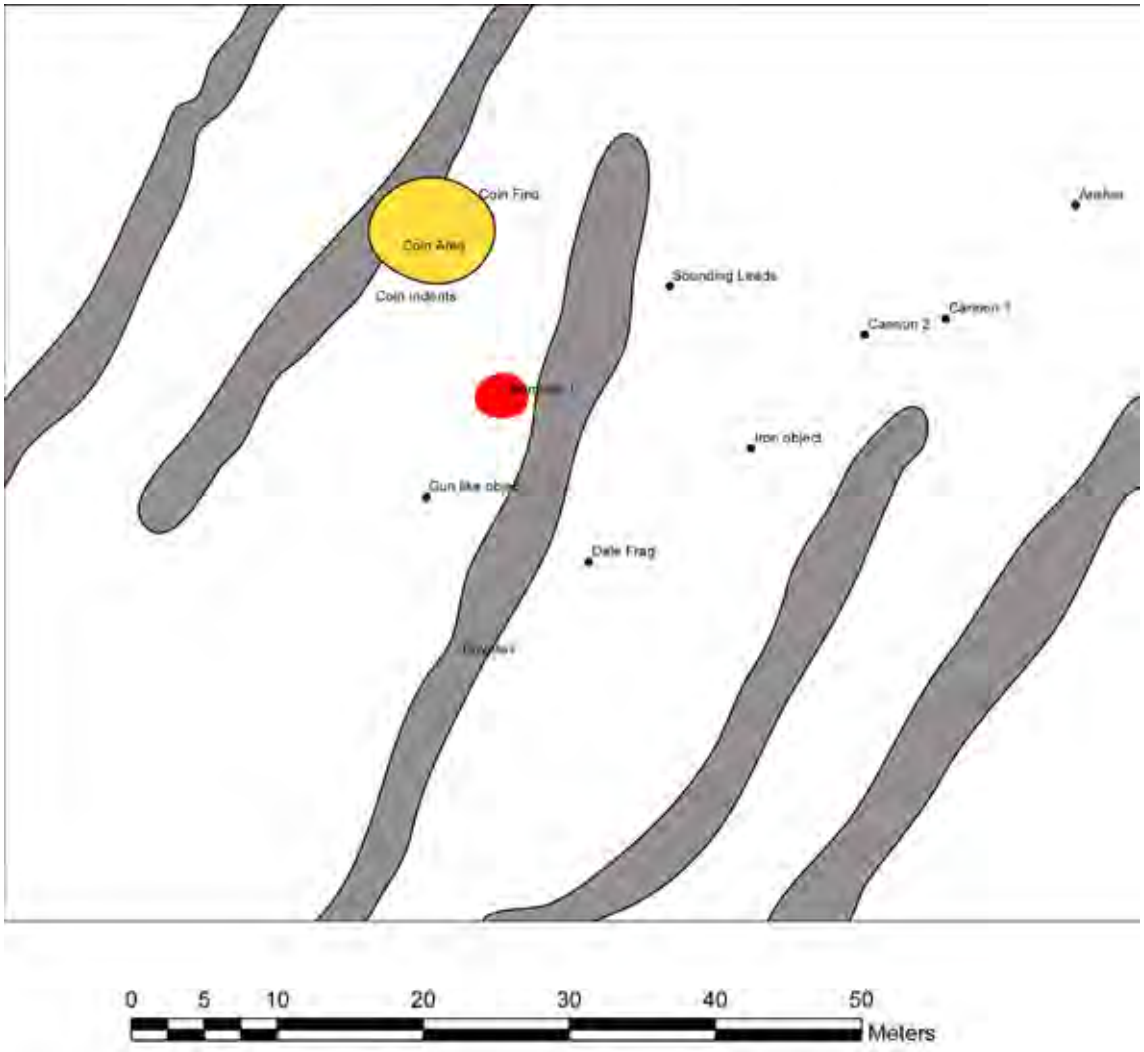


Figure 104. Plan of the gully or gutter areas (grey) showing location of coins and major artefacts (Ross Anderson, Jeremy Green).

Australia in the same year.

Ningaloo Reef Unidentified shipwreck

Ross Anderson

In 2003 Fugro Survey conducted an aerial magnetometer search for the shipwreck *Correio da Azia* (1816) that located four magnetic anomalies on the outer edge of Ningaloo Reef (Figure 94), approximately 8 nautical miles south of Point Cloates. On 28 April and 1 May 2004 the Department of Maritime Archaeology investigated the anomalies and located two shipwreck sites, one of which was immediately identified as the Portuguese dispatch vessel *Correio da Azia* (1816). The other site was identified as a mid-19th century timber shipwreck, and in the absence of any historical documentation was named the 'Ningaloo Reef Unidentified' (NRU) site.

The NRU site consists of a windlass, two large iron-stocked anchors (one with the stock broken), one stockless anchor, a small iron-stocked anchor, iron knees, copper alloy rudder fittings (pintles and gudgeons), copper alloy sheathing, an un-inscribed ship's bell, a glass decanter stopper, copper alloy spigot and an abraded white ceramic plate fragment.

The site lies between 2 and 6 m depth on the exposed edge of a limestone reef platform sloping gradually shallower inshore, with deeper gullies oriented approximately south-west–north-east. The reef is usually subject to breaking waves, with consistent heavy surge even in small swells. It is notable that two anchors are located near an outcrop of rocks on the outer edge of the reef, while the windlass is close inshore on shallow reef next to another outcrop of rock. It therefore appears that the ship was wedged upon the reef bow first between these protruding rock outcrops and subsequently broke up, with the wooden hull and sheathing being ground into the reef and gullies. Portable artefacts have only survived if they were trapped in rock holes and gullies. The consistent powerful swell on this outer reef would have broken a wooden ship up quickly, and dispersed any wreckage and artefacts widely.

Further fieldwork was conducted in May 2008 and May 2009 that resulted in a more detailed site plan, and recovered further artefacts, but, as yet, nothing conclusive to provide an identity or indication of its country of origin.

Artefacts and identification

There are no markings visible on the broken and eroded bell to assist in the identification of the NRU wreck. The bell has three raised decorative lines encircling the base (near the mouth). Approximately 35% of the mid-section (where a name and date might be expected to have been engraved, if any) is missing, as is the entire top of the bell.

The anchors have a curved crown that are consistent with a post-1820s date (Curryer, 1999). Dimensions of the anchors were recorded *in situ* and are provided in Table 2.

Table 2. Anchors from NRU shipwreck.

Feature ID and description	Length shank (m)	Length stock (m)	Width between palms-pee (m)	Orientation of shank

Figure 105. The NRU wreck bell *in situ* on the site (Patrick Baker).

A. Lying flat, no stock with ring	2.98	n/a	1.65	330º
B. Lying flat, iron folding stock in stowed position	1.53	1.82	1.02	Not recorded, 210º approx.
C. Large anchor, folding iron stock in stowed position and ring	2.65	2.65	2.0	160º
F. Large anchor, iron stock, ring and shackle	2.85	2.83	1.80	230º

A large timber and iron composite windlass is missing all timber structure with only the heavy iron axle, pawl and capstan remaining. The axle is 4.23 m long. The size and type of the windlass is consistent with remains of a large mid-19th century ship.

The rudder gudgeon inner arm width provides an indication of the vessel's tonnage by providing the stern-post width. Pintle and gudgeon hole diameters and arm lengths do not necessarily correlate with tonnage, due to factors such as use-wear and differing locations on the stern-post. The inner arm width of intact gudgeon NRU32 is 320–355 mm (12 13/16 in – 13 7/8 in) and corresponds most closely with the measurements for a 351–450 ton ship, recommended to be 12 x 15 in (Lloyd's, 1864, Table 3E).

Seven copper alloy fastenings were recovered that were compared with Lloyd's Table 3D

(1864) for minimum fastening size requirements for a given tonnage (see Table 3).

Table 3. Measurements of fastenings recovered from NRU shipwreck.

Artefact No./ Description	Maximum diameter in inches	Lloyd's (1864) tonnage range from Table 3D (in tons)
NRU 6 Large bolt	15/16	700
NRU 8 Thin bolt	11/16 – 12/16	100–700
NRU 9 Thin bolt	9/16	50
NRU 10 Large bolt	14/16	150–700
NRU 11 Thin bolt	10/16	100–200
NRU 12 Thin bolt	10/16	300-700
NRU 15 curved bolt	1	150-500

Given that even the largest vessel has a wide range of fastenings ranging from those used in the hull such as keel and keelson bolts, frame bolts, spikes and nails down to those used to secure fittings and fixtures, the smaller fastening sizes in this sample can be ignored leading to the conclusion that the vessel is in the 300–700 ton range.

The coal sample recovered from the gudgeon (NRU32) was provided to geologist Alan Cook for analysis, who concluded that the coal was not from the UK, Germany, Australia or India. The sample best resembles the Chapudi coals from South Africa near the Zimbabwe border, and possibly Mozambique coals from the same belt with similar rank. Though these coals appear to be the best match, there is not enough information on these coal sources available to make a definitive assessment of the source (A. Cook 2008, pers. comm. to I. Godfrey, 1 July).

Two copper sheathing samples (NRU14 and NRU16) were analysed for elemental composition with their predominant elements consisting of copper and zinc in both samples with ratios of 65.9–66.7% copper and 30.4–33.2% zinc with a small percentage of lead (0.36–0.84%) (Gloyn, 2004). This can be compared with the low (0.97–0.142) zinc content of sheathing from the HMS *Sirius* (1780–1790) that is almost all copper (98.9–99.4%) (MacLeod in Stanbury, 1994: 103, appendix. 2.2) reflecting the earlier phase of British Admiralty experimentation with copper sheathing.

There was considerable experimentation with various compositions of copper alloys for ships' sheathing and fastenings during the late 18th and 19th centuries, and certain sheathing alloys were known as 'Naval brass' (62% copper, 37% zinc and 1% tin) and 'Admiralty brass' (70% copper, 29% zinc and 1% tin). Other forms are simply described as 'composition metal' or 'yellow metal' (McCarthy, 2005: 117–118).

Muntz metal was widely used for sheathing wooden vessels following its patenting by English metallurgist George Muntz (1794–1857) for that purpose in 1832. Muntz secured a fourteen-year patent for his invention, and by 1840 'Muntz' or 'Patent yellow metal' sheathing and bolts were being widely used on British-built merchant ships. The composition of Muntz metal falls within a narrow range of 60–62% copper and 40–38% zinc (McCarthy, 2005: 115–17; Staniforth, 1985: 27), and following the expiry of Muntz's patent other companies

such as P. Grenfell and Sons manufactured 'yellow metal' sheathing in a similar ratio to Muntz metal, that is 60% copper 40% zinc (McCarthy, 2005: 116–17; Stanbury, 2003: 57). By the time his patent expired in 1846 Muntz was the dominant supplier of yellow metal sheathing, though there were other suppliers and 'its use expanded to foreign and colonial built vessels by the 1840s and 1850s' (Staniforth, 1985: 27).

The NRU sheathing is not Muntz metal, but is consistent with the composition of sheathing nails analysed as being 68.5% copper and 30.6% zinc found on the wreck of the *Eglinton* (1852) (Stanbury, 2003: 58). Interestingly yellow metal sheathing recovered from the *Eglinton* was manufactured by P. Grenfell and Sons (who were once manufacturing partners with Muntz before his patent expired) and is similar to Muntz metal in composition (Stanbury, 2003: 57).

Even allowing for a phenomenon known as 'dezincification'–the loss of constituent zinc metal in copper alloy artefacts due to long-term underwater corrosion processes–the NRU sheathing is not typical of the most common sheathing alloys found on mid-late 19th-century ships, especially British-built ships. As a mixed-composition copper alloy, the NRU sheathing is unlikely to date pre-1832. Given the popularity and cost-effectiveness of Muntz metal and other similar ratio compositions being used for both sheathing and fastening wooden ships in the UK post-1840s, this may point to the vessel having been built elsewhere.

Discussion

Based on the dimensions of the anchors, windlass, copper alloy fastenings, sheathing and gudgeons the site has been identified as a mid-19th century wooden ship or barque probably between 300–500 tons, and not over 700 tons. The presence of small pieces of coal indicates the site is likely to have been involved in the coal trade (Anderson, 2005; Gainsford, 2004) though there is no evidence for the ship having touched at Newcastle, New South Wales. As Newcastle is the only coal port on the Pacific rim, the ship does not appear to have been involved in trading with the Australian colonies.

As the NRU site was discovered after the discovery and identification of a wreck site identified as the *Stefano*, a question arose as to whether the NRU site could be *Stefano* and vice versa. However, the *Stefano* is recorded as being 858 tons register, and following comparison of the wreck sites, the initial identification of *Stefano* was confirmed to be correct as it is the larger vessel.

On 2 August 2005 Indigenous elders Anne Priest and Maureen Dodd visited the Western Australian Museum—Shipwreck Galleries, and met with Michael McCarthy to discuss interpretation presented on the Point Cloates wrecks including the succour of *Stefano* survivors by Payungu people. Questions were raised about territorial borders between Aboriginal tribes in the Point Cloates area. Anne and Maureen stated that if the *Stefano* survivors had crossed the boundary into Payungu territory the survivors would have been killed and eaten, and it was in fact the Thalangi people who succoured the *Stefano* survivors (McCarthy, 2005, pers. comm.). While this information is inconsistent with north-western tribal boundaries as understood and delineated by Tindale (Department of Indigenous Affairs, 2004), it raises questions about the Point Cloates shipwrecks, and shipwreck survivors in the area particularly in light of a newspaper article from 1876 that reported an Aboriginal man from 'a North West tribe' who stated:

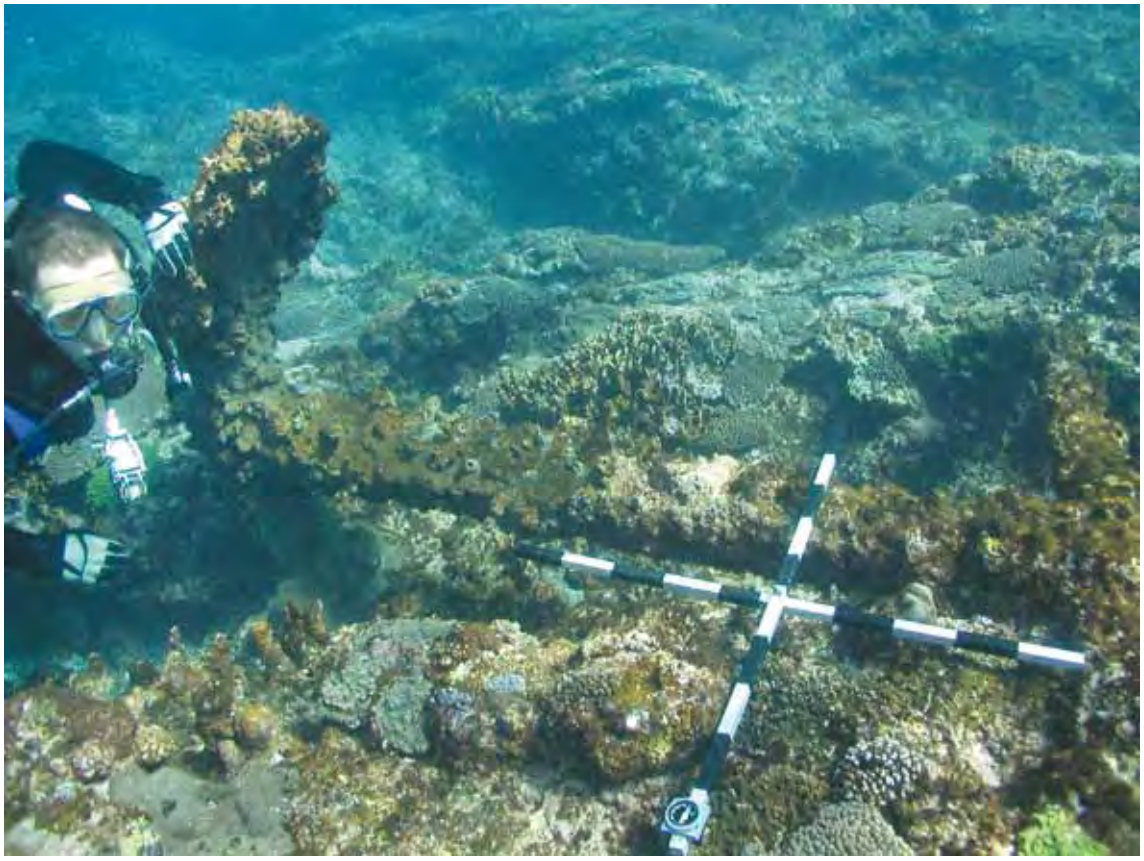


Figure 106. Stocked anchor on wreck site (Corioli Souter).

> A long time ago (about 10 years ago he described) a ship was wrecked near North West Cape; the passengers landed, at night, in the boats, and as they had no means of defending themselves the natives had no difficulty in making them prisoners. There was a large number of persons, and amongst them were some females. The natives were not 'sulky' with them, but nevertheless they killed and ate all of them, the narrator partaking of some of the flesh (*Inquirer,* 19 January 1876).

Although the 116-ton schooner *Emma* lost at Point Maud in 1867 was carrying 34 passengers and coincides with the approximate period of the report, it did not have any female passengers. An alternative explanation is that if the NRU wreck was carrying female passengers it may be related to this Indigenous account (McCarthy, 2005).

The NRU site could be one of any number of vessels that went missing carrying coal between Europe, Asia and Australia, following the Indian Ocean sailing trade routes that still used Point Cloates as a landfall. One such ship was the *Osman Pacha* (1892), a wooden barque of 509 tons built in 1878 on dimensions of 142.6 x 29.8 x 17.9 ft (43.5 x 9.1 x 5.5 m). The *Osman Pacha* was last seen off Goode Island in the Prince of Wales Channel, Torres Strait, on the 21 April 1892 after leaving Newcastle, New South Wales, with a cargo of coal for Mauritius. A lifebuoy with its name painted on it was picked up in the Indian Ocean and it was believed it must have foundered during a cyclone. Lloyd's officially posted the ship missing on 7 September 1892 (Loney, 1991: 81). It is possible the *Osman Pacha*'s course via Torres Strait took it past Point Cloates on its way

Figure 107. Windlass on the Ningaloo Reef Unidentified site (Patrick Baker).

to Mauritius. If it was wrecked along the north-west Western Australian coast it would have been a late cyclone as the cyclone season in north-west Western Australia is from the end of November until the end of April. No remarkable wind storms, gales or cyclones were reported between February and June in WA in 1892 (Bureau of Meteorology, 1929: 172) and the vessel may have been wrecked for some other reason.

Overall the NRU site remains a one of the maritime mysteries of Ningaloo Reef. Based on the lack of historical information in Australian archives, evidence of the copper sheathing composition (possibly indicating the vessel was built outside the UK) and source of coal being from eastern Africa, it appears that the NRU wreck is unlikely to have been a British-built or operated ship, and was not involved in trade with the Australian colonies at the time of its wrecking.

A parallel occurs with the *Stefano* where if the two boys had not been saved, no written records of their rescue and the *Stefano* having been wrecked on the Ningaloo Reef would have ever have come to light, and it too, would have remained 'unknown'.

Conservation report

Jon Carpenter and Vicki Richards

Date of Inspection: 9 May 2009

Corrosion data was recorded from three anchors and a windlass (Figure 106 and Figure 107). A fourth anchor was found during the survey but no data was recorded from it due to time constraints. Corrosion data recordings were carried out using standard methods

and equipment. A copious quantity of gas was released from the single access hole drilled in the concretion encapsulating each object. The pH varied initially around 7.00 but settled and held around pH 6.00 (pH ranged between 6.02 to 6.66 for the four objects). Corrosion potential readings (E_{corr}) ranged between –0.301 to –0.328 V. The presence of a strong underwater surge required the diver recording corrosion data to wedge in and wrap an arm or leg around something in order to maintain position and to avoid damage to the probes being used. The data recording sequence was as follows: drill the probe access hole; record pH and then E_{corr} voltage; measure depth of drilled hole; record water depth to drilled hole and record water temperature (ranged between 26.5 to 27.2° C). Finally each of the drilled holes was plugged with epoxy putty.

General observations of the site and associated artefacts are described in the On-Site Conservation Survey Data Sheet. The physico-chemical measurements of the sea water and the corrosion parameters of major ferrous elements are outlined below.

Environmental Conditions

On the day of the survey (9 May 2009), the weather was fine with a light south-easterly wind in the morning tending south-westerly by early afternoon. The sea conditions were calm with a long period, low swell. There was a moderate current, flowing in a westerly direction over the site. The underwater visibility was approximately 20 m with very little suspended material in the water column. The pH of the sea water was 8.20 at 4 m. The temperature, salinity and dissolved oxygen concentration of the water column are shown in Table 4.

Table 4. Salinity, dissolved oxygen content and temperature of the sea water measured between the *Correio da Azia* and the NRU wreck sites.

Water Depth (m)[1]	Salinity (ppK)	Dissolved Oxygen [ppm(S)]	Temperature (° C)
0.0	35.6	5.68	27.2
0.5	35.8	5.72	27.1
1.0	35.8	5.78	27.0
1.5	36.0	5.85	26.9
2.0	36.1	5.89	26.8
2.5	36.1	5.91	26.8
3.0	36.1	5.86	26.7
3.5	36.1	5.97	26.7
4.0	36.2	5.86	26.7
4.5	36.2	5.96	26.6
5.0	36.3	5.85	26.7
5.5	36.2	5.99	26.6
6.0	36.2	6.08	26.5
6.5	36.2	6.11	26.5
7.0	36.3	6.02	26.5
Average	36.1 ± 0.2	5.90 ± 0.12	26.8 ± 0.2

[1] The total depth of the sea water column measured was 7.0 m, however it should be noted that the electrodes were not totally vertical due to the strong current flow in the immediate area.

There was no significant change in salinity and temperature with increasing water depth, which is typical of the hydrology of well mixed near coastal waters. The average water temperature was 26.8 ± 0.2° C and the average salinity of the water column was 36.1 ± 0.2 ppK. The usual salinity range for the open ocean is 32–36 ppK and the sea water near this site falls within this expected range. The average dissolved oxygen concentration of the sea water was 5.90 ± 0.12 ppm (74% saturation at 27° C), however there appeared to be an increase in dissolved oxygen content with increasing water depth (Figure 110).

For open ocean environments, there is usually a surface maximum in the dissolved oxygen concentration. This maximum is a direct result of absorption from the atmosphere interface, increased water movement and photosynthetic activity by plants and cyanobacteria. Then, typically, the dissolved oxygen concentration of the water column tends to decrease with increasing water depth. Factors contributing to this trend are decreasing water movement, which leads to less oxygen exchange with the atmosphere, decreasing photosynthetic activity due to less light penetration and increasing aerobic respiration of plankton in the photosynthetic zone. Therefore, the general increase in dissolved oxygen content as water depth increased on this site is highly unusual. In retrospect this anomaly was caused by electrode failure due to the presence of air trapped in the electrolyte chamber. Despite this problem, the physico-chemical data indicate a well mixed, open circulation, oxidising marine environment.

Corrosion Measurements

The corrosion parameters of some major ferrous elements on the NRU site were measured and the results are presented in Table 5. The on-site positions of the measured features are shown in Figure 108. The average water temperature on the site during the survey period was 26.8 ± 0.2° C and significant quantities of gas were released on drilling all iron features.

Table 5. Corrosion parameter measurements of some exposed ferrous features on the NRU site.

Description	pH	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)	Depth of concretion (mm)	Depth of corrosion (mm)	Water Depth (m)
Windlass (H)	6.39	–0.306	22	nd	nd	2.8
Anchor (A)	6.03	–0.301	42	nd	nd	3.8
Anchor (C)	6.66	–0.311	36	nd	nd	4.0
Anchor (F)	6.02	–0.328	16	nd	nd	3.4
nd – not discernible						

The iron structural features exposed to this oxidising marine environment were covered with thick aerobic concretions, heavily encrusted with secondary marine growth. Iron is not biologically toxic and increases the growth rate of encrusting organisms. The concretion acts as a semi-permeable layer on the surface of the iron, effectively separating the anodic and cathodic sites and produces an acidic, iron and chloride rich micro-environment at the residual iron surface. By plotting the measured voltages and the corresponding surface pHs of the residual metal on the Pourbaix diagram for iron at 10^{-6} molar in aerobic sea water at 25° C, the thermodynamic stable state of the iron

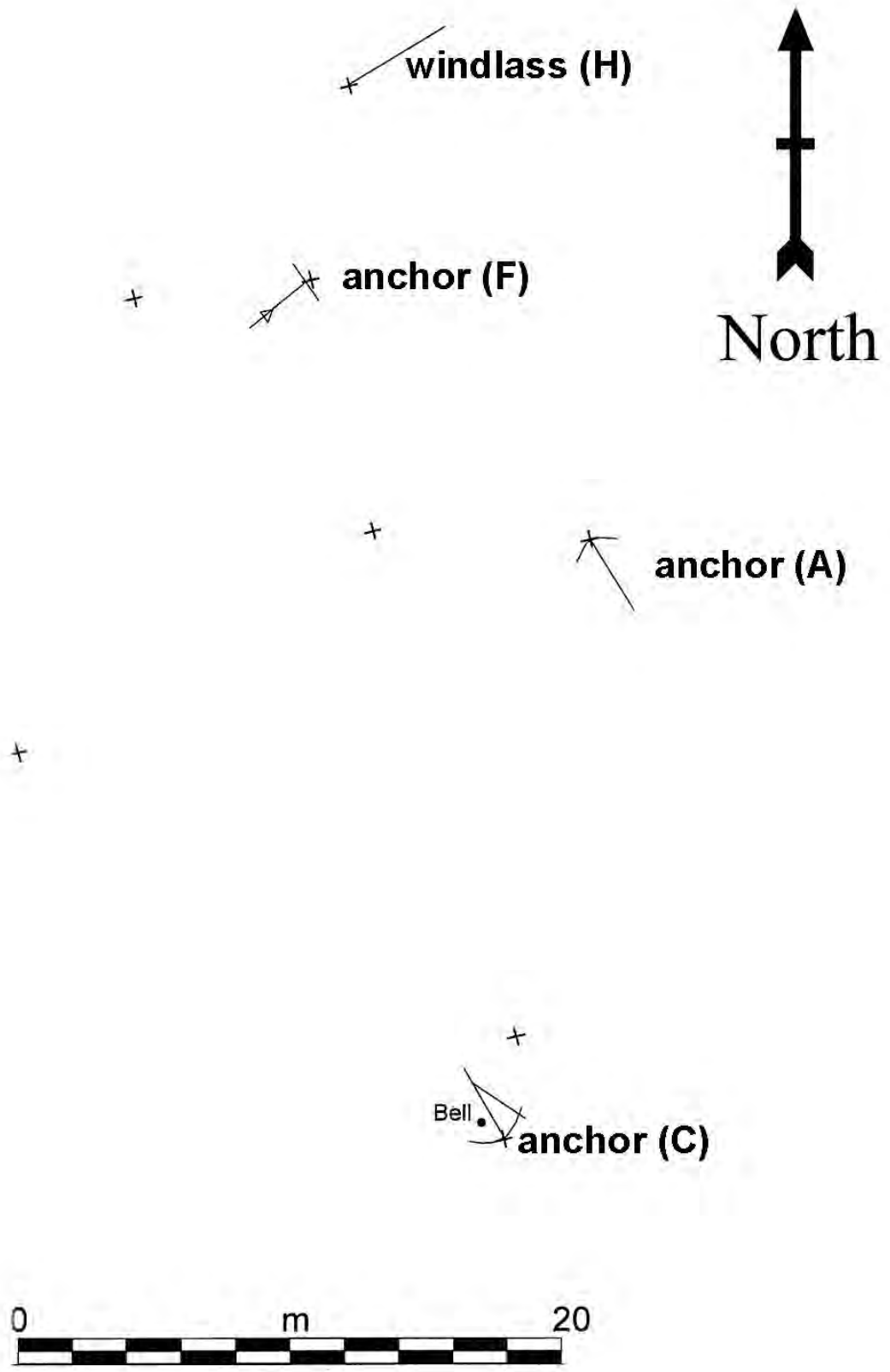


Figure 108. Plan of the Ningaloo Reef Unidentified site indicating the positions of the measured ferrous elements (Richards 2011 after Gainsford 2004).

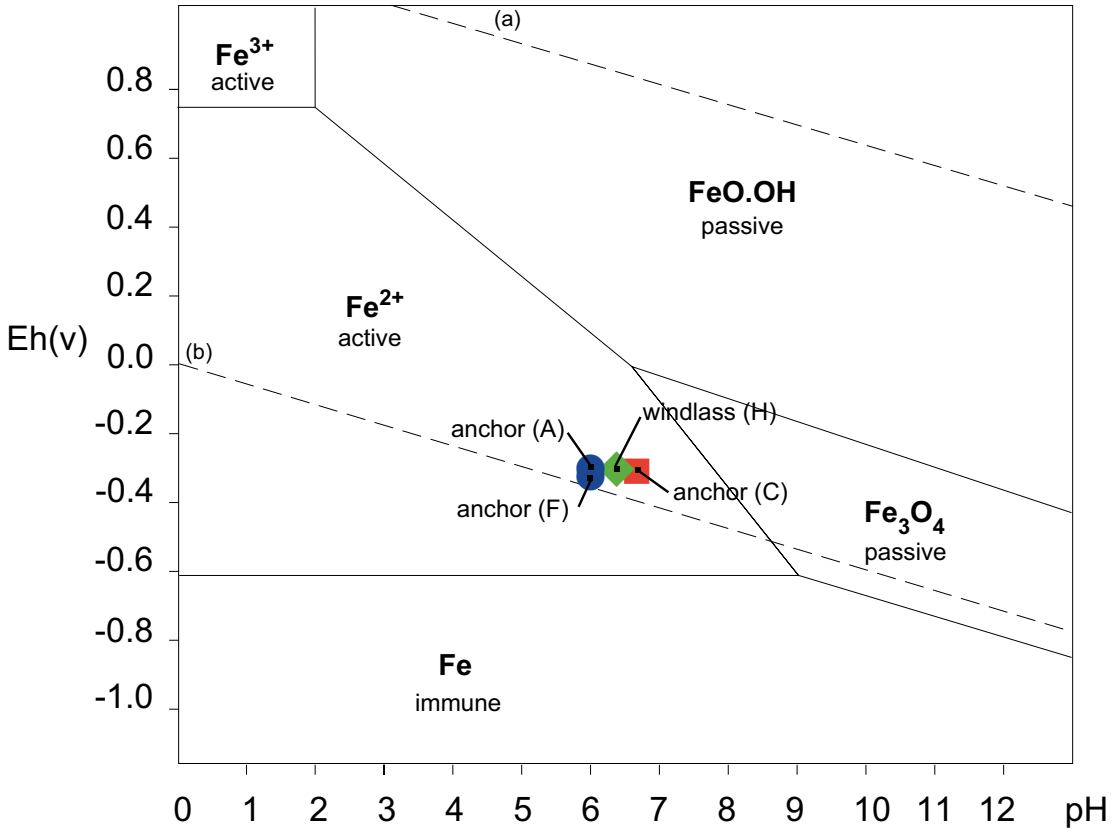


Figure 109. The Pourbaix diagram for iron (10^{-6} molar) in aerobic sea water at 25° C indicating the intercepts of the ferrous metal artefacts measured on the NRU site (Vicki Richards).

can be easily ascertained (Figure 109).

From this Pourbaix diagram, it is readily apparent that these iron artefacts are actively corroding, which is not surprising based on the environmental data. It should be noted that Pourbaix diagrams are thermodynamic stability maps and therefore, do not provide kinetic information with regards to corrosion rates. However, the average corrosion potential of the four artefacts was –0.312 ± 0.012 V. This 12 mV standard deviation is comparatively small and within experimental error for the equipment and measuring procedure suggesting that the corrosion mechanism is similar for these four iron features and that they are possibly corroding at similar rates. The total depths of concretion plus corrosion were quite large, ranging from 16–42 mm with an average total depth of 29 ± 12 mm but it was extremely difficult to ascertain the depth where the concretion layer ceased and the corroded metal surface began. Hence, the actual depth of corrosion could not be ascertained, which can be used to estimate corrosion rates. So based on the environmental and the corrosion parameter measurements, the windlass and the three anchors are actively corroding in this well-mixed, open circulation, oxidising marine environment but their rates of corrosion cannot be estimated.

On-Site Conservation Survey Data Sheet

Date of Survey: 9 May 2009.

Time of Survey: 10 am–3 pm.
Water Temperature: 27.2° C at surface, 26.5° C at 7 m.
Salinity/Conductivity: See data recorded between *Correio da Azia* and NRU site.
Dissolved Oxygen Content: See data recorded between *Correio da Azia* and NRU site.
pH Sea water: 8.2 at 4 m measured on the NRU site.
Water Depth: 0 m (reef top); 4 m maximum (anchor C) .
Visibility: Approximately 20 m (very little suspended material).
General Sediment Composition: Coarse coral sand.
Mobility of Sediment Surface: Sand accumulated (banks up) towards reef in gullies.
Seabed Topography: Coralline reef gradually inclined to seaward, cut with seaward running gullies and higher reef structures. The reef is very jagged and barnacle encrusted on higher formations and structures including the iron anchors. Coarse coral sand and fragments have collected in some gullies. Further out to sea the reef retains some higher structure due to increasing water depth. At the bottom of these drop offs, finer sands and sediments exist.
Marine Macrofauna and Flora: Coralline algae on the reef platform with small coral forms, large barnacles, algal mats, seaweeds (not abundant coverage), snake head cowries and small surf tolerant gastropods. The dominant fish species are parrot species, some angel and surgeon fish species and the occasional shark.
Wreck Specific Types of Marine Life: Principally algae mat type covering with barnacles on iron objects but not necessarily specific to wreck material. Copper alloy artefacts have some living marine encrustation in crevices (e.g. folded sheathing) but objects are mostly clean and worn due to sand abrasion. Some fragments of ceramic and glass have coralline algae encrustation. Lead mostly encrusted but lead surfaces are exposed in places where sand abrasion has occurred.
Composition of Dominant Wreck Material: Dominant material is wrought and cast iron. Secondly, copper alloys (bronze/brass), some lead with limited ceramic and glass fragments.
Degree of Site Exposure: No actual ship structure appears to have survived (wood). Reef structures are generally dominant but large iron objects, the windlass and anchors reveal the presence of the wreck.
Evidence of Seasonal Exposure: No apparent evidence of seasonal exposure variation. Storm, cyclonic conditions and rough sea conditions at any time will move abrasive coral sands about, especially in the gullies, potentially resulting in temporary burial of smaller shipwreck material. The coarse openness of the coral sand implies aerobic conditions are very likely to persist for temporarily buried items unless they are already embedded in the reef or encapsulated in concretion.
Evidence or Potential for Storm, Cyclone Influence: The wreck's exposure to the open sea obviously indicates that it is subject to all the conditions that affect this part of the Western Australian coast. The absence of a potential cargo material, the limited number of smaller finds and dominance of larger and heavier metal objects supports this conclusion.
Evidence of Human Disturbance: To date no evidence has been found to indicate previous human activities on this site. Absence of cargo and other material is, at this stage, believed to be due to site conditions and not salvage, etc. If the vessel is eventually identified then human involvement with the site may become apparent.
Exposed Artefacts: Windlass, wrought and cast (?) iron, the more robust components remain. Four anchors (3 iron-stocked), wrought iron with cast iron fixtures, visually intact

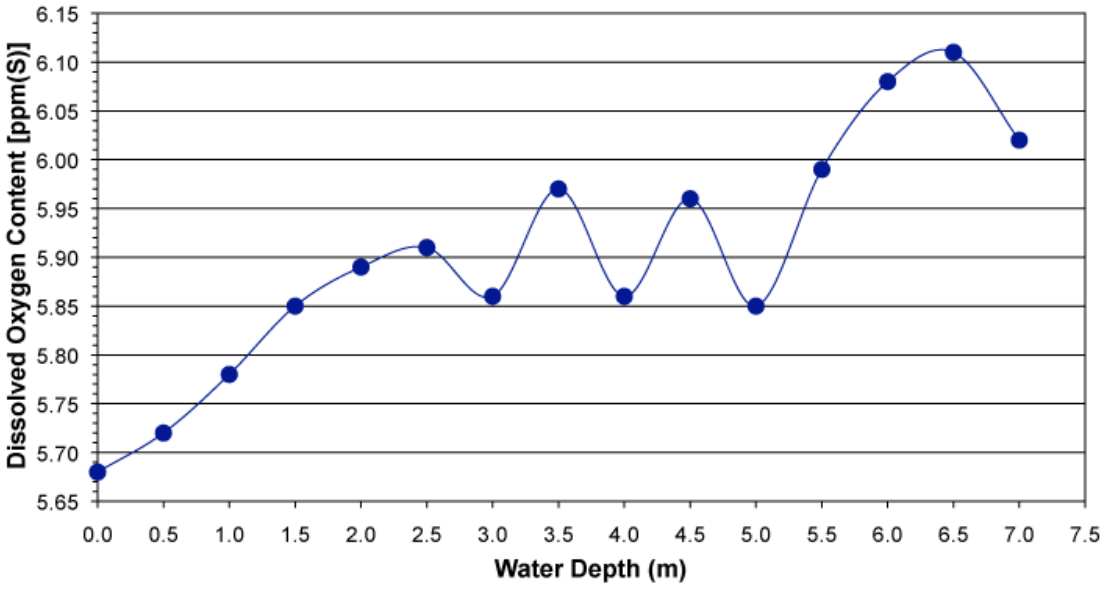


Figure 110. Change in dissolved oxygen concentration with increasing water depth measured between the *Correio da Azia* and NRU sites (Vicki Richards).

as concreted objects but depth of holes drilled to conduct corrosion survey suggests surfaces are quite extensively corroded (the exposure to dynamic sea conditions imply this would be the anticipated outcome for metal objects on this site). Distributed to seaward along the site are ships' fastenings, rudder pintles and gudgeons and miscellaneous objects. Copper alloy fastenings are very worn due to abrasion. The very few ceramic sherds observed are in good condition and not overly worn despite site conditions. Most sherds were observed closer in towards the reef top. Ceramic and glass fragments were also seen in some isolated pockets on the seaward reef of the site. Fragments include a probable decanter stopper. A single piece of crystal glass was also observed but green and 'black' glass fragments are predominant.

Corrosion Potential Metals (concretion/metal interface): See corrosion data in Table 5.

Surface pH Metals (concretion/metal interface): See corrosion data in Table 5.

Depth of Concretion and Graphitisation: See corrosion data in Table 5.

Stefano 1875

Michael McCarthy

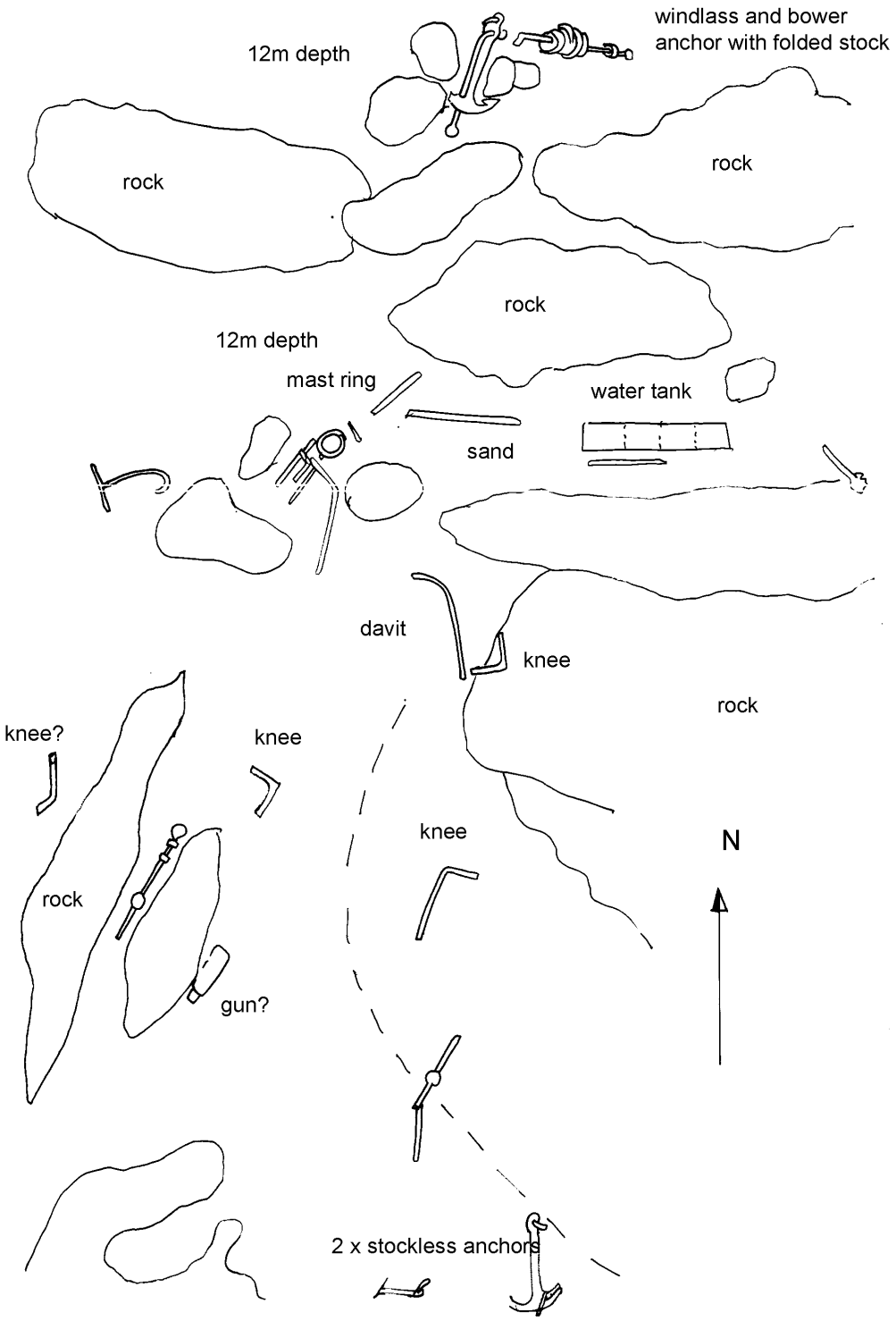


Figure 111. Sketch plan of the *Stefano* wreck site (Ross Anderson).

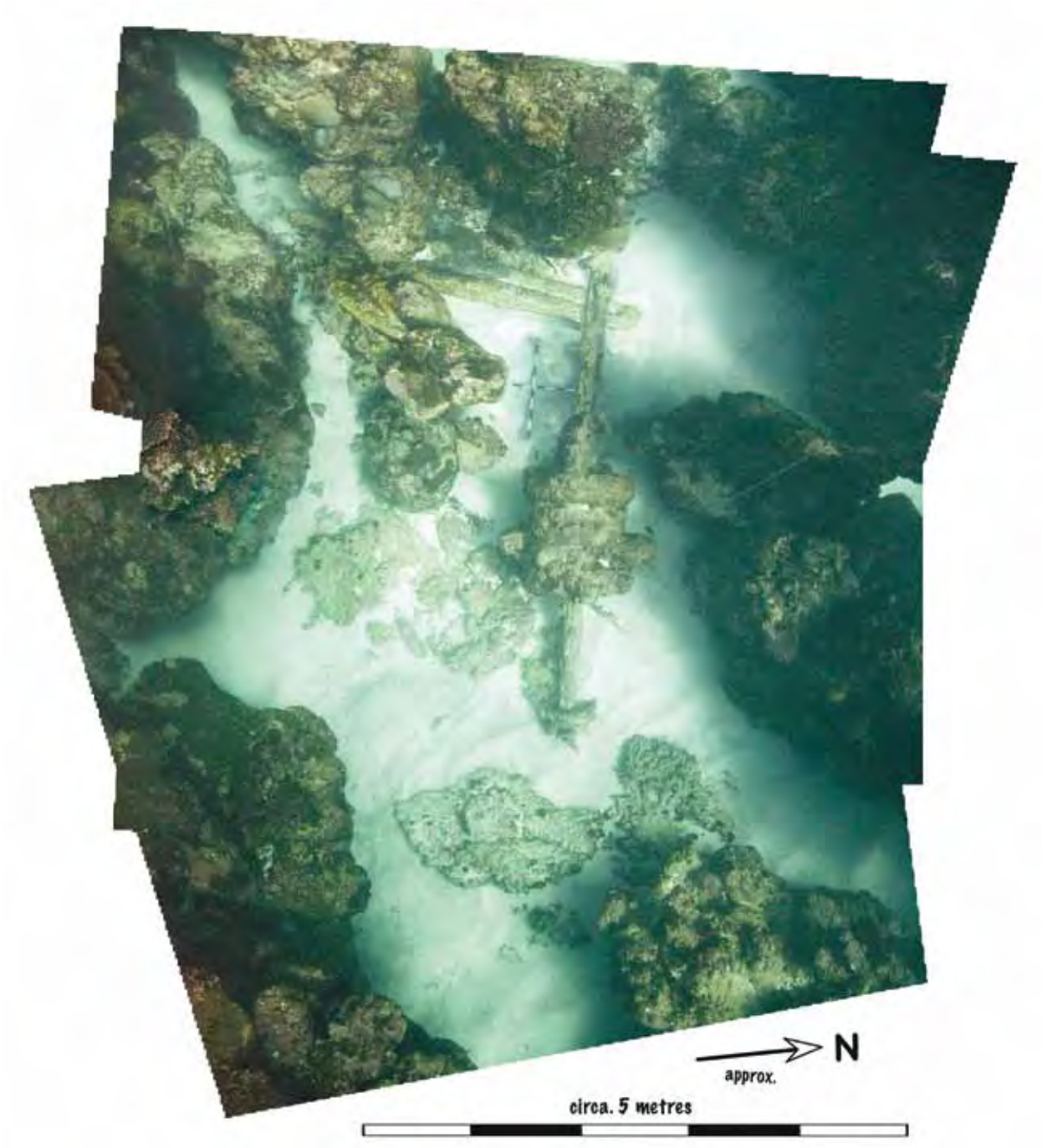


Figure 112. Photomosaic of windlass and folded stock anchor at north end of site (Patrick Baker and Jon Carpenter).

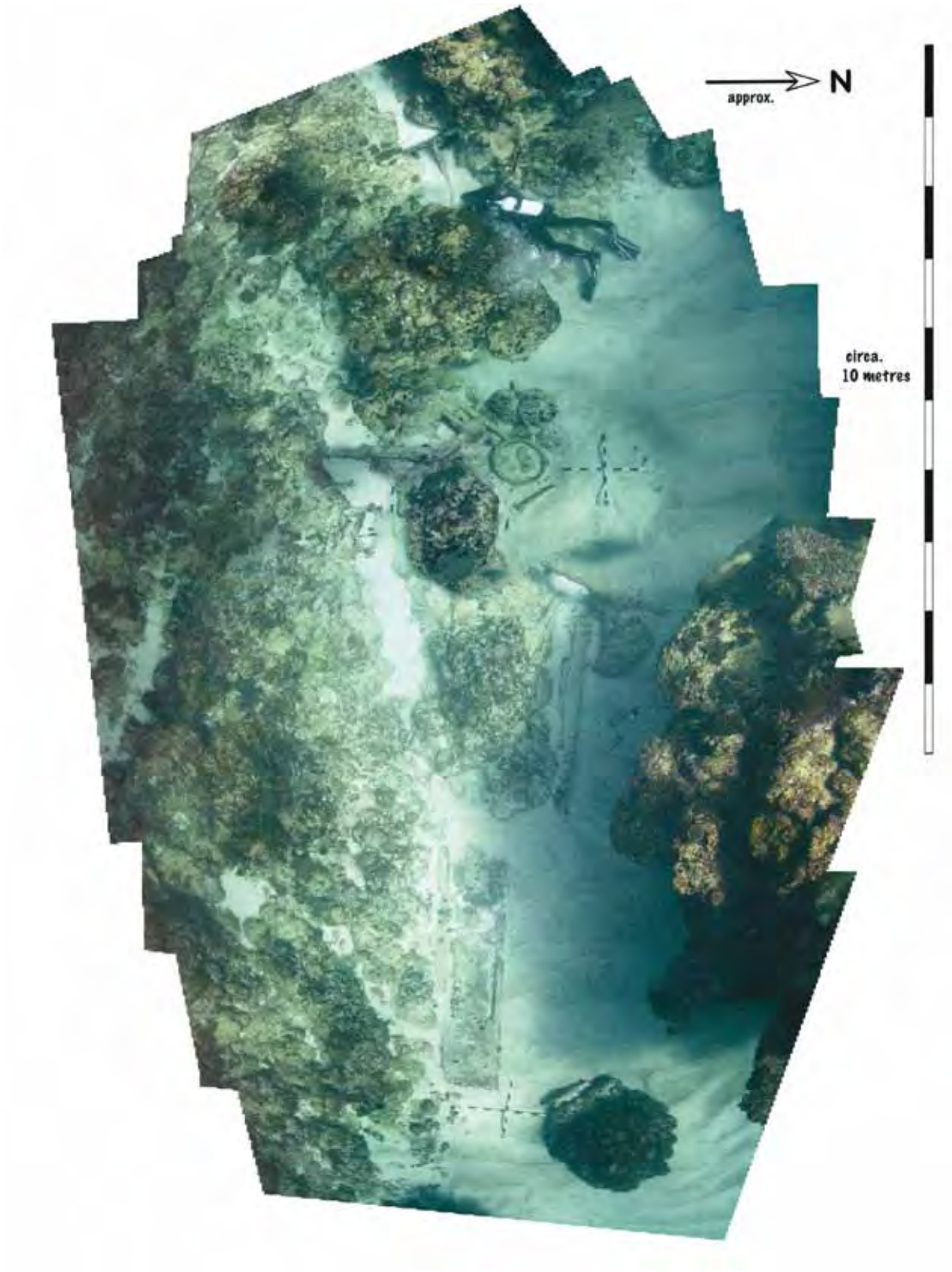


Figure 113. Photomosaic of water tank and mast ring area of site (Patrick Baker and Jon Carpenter).

Introduction

This chapter is allied to an inspection report by Ross Anderson, and to the chapter headed 'Strangers on the Ningaloo shore'—an examination of the interaction of shipwreck survivors with the indigenous people along the Ningaloo coast (see page 8). In essence this chapter examines firstly the history of the ship, its loss and the story of the survival of two of the crew. This is followed by a brief account of the sometimes complex events leading up to up to the Museum's involvement in the search; then how difficult the actual location process was; and, finally, the complex aftermath of the finding and the works produced since.

The wreck of the *Stefano*

The wooden-hulled, three-masted Austro-Hungarian barque *Stefano* (1873–1876) is one of the most significant of all the colonial-era wrecks in Western Australia.

According to listings in the *Registre Veritas* (a publication of the Paris-based shipping registration agency Bureau Veritas) the 857-ton *Stefano* was built by G. Brazzaduro at the Adriatic port of Fiume in 1873 and was owned by N. Baccich and Co. The *Stefano* had one deck and was fastened with yellow metal below the water-line and galvanized iron above. Being nearly new, and in very good condition throughout, the ship received a first class category for both hull and stores at a survey conducted in London in June 1875. There are no known images of the ship.

The *Stefano* loaded 1 300 tons of coal at Cardiff in Wales and left for Hong Kong at the end of July 1875 with 17 crew, all were from Croatia bar one, an English boy. The eldest, the master Vlaho Miloslavic, was 25 years old. It was intended to sight St Paul Island, in order to fix their longitude; however, the crew missed the sighting in thick fog. They sailed on with the intention of sighting land on the Western Australian coast in order to fix their position, before heading north for the Straits of Lombok. After sighting land near Cape Cuvier on 26 October they continued on, steering north by east. As a result, the ship headed inexorably in towards land and was wrecked at 2 am whilst sailing at an estimated 9 knots. When the ship struck it was thrown onto its starboard side, the hull was quickly breached in the heavy seas and five men were washed overboard. Seeing some flotsam drift by, another leaped in after it and disappeared. The remaining crew took to the masts. At daylight a boat was launched carrying three men including the Captain and Miho Baccich, the owner's nephew. It capsized leaving only Baccich alive and clinging desperately to its keel. As the ship continued to break up, the others also leaped into the sea grasping whatever wreckage they could find. After many hours they all slowly made it to shore, clinging to wreckage or on upturned boats, thus commencing a saga that was to become one of the greatest shipwreck survival stories for two of them—Miho Baccich, who was then 16 years old and Ivan Jurich, who was 20.

Neven Smoje, a student of Croatian shipping and settlement in early Australia, first read of the story in Jack Honniball's 1961 description of the Tuckey family of Mandurah, where Charles Tuckey's role in both the *Stefano* and the *Emma* disasters featured. Smoje commenced the first detailed study of the history of the wreck (Smoje, 1978). Using a researcher in Croatia, a contemporary account of the wreck based on Baccich and Jurich's accounts was discovered, produced by a Catholic priest Stefano Skurla. The boys' account shows that after landing just south of Point Cloates, nine survivors established a camp, collected all that looked useful amongst the flotsam from the wreck, found some provisions and barrels of water, erected a rough hut and got a fire going. On 31 October a small group of Aborigines

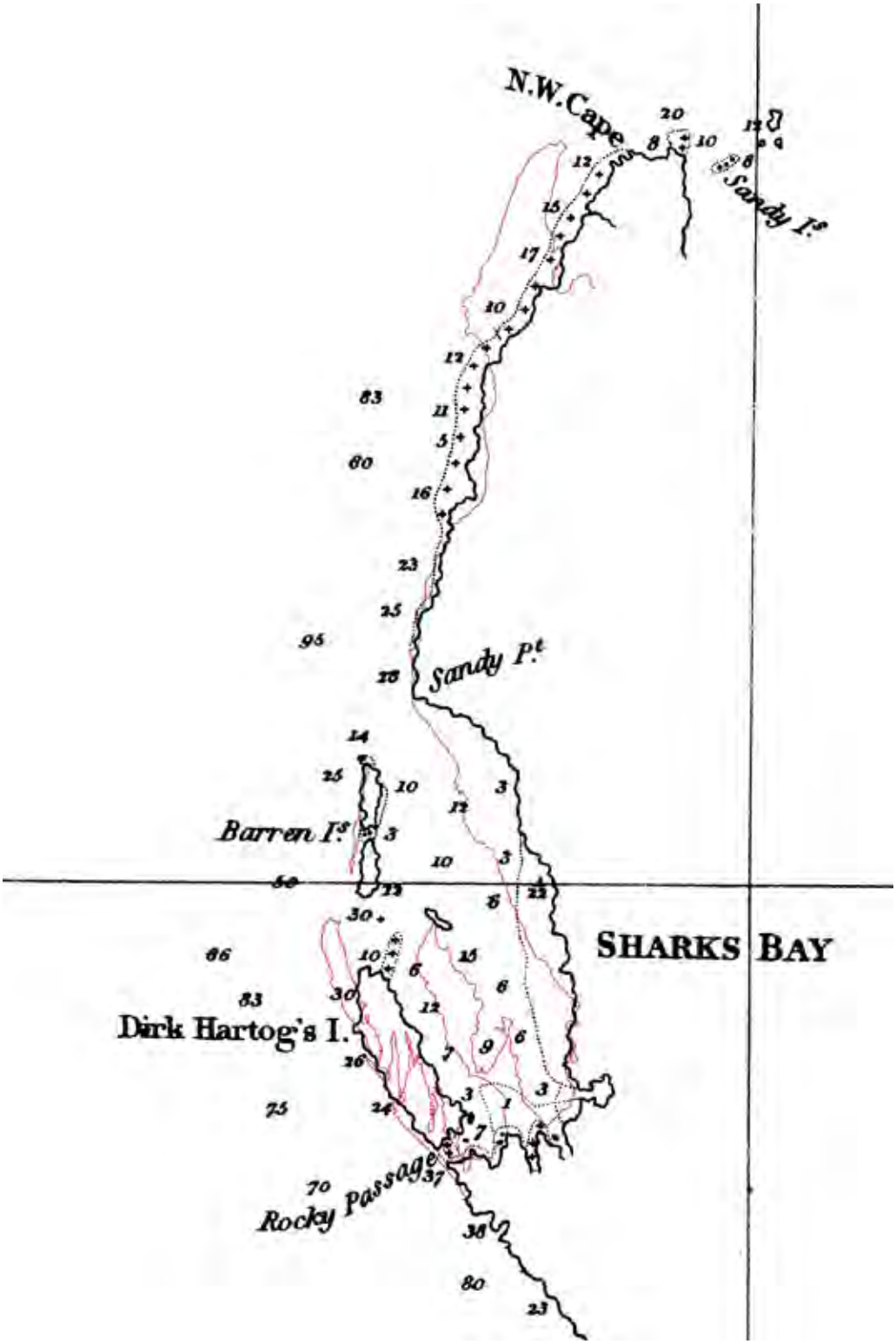


Figure 114. Old and modern charts superimposed showing the transposition of the coast in the Point Cloates region (Artwork by Annie Boyd).

walked into their camp, and though one produced a map that had washed ashore from the *Stefano,* the two groups could not understand each other. The Aborigines then left the camp and continued their walk north. The crew for their part elected to head for the Gascoyne River, an estimated 120 miles south. They made bread, gathered their food, buried what they could not carry and, after inscribing on the door of their hut the ship's name and the names of all the crew, headed south on the next day. After five or six days they passed Cape Anderson, but by then three were becoming so exhausted that they had to be left behind, as the others pressed on in the hope of reaching a water supply. At Cape Farquhar they sheltered in a large cave and were soon approached by two Aborigines who, in taking up their empty water containers, took them inland to a soak. They then took some of the survivors' flour and after lighting a fire made them some bread. In the interim the three crew, who had been left behind, had begun to follow. En-route they were approached by around 50 Aborigines. They also provided assistance, cooking fish for the sailors and taking them to their camp where another crew member who had come ashore on an upturned boat had been living. Soon the ten survivors were all reunited. They then headed on south, but on reaching Cape Cuvier, were presented with a vision of extremely desolate country and blinding reflections from the salt lakes. With very little water remaining, they turned back and arrived at their original camp after four days. On 21 December a cyclone hit the camp, causing them to become totally disoriented, exhausted and separated. Two of them died on Christmas Day. By 6 January all the others, bar Baccich and Jurich, had also died. With no hope remaining, the two survivors headed inland to find the Aborigines who had earlier assisted them. Though some apparently wanted to kill them, those wishing to assist prevailed. Nursed back to health, on occasions even carried by the women until their strength returned, for three months the boys were assimilated into the group, learning a great deal about the land, the animals, and according to Skurla, the 'customs, ceremonies and language' (Smoje, 1973: 40). The group slowly made their way north traversing the length of the North West Cape to its easternmost tip. There, on 18 April, not far from the wreck of the *Fairy Queen* (McCarthy, page 242), the boys were picked up by the pearler, Charles Tuckey, in the cutter *Jessie*. Tuckey regularly recruited his labour from amongst the Aborigines of the Cape and knowing he was pearling in the Gulf, the Aborigines escorting the survivors north had intended to give the boys to him from the outset. On sighting his sails in the distance they lit a fire to make smoke and bring him to the shore. On arrival the astounded Tuckey then took the boys on board and sailed with them down to Fremantle arriving in May.

At Fremantle, Baccich and Jurich were taken in by a countryman John Vincent, formerly Vicko Vukovich, who, according to Smoje, had anglicized his name after arriving in the colony 17 years earlier. The survival of two teenage boys and their life among the Aboriginal people completely captured the imagination of the officials and of the people in the Swan River Colony. An inquiry was held into the wreck and it was resolved that the Aborigines were to be rewarded. The boys then joined Vincent's schooner *Rosette* as crew, and a fortnight after landing in Fremantle accompanied him back north with the reward which comprised flour, sugar, tobacco, knives and mirrors. There, according to the Fremantle press, the boys were greeted with much affection by the Aborigines. They then returned south and were honoured with two benefit concerts. In August they embarked for home via Egypt. Later, Tuckey received a gold watch from the Austro-Hungarian Embassy in London.

In the interim, news of the disaster reached Roebourne, the administrative centre for

the north. R.J. Sholl, the Resident Magistrate, immediately chartered the schooner *Victoria* and sent it south under the command of Pemberton Walcott. Landing with a constable, an armed boat crew, and 'with Tony—a native guide…who had camped with the survivors of the *Stefano* immediately after their wreck', Walcott found a great deal of wreckage in the bay south of Point Cloates. This led him to conclude that

> …not less than four—probably five vessels had been wrecked within seven or eight months. The wreck of *Stefano* was pointed out by natives, and the map of survivors, where sundry articles belonging to her were found such as boards with written particulars—torn charts, stools etc. etc… (Walcott Report, Reproduced in Henderson and Henderson, 1988: 178).

While Jurich returned to his home on the Pelješac Peninsula in southern Croatia, Miho Baccich remained in Rijeka (the Croatian name for Fiume). As a result, he appears to be the chief source of the story provided to Father Skurla, who according to Smoje, was also a specialist writer on religious and architectural heritage, and had been commissioned by Baccich's parents to record the story (Smoje, 1978: 35). They also commissioned a painting showing Tuckey rowing ashore from the *Jessie* towards the assembled group. By the 'well-known Croatian maritime artist Basilije Ivankovic' (Smoje, 1978: 45), this painting still hangs in the church of Our Lady of Mercy in Dubrovnik. What follows is an account of how *Stefano* was eventually found, together with a précis of the complex series of events leading up to it, and of the equally complex aftermath.

The Ningaloo Reef and its changing features

As examined by Jeremy Green in his introduction and in his chapter on the *Correio da Azia* (page 83), Point Cloates was a place used since the early 17th century as a sighting point for ships attempting to fix their longitude. Appearing from the sea as a detached land mass—hence its earlier name 'Cloates Island'—it became, with the Zuytdorp Cliffs further south, a touchstone for mariners determining their 'eastings' or in later years needing to check their chronometers (Halls, 1975; Green, page 2). Another feature, far more visible from a distance in earlier years and central to what follows, was Black Rock, lying just south of Point Cloates and only a few kilometres offshore. While it appears today as a flat platform just above sea level, it once had a 'pinnacle of rock in the centre 8 feet high' (Hydrographic Department, 1927: 290). The pinnacle would have been plainly visible from a ship at sea and the rock itself has long-since been described as the scene of *Stefano*'s demise in a number of works (e.g. Rathe, 1990).

Black Rock, and the reefs lying just off Point Cloates, were especially hazardous, given that the Continental Shelf comes closest to the shore at Point Cloates, providing mariners with no opportunity to obtain soundings until they were too close to the reef to avoid being wrecked. It is also place where currents are reported to set unsuspecting mariners in towards the land. The many wrecks in the area can also be attributed to Flinders' and Baudin's early 19th-century charts that had it wrongly positioned. Incarcerated by the French for nearly a decade after his near circumnavigation of what he came to call Australia, Flinders finally returned home to England with his records and his nearly completed maps and charts. There he remained exhausted and in chronic ill health. As a result, he was unable to return to fill in the gaps, as he had planned, and was forced to use Tasman's 1644 approximation of this coast to complete his the first chart of the island continent. The French explorers Baudin, Hamelin and Louis de Freycinet and the Australian-born Phillip Parker King—on his three

circumnavigations of the island continent—also remained too far offshore to examine the area. As a result, charts throughout the 19th century showed a clear sea north along the coast where in fact Point Cloates and the reefs just south of it actually took a very dangerous line to the west. As a result, and with the benefit of hindsight, any course set north or east of north after sighting the high land around the tip of Dirk Hartog Island or at Cape Cuvier and Red Bluff further north, was fraught with danger (see Figure 114).

Some features, like the pinnacle once so prominent on Black Rock itself, are now known to have been toppled, most likely in the storms and cyclones that often beset the area. In an opposite circumstance, a very conspicuous white (guano) topped pinnacle lying in shallow water some miles further south appears on modern charts. It was actually thrown up by the seas, perhaps in a cyclone, to become a cause of some delays in locating *Stefano* as will be seen.

The Museum begins searching for wrecks

During the occasional break in the excavation of the American China trader *Rapid*, teams led by Graeme Henderson performed *ad hoc* tow searches of the seabed nearby for signs of the *Stefano*, looking notably for a plume of wreckage, especially its cargo of coal. These proved unsuccessful.

A change in the Museum's attitude towards conducting specific-purpose searches for shipwrecks occurred when it received notice of an auction in London of hydrographical notes referring to the wreck of the *Correio da Azia* near Point Cloates in 1816 (Green, page 83). Concerned that it might be carrying bullion and that others would be soon be accessing this new data in search of the wreck, in March–April 1987 the first of what were to be many searches for that wreck took place.

From the outset, the search for the *Correio da Azia* also included the possibility that the *Stefano* (and other wrecks) might also be found. Commencing just north of Coral Bay, divers were trailed behind the Museum's 6-m aluminium workboat, *Starcraft*, travelling for miles along straight, hard-edged limestone reefs; around coral gardens, hectares in size; around reefs; and, around Black Rock. In some areas there were literally hundreds of coral heads to examine, each with deep water around, rendering tow searches impossible. With no means of accurately plotting a courses in and around them (in the time before the advent of GPS) staff were forced to use rudimentary methods to record progress such as sextant and compass angles. Given the difficulties in towing divers amongst the forests of pinnacles, at times the viewing port in the vessel's hull was also used, to little avail. As a result of these difficulties, the area around a very prominent guano-topped pinnacle lying in shallow water amongst a reef complex some miles south of Black Rock was not given any priority on the basis that in being so conspicuous and now marked on all the charts, it would have been mentioned by the survivors of each vessel.

Historical and social developments in the search for *Stefano*

In 1990, three years after the search for *Stefano* commenced, Gustave Rathe, American grandson of Miho Baccich one of the two survivors from the *Stefano,* arrived at the Museum, together with Stirling Tuckey, the grandson of their rescuer Charles Tuckey. Rathe was on a tour promoting his new book *The Wreck of the Barque* Stefano *off the North-West Cape 1875.* It was part-based on his family's English translation of the story told to Father Stefano Skurla on the boys' return home. His original hand-written account entitled *I naufragi del bark*

austro-ungarico "Stefano" alla costa Nord-Ovest dell Australia, was in Italian, then the lingua franca for commerce and discourse in the region. Rathe's book and the visit resulted in a two-page article in the Weekend Supplement of *The West Australian* entitled the *Epic Tale of the Barque* Stefano *Odyssey* by Michael Zekulich (23 June 1990). Subsequently Carnarvon-based maritime historian Bryan Clarke advised the author that he had another recently completed translation of the Skurla manuscript. In his letter Clarke went on to stress the importance of the original manuscript, adding that the previous published and unpublished accounts of the loss of the *Stefano* were 'interpretations more than translations, and therefore not inherently accurate' and that the version, which he lodged in the State Archives, 'differs widely in its content and expression from those which preceded it, as accuracy was the objective'. He concluded his letter in the belief that the 'site of the disaster was Black Rock' (B. Clarke 1991, pers. comm. to McCarthy, 14 August). Apparently Gustave Rathe had provided Clarke and the former Carnarvon-based electronic inventor, Amadeo (Monte) Sala, with a copy of the original Skurla text. Sala then translated it.

Like *Stefano* and its crew Sala traced his roots to Dalmatia. As a result, he came to disagree with Rathe's use of the term Croatian to describe *Stefano* and its crew stating, however, that 'the truth is more complex', and that the region from whence the ship and its crew came was part of the Austro-Hungarian Empire (Sala, 2009: 11). Thus the *Stefano* story has also became part of a complex social and historical divide with often passionate argument from supporters of each point of view.

In 1993, the Museum's volunteer wing, the Maritime Archaeological Association of Western Australia (MAAWA), became involved in the search for the *Stefano* and commenced gathering research to the whereabouts of *Stefano*. They regularly reported on their finds in their Newsletter, as did Sala in the information sheets that he often published. Subsequently Sala donated $2 500 to the Museum for the *Stefano* search. Following Sala's presentation of a bi-lingual version of Skurla's *I naufragi del bark austro-ungarico 'Stefano'* to the Museum, the first search, led by Ian Warne, took place in the Easter of 1993. Their aim was to work from land and sea, using four-wheel drive vehicles and the museum workboat *Seaspray,* and thereby locate the area defined by Pemberton Walcott in 1876 where he saw wreckage on the shore. Their intention was to examine and identify any wreckage; and to eventually follow in the *Stefano* survivors' footsteps and identify the locations referred to in their reminiscences (Warne, 1993). Later, pleased with their results, Sala doubled his grant. There were also thoughts that a re-enactment of the boys' walk would be appropriate, in conjunction with crew and trainees from the STS *Leeuwin* and with zoologists, historians and archaeologists present. They were to examine the present flora and fauna of the region against the survivors' account and also to properly examine any cultural remains.

In March the next year, the *Gascoyne Gazette* in Carnarvon advised of measures being undertaken by the local Croatian community to commemorate the wreck. This took the form of a plaque erected onshore near Coral Bay the largest settlement in the region. Adding to the body of knowledge and the developing interest, in October that same year John Melville-Jones wrote to the Museum advising of his commencement of collaborative work with Sala and providing a draft with revised translation of the Skurla account held in the Battye Library of Western Australian History, Perth.

Another MAAWA search, using Sala's funds, took place in July 1995, again led by Warne, this time focusing on a magnetometer search of the Pemberton-Walcott area and the survivors'

track south down to Cardabia, Warroora, and Gnaraloo Stations. In October of that same year, Sala also produced a detailed account of the ship and of the Baccich family produced by his researcher in Rijeka, Radojica Barbalić. In May of the following year, as the result of an informal seminar hosted by Melville-Jones, the Museum received a second version of Melville-Jones' work entitled *The* Stefano *Castaways* (1996). This had additional input from Alan Dench (a specialist in Indigenous language), Kevin Kenneally (a botanist with the then Department of Conservation and Land Management) and with Phillip Moncrieff (an informant from the region) providing an Indigenous perspective. Moncrieff was a descendent of the Payungu people and, at the time, he was the first to put their perspective to the Museum; leading to the understanding that the Indigenous groups involved were the Payungu and Yinikutira.

In 1996 a MAAWA expedition investigated a report by the ornithologist Thomas Carter, the founder of Ningaloo Station, appearing in his book '*No Sundays in the Bush'.* There he wrote:

> At Warroora…in a cave on the beach were the skeletons of some of the crew of the Australian [*sic*] ship *Stephanie* which was wrecked at the Black Rock channel at Point Cloates…some of the crew wandered to Warroora (Carter, n.d.: 123)

The remote sensing phase of the *Stefano* search begins

By 1997, it was possible to obtain GPS plots of the workboat's path and to marry it to both the existing charts and, more importantly, to aerial photography. These were linked to the magnetometer read-outs. While divers were still required to monitor the seabed and were trailed behind the boat, sometimes ahead of the magnetometer 'fish', their positions and their track over the sea floor was thereby fixed. Thus the team was able to accurately plot where they had been and also where they still needed to go (see Green, *Correio da Azia*, page 83).

***Stefano* is found**

In later searches the Department was based in the fishing shack at the foot of the Ningaloo Station homestead. Despite having an excellent base camp, there remained many problems, as shown by the day book entries for Wednesday 2 April 1998:

> Conditions deteriorating and the area not conducive to towed search on account of the exposed bombies, did a glass bottom run through the area searching for debris field given that any reef exposed to the S-SW was dangerous. Weaved our way through the bombies which render the area very difficult to search. Very difficult to see the bombies to the east with the sun in that quarter. JNG [Green] plotted the track using differential GPS… for the first time the complexity of the area became apparent {compared with}the reefs examined in earlier years with straight edges. A great deal of swim and magnetometer searching will be required. PM re-read the research for clues in the light of our visit.

As indicated other wrecks and wreckage were also examined in these phases. After the magnetometer failed on one particular morning, requiring a trip to Exmouth for parts, the day-book for 1300–1500 on that day read for example:

> Towed search checking for possible wreckage plumes from *Rapid* and SS *Perth* (a coal-

> fired steamer wrecked opposite the homestead in 1887). Finding none we moved across to the wreck of the *Benan* which had been wrecked nearby in 1888 and more importantly was carrying *c*. a thousand tons of coal like *Stefano*—again with a disappointing result. It appears that coal, with a relatively low specific gravity, is especially light for its size when submerged and quickly rolls downstream off a wreck. It would also be gradually abraded as it travelled over the bottom. From these investigations it became evident that *Stefano* would not be found from its wreckage plume alone.
>
> The next day, with a heavy swell precluding any work on any of the reefs…the deeper water off Black Rock [was surveyed] with the magnetometer…to no avail…With the magnetometer rendered useless over the next few days, due to lightning from thunderstorms…examining other areas including the area around the white pinnacle, finding it a mushroom shaped formation that had apparently been blown over in a cyclone (Figure 88). Clearly it was not an ancient phenomenon and may not have been visible at the time the *Stefano* was lost.

Found on the last day

On the last day of the expedition, Wednesday 9 April, the swell was down, the wind SW, but light. A decision was made to fill in the gaps in the search resulting from the decision not to examine the region offshore from the prominent guano covered rock. It was decided not to go south, but to fill in the search around the Pinnacle area. After about an hour wreckage found, including a davit, iron bar, mast ring and plate iron. Searching further to the south anchors were found. During the inspection of the site the ship's bell and navigation lights were found. The wreck was measured at 50 m long, apparently canted to seawards with the rudder pintles to seaward of the bow in 7 m of water. The bow anchors were *c*. 3 m by 1.80–1.90 m across the flukes. Iron knees and other metal material visible under the coral.

The aftermath of the find

The late Max Cramer, a prominent member of the Museum and heritage community in Geraldton, was given the DGPS position of *Stefano* by this author and he subsequently produced an underwater video, sending a copy to the Museum. He also sent a copy to a delighted Gustave Rathe in America. An account of the Museum's find was then carried by the press, with one article penned by the Hon. Jim McGinty MLA, a senior politician with a noted diving and historical bent. Monte Sala also sent his congratulations, and soon Gustave Rathe was in contact, congratulating the team, and responding positively to our invitation to come and view the artefacts. The Hon. Phillip Pendall MLA, fresh from chairing an inquiry into a suitable—albeit sadly belated—recognition for those early finders of the Dutch and English East Indiamen, *Trial*, *Batavia*, *Vergulde Draeck*, *Zeewijk* and *Zuytdorp*, also invited the team, as the most modern of all shipwreck finders, to a Parliamentary dinner and to be introduced to the members in the House.

The *Hansard* of the Day reads:

> The SPEAKER: Before we proceed to the business of the House I have pleasure in welcoming to the Speaker's Gallery today the four discoverers of the *Stefano* which sank at Point Cloates, south of Ningaloo Reef in 1875, and which is the latest of the historic or ancient shipwrecks to be discovered off this coast. The discoverers present today are Jeremy Green, Mike McCarthy, Geoff Kimpton and Bob Richards. They are accompanied today

> by another distinguished discoverer [of the *Vergulde Draeck*], Graeme Henderson, the Director of the Western Australian Maritime Museum (*Hansard*. Legislative Assembly, 7 May 1997: 2494).

Buoyed with the find and the resultant publicity Monte Sala, John Melville-Jones, Alan Dench, Kevin Kenneally continued with their work. Sala and the author also discussed the need to erect a suitable memorial to the Aboriginal people who saved and nurtured the two boys, directly opposite the wreck of the *Fairy Queen* (1875) on the North West Cape where Charlie Tuckey met the group. This still awaits a consensus within the Indigenous communities involved (see below).

Cramer again went north this time by land in search of the *Stefano* dead and their last resting places (Cramer, n.d.). His subsequent report was passed on to the MAAWA and to pre-historians with research interests in the area, given that any skeletal materials found in those coastal sand dunes and caves, could also be Aboriginal and needed be dealt with under Aboriginal heritage legislation.

In November 1998 Gustave Rathe and his son Paul arrived in Fremantle at the invitation of the Korcula-Fremantle Chapter of Friendship Committee. This was a group formed in recognition of the links between Fremantle and the Island of Korcula, the island of origin of both the surviving boys. On that visit they viewed the *Stefano* bell and other relics and were given a commemorative plaque by the Mayor of Fremantle. At the Museum Rathe was invited to express an opinion how he, as the closest living relative of the survivors, would like to see the bell presented to the world. In receipt of advice from conservator Vicki Richards that either with or without its layer of calcified marine growth was feasible, he chose the latter, and that is how it has been preserved for posterity.

In 2002, the then director Graeme Henderson, hosted a celebratory symposium of the *Stefano* in the newly-opened Maritime Museum on Victoria Quay. It was conceived and arranged by Josko Petkovich of Murdoch University. At the Symposium the original painting depicting Tuckey's *Jessie*, and his boat being rowed towards the boys and their Aboriginal saviours on the shore was shown. It had been escorted to Fremantle by a priest from the Church in Dubrovnik where it hung for well over a century. Another highlight was the presence of three great grand-daughters of the *Stefano* survivors Miho Baccich, and nieces to Gustave Rathe. The resultant publicity about the finding of the two ships saw an exhibition mounted in the Entrance Gallery of the Western Australian Museum—Shipwreck Galleries in Fremantle.

In August 2005, Ann Preest and Maureen Dodd, who traced their ancestry to the North West Cape people, viewed the *Stefano* exhibit and asked why in mentioning the Payungu and Yinikutira, it contained no mention of the Thalanyji people who they felt must have had a role in saving the boys.

Recent books and websites

Petkovich subsequently produced a number of works and websites containing a history of the wreck and its people, and a detailed examination and translation of the Scurla manuscript that presently resides with the Baccich family. For his part, John Melville-Jones, together with the late Monte Sala joined to produce yet another translation. Apparently Canon Skurla had produced at least three Italian language copies of the manuscript, one travelling with Miho

Figure 115. The *Stefano* windlass (Jon Carpenter).

Figure 116. General view of the wreck site (Michael McCarthy).

Baccich when he moved to New Orleans, where his many descendants still reside. Before he died in 1935, aged 76, his wife Angelina translated the manuscript into English and each of their seven children received a copy. This led to their grandson Gustave Rathe's 1990 popular book mentioned earlier. Of the two other copies of the original Skurla manuscript found to date, one, possibly that prepared for Ivan Jurich, is held by the Dubrovnik Libraries and the other is held by the Maritime and History Museum of the Croatian Littoral in Rijeka and is provenanced to Baccich's parents, who commissioned Skurla to produce the work.

In 2009 Warrigal Press produced the latest work entitled *The* Stefano *Castaways by Stefano Skurla.* Edited by John Melville-Jones, the 191-page tome contains a preface by Amadeo (Monte) Sala who backed the venture and another by his son Tony that was produced after his father's death in 2002. These are followed by an explanatory introduction from Jones providing essential background to a complex series of events in Dalmatia and on the North West Cape. A transcription in Italian of the Skurla manuscript appears alongside the English translation produced by Amadeo Sala. This forms the bulk of the work. Pointing out the importance of collecting in one volume the original Italian text, an accurate translation and associated material, Melville-Jones wrote in his introductory chapter that:

> The publication of the Italian text and an English translation matched to it will facilitate the production of a Croatian version, which is greatly to be desired, because the story of the castaways from the *Stefano* has always been of great interest to many persons who dwell on the eastern shores of the Adriatic, from which the ship and her crew came (Melville-Jones, 2009: 16).

The Skurla text is followed by a chapter headed *The Aboriginal People of the North-West Cape* by Dench; then *Skurla's Observations on Natural History* by Kenneally; an examination of Basilius Ivancovich's painting of the *Jessie;* and, a selection of documents from the archives by Melville–Jones. Also included is a chapter on the search for *Stefano* by this author. Some of the photographs are by well-known shipwreck enthusiast and researcher Annie Boyd.

In his chapter, advising that 'Skurla's manuscript provides the only description we have of the daily lives of the Aboriginal people [especially the Yinikutira] who once lived on the Cape Range Peninsula' describing it as a 'very rich' source, Alan Dench also notes that Skurla 'embellishes the account given to him by Baccich and Jurich, with his own speculations and draws faulty conclusions' (Skurla, 2009: 140). These, and the use of language, which he found to be predominantly Gnarluma from the Roebourne/Cossack region, he examines in some detail. This lead Dench to question whether the language recorded by Skurla was a form of pearling lingua franca. He also considers the fate of the North West Cape people highlighting especially the effect of disease—ironically given Charles Tuckey's role in the boys' salvation—that was 'brought to them through contact with the pearling fleet'. Notwithstanding he observes:

> If it were not for the writings of Stefano Skurla…we would know nothing of the Yinikutira but the fragmentary stories remembered by local Aboriginal people, and what we have been able to reconstruct form the archaeological record. Skurla's account brings a lost and forgotten people back to life (Dench in Melville-Jones, 2009: 149).

For his part, Kevin Kenneally examines descriptions of the flora and fauna and the accounts of the Aborigines' log rafts provided by Canon Skurla, finding them in many cases quite anomalous. This led him to conclude that when dealing with the natural history described

by Skurla

> …the contents of the manuscript should be treated with caution [for] it is my conclusion that…taking the survivors' account as a starting point, he embellished the material, using the contemporary publications describing Australia that were available to him. It is now difficult in some parts of the narrative to separate fact from elaboration.

Nonetheless, like Dench and all others involved in the *Stefano* saga today, Kenneally remains positive towards Skurla, urging all to 'keep the text in perspective' and in accepting its failings to recognise it for what it is 'a celebration of rescue, survival and return' (Melville-Jones, 2009: 156).

2009 wreck inspection

Ross Anderson

The *Stefano* site was re-inspected on 10 May 2009 in a 1.5–2 m swell with a fresh easterly breeze. The main aim of the inspection was to relocate and map in the two anchors at the south end of the site that were not seen in the 2008 inspection. The anchors lie 5.6 m apart in 10 m depth, and their orientation and dimensions were relocated (see Table 6), measured and mapped in relation to the rest of the site. The chain mound lying between the anchors was also relocated and measured and chain links were measured at 250 mm. It was noticed that there was more sand in the gullies at the deeper (12 m) northern part of site than noticed in the 2008 inspection, indicating that some sand movement and changes occur in this area.

Table 6. *Stefano* anchors at south end of site.

Anchor description	**Dimensions**	**Orientation of shank**
Iron shank, no stock, iron shackle, crown appears broken, obscured by plate coral growth	Length of shank 2.80 m	270º
Iron shank, no stock, crown intact, iron shackle	Length of shank 3.08 m Width across palms/pee 1.90 m	180º

Jane Bay unidentified

Jim Stedman

Introduction

Jane Bay was named after Jane Lefroy of Ningaloo Station in 1990. It lies within Point Cloates Anchorage (Australian Admiralty Chart Aus 72, Anchorages on the West Coast of Australia), which was formerly known as Port Sholl (Walcott, 1876). The bay is located on the southern side of Point Cloates, extending to the east and south-east for approximately 6 km as far as Apex Hill. Ningaloo Reef, which lies approximately 5 km offshore and runs parallel to the coast, affords Jane Bay some shelter from the majority of the Indian Ocean surge. A 3.5 km wide break in the barrier reef, east of Black Rock, provides vessels access into Jane Bay, through Black Rock Passage. The sandy beach in Jane Bay is relatively flat and narrow, and the waters are shallow. Black Rock Passage, however, does permit a significant amount of water movement through the reef, and the beach in Jane Bay forms a natural trap for flotsam and jetsam that has washed in with the currents and prevailing winds. Jane Bay experiences the significant tidal fluctuations that typify the west coast of North West Cape. The littoral hinterland comprises a series of fringing sand dunes, with Sextant Hill and Entrance Hill rising to 87 m and 67 m above sea level, respectively. The dunes are sparsely vegetated with spinifex (*Triodia* sp.) and other salt-tolerant grasses and succulents. The high water mark is delineated by a steep, low sandy bank, approximately 1.5 m high, which runs along the top of the beach. This is severely eroded by the increased wave action created during summer cyclones and at king tides, when large quantities of sediment are transported and redeposited.

The waters around Point Cloates are notoriously treacherous to navigate, and have historically claimed many ships that either sailed too far east whilst bound for Southeast Asia, or else travelled too close to land whilst plying the coastal routes and circumnavigating North West Cape. The prevailing winds blow from the south and west, rendering the coastline off the point all the more treacherous. There are several shipwrecks recorded in the vicinity, including those of *Rapid* (1811), *Correio da Azia* (1816), *Stefano* (1876), *Benan* (1888) and the Ningaloo Unidentified Wreck (19th century). The details of these wrecks are described elsewhere in this volume and are not repeated here.

The presence of buried timbers with copper or copper-alloy fastenings on the beach at Jane Bay was brought to the attention of museum personnel at the beginning of the May 2009 fieldwork (Ningaloo Expedition Day-book 8/5/09). The buried timbers had been exposed and lay visible on the beach, following scouring by waves during winter storms (see Figure 119).

First site inspection

An initial site inspection was conducted on 14 May 2009 with the site's finders, Sam and Jeanette Gammon of Mount Barker. The museum's workboat was anchored in the shallows off the beach.

It was immediately evident that the wreckage was again covered in sand, with no timbers visible on the beach at the location indicated by the Gammons. Systematic probing along the shoreline using a steel rod soon located buried structure at a depth of 200–300 mm. Hand excavation in the area exposed buried timbers, as well as substantial copper or copper-alloy ship's fastenings, the largest with a diameter of approximately 15 mm. Taking detailed measurements was impossible due to the wet sand constantly recovering the timbers. Metal detector transects walked parallel to the shoreline also indicated numerous targets along the beach, pointing to the presence of buried material (see Figure 121). With a rising tide making further investigations impossible, it was decided to return at a later date and conduct a further site inspection on a low tide.

The site was named Jane Bay Unidentified and its location recorded as 22.73227° S 113.73215° E, using a handheld GPS unit.

Second site inspection

The second site inspection was conducted on 16 May 2009, lead by Jeremy Green, assisted by the same personnel as the previous inspection. Again, the workboat was anchored in the shallows of Jane Bay. The steel rod was used to probe the beach sand and buried timbers were quickly relocated. A water pump was then set up on the boat's gunwale, comprising a petrol engine and pump, that provided, through a length of flexible hose, a high pressure water jet on the beach. Using the jet to remove wet sand and at the same time hand excavating, the extent of the buried timbers was investigated. The timbers were found to extend for an area of approximately 10 m x 3 m, and this was mapped using a Differential GPS (DGPS) (see Figure 117). No discernible shape or form to the timbers could be determined.

A total of seven small timber samples were retained for analyses, one of which was recovered during a snorkelling inspection of the shallow water adjacent to the site. The underwater inspection also recovered a square, clear glass lemon cordial bottle embossed 'BROOKE'S LEMOS LIMITED. MANUFACTURERS OF LEMOS, REGISTERED TRADE MARK', dating to the 1930s (see Figure 120). This is likely to have washed into the bay and is not thought to be associated with the buried timbers. The conduct of the site inspection was recorded by photographer Patrick Baker, using digital stills and video.

Discussion

Historical records from the 19th century describe a number of shipwrecks in the Point Cloates area, but the most precise is doubtless the chart and account by Pemberton Walcott, dating from 1876 (see Figure 118).

Following the wreck of the barque *Stefano* on North West Cape in the winter of 1876, the schooner *Victoria* was chartered by Government Resident Robert Sholl, who placed the vessel under the command of Pemberton Walcott, with orders to examine the Point Cloates area. Walcott, as an 18-year-old, had survived the wreck of the barque *Eglinton* north of Fremantle in 1852. After a protracted voyage, Walcott anchored *Victoria* inside the reef at Point Cloates in June 1876 (Henderson and Henderson, 1988: 177–178). Prior to Walcott's visit, the following wrecks are known, or thought to have occurred in the vicinity of Point Cloates:

1. the 366-ton American China trader *Rapid*, lost just south of Point Cloates in 1811;
2. the Portuguese dispatch vessel *Correio da Azia*, wrecked on the outer reef to the south of

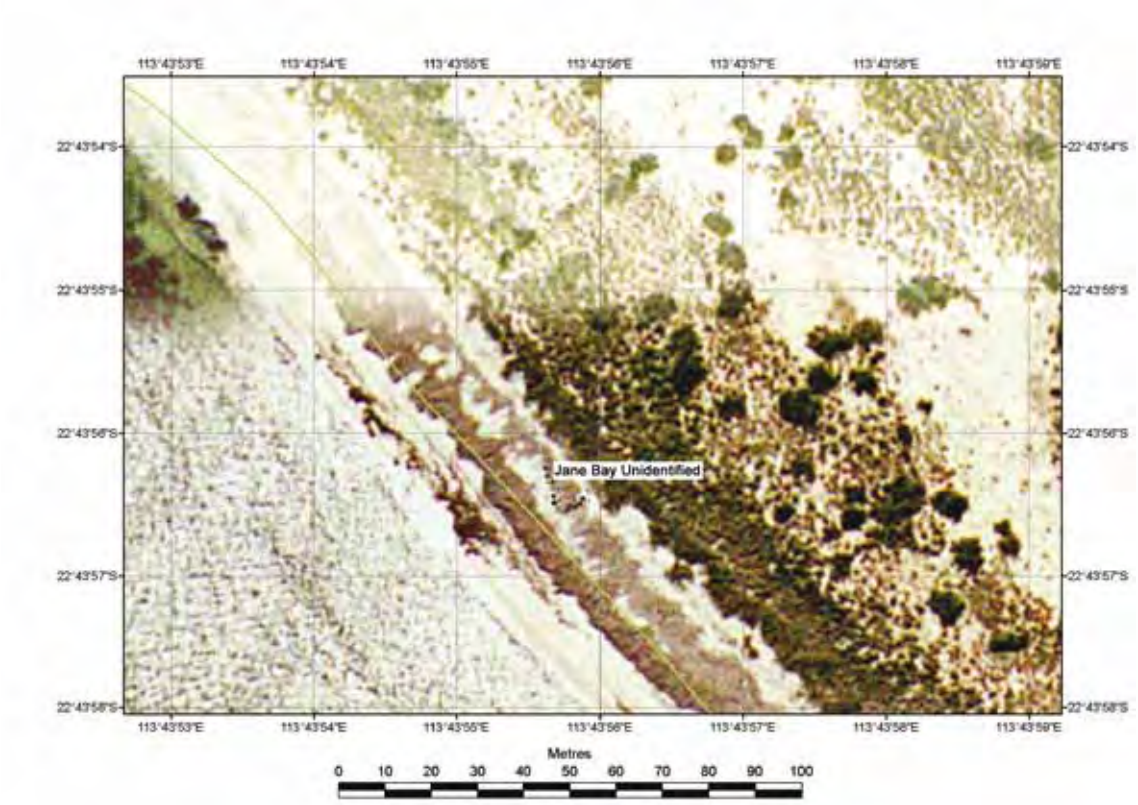


Figure 117. Plan showing the metal detector targets for the Jane Bay Unidentified site (Jeremy Green).

Jane Bay in 1816;

3. the 145-ton *Occator*, lost in 1856, some distance further north;
4. the 116-ton *Emma*, lost south of Coral Bay;
5. the 16-ton *Brothers*, lost in 1867, possibly in the vicinity of Point Cloates; and
6. the small pearling cutter *Bertha*, lost in 1874.

The 450-ton barque *Strathmore* may also have struck close to Point Cloates in the early 1870s, but floated off. In addition, the American galley *Caledonia* struck mid-way between Point Cloates and Point Maud in 1815, and the galley *Ollices* encountered a reef further north prior to 1818. No other vessels are known to have been lost in the vicinity between the time that *Stefano* was wrecked and June 1876, when Captain Walcott examined the shoreline (Henderson and Henderson, 1988: 180–181). The provenance and precise date of the Ningaloo Unidentified Wreck, which lies close to that of *Correio da Azia*, is yet to be determined, although it is considered to be a 19th-century timber sailing ship (WAM File MA-357/04).

In 1876, when Walcott went ashore at Jane Bay he reported the following:

> After tea being full moon I proceeded on shore in a whaleboat accompanied by P.C. Coppin and armed boat's crew—with Tony—native guide. Steering E by N½ N for a conspicuous hill we landed amid a mass of wrecks. Walked about a mile along the beach and came to the conclusion that several vessels had been lately wrecked—then proceeded on board at 11 pm.

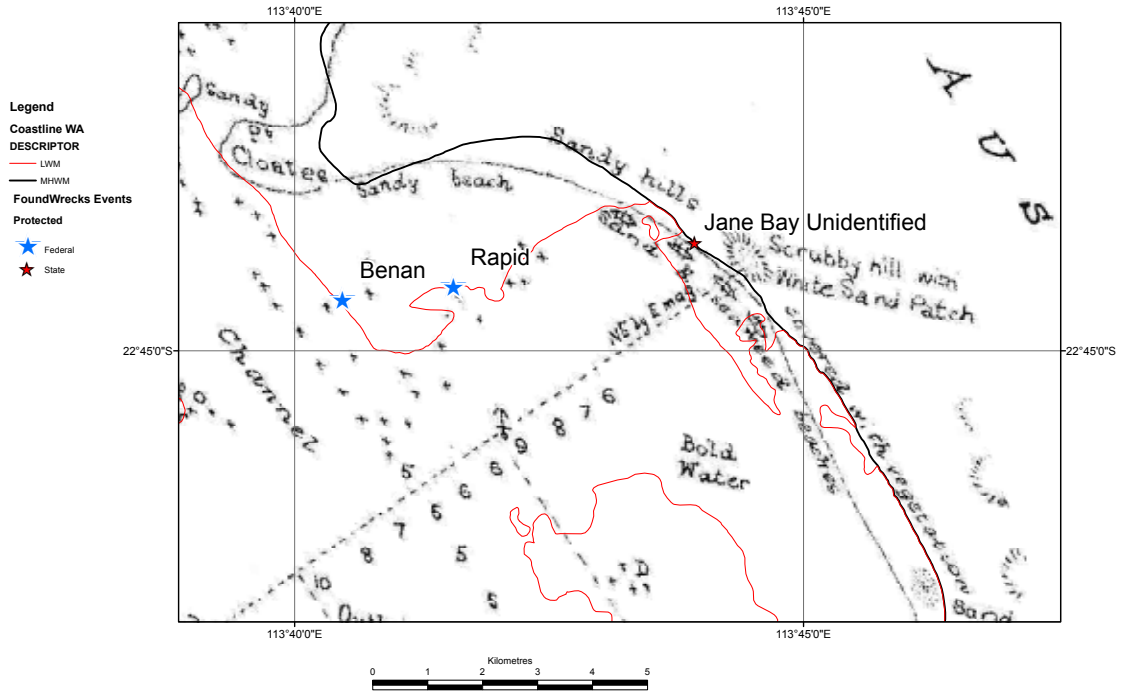


Figure 118. Walcott's map of 1876 georeferenced on the modern coastal outline (black line), Jane Bay Unidentified corresponds almost exactly with the Walcott wrecks (Jeremy Green).

On the 8th June at 6 am left ship accompanied by same party and Crouch and two natives. Made a minute examination of the different wrecks and from differences of wood and size of spars came to the conclusion that not less than four—probably five vessels of considerable tonnage had been wrecked within seven or eight months. The wreck of *Stefano* was pointed out by natives, and the camp of survivors, where sundry items belonging to her were found such as boards with written particulars—torn charts, stools, etc., etc. This wreck, since verified beyond a doubt as the remains of *Stefano* appeared to us the oldest wreck on the beach, as far as amount of damage sustained, and more buried in sand, seaweed etc. But at same time, the paint work appeared brighter and fresher, probably having been newly painted. In her immediate neighbourhood on each side within ¼ mile of her were two other vessels, or sides of vessels partially buried in sand and seaweed, and filled up with spars and timber. One of them was Indian built–hard wood–I should judge about from 300 to 500 tons burthen. The other was Oregon pine, and apparently American built–about same size. Half a mile further up the beach S. Westerly was the deck of a softwood ship with main hatch, combings etc. complete but so choked with spars, masts, yards and other wreckage, as well as to a great extent buried in seaweed, that I found it difficult to identify it as a part of one of the other wrecks. A little further south westerly on the beach, just awash was the side of a very large vessel—apparently lately wrecked hard wood (very like teak) copper fastened and coppered, the copper sheathing being but very slightly torn in a few places and quite bright without any barnacles or other indications of having been any considerable time afloat. I counted 13 planks 9"wide between her copper and coaming boards. The wood appeared to consist of nearly the whole length of the vessel broadside—but a number of the lower planks had been torn from her timber.

> There were 13 rows of sheathing left on her and by comparison I am of opinion she must have had about the same number below. 4/5th of the side (being end on) was under water at an angle of about 7° or 8°, the extreme end not being visible. I should judge her to be a vessel of about 1000 tons. I noticed the other side of apparently same vessel afloat about ¼ mile from the beach. No cargo of any kind or boxes etc. were observed on the beach. I noticed three built masts of very large size, not less than three feet diameter, (a bowsprit I measured was 41 feet long and 2 feet 9 inches diam.), and a main or fore yard, a small portion of one end of which had been broken off measured 71 feet. Hundreds of other spars were strewn along the beach but it was remarkable that all the wreckage had come ashore within a distance of two miles—and literally nothing was seen beyond. The native Tony who had camped with the survivors of the *Stefano* immediately after their wreck seemed very much surprised to see many other wrecks and declared that they were not there at the time he was last there and this has since been verified by statements of the two survivors of the *Stefano* in the *Rosette* who informed me that no wrecks were visible when they left. The native also informed me that about two winters ago a very large steamer had been wrecked down at his country (Cape Cuvier) and all hands lost including a woman (Henderson and Henderson, 1988: 179–180 citing P. Walcott to R.J. Sholl, Cossack, 21 June 1876, CSR 844, fol. 105).

Following Walcott's inspection of the beach at Jane Bay in 1876, several other vessels are known to have come to grief in the vicinity of Point Cloates (MA-209/80. Battye Library, Perth). These include:

1. Brig *Cock of the North* reported on the beach in 1879;
2. Lugger *G.S.S.*, sank in 1883;
3. The clinker constructed *Queen*, which sank offshore in 1891;
4. The lugger *Don Joseph*, reportedly wrecked at Black Rock Passage in 1899; and
5. The 12-ton, carvel constructed schooner *Wyndham*, sank in 1910.

(For further details of the undiscovered sites see '"Undiscovered sites in the Ningaloo Reef area" on page 248.)

The beach where Walcott found wreckage acts as a collecting point for flotsam coming over Ningaloo Reef, for distances of up to 16 km to the south of Point Cloates. Walcott would certainly have seen wreckage from *Stefano* and *Rapid*, and this would explain his descriptions of a 1 000-ton wreck and a 300–500-ton wreck. The cyclone of December 1875 could have brought ashore, and would have left exposed, material from both of these wrecks, together perhaps with material from *Correio da Azia*. Shortly after Walcott's return to Roebourne, several boats left for Point Cloates intending to salvage the reported wreckage (Henderson and Henderson, 1988: 181). More recently, ships' timbers, salvaged from the beaches around Point Cloates, are known to have been used as building material for the nearby Ningaloo homestead (Carter, 1987).

Conclusions

Given the fact that the May 2009 expedition only conducted initial site inspections in Jane Bay, from the data recovered, it is impossible to draw any definite conclusions detailing the provenance or age of the buried timbers. Suffice to say that there are definitely some relatively well-preserved timbers present, which almost certainly derive from a vessel of some kind. The size of the fastenings that were visible in the timbers would suggest that they derive from

a ship, rather than a small boat. Also, it must be considered there may only be a small part of a shipwreck buried in the sand, bearing in mind that the site inspection found timbers extending for an area of approximately 10 m x 3 m.

It is possible that the timbers derive from a vessel dating as early as the 18th century, although they are more likely to be from a 19th or early 20th-century wreck. Analyses of the metal fastenings may help to determine whether they are made from pure copper, or else an alloy such as 'Muntz metal', which became the preferred material for timber ships' fastenings and sheathing after its discovery in 1832 (McCarthy, 2005: 115–18).

Recommendations

Maritime archaeologists from the Western Australian Museum consider that the buried timbers at the Jane Bay unidentified site derive from an historical ship. It is, therefore, recommended that the right to possession of the Jane Bay Unidentified site be vested in the Western Australian Museum on behalf of the Crown, as defined by the Western Australian *Maritime Archaeology Act, 1973* (*The Act*); the site being a maritime archaeological site, as defined by Section 4.(1)(a) of *The Act*.

It is also recommended that additional survey work and archaeological test excavations be carried out on the Jane Bay Unidentified site, in an attempt to provenance the source and date of the timbers, to establish if they derive from an historic ship, as defined in Section 3 of *The Act*. Future work should also include analyses of the metal fastenings, which may assist in dating the site.

It is finally recommended that any future fieldwork undertaken on the Jane Bay Unidentified site be timed to benefit from periods of low tides, immediately post cyclone season.

Table 7. List of material recovered from Jane Bay Unidentified site.

Registration	No Items	Description	Material Code	Date Registered	Site Location	Dimensions
JBU 5430	1	Bottle, clear glass embossed with 'BROOKE'S LEMOS LIMITED, MANU-FACTURERS OF LEMOS, REGISTERED TRADE MARK'.	Glass	22/05/2009	Unid. wreck in Jane Bay. Retrieved 10 m offshore in from of site	Ht. 250 mm, base diam. 87 mm
JBU 5431	2	Plank cut in two pieces with iron fastening *in situ*	Ship's timber	22/05/2009	Unid. wreck in Jane Bay. Located 10 m offshore with Lemos bottle (JBU5430)	Lg. 552 mm
JBU 5432	1	Wood sample small	Ship's timber	22/05/2009	Unid. wreck at Jane Bay. Located on beach at high water mark. DGPS 22° 43.94097, 113°43.93139	
JBU 5433	1	Wood sample pine?	Ship's timber	22/05/2009	Unid. wreck at Jane Bay. Located on high water mark. DGPS 22°43.94068, 113°43.92797	Lg. 90 mm
JBU 5434	1	Wood sample	Ship's timber	22/05/2009	Unid wreck at Jane Bay. Located on high water mark. DGPS 22°43.93907, 113°43.92767	Lg. 95 mm
JBU 5435	1	Wood sample	Ship's timber	22/05/2009	Unid wreck at Jane Bay. Located at high water mark. DGPS 22°43.93842, 113°43.92723	Lg. 150 mm

Figure 119. Buried timbers with copper or copper-alloy fastenings (Jeanette Gammon).

Figure 120. Moulded, clear glass, lemon cordial bottle marked: BROOKE'S LEMOS LIMITED, MANUFACTURERS OF LEMOS', from the shallows adjacent to the buried timbers (Jim Stedman).

Figure 121. Corioli Souter conducting the metal detector survey (Patrick Baker).

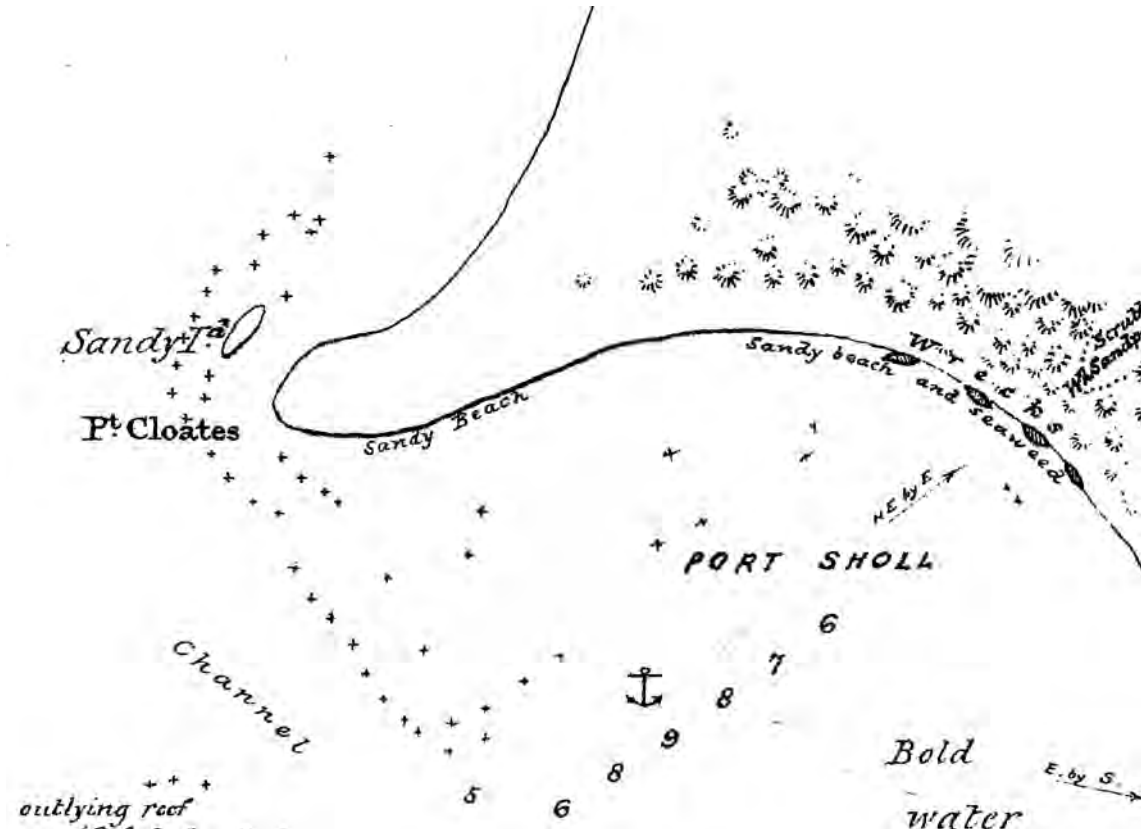


Figure 122. Walcott's 1876 chart showing shipwrecks on the beach in Jane Bay.

JBU 5436	1	Iron concretion	Ferrous	22/05/2009	Unid wreck at Jane Bay. Located at high water mark. DGPS 22°43.93842, 113°43.92723	Lg. 94 mm
JBU 5437	1	Wood sample	Ship's timber	22/05/2009	Unid wreck at Jane Bay. Located at high water mark. DGPS 22°43.93842, 113°43.92723	Lg. 75 mm
JBU 5438	1	Wood sample and iron fastening	Ship's timber	22/05/2009	Unid wreck at Jane Bay. Located at high water mark. DGPS 22°43.93736, 113°43.92707	Lg. 225 mm

Wood identifications of Jane Bay Unidentified samples

Ian Godfrey

Seven samples of wood, recovered from the Jane Bay site were submitted for analysis by the Department of Maritime Archaeology (Department of Materials Conservation Job # 09/93). Each sample was polished to a 1200 grit finish, prior to microscopic examination (x 10). In some instances radial-longitudinal sections were sliced from softwood samples prior to being mounted and subjected to high power microscopic examination (x 200).

JBU 5431

This was a large piece from a plank, cut in two with an iron fastening *in situ*. The sample was solid and in very good condition.
Transverse Surface:
Rays are narrower than the pores.
Soft tissue was indistinct but some appears to surround the pores.
Distinct growth rings.
The pores are few (<4/mm^2), bordering on moderately numerous (5–11/mm^2), large in size (separately distinct to the naked eye), in a ring porous arrangement and predominantly solitary.
Tyloses (outgrowths on parenchyma cells of xylem vessels) are abundant.
A search using CSIROID software produced only 1 species with the above features, *Tectona grandis* (teak).
Examination of the tangential longitudinal surface confirmed this identification.
While teak occurs naturally in Burma, Thailand, India, Indo-China and Java, it has been planted in many parts of the world.

JBU 5432

The sample is blackened and in very solid, good condition. Although in apparently very good condition the surface features were not especially clear.
Transverse Surface:
Rays were of 2 distinct widths.
Soft tissue surrounds the pores.
Distinct growth rings.
Pores vary markedly in size across the growth ring with the larger pores intermediate to large in size (distinct to the naked eye) and are in a ring porous arrangement.
Tyloses are abundant.
The wood is clearly a *Quercus* species (White oak). As European and North American white oak cannot be differentiated microscopically it is not possible to attribute a conclusive

provenance to this sample.

JBU 5433

The sample has a natural brown colour and is quite degraded and soft.
Transverse Surface:
Resin canals are present.
There is quite a sharp transition between the denser late-wood and the early-wood.
Radial Longitudinal Surface:
Although it was difficult to cut good sections because of the softness of the sample, the following features were able to be confirmed.
Ray tracheids (elongated cells in the xylem of the tree's transport tissue) are dentate.
Presence of simple pits in the cross-field areas.
These features on the radial longitudinal surface clearly indicate that the sample is a pine of the 'red deal' type. This conclusion contrasts with the transverse surface observations as red deal pines usually show a more gradual transition from the early to the late-wood. The radial observations are however more compelling and less subjective than those made with respect to the transverse surface.
Pines in the red deal group, which cannot be further differentiated, include red pine (*P. resinosa* Ait.), Scots pine (*Pinus sylvestris* L.) and Austrian and Corsican pines (*P. nigra* Arnold). The latter two pine types are native to Europe while the former type is native to eastern North America.

JBU 5434

The sample is slightly darkened, very soft and highly degraded. As with JBU 5433, it was difficult to obtain a suitable radial longitudinal section for analysis.
Transverse Surface:
Resin canals are present.
Gradual transition between the early and the late-wood.
Radial Longitudinal Surface:
Ray tracheids are smooth-walled.
Large simple pits in the cross-field areas.
The sample is a soft pine of the yellow pine type, exemplified by yellow pine (*Pinus strobus* L.), sugar pine (*P. lambertiana* Dougl.) and western white pine (*P. monticola* Dougl. Ex Lamb.). The latter two pines are native to western North America while the former is native to eastern North America.

JBU 5435

This sample has a degraded, brown outer layer, with a hard, blackened core. It appears to be part of a small branch.
Transverse Surface:
Resin canals present.
Gradual transition between the early and the late-wood.
Radial Longitudinal Surface:
Dentate ray tracheids (not highly dentate).

Large simple pits in the cross-field areas.
As for JBU 5433, this sample is a pine of the red deal type.

JBU 5437

This sample is degraded but in reasonable condition. It is quite soft with a dark brown colour and some internal iron staining. As with the other softwood samples, it was difficult to cut a good section for microscopic examination.
The features of this sample were the same as those for JBU 5434, except that the transition from the early to the late-wood was sharper. The wood is therefore a soft pine of the yellow pine type.

JBU 5438

This sample, although blackened is in good, solid condition.
This sample is white oak (*Quercus* Sp.), having microscopic features that are identical with those of sample JBU 5432.

Rapid 1811

Michael McCarthy

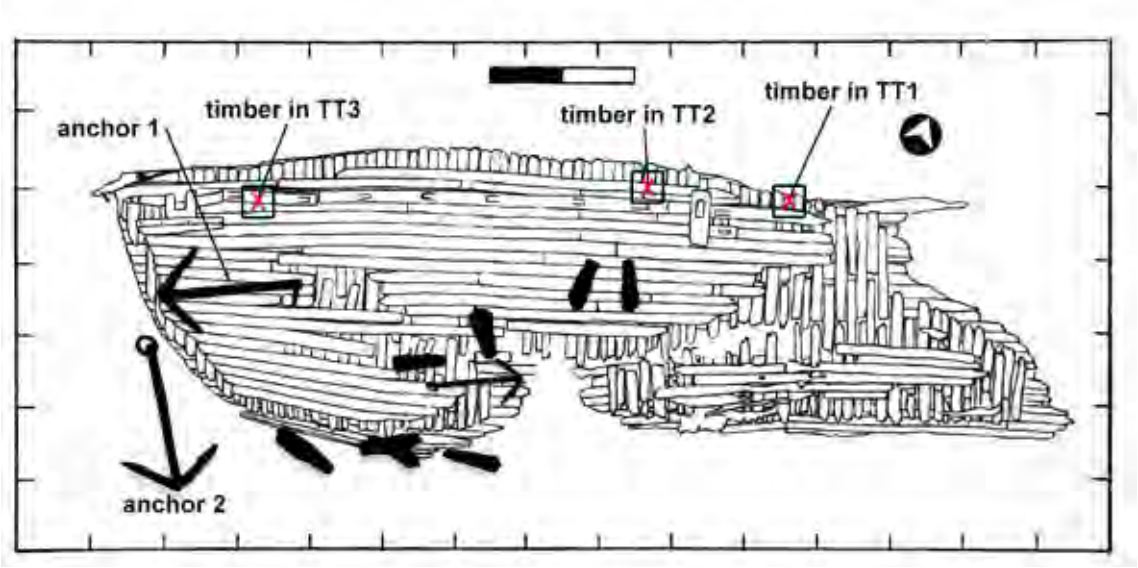


Figure 123. Plan of *Rapid* wreck site made during the 1982 excavation, 2009 conservation sample points indicated (Graeme Henderson and Vicki Richards).

The *Rapid*, a 367-ton American China trader, with 22 crew under Captain Henry Dorr, was bound for Canton (Guangzhou) with a cargo of 280 000 silver dollars. The vessel was wrecked at Point Cloates on the night of 7 January 1811. Next morning a storm hit and efforts to refloat the ship failed. A total wreck, but visible from the ocean, the *Rapid* was deliberately burnt to avoid its 7.8 tonnes of silver being recovered. Dorr and his crew then departed in three open boats and successfully made the open journey to Batavia (modern Jakarta) in just over a month. A number of men died soon after arrival; they apparently suffered terribly on the voyage north. Dorr, for example, was in a 5-m, leaking boat, with only around 30 cm of freeboard even after they threw much of their supplies, clothing and water overboard. They also had little water other than what they collected from rain, using the sails. Starving, they were forced to land on Christmas Island where they ate rats and crabs in order to survive. Six weeks after arriving at Batavia, Dorr and some of his crew took over the American schooner, *General Greene,* whose captain and most of its crew had died. Dorr arrived in Philadelphia on 27 July 1811. Because the survivors travelled to Batavia, and because England and America were at war when the ship went down, knowledge of the wreck did not filter through to British authorities in London.

Its wreckage, which would have washed ashore in what is known today as Jane Bay, south of Point Cloates, would have been joined by that from other early 19th century wrecks notably the *Correio da Azia* in 1816; the *Emma* in 1867; the NRU site; and, the *Stefano* in 1876. Though Pemberton Walcott describes the wreckage of four ships in Jane Bay when he came

Figure 124. View of the *Rapid* site during the 1979 excavation (Patrick Baker).

in search of the *Stefano*, he was unable to provide any clues as to their origin (Anderson, this volume; Green, this volume; McCarthy, this volume; Stedman, this volume). Thus the wreck of the *Rapid* and all others in the vicinity, bar those known to the authorities at Fremantle or at Roebourne (the administrative centre for the north after 1866) faded from living memory.

A spear-fishing group, in 1978, discovered the wreck. During three seasons of excavation between 1979 and 1982 archaeologists from the Department of Maritime Archaeology, surveyed the ship's timbers and removed the artefacts from within the hull, including some 20 000 remaining Spanish silver dollars. The excavation provided a picture of the life on board one of these fast ships. Ship's fittings, provisions and the personal possessions of crew members had survived in reasonable condition on the site. The hull survey provided sufficiently comprehensive data for the lines of the vessel to be reconstructed, giving information about a vessel type often referred to in the literature but never comprehensively described.

Indications of a wreck

On 4 October 1978 Perth-based divers Brian Stagg and Ken Todd visited the Western Australian Museum's Inspector of Wrecks, Scott Sledge, producing a 'small, corroded, silver coin in concretion and a dozen or more very soft, faceless coin fragments mixed in amongst half an ice cream container of coralline concretion chips' (S. Sledge, 1978, pers. comm. to J. Bannister, 4 October).

In examining the materials Sledge estimated that around 200 'Mexican 8-real coins' had been originally encased in concretions which had been found at a beach camp on Ningaloo Station, at Point Cloates. The impressions in the concretions (effectively a reverse imprint of

the original contents), led Sledge and the Museum's Honorary Numismatist, the late Stan Wilson, to identify their former contents as 'Spanish Pillar dollars' with a date range of 1796 through to 1806. They were of a type commonly used in 'fledgling British colonies' and they remained legal tender in Australia into the 1830s. This led Sledge to the conclusion that they may have emanated from the wreck of a 'trading or whaling vessel of the early colonial period' (S. Sledge, 1978, pers. comm. to Director, 4 October).

After first considering the East Indiaman *George*, that was believed to have been wrecked on the coast of New Holland around 1804, and then dismissing it due to the dates on the coins, attention turned to the possibility they might be indicative of the remains of the barque *Mercury* which had been lost without trace while en route to King George Sound, Albany, from Calcutta, in 1833. According to Graeme Henderson, who was then conducting research for his *Unfinished Voyages* series, the *Mercury* had been carrying silver coin, passengers, Indian labourers and trade goods for the colony, when it disappeared.

Stagg then filed a form of finding a wreck or relic believed to be historic and advised that he, Ken Todd, Rod Wright and Fred Moffat, had found the concretions at a camp located about four miles north of the Station in the previous June. They also advised that more information might be gleaned from Perth-based spearfishermen, Frank and Barry Paxman, who regularly used the camp at which the concretions were found. This resulted in Sledge writing on 13 October to the Paxman group with his understanding that they had found a wreck, seeking further details and requesting them to file a report of finding a wreck. He also advised of what he knew of the concretions found at their camp and outlined the provisions of the *Historic Shipwrecks Act 1976*, including the section dealing with rewards.

The report of finding

On 24 October, Parker and Parker, solicitors on behalf of divers Frank and Barry Paxman, Glynn Dromey and Larry Paterson, a visiting diver from New Zealand, forwarded to the Federal Minister a report of finding a wreck believed to be historic. In the letter it was advised that the wreck lay in about three fathoms of water, about two miles south of the Point Cloates Lighthouse. The solicitors went on to state that:

> The wrecked ship was of wood construction. It shows signs of having been ravaged by fire and contains silver coins minted at about the turn of the 18th century. It is believed that the ship would have measured approximately 90 feet and was carrying at least three anchors and objects which could well be cannons. When the wreck was located some marine growth encrusted objects including approximately 450 pounds [weight] of silver coins and other small objects were removed …[these] will be handed over to the Director of the Western Australian Museum as soon as he is ready to receive them (Parker and Parker, 1978, pers. comm. to Minister for Home Affairs, 24 October: WAM File (*Rapid*) MA-12/78/5).

On 31 October the Head of Department of Maritime Archaeology, Jeremy Green and Graeme Henderson, went to view the materials raised from a wreck, the coins and other objects were handed over to them and were then registered in the Museum collection. In all, the coins weighed 191.90 kg and comprised 6016 coins and fragments, of which 1815 were dated. Copper fastenings, bone fragments, musket balls, ballast stones, glass, ceramic and what was thought to be a toothbrush were also handed over. In the understanding that they were from the wreck of the *Mercury,* the materials were given the prefix ME (*Mercury*) with

numbers ranging from 1853 through to 2182.

On 2 November, WA Museum staff Jeremy Green, Graeme Henderson and Pat Baker left for the site accompanied by the Paxmans and their colleague Larry Paterson. On the same day, the Minister responsible for the operations of the Commonwealth *Historic Shipwrecks Act* was advised of the find, and on the following day was alerted to the need to protect the site. The finders listed in the Director's memo to the Minister were Messrs F. and B. Paxman, Dromey and Paterson. In the interim the museum team arrived at the site and on 4 November the conducted an inspection with the Paxmans and Paterson. Inspections over the following few days revealed three large anchors, cannon, a large ballast mound of stone, copper fastenings, rudder gudgeons, coins, ceramics and glassware. The ship's bell and visible coinage were removed for security reasons. A rough site plan was also produced. On Saturday 9 December, when the team returned to Perth, *The West Australian* carried news of the find under the heading 'Treasure in old ship find'. In the article Frank Paxman was quoted as saying that he and the other finders had located the wreck while spearfishing in the previous July after having been forced inshore by bad weather. Interest in the find was such that the Minister also published a warning in the press and a museum watchkeeper was then sent to the site.

Controversies surround the finding process

The recognition given to the Paxman team and the press items crediting them with the find initially caused concern to Brian Stagg and his associates, for they were of the opinion that it was their discoveries that led to the Paxman report, and that all that transpired was as a result of their actions.

While the events above were in train, the Stagg team and the museum staff were unaware that the Paxman group had already reported the site to the federal government on 26 July via their solicitors, Parker and Parker. This appears evident in a series of letters from Parker and Parker to the Minister that were forwarded to the Museum some years later. These help to explain the then widely held perceptions amongst divers about the primacy of the Stagg group, and also help explain the apparent delay in the Paxman team reporting the site to the Museum. One letter, dated 26 July 1978, from Parker and Parker advised the Commonwealth Minister that the Paxman team had located 'wreckage', and their desire to comply with the statutes, yet not to reveal the location of the wreck for fear of vandalism. The question of possible reward was also raised; however, there was no reply to this. A follow-up letter was sent in the following month, seeking a reply from the Commonwealth. A reply was received on 22 August, referring Parker and Parker to the Director of the Museum. On 10 October Parker and Parker wrote to Frank Paxman advising that the Minister was still awaiting details of the site and that the Director had been notified of the find by the Commonwealth. This resulted in a letter from the Paxman group advising Parker and Parker of the possibility that the wreck could be of 'considerable historical significance and could contain a large quantity of treasure trove'. They also advised that after disclosing details to an authorised officer they would hand over the materials in their possession to that officer.

The WA Museum excavations

In the period 17 December through to 7 February (with a short break over Christmas Eve and Day) a major excavation ensued. Led by the then Curator of Colonial Wrecks, Graeme

Henderson, it was to become one of the largest ever conducted by the Museum, involving the 9.5 m workboat *Beagle* and smaller craft, a large amount of equipment and a very large team based out of the Ningaloo Station sheds and quarters. Numbers varied from 7 to 25 at any one time and they included archaeologists, conservators, MAAWA and other volunteers, field registration, equipment maintenance, conservation and photographic personnel. A film crew also joined the team, eventually producing a documentary 'Wreck at Madman's Corner' (as the area was colloquially known). The programme was to entail a full 'area excavation' using airlifts and a recording and recovery regime based on a grid laid over a 48 by 16 m rectangle in strips of 2 m long. Using both a morning and afternoon shift providing 7–8 hours on site, Henderson's team progressively removed ballast and excavated and recorded down to the ceiling timbers using manual recording systems he had developed at the wreck of the former slaver *James Matthews*. Standard photomosaics and object photography rounded out the record. Attempts were also made to record the under surface of the hull and thereby also record the external planking, but this was not completed due to the presence of rock formations beneath the wreck.

By the end of the first eight-week season 15 879 silver coins had been raised. All bar a few were Spanish silver dollars. One was counter-stamped with the head of the British King George III, indicating it had been appropriated as British currency. Predominantly from the Mexico mint, the dates on the Spanish coins ranged from 1766 through to 1809. Eleven coins were United States dollars. Twelve 2 m-wide 'strips' across the site had been exposed, excavated and recorded. Major finds were a jug marked 'BOSTON', a wooden barrel marked 'BOSTON MASS. MESS BEEF', ceramic sherds, a gudgeon marked 'J Davis' (Jonathan Davis), copper and bronze fittings and fastenings and six of the eight cannon. On being raised one gun was deconcreted and found to be a 4 pounder carrying a broad arrow denoting Crown Property and the monogram of King George III of England (1760–1820).

Despite the sometimes conflicting clues, after travelling to American archives, Henderson was able to identify the wreck as the 367-ton American China Trader *Rapid* with 22 crew under Captain Henry Dorr. Finding he could not save the ship, Dorr had the wreck set on fire such that its location would remain hidden allowing him to effect the salvage of the silver at a later date. After a difficult voyage of 37 days in three boats they arrived in Java. After recovering, Dorr and some of the crew made their way home, where he apparently arranged for salvage. This appears to have been successful leaving only those coins subsequently found on site.

A second eight-weeks excavation season commenced on 1 April 1980 and a third season of six weeks commencing on 4 January 1982. On this occasion students from the Post Graduate Diploma in Maritime Archaeology course joined the team. At the end of this season under the supervision of diving conservators the site was re-buried together with the timbers that had been covered with chemically impregnated hessian, to deter marine organisms present while the timbers were exposed.

The *Rapid* reward

While Messrs Todd, Stagg, Wright and Moffat were not recognised as the 'finders' of the wreck, at a meeting of the Museum's Maritime Archaeology Advisory Committee (MAAC) in February 1979 they were commended for their 'responsible action in reporting its evidence to the Museum'. It was also recommended that they each be presented with a coin from the

Figure 125. Geoff Kimpton and Vicki Richards carrying out analysis on the *Rapid* site in 2009 (Patrick Baker).

wreck, mounted with a commemorative brass plaque and that any expenses incurred while working with the Museum's team on its excavations be reimbursed. These costs were to be calculated on the basis of fares, field allowances and payment for the use of any equipment (MAAC Resolutions 2 July 1979). Though initially disappointed that their role in having the wreck reported (as described above) was not better recognised, in August 1982 Stagg wrote to the Museum expressing his team's appreciation of the coins and plaques presented to them by the Museum with Commonwealth support. For their part, the Paxman team also joined the Museum's excavations and in February 1980 they received $17 500 as an interim reward, while the excavation and identification processes was underway. After the excavation had concluded, a further reward was calculated, based on a number of considerations, including: the historic nature of the site; the need to encourage divers to report their finds; the value of the cargo and fittings; and on half the value of the bullion, as calculated at the time it was raised. A total of 342 kg (10 9997 troy ounces) of silver was recovered from the site. At that time the Perth Mint was purchasing silver at $4.67 per troy ounce, so the reward based on the silver alone equalled $25 000. With other the considerations, a total reward of $30 000 was given to the group. Nonetheless, in *The Weekend Australian* (28 January 1984), the Paxman group expressed their disappointment at the amount paid and sought further advice form their solicitor. It was particularly contentious, because during that period, the value of silver almost doubled, as the result of the Bunker Hunt silver speculation, but the reward was based on the value of silver at the time of the recovery, whereas, when the reward was given,

the value had doubled. Though supported by others in the diving community, nonetheless the Commonwealth considered the amount paid appropriate. In the decades following the *Rapid* case no other wreck of equivalent value was found, leaving it, HMS *Pandora* (1791), SS *Xantho* (1872) and the East India ships off the Western Australian coast, the only wrecks for which substantial rewards have been paid.

Some historical notes

The *Rapid* was built in 1807 by Nathaniel Thomas, master carpenter, at Braintree in Massachusetts for Andrew Ritchie of Boston. According to the Boston Customhouse Register (Number 246) the 366 $^{84}/_{95}$ ton *Rapid* was built with two decks and three masts and was 104 ft (31.7 m) long, 28 ft 4 in (8.6 m) in breadth and 14 ft 2 in (4.3 m) in depth. The vessel had a figurehead and a square stern with no galleries. No illustrations have been located, but according to Henderson it is likely that the *Rapid* would have followed the fashion of the time and had a black waist, yellow moulding, and black strakes. The *Rapid* was first registered on 23 December 1807, a day after President Jefferson's *Embargo Act* came into effect, prohibiting all American vessels from engaging in foreign trade. This lasted until 15 March 1809, resulting in the *Rapid* lying idle until it was sold in July 1809 to Paschal Pope, William Boardman, Jonathan Amory, Ebenezer Dorr, Joseph Bray and Jonathan Dorr. They intended it for the China trade. Henry Dorr, part of the prominent Dorr family of Boston shipowners, ship captains and merchants, commanded the *Rapid* on its maiden voyage to the East in August. Most notable was Ebenezer, who collected sealskins for the China market and William who, like his brother Henry, had completed many voyages to China and in the Pacific. The first voyage appears to have been a success, and another voyage, carrying silver to invest in Chinese goods, was planned. According to Henderson, and certainly supported by the archaeological record, it appears that the *Rapid* carried only ballast in the hold, in order to steady the ship under sail. In this period, other outbound East Indiamen did likewise.

After the wreck, Dorr arranged for a ship to return to the site with divers, commencing work on the recovery of the silver in April 1812. Few details of the salvage of an estimated 58 boxes of silver, each weighing around 136 kg, have been found, partly because war broke out between America and Britain in the following June. With fears of American assets in the Far East also being confiscated, little news of their activities in the region leaked out, although, according to the ship's agents, some of the silver (around 91 000 dollars) arrived at Canton in February 1813 via the ship *Meridian* (Henderson, 1981; *Java Government Gazette*, Vol. 1, No. 15, Saturday 6 June 1812, p. 2, col. 2). It appears to have been obtained by the owners, or insurer's agents, specifically for the salvage. Henderson's research indicates that while the silver was fully insured by the Boston Marine Insurance Company, the ship itself, although worth $30 000, was only covered up to $7 000, at a 10% premium. As a result the Dorr family lost heavily on the *Rapid*. The insurance company appear to have been the greatest losers, however, for it is evident that a Batavia-based group had also recovered silver from the wreck. With Batavia in British hands during the war, the silver could not be taken there. Some was also held at Madras, by the salvors, or their agents, at least until December 1814, when the Anglo-American War ceased. There is also a possibility that salvage continued at the wreck after the war, for some claims were settled in 1815, 1816 and 1819, suggesting either a protracted and difficult legal process, or a continuing salvage effort during the ensuing peace. While it is evident that the majority of the silver was recovered, no definitive account has yet

been found (Henderson, 2007: 100–107).

Conservation report 1992

Jon Carpenter and Vicki Richards

Date of Inspection: 8–9 September 1992
Weather Conditions: Fine with a cold southerly wind.
Sea Conditions: Sloppy sea. Slight underwater surge from a southerly direction.
Underwater Visibility: 10 m.
Water Temperature: 20° C.
Site Depth: 4.5 m.
Site Description: The wreck lies in a sand seabed and is parallel to a wall of hard reef on its starboard side. A large coral head is established forward of the starboard bow region and there is low reef to the stern. The coral sands around the site are intermixed with small fragments of the vessel's stone ballast. Ten years after the *Rapid* excavation was completed in 1982, the wreck remains comprise a mound of stone ballast (approx. 500 mm high) lying over ship's timbers. Two anchors are situated in the vessel's bow region. One of the anchors points west, the other to the south. The latter example is partly buried at the crown. The west facing anchor is proud of the seabed as it rests on a 'pier' of concreted stone ballast. Except for some hull timbers exposed in the starboard bow region (50 mm above the seabed), the site appears undisturbed. During redeposition of the ballast mound on the site in 1982, this small area appears to have been left uncovered. Some sand has been deposited between ballast stones and some algal forms are growing on the ballast.
Iron Artefact Condition: Both anchors appear to be in very good condition and are complete with hawse rings.
Electrochemical Survey: The pH and corrosion potential measurements were recorded on both anchors (Figure 127). The results are outlined in Table 8 and the on-site positions of the anchors shown in Figure 129. The pH of the sea water was 8.2. The water temperature was 20° C and the maximum water depth was 4.5 m.

Table 8. Corrosion parameter measurements (1992) of the two anchors on the *Rapid* wreck site.

Description	pH	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)
Anchor 1B (shank) (west facing)	7.18	-0.382	10
Anchor 2A (crown) (south facing)	6.56	-0.336	nd
nd – not determined			

Wood condition: No attempt was made to uncover buried and/or ballast covered wood. The exposed wood was dark brown in colour with slight surface furrowing. It appeared well preserved an observation supported by investigative drilling to obtain a pH profile (Figure 126). At a depth of 20 mm the wood became a natural oak colour. The results of the pH profile are presented in Table 9 and the on-site position of the measured timber is shown in Figure 129.

Figure 126. Jon Carpenter measuring the pH profile of an exposed timber on the *Rapid* site in 1992 (Patrick Baker).

Figure 127. Jon Carpenter measuring corrosion parameters on the *Rapid* anchor 1 in 1992 (Patrick Baker).

Table 9. pH profile of an exposed timber measured on the *Rapid* wreck site in 1992.

Depth into Timber (mm)	pH
Surface (0 mm)	8.10
5	7.92
15	7.48
20	7.34
25	7.39
30	7.41
40	7.55
60	7.35

Conservation report 2009

Vicki Richards

Date of Inspection: 20–21 May 2009
Aim of the Inspection: The objectives of the on-site conservation survey on the *Rapid* site were to quantitatively measure the extent of deterioration of the timbers; perform a corrosion survey of the anchors; and, ascertain if any further deterioration had occurred since reburial after the excavations in the early 1980s and the site inspection in 1992.
Weather and Sea Conditions: Generally fine weather conditions with temperatures ranging from 28–29° C for the survey period. The wind direction was from the north-east on 20 May 2009 at 7 knots, which tended more northerly in the afternoon increasing to 11 knots. The wind direction for the second survey day (21 May 2009) was northerly in the morning at 11 knots increasing in speed and tending north-westerly towards the early afternoon. Seas were from the south west increasing from 1.7 to 2.4 m over the two-day survey period. There was a slight south-westerly surface current, which increased over the survey period and a noticeable NW–SE surge running perpendicular to the site. The diurnal tidal range over the survey period was 0.6–2.0 m.

The in-water visibility was approximately 5 m. The water temperature at the surface was 24° C. The average pH and redox potential of the sea water on site at 4.6 m was 8.13 ± 0.02 and 0.239 ± 0.020 V, respectively, indicating a typical oxidising marine environment. The change in salinity, dissolved oxygen content and temperature of the water column with depth is shown in Table 10.

Table 10. Salinity, dissolved oxygen content and temperature of sea water measured on the *Rapid* wreck site

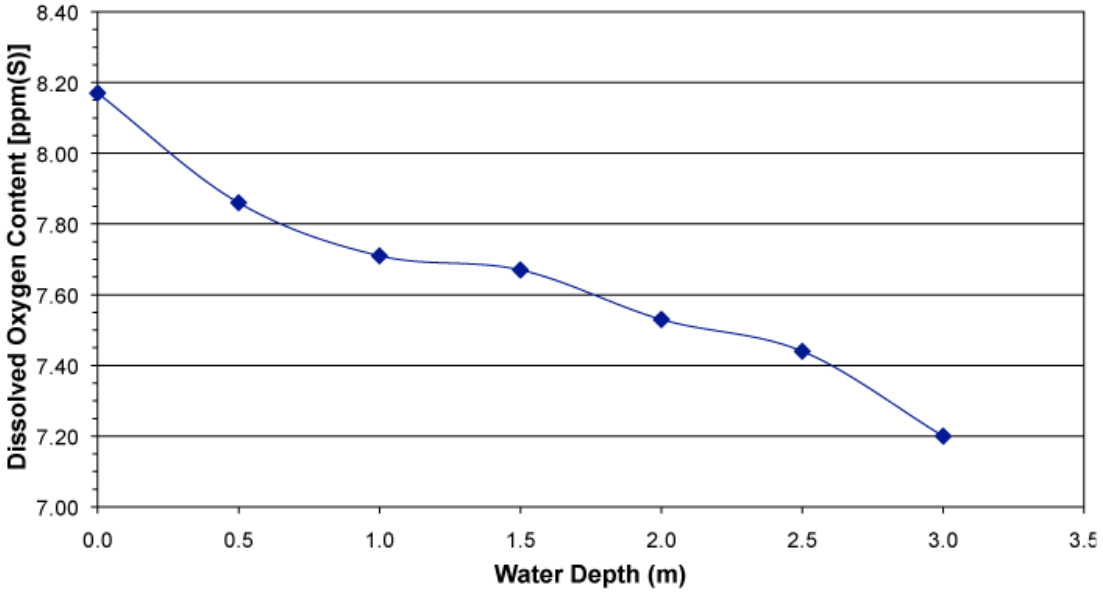


Figure 128. Change in dissolved oxygen with water depth on the *Rapid* site (Vicki Richards).

in 2009.

Water Depth (m)	Salinity (ppK)	Dissolved Oxygen Content (ppm)	Temperature (°C)
0.0	36.0	8.17	23.9
0.5	36.3	7.86	23.9
1.0	36.3	7.71	23.9
1.5	36.3	7.67	23.9
2.0	36.3	7.53	23.9
2.5	36.2	7.44	23.8
3.0	35.7	7.20	23.5
Average	36.2 ± 0.2	7.65 ± 0.31	23.8 ± 0.1

There was no significant change in salinity and temperature with increasing water depth, which is typical of the hydrology of well-mixed, near coastal waters. The average water temperature was 23.8 ± 0.1° C and the average salinity of the water column was 36.2 ± 0.2 ppK, which is within the usual salinity range for the open ocean of 32–36 ppK. The average dissolved oxygen concentration of the sea water was 7.65 ± 0.31 ppm (88% saturation at 24° C), which is in general agreement with the dissolved oxygen content measured in 1982 (80–85% saturation at a depth of 6 m) (Taylor and MacLeod, 1985). However, the average dissolved oxygen concentration on the *Rapid* site in 2009 was much higher than that measured on the *Zvir* site in the same year (page 194). Dissolved oxygen concentrations increase with decreases in water temperature and salinity and there was a 4° C decrease in temperature and a 1 ppK decrease in salinity on the *Rapid* site compared to the *Zvir* site. In addition, dissolved oxygen concentrations will generally increase with decreasing water depths, due to the increase in overall water movement in shallower waters. The *Rapid* site is much shallower

(4.5 m) than the *Zvir* site (8 m) so an increase in the average dissolved oxygen content on the *Rapid* site would not be unexpected. The decrease in dissolved oxygen content with increasing water depth is shown in Figure 128. This trend is similar to that observed on the *Zvir* site, except the dissolved oxygen measurements are much higher due to the decrease in water depth, average temperature and salinity.

For open ocean environments, there is usually a surface maximum in the dissolved oxygen concentration. This maximum is a direct result of absorption from the atmosphere interface, increased water movement and photosynthetic activity by plants and cyanobacteria. Typically, after this surface maximum the dissolved oxygen concentration of the water column will decrease with increasing depth. Factors contributing to this trend are decreasing water movement, which leads to less oxygen exchange with the atmosphere, decreasing photosynthetic activity due to less light penetration and increasing aerobic respiration of plankton in the photosynthetic zone. Therefore, this general decrease in dissolved oxygen with increasing water depth, coupled with the other physico-chemical measurements, are typical for an open circulation, oxidising marine environment.

The Wreck Site: The *Rapid* wreck site lies about 2 km to the south-south-east of Point Cloates. The wreck is relatively exposed and lies in an area which is prone to cyclonic storms from December to April.

The bow of the *Rapid* lies to the west-south-west and the stern in an east-north-east direction at a depth of approximately 4.5 m. The reef runs parallel to the starboard side of the wreck. There is a large coral head situated forward of the starboard bow and a low reef located near the stern (Figure 129). The site is dominated by a large ballast mound (Figure 131), covering an area about 10 x 25 x 1.2 m high with two exposed anchors located in the bow region (Figure 132). The wooden hull remains consisting of the keel, bow and port side (Figure 123) lie buried under the ballast mound and layers of sand and coral debris. The sand is calcareous in nature with a coarse particle size (>700 μm).

The most exposed areas of the wreck are the iron anchors on the starboard bow and the ballast mound. Anchor 1 lies directly on the ballast mound and rises to about 1.5 m and anchor 2 lies on the seabed slightly to the south of anchor 1 (Figure 129 and Figure 132). The concreted surfaces of the iron anchors are quite densely covered with sessile marine organisms including mussels, sponges, barnacles, ascidians, tunicates and a variety of seaweeds. In less concentrated areas of growth, small algal forms are present. There is seaweed, soft corals and algal growth on upper surfaces of most of the ballast stones (Figure 131). No exposed wooden structural features were noted during this inspection but a complete visual survey of the site was not performed.

Three seasons of excavation were carried out in 1979, 1980 and 1982 led by maritime archaeologist, Graeme Henderson (Henderson, 1982). The ballast mound consisting of several hundred stones was removed so the hull remains could be recorded (Figure 124). The ship's bell, one anchor, eight cannons and over 18 000 coins, 4 000 fastenings and 3 500 artefacts were recovered from the site during these excavation periods. At the completion of the last excavation season in 1982, the ballast stones were replaced and the hull timbers completely covered with local sediment from the surrounding seabed (Henderson, 1982).

The site was inspected in 1992. Corrosion measurements were taken on the two anchors (Figure 127) and a pH profile measured on an exposed timber situated near the bow (Figure 126). The results of these surveys will be discussed below.

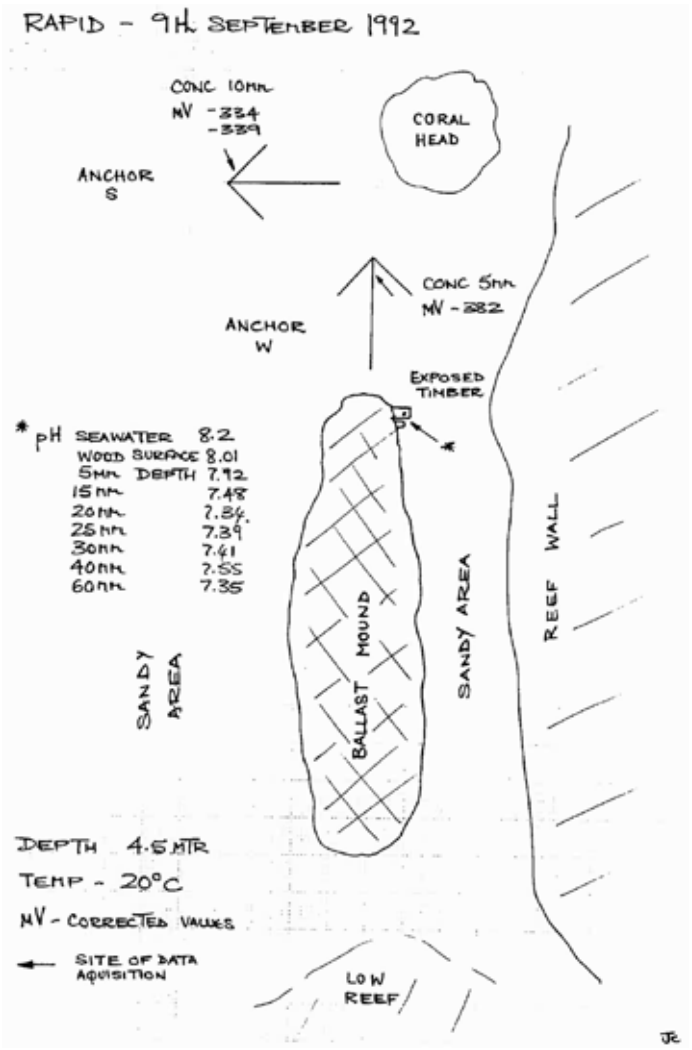


Figure 129. The 1992 sketch plan of the *Rapid* site (Jon Carpenter).

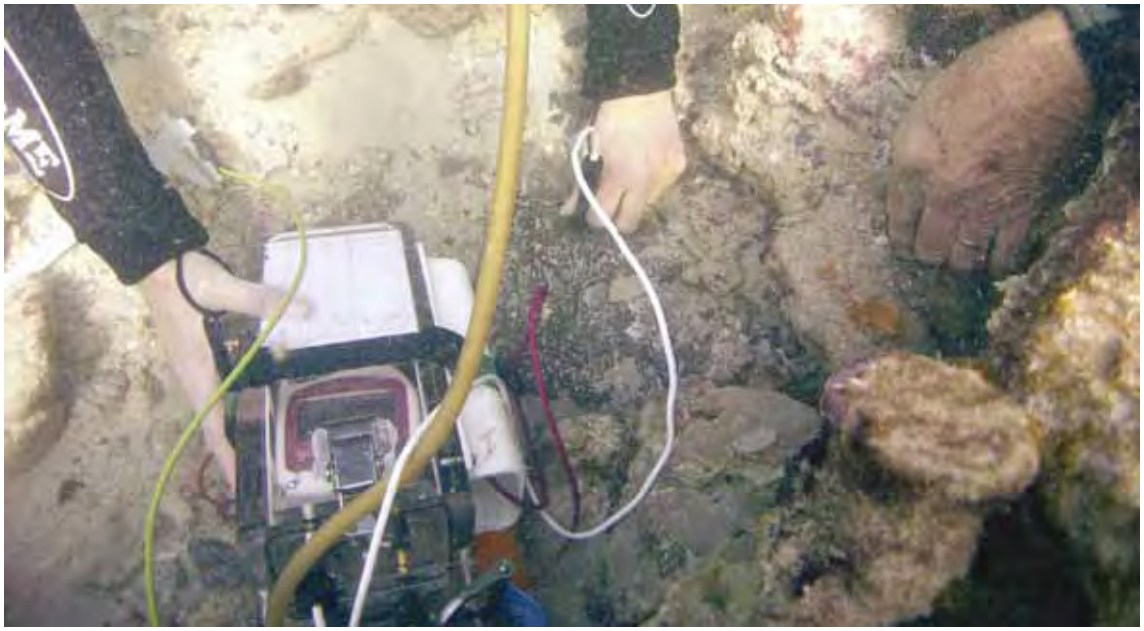


Figure 130. Measuring pH profiles of the timber in Test Trench 1 (TT1) on the *Rapid* site in 2009 (Patrick Baker).

Figure 131. Ballast stones on the *Rapid* site in 2009 (Patrick Baker).

Figure 132. Anchors on the *Rapid* site in 2009 (Patrick Baker).

During the 2009 survey period, three Test Trenches (TT1, TT2 and TT3) (Figure 123) were exposed (~1 m^3) by removing the ballast stones and hand fanning the sediment until a small area of timber was exposed so the extent of degradation of the hull timbers could be ascertained by measuring probe depths and pH profiles (Figure 130). The pH and redox potential of the sediment in each test trench was also measured. Finally the corrosion parameters of the remaining two anchors were measured for comparative analysis. At the conclusion of the survey in 2009, the timbers in each trench were lightly covered with sand and the ballast stones redeposited in order to protect them from future deterioration.

Iron Alloy Survey: The corrosion parameters of the two exposed anchors on the *Rapid* site were measured in 2009 and the results are presented in Table 11 and the on-site positions shown in Figure 123. Anchor 1 was measured on the ring, shaft and crown whilst anchor 2 was only measured on the crown and shaft because the SCUBA tank driving the pneumatic drill ran out of air.

Table 11. Corrosion parameter measurements (2009) of the anchors located on the *Rapid* wreck site.

Description	pH	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)	Depth of concretion (mm)	Depth of corrosion (mm)	Corrosion Rate (mmy^{-1})
Anchor 1A (crown)	7.39	-0.368			2	0.010
Anchor 1B (shank)	8.06	-0.368			6	0.030
Anchor 1C (ring)	7.89	-0.368	10			
Anchor 2A (crown)	6.20	-0.327	34			
Anchor 2B (shank)	7.96	-0.328			3	0.020

In order to compare the corrosion data collected in 1992 and 2009, the corrosion potentials and surface pHs of the wrought iron anchors were plotted on the iron Pourbaix diagram in aerobic sea water (Figure 133).

The average pH and E_{corr} measured in 2009 were 7.78 ± 0.35 and –0.368 ± 0.000 V for anchor 1 and 7.08 ± 1.24 and –0.328 ± 0.000 V for anchor 2, respectively. The intercepts on the Pourbaix diagram are denoted by crosses (Figure 133). The pH and E_{corr} measurements measured on anchor 1 in 1992 were 7.18 and -0.328 V and on anchor 2 were 6.56 and –0.336 V, respectively. The intercepts of the anchors measured in 1992 and 2009 lie in the active corrosion region, where ferrous ions are the thermodynamically stable chemical species and corrosion will continue until all iron is consumed (Figure 133). Generally, with film free corrosion mechanisms, such as occurs on concreted iron artefacts, an increase in the corrosion potential (tending more positive) indicates an increase in the corrosion of the metal. Since 1992, the corrosion potentials of anchor 1 and 2 have increased by 0.014 V and 0.009 V, respectively, which is indicative of an increase in the corrosion of both anchors over the past 17 years.

After decades of immersion, concreted metals are in a quasi-equilibrium state and the corrosion potential data represent a steady long-term rate of decay but only if they remain

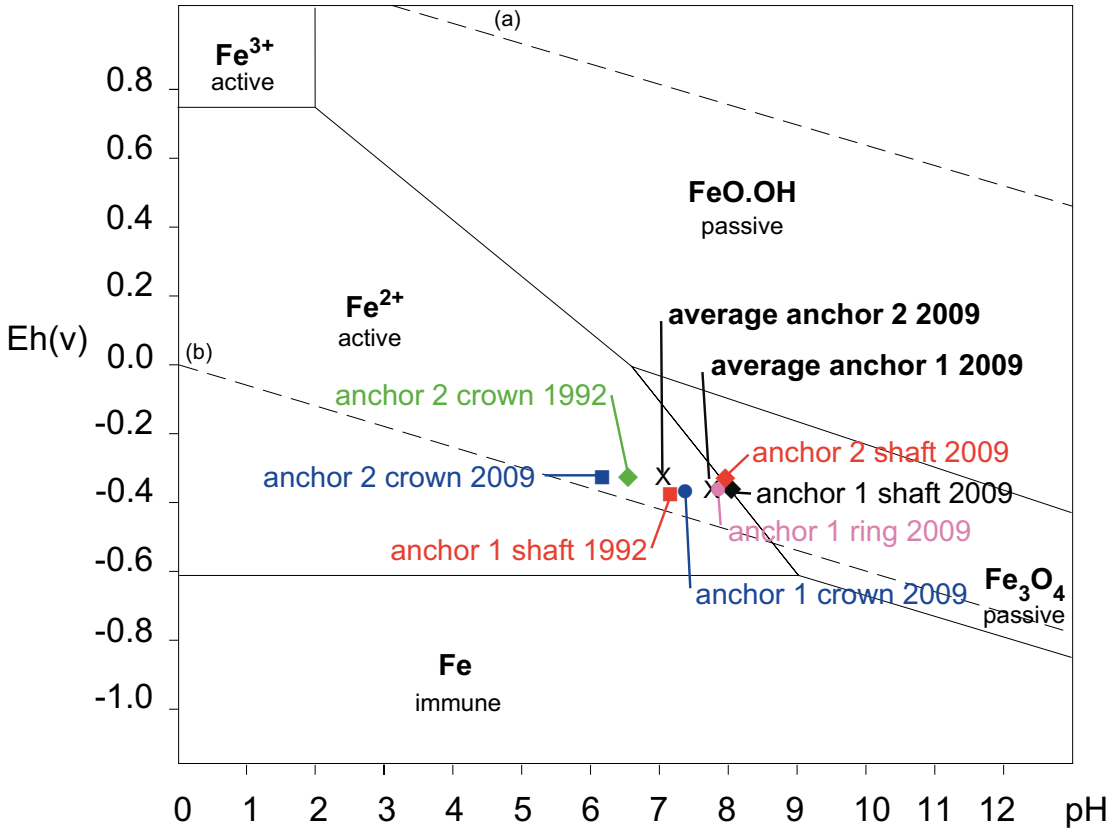


Figure 133. The Pourbaix diagram for iron (10^{-6} molar) in aerobic sea water at 25° C indicating the intercepts of the anchors measured on the *Rapid* wreck site in 1992 and 2009 (Vicki Richards).

essentially undisturbed (i.e. no damage occurs to the protective concretion and corrosion product layers). The potential difference between anchors 1 and 2 in 1992 was 0.046 V and in 2009 was 0.041 V. These potential differences are essentially the same, which indicates that the micro-environment on the anchors has remained essentially unchanged over the past 17 years and they are indeed corroding at a steady long-term rate.

In comparing the E_{corr} and pH measurements of anchor 1 to anchor 2 taken in both 1992 and 2009 it appears that anchor 2 is corroding faster than anchor 1. That is, the corrosion potentials of anchor 2 are more positive than anchor 1 and the average pH values of anchor 2 are more acidic than those measured on anchor 1. One explanation for this corrosion difference between the two anchors is the presence of the large coral head just a few metres to starboard of anchor 1, which may be providing some protection from increased water movement and thus, oxygen impingement to the concreted corroding surface during periods of increased swell and current.

It has been previously reported (MacLeod, *et al.* 2007) that the total thickness of concretion plus corrosion (d_{total}) is an important factor in determining how effective the marine growth is in establishing separation of the anodic and cathodic sites of the corrosion cell and this, in turn will be reflected in the pH values. In simple terms, areas that possess thinner concretion layers tend to present more alkaline pH values whereas the fully matured sections possess more acidic values. The depths of concretion on the anchor rings and especially the shafts were considerably thinner and therefore the pH of the residual metal surfaces measured in

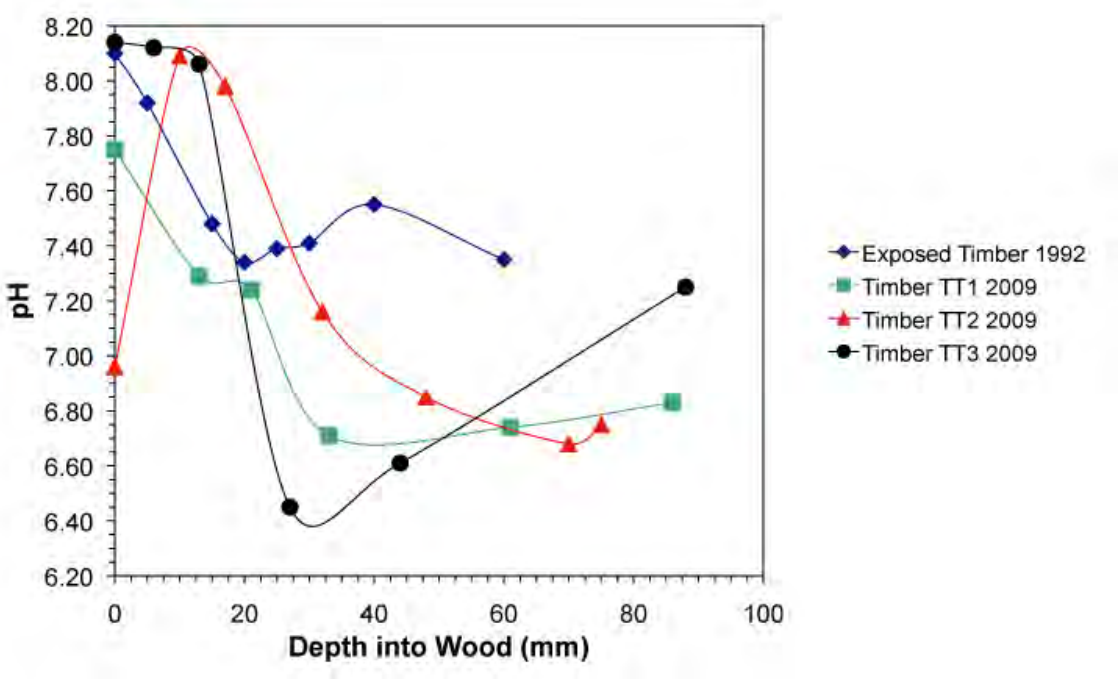


Figure 134. pH profiles of structural timbers measured in 1992 and 2009 on the *Rapid* wreck site (Vicki Richards).

these areas were more alkaline than the pH values measured on the crowns and flukes where the concretion layers were much thicker (Figure 132). This may indicate a slight increase in the corrosion rate of the crown and fluke areas where the wrought iron is under the most mechanical stress and may possess a slightly different microstructure than the shafts and rings. It is important to note that where concretion has been recently removed from underlying iron, more alkaline pH values are often measured but the corrosion rates are still high. This observation is supported by the annualised corrosion rate data (Table 11) for the anchors measured in 2009, where the rate of corrosion for the shafts are slightly higher than for the crown on anchor 1; however, there is not enough data to make any definitive conclusions.

Wood Analysis: There were no marine organisms present on the freshly exposed timbers in the test trenches that would indicate recent exposure to an aerobic environment, however there was some evidence of past depredation by teredo worm on the timbers in Test Trench 1 (Figure 130). Preliminary wood identification of some timber samples recovered from the hull remains in 1979 indicated that white oak ribs and spruce planking affects had been used in the construction of the vessel (Henderson, 1980). *In-situ* pH profiles and probe depths of the exposed structural timbers in the three test trenches were obtained. In teredo damaged timbers, the presence of excreted calcium carbonate that lines the worm bore holes effects the maximum water contents and therefore, this particular measurement cannot be applied to timbers with extensive marine borer attack. However, pH profiles provide a good indication of the state of degradation irrespective of the extent of wood borer attack. The results of the pH profiles, including the measurements recorded on the exposed timber in 1992 are shown in Figure 134.

Generally, the pH profiles of the timbers followed a typical sigmoidal relationship (Figure 134). That is, the pH of the wood near the upper, more exposed surfaces was high then as the timbers were vertically traversed there was a decrease in pH that tended to plateau with

Figure 135. Timber measured in Test Trench 2 on the *Rapid* site in 2009 (Patrick Baker).

increasing depth. The normally acidic nature of undegraded waterlogged wood, albeit more alkaline than undegraded, seasoned wood of the same species, becomes progressively more alkaline with increasing degradation due to the inward diffusion of alkaline sea water into the void spaces of the more degraded wood cells. Therefore, the higher pH values generally observed near the timber surfaces denoted the areas of greater deterioration. The decreasing trend in pH as the core depth increased was indicative of a gradual decrease in the extent of degradation towards the interior of the timbers until the pH reached a minimum that represented the area of least deterioration. For the 'buried' timbers measured in 2009 after the minimum pH is reached there is a turning point and the pH begins to increase again. This indicates a gradual increase in the extent of wood deterioration as the interior side of the timber is approached. In addition, the final pH of the timber is considerably more acidic than the pH measured on the upper, more degraded surfaces. Hence, the extent of deterioration of the outer surfaces is significantly greater than the interior surfaces. This is not unexpected as the upper surfaces of the timbers would be more exposed to the degradative effects of the local micro-environment.

Not unexpectedly, the exposed timber measured in 1992 is the most degraded of the timbers. Generally, the pH values were much higher than those recorded for the other 'buried' timbers, denoting more extensive degradation throughout the entire width of this timber. The test trench timbers measured in 2009 were in considerably better condition indicated by the more acidic pH measurements recorded throughout the inner regions of the timbers (Figure 134). The pH profiles for these 2009 timbers are very similar to the profiles measured on the *James Matthews* site in 2000 (Richards, 2001), where the maximum water contents ranged between 100–150%, indicating a degraded outer surface overlaying a relatively undegraded core.

Overall it would appear that the timber in TT2 (Figure 135) is more degraded than timber

TT1 and timber TT3 is the least degraded of the three timbers. This is supported by the probe depths where the timber TT1 and TT2 ranged from 5–10 mm but the depth range for timber TT3 was <5 mm. In addition, the redox potential of the sediment measured in test trench 3 was slightly reducing in nature (-0.078 V), indicating a less oxygenated environment and therefore less biological deterioration of the timber will occur in this trench.

The lower pH values measured on the surface of the timber in test trench 1 (TT1) and test trench 2 (TT2) would indicate active microbial and fungal deterioration which produces acidic metabolites and wood by-products that can be accumulated near the wood surface. Usually biological deterioration on this scale would require significant levels of oxygen thereby indicating that the sediment in these test trenches were far from anaerobic. This was confirmed by the redox potential measurements of the sediment, which was slightly oxidising at 0.014 V.

It is well known that less oxygenated, more reducing, near neutral environmental conditions are more conducive to the preservation of wooden and metal wreck remains. Biological, chemical and physical degradation of wood occurs to some extent on all shipwreck sites; however, biodeterioration, especially from marine borers and physical damage from wave and sand movement are the major causes of degradation of exposed timbers. When a site is disturbed either by dredging, excavation, scouring, and so on, the concomitant increase in oxygen, nutrient and water contents will almost certainly lead to a more aggressive environment. Consequently, wood will be exposed to increased marine borer and aerobic fungi and bacterial activity. However, if the wood is reburied, such as occurred with the *Rapid* hull remains, with time microbial processes within the sediment will consume the oxygen and less aerobic environments will be established excluding marine borers and other obligate aerobic micro-organisms. However, soft rot fungi (*ascomycete* and *fungi imperfecti*) and tunnelling bacteria are able to tolerate lower oxygen levels and can attack remaining sound wood under less aerobic conditions. As the oxygen concentration in the sediment decreases further to near anaerobic conditions, wood will only be subjected to the relatively slow action of erosion bacteria. Furthermore, no degradation of wood occurs in the complete absence of oxygen. Hence, it is obvious that depth of burial is one of the important factors to consider during reburial.

In conclusion, it appears that the replacement of the ballast mound has decreased the rate of deterioration of the shallower wooden timbers by decreasing physical, chemical and biological degradation; however, the micro-environment in the upper 200–300 mm of sediment under the stones is not anaerobic and therefore, degradation will continue into the future albeit at a much slower rate. One way in which a more deoxygenated micro-environment could be encouraged in the sediment under the ballast stones would be to cover the entire ballast mound with geotextile, such as Terram 4000. This remediation technique would be easily deployed, cost effective and could be easily removed if further archaeological investigation was warranted in the future.

Benan 1888

Corioli Souter

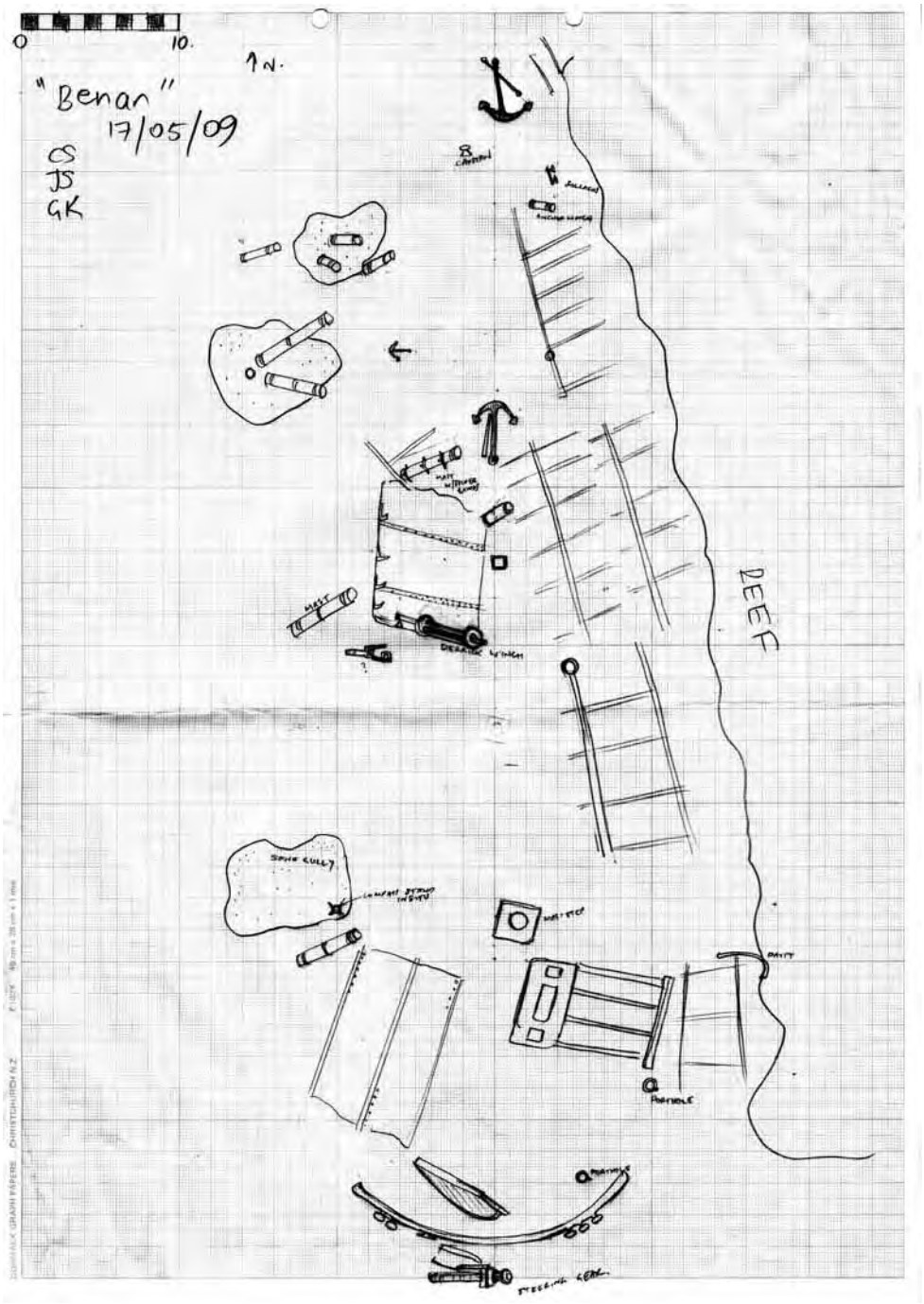


Figure 136. Sketch plan of the *Benan* wreck site (Corioli Souter).

Figure 137. The binnacle stand of the *Benan* (Corioli Souter).

Figure 138. The *Benan* steering gear (Patrick Baker).

Figure 139. The *Benan* winch (Patrick Baker).

Figure 140. The stern bitts of the *Benan* (Patrick Baker).

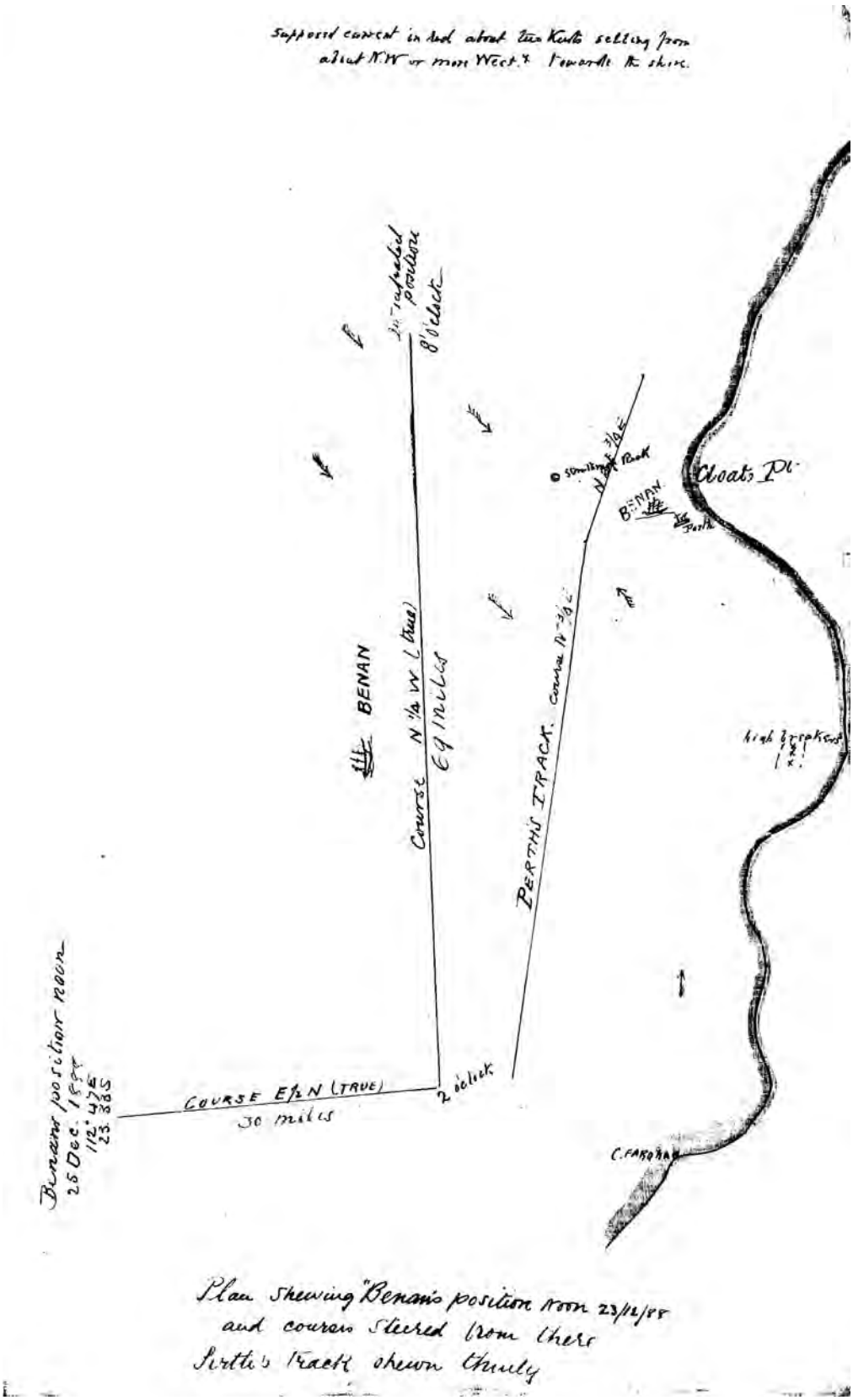


Figure 141. The course of the *Benan* from 'Inquiry into the Wreck of the *Benan*'. Harbour-Master, Fremantle 18 January 1889 State Archives of Western Australia. Acc 527. *Benan* WAM File MA-25/92. Note position of two wrecks is incorrect.

Figure 142. Photomosaic of *Benan* wreck site in 2009 (Patrick Baker).

Wrecking event and inquiry

> I loved that ship; I took pride in her; not a speck of rust from stem to stern; I shall never like another as I did her, I felt inclined to go with her, and better if I had 'But Captain,' a listener said, 'there's a wife and others have got a claim on your affections'. I thought of them, and but for that thought I should have, and gladly, too, been at the side of the good *Benan* (*West Australian* 8 February 1889: 3b).

The iron ship-rigged *Benan* (Official Number 70766) was built in Leith, Scotland, in 1875, and was owned by Thompson and Co. of Leith (*Lloyd's Shipping Register* 1888–89). The vessel was en route from Cardiff, Wales, to Hong Kong, with a cargo of coal. On 23 December 1888, land was sighted just north of Cape Farquhar. There was a fresh breeze from the south and the vessel kept off the land, which was scarcely visible at sundown. At 8 pm, the vessel struck a reef off Point Cloates. The master, Captain John Burns, immediately attempted to put the ship around, but the bow was struck by a breaker, sending the vessel further onto the reef. Attempts to get the port life-boat launched were foiled due to the sea making a clear breach over that side. Fortunately, the starboard boat was successfully launched and as the cabin was now full of water, with the deck fittings washing about, all hands quickly boarded the boat. They pulled away from the ship, and not knowing what dangers lay between them and the shore, kept out to sea until daylight, when they tried to re-board the ship. With the sea breaking right over it, they had to abandon the attempt. Finding an opening in the reef, they were able to guide the boat through and safely reached the shore. As there had not been sufficient time to properly provision the life-boat, they had no food at all, though they did have a supply of water. Hoping that some provisions might be washed ashore from the wreck, the men stayed at the spot where they had landed, and on 25 December, a tank full of flour was found on the beach. This allowed them to make some damper using salt water and the flour. Taking a supply of the bread, they set off down the coast towards the south, leaving a message attached to the life-boat to inform searchers where they had gone. They were fortunate in encountering some local Aborigines, who directed them to Brockman's station at Yalobia. Arriving there on the night of 27 December, they were met by the sheep manager, Grierson, and stayed with him until 6 January 1889, when the cutter *Gipsy* arrived. The *Gipsy*'s crew had discovered the message left with the life-boat and set out to find the castaways. The 28 men left Yalobia in the cutter on 6 January 1889. With so many aboard the small vessel, provisions ran out well before the *Gipsy* reached Carnarvon on 16 January (*The West Australian* 16 January 1889: 3a).

At the inquiry, which was held at Carnarvon, evidence echoed that given in the SS *Perth* inquiry the previous year. The master and mates were cleared of all blame, the cause of the wreck being given as a strong current setting from the north-west, and wrongly laid down in the Admiralty charts. This verdict was criticised by Captain Charles Russell, the Chief Harbour-Master who quoted from the Admiralty sailing directions, which clearly warned of the possibility of a current setting towards the land in the vicinity of Point Cloates. The Collector of Customs also expressed dissatisfaction with the findings. He complained of the requirement for the inquiries to be held at Carnarvon, the nearest port, and suggested that in the cases of both the *Benan* and the *Perth*, a Fremantle court of inquiry may have reached a different conclusion (Cairns and Henderson, 1995: 127–129).

The course of the *Benan* and the sequence of its wrecking was charted and at the time

compared to that of SS *Perth* which had wrecked at Point Cloates just over a year earlier (Figure 141).

Site description

The wreck was discovered by Mike Forde in 1989, with the bows lying to the north. The seabed comprises a hard compact coral-limestone, interspersed with sand gullies. The primary site, defined by the length of the keelson, lies off the main reef on the seaward side and is 80.3 m long. More wreck material lies on the shallow reef platform to the east, although this is difficult to access in most conditions. This area contains iron hull sections, pieces of hull plating, one pair of small anchors, dead-eyes, portholes and baulks of wood. At the primary site, the vessel's frames and decks have collapsed down on top of one another, while the outer plating has popped off and lies to each side, although generally, the hull lies to starboard. Some of the more prominent features include the rounded counter stern complete with bollards and bits, still *in situ* (Figure 140), and the rudder and steering gear complete with the wooden hub from the ship's wheel (Figure 138). Two brass bands reinforce the hub which also houses a brass boss.

A number of iron mast and spar sections are spread across the wreck, many wedged in the sand gullies located to the west of the site. A number of masts also have spider bands still attached. Three anchors are visible, one in a set position located at the bow and two located approximately midships, one is a large folded anchor and the other a smaller anchor. Three windlasses were recorded on the primary site during this survey: a large derrick winch approximately midships and small anchor winch near the main anchor (Figure 139). Interestingly, no coal has been found on site during this, or previous inspections.

A copper-alloy instrument binnacle stand was recovered from a sand gully near the stern (Figure 137). Other miscellaneous features include, mast steps, brass port-holes, dead-eyes, davits and a capstan near the bow anchor.

Benan was also subject to some primary salvage and material was removed from the beach when it floated in as described in an excerpt from Tom Carter's diary, a Jackaroo working in the region:

> As we had no load on the wagon as soon as we reached Minilya, where Brockman assured me that I might as well turn back as I could not possibly get a load of wool over the Lydon River his empty bullock cart had just got bogged there on its way down to the coast to bring back some wreckage off the *Benan*… (Carter, 1987: 122).

Site survey

An offset survey was conducted over one dive with the aim of identifying and orienting specific features. A baseline was laid on the primary site, with the bow anchor marking the zero end of the tape, down the keelson to the steering gear at the site's southern extremity.

Table 12. Distance survey.

Baseline (m)	Distance (m)	Port/Starboard	Feature
3.3	0		Upright anchor
6.6	0	S	Anchor stock end
6	0.7	P	Fluke

5.9	2	S	Fluke
8.2	1.5	P	Capstan
12	22	S	Anchor winch
15.5	5.5	P	Mast section
21.4	5.4	P	Small anchor (1.7 m long)
22.5	0	BL	Large anchor (N end)
26.2	0	BL	Large anchor (S end)
31.3	BL	S	Windlass(2.6 m long)
33.7	0	P	Bollard
37	6	P	Derrick winch (N end)
38.4	1.2	P	Derrick winch (S end)
44.4	0	BL	Mast step
57.1	1	S	Circular hatch (0.90 m diam.)
58	8.9	P	Mast section
80.3	0	BL	Steering gear

Newspaper reports

Jeremy Green

The West Australian Saturday 12 January 1889

TOTAL WRECK OF A SHIP NEAR POINT CLOATES. THE CREW SAVED.
CARNARVON, January 11.
The ship *Benan*, 1,400 tons, Burns, master, from Cardiff for Hong Kong with coal, is a total wreck near Point Cloates, close to the sene of the wreck of the ss *Perth*. The crew, numbering 28, were all saved. They walked down the beach to Yatobin, and fell in with a sheep station. The cutter *Gypsy* took the shipwrecked crew on board, and is now on her way to Carnarvon. The cause and particulars of the wreck are not yet known. I will wire full particulars on the arrival of the *Gypsy*.

The West Australian Wednesday 23 January 1889

WRECK OF THE "BEN AN." THE FINDING OF THE COURT OF INQUIRY.
(By Telegraph) [From our Correspondent]
Carnarvon, Jan. 22.

The Court of Inquiry into the stranding of the British ship *Benan* at Point Cloates, has found that she stranded in consequence of a strong current setting in from the North West, which are wrongly laid down in the Admiralty charts and directories, and it relieves the master and officers from all blame. The currents are laid down in the charts as setting along the coast from the southward. The *Perth* wreck, and now the *Benan*, appear to show that the finding of the court is correct. Evidence was given at the Inquiry by the master, mates, and three German seamen, and it is similar in almost every particular to the particulars already reported. Captain Burns, and his crew proceed to Fremantle per *Otway*.

The West Australian Wednesday 6 February 1889

Capt. Burns, of the ship *Benan*, 1,338 tons, arrived in Fremantle by the SS *Otway*. He reports that his vessel left Cardiff on the 28th September, with a cargo of coal for Hong Kong. Had fairly good weather, and on Sunday, Dec. 23rd, about a quarter past eight in the evening, while a strong S.S.W. breeze was blowing, the vessel took the ground on the outside of the reef at Point Cloates. He corroborates all that has already appeared in the *West Australian* respecting the disaster. He lost all his clothing, chests, and, while many of the men secured their goods as they were washed ashore. There were 25 in the crew, and they have all come down to Fremantle. The vessel was built on the Clyde in 1875, and was owned by Messrs Thompson and Co. of Leith. Captain Burns and the officers intend to return home as Boon as possible, while the men will no doubt secure employment on the vessels in the harbour.

THE WRECK OF THE *BENAN*

Our Carnarvon correspondent supplies us with the following particulars, in addition to those already furnished by telegraph, respecting the wreck of the *Benan* at Point Cloates on Dec. 23: On Sunday afternoon the 23rd December, land was sighted shortly after two o'clock. The *Benan* then stood in for the land, and made out Cape Farquhar, where the captain corrected his chronometer, and otherwise made his position safe, ere he reached the Northern Straits, through which he had to pass. Having gained what he wished, the ship's head, was hauled off the land, and the land being low, soon commenced to disappear. At dark little or no land was visible, and at this time the ship's head was north-half-west, and making a more westerly course than that. Everything seemed secure on board, and active preparations were made by the cook for Christmas Day, which, doubtless, the crew expected to spend as merrily as the circumstances of sea life would allow. At eight o'clock in the evening, the change of watches, the ship's course was altered half a point in, she steering due north, and as subsequent events proved it was a fatal shift. Five minutes after the course had been altered, the vessel, going over eleven knots an hour, had struck on a reef. The helm was immediately put hard over, and the ship came too two points, and doubtless would have stayed, but then a dumb breaker caught her on the bow sending her back again upon the reef where she struck. Orders were at once given to the second mate's watch, to clew up the after sails, whilst the mate's watch were to launch the port life boat. These orders were not obeyed with that alacrity with which they would have been, had there been a European crew on board, but masters Sambo etc., thinking that not only self-preservation, but as much as belonged to self as possible, was the first and only law of nature, were busily employed packing up their bags, and some little time elapsed before the officers could get them to their posts. The second mate was successful in clewing up the after sails, which made the ship lay steadier. The attempt to launch the port boat was futile, the heavy breaking sea, washing completely over the ship from the port side, making it impossible for them to work on that side. The life boat on the starboard side was then successfully, though not without some difficulty, swung from the davits. The carpenter having sounded the vessel and found the water making quickly, the captain determined on leaving her. She was breaking up quickly, and the seas were completely washing her deck, carrying away all the woodwork and other deck fittings. So some twenty minutes after the vessel struck, orders were given to lower away the boat, twenty-five of the crew crowded into her as she swung in the davits, and only that the davit falls were good, they would have lost their only means of safety. The falls were

good; she was successfully lowered, and those who remained on board the ship got into her, Captain Burns being the last man to leave. They immediately pulled away from the wreck, and all that night they kept dodging about the locality. At day-break next morning they pulled back to the ship, with the intention of going on board her, but it was impossible with the tremendous sea breaking over her. Shortly after this she slipped off the edge of the reef into deep water, where all that is left of a noble ship lies engulfed. The captain pulled for an opening in the reef, and having found one, steered in and safely, almost opposite the scene of the catastrophe. This was on the morning of the 24th December. The look out to them, all strangers, was anything but promising. Only a small quantity of water, two tins of fancy biscuits, and a few tins of sardines composed their provision for twenty-eight men for an indefinite period. Some time that day a tank of flour washed ashore, and this they mixed with salt water, and made dampers of. On the morning of the twenty fifth, when heart was going out to heart in the "Merry Christmas", they commenced their journey southward-where they knew not. They left a message written on the side of the boat which they left. The crew of the *Benan* started for the south to Carnarvon Port, and but that civilization has reached up the Northern coast, nothing more might have been heard of them. On the evening of the 26th, they came across a horse's bridle, and this gave them hope. Next they came upon a stack of wood which in the distance they mistook for a house. A party set out from this place following the cart tracks, in the hope of falling across some house. Many a weary mile beyond the five they walked would they had to go had they not fallen in with two natives, who took the whole party to water, then to Yalobia, where a man named Grierson was stationed with some of Brockman's sheep. Almost at the same time a native, sent by the master of the *Gipsy*, who had read their message on the boat, reached them. Thus they were doubly saved. Previous to this, not knowing that the length of time which would have to elapse before they got succour, the captain with great wisdom allowanced the men out with a wine glass full of water and a sardine a day. The captain slept alongside the cask of water thus protecting it. He had been away one night with the second mate and another, digging a well and trying to obtain water; finding the attempt useless they returned, the captain weary, and with a multitude of care and anxiety upon his shoulder, lay down, but not to sleep. Shortly afterwards he heard someone coming, whom he recognised as one of his coloured crew, who came to the boat, got the cask of water, emptied about half a bucket out of it and drank it. The captain was powerless. He had no fire arms, to chastise. He might have caused mutiny among the coloured men, and yet this wretch so greedily drank that which might have cost many a one of that crew their life. They came across a dead turtle on the beach, and without roasting, they ravenously devoured it, thinking it a luxury. Berries found on the trees were eagerly sought after and eaten, and fortunately they came across no poisonous ones. The heat walking along the beach was frightful, and seemed the more severe as the crew had no boots. The second officer was in the worst plight, and the captain said that, notwithstanding the danger, it was comical to see that gentleman with only a cap and shirt, walking along the beach.

On the 6th. January they went on board the *Gipsy*, which started for Carnarvon with only a limited stock of provisions, though all they could get. The provisions ran out before they reached port, and also the water the day they got in. On the morning of the 15th they landed at Carnarvon, where Foss, the sub-collector of customs met them, informing them where they had to go.

Conservation report 1992

Jon Carpenter and Vicki Richards

Date of Inspection: 9–10 September 1992.
Weather conditions: Fine with cold wind.
Sea Conditions: Sloppy seas with a low swell. A tolerable surge was experienced whilst diving on the main site but generally conditions were very good (9/9/1992). Rough seas with large swell (10/9/1992). An almost constant flow of water over the reef made the inside reef inspection an arduous task. Underwater visibility was reduced by foam generated by breaking waves.
Site Depth: 2–8 m.
Water Temperature: 20° C.
Site description: The main site lies on a seaward slope, which rises more abruptly towards the reef shallows. Gullies are present on either side of the site and there is another running parallel to the reef seaward of the vessel's stern. The seabed comprises a hard compact coral/limestone with coarse sand in the gullies. On the inside reef there are low coral formations and reef structure with intervening patches of sand. The main site features a great variety of schooling fish, potato cod and tropical reef fish. The inner reef has comparatively few fish. Sea urchins and corals are dominant. The exposure of the main site to open sea conditions and lack of concretion appears to have inhibited extensive colonization by marine life. Most wreckage lies on the seaward side of the reef, while other portions have traversed this barrier and come to rest in the immediate shallows behind.

Inner reef material consists mainly of iron hull sections (2-3 m long) and pieces of hull plating. The small (less than 1 m^2) pieces have travelled furthest from the main site and spread out in a northerly direction down the inner reef. One small anchor has come over the reef. Dead-eyes are present and a port-hole attached to hull plates, another found lying loose was recovered. A baulk of wood was discovered and subsequently sampled for species identification. It was speculated that the wood may have formed part of a figurehead.

The main outer reef site has collapsed in and around its own dimensions. Large sections of iron hull plates and bracing structure survive. The vessel appears to have had a counter stern of which the curved or rounded uppermost stern portion has survived including some railing posts a fairlead and bollard (Figure 140). A dominant feature is the ship's rudder, which projects upwards from the inside of the curved stern. Alongside this structure can be seen the steering mechanism complete with wooden hub from the ship's wheel (Figure 138). Two brass bands reinforce the hub which also possesses a brass boss. Surface deposits on the boss may hide an inscription. Iron mast and spar sections lie about the site. A pair of large anchors were observed and the smaller of the two appeared similar to, or the same as, the one located on the inner reef. A windlass and anchor sit up on the higher forward part of the reef (Figure 139). Nearby is a comparatively small engine(?) made of brass. A number of dead-eyes and brass port-holes are scattered about the site, most of the latter are loose. A decorated brass binnacle stand (Figure 137) was found wedged and concreted into a reef crevice. During the site inspection no evidence was seen of cargo or small artefacts.
Artefact condition: An assessment of the extent and rate of corrosion of the iron artefacts will be required to determine their present condition and to enable predictions to be made

on survival potential. It appears that the vessel's structural components and other artefact material on the site are in sound condition. The fact that relatively thin walled mast and spar sections have survived indicates this. Corrosion activity is evident in the form of isolated patches of orange rust. Iron surfaces are only thinly concreted if at all. In some areas erosion appears to be accelerating degradation. The wood of the dead-eyes has survived very well with some evidence of abrasive damage only. The port-holes vary in condition. Substantial metal remains but most appear to have suffered from erosion/corrosion. Those secure in iron ship structure are perhaps the best examples though most have lost their glass. The binnacle stand has been partly crushed and distorted. The small brass engine(?) appeared to have lost some of its original surface but is otherwise well preserved. The anchors retain substantial metal. The steering mechanism and windlass appear to be in good condition also. The wooden hub of the ship's wheel may have survived due to impregnation by copper salts; however, the typical green discolouration of the wood was not apparent. The overall 'cleanliness' of the site gives the impression that it is subject to much water movement, obviously wave action, current flow and surge. Although a large quantity of sand was not seen it appears the site is also subject to abrasion/erosion. This is may be a cyclic occurrence.

Artefact recovery: Two port-holes were recovered; one from the main site and a second from the inner reef. A wood sample was removed, for species identification, from a baulk of timber discovered on the inner reef. Besides wood associated with the boss of the ship's wheel the only other wood seen on site (probably *Lignum vitae*) was the dead-eyes.

If this dive site becomes popular and no guide or guardian is appointed then certain artefacts may be removed without authorization to do so. Isolated port-holes are vulnerable. The small brass engine(?), binnacle stand and possibly the ship's wheel hub or brass boss could also be removed with the aid of tools.

Corrosion potential measurements were successfully acquired from artefact material on the inner reef site (Table 13, Figure 144). No attempt was made to acquire surface pH of artefact materials due to the lack of concretion. The pH of the sea water was 8.2, the water temperature 20° C and the water depth ranged from 2–8 m.

Table 13. Corrosion potential measurements (1992) of some exposed artefacts on the *Benan* site.

Description	E_{corr} vs NHE (V)
Ferrous materials	
Hull plate 1	-0.345
Hull plate 2	-0.357
Iron rod (deconcreted)	-0.389
Anchor	-0.338
Copper alloy materials	
Brass port-hole (attached to iron)	-0.004
Brass port-hole (unattached)	-0.005

Conservation report 2009

Kalle Kasi and Vicki Richards

Date of Inspection: 17 May 2009

Figure 143. The rudder, steering shaft and steering mechanism on the main *Benan* wreck site (Patrick Baker).

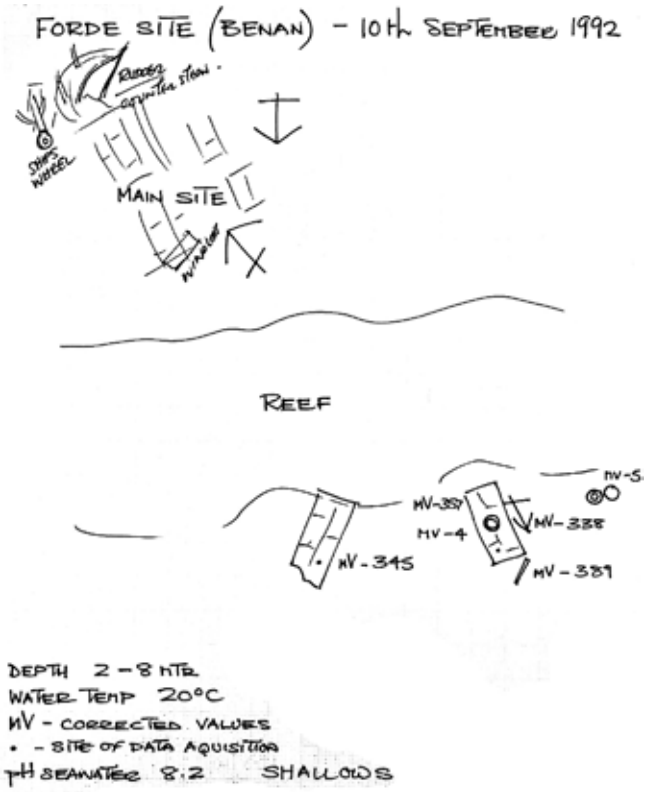


Figure 144. Sketch plan of the *Benan* site inside the reef indicating the positions of the structural features measured in 1992 (Jon Carpenter).

Corrosion Survey: The corrosion parameters of two ferrous elements (rudder and steering shaft) (Figure 143) and a copper alloy reinforcing band on the steering mechanism (Figure 138) located on the main section of the *Benan* wreck site (Figure 146), outside of the reef, were measured and the results are presented in Table 14. At the time of the survey, the water

temperature was 26° C and the pH of the sea water was 8.17 at 6 m.

Table 14. Corrosion parameter measurements (2009) of some exposed ferrous and copper alloy features on the *Benan* wreck site.

Description	pH	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)	Depth of concretion (mm)	Depth of corrosion (mm)	Water Depth (m)
Ferrous materials						
Rudder	7.92	-0.433	6	2	4	8.1
Steering shaft	7.97	-0.325	7	0	7	7.6
Copper alloy materials						
Reinforcing band	8.17	-0.016	na	na	na	7.2
na – not applicable						

In order to compare the corrosion data collected in 1992 and 2009, the corrosion potentials and surface pHs of the ferrous and copper alloy structural features were plotted on the appropriate Pourbaix diagrams (Figure 145 and Figure 147).

No pH measurements of the residual ferrous metal surfaces were collected in 1992 so the pH of the sea water (8.2) was used as the default. Usually the pH of sea water is not suitable to use as a default for concreted iron because the separation of the anodic and cathodic sites by the thick concretion produces an acidic, iron and chloride rich micro-environment at the residual iron surface and the measured pH decreases significantly from that of the surrounding sea water. However, the concretion thickness measured in 2009 on the rudder and steering shaft was 2 and 0 mm with depths of corrosion of 4 and 7 mm, respectively. This lack of thick aerobic concretions has inhibited the usual build-up of hydrogen ions, therefore the pHs measured in 2009 (7.92 and 7.97) were only slightly less than the surrounding sea water. Subsequently, using the sea water pH of 8.2 for the 1992 measurements is an acceptable approximation in this instance.

The intercepts of the iron structural features measured in 1992 and in 2009 lie very close to the equilibrium line between active corrosion and the passive region (Figure 145). This implies that the typical aerobic corrosion mechanism where the major stable chemical species is Fe^{2+} in solution is in equilibrium with the formation of an insoluble corrosion product layer of magnetite (Fe_3O_4), which protects the underlying metal. This is a very common corrosion state for large iron ships that possess extensive residual iron alloy plating and other iron structural features in direct electrical contact, dispersing the current density over a larger surface area and effectively lowering the corrosion rates as compared to isolated iron artefacts, which will corrode at a faster rate, such as the anchors and windlass on the NRU site (Figure 109).

In 2009, the *Benan* has been submersed for 121 years, therefore using the depths of corrosion measured on the rudder (4 mm) and the steering shaft (7 mm) (Table 14), the mean corrosion rates for these elements were calculated at 0.033 mmy^{-1} and 0.058 mmy^{-1}, respectively. These corrosion rates are slightly less than the standard corrosion rate for isolated mild steel in sea water, which is approximately 0.11 mmy^{-1}, thereby supporting the results from the Pourbaix diagram.

The copper alloys measured in 1992 and in 2009 possessed very little concretion due to the biologically toxic nature of copper corrosion products. Subsequently, the pH of the

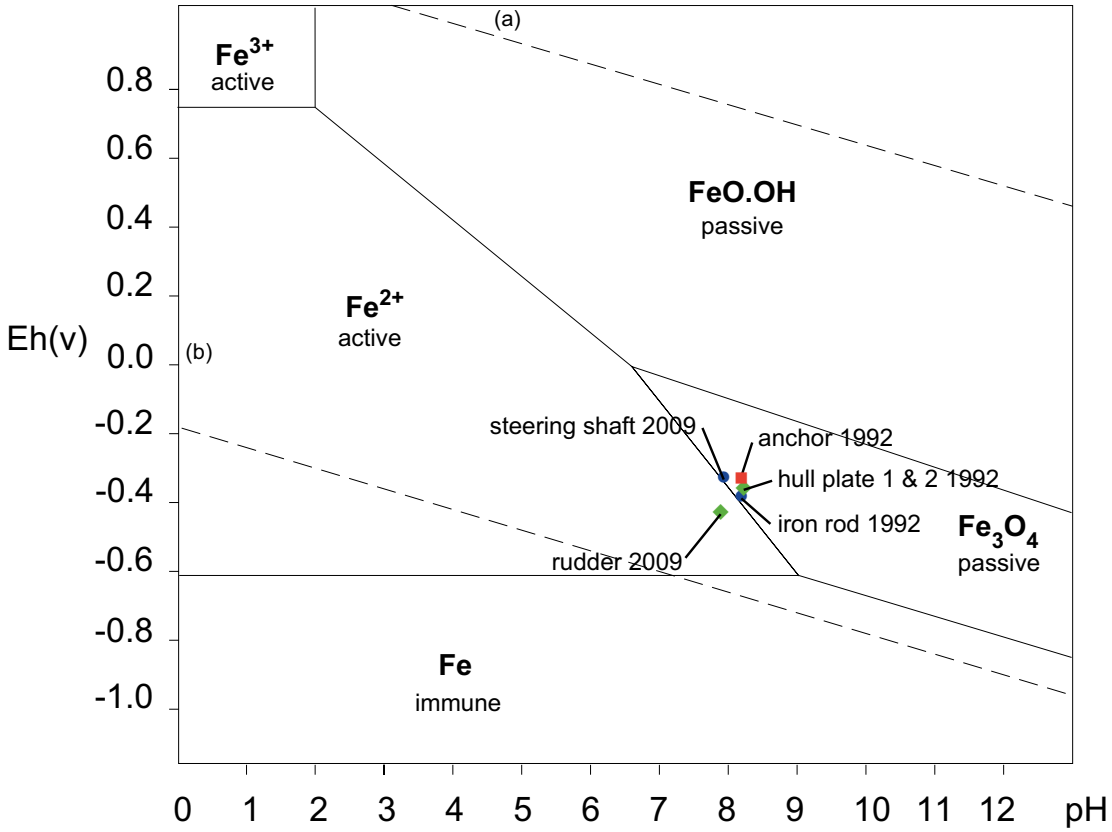


Figure 145. The Pourbaix diagram for iron (10^{-6} molar) in aerobic sea water at 25° C indicating the intercepts of the ferrous structural features measured on the *Benan* wreck site in 1992 and 2009 (Vicki Richards).

surrounding sea water at the time of the survey was used as the default. Again, the intercepts of the copper alloy structural features lie very close to the equilibrium line between active corrosion and the passive region (Figure 147). In aerobic marine environments, copper alloys readily form protective layers of cuprite (Cu_2O). However, the chloride ions from the sea water can penetrate this protective oxide layer and react with the metal to form cuprous chloride complexes, such as nantokite ($CuCl_2^-$), the rate being controlled by the diffusion of these complexes from the metal surface to the sea water interface. There the cuprous chloride complexes can then hydrolyse to produce cuprite. This is the basis of the pitting corrosion mechanism for copper alloys and this corrosion process is cyclic in nature.

Typically galvanic corrosion will occur if a more noble metal (i.e. copper alloy port-hole) is in direct electrical contact with a more active metal, such as iron (iron hull plate), resulting in an increase in the corrosion of the iron and concomitant protection of the copper alloy (decrease in E_{corr}). However, the corrosion potential of the port-hole attached to the iron hull plate measured in 1992 was the same as the isolated port-hole. This may indicate that the attached porthole was electrically isolated from the hull structure, possibly by a rubber gasket or by a thick non-conductive iron corrosion product layer.

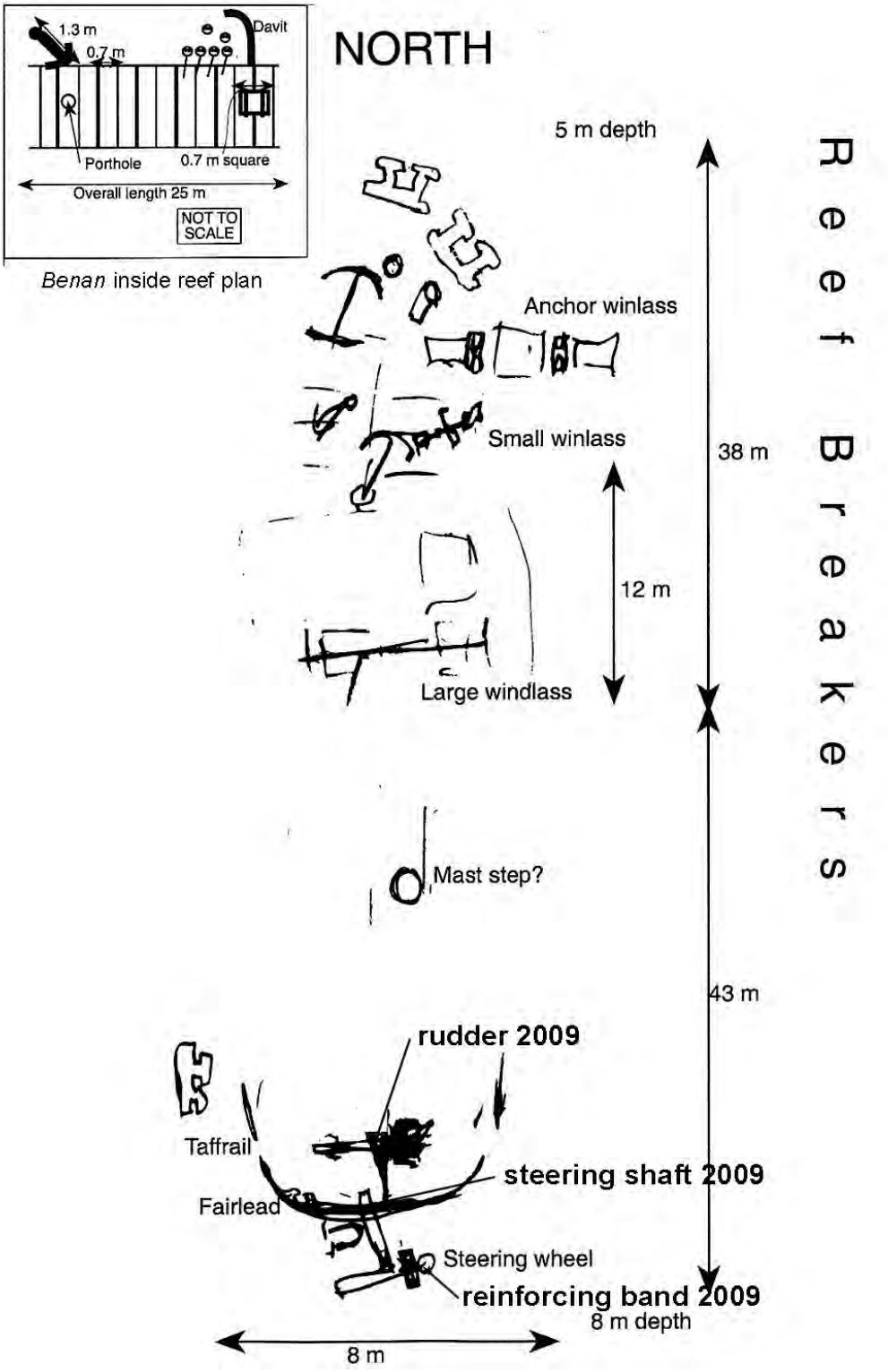


Figure 146. The *Benan* site plan showing measurement positions (Vicki Richards after Green, *et al.*).

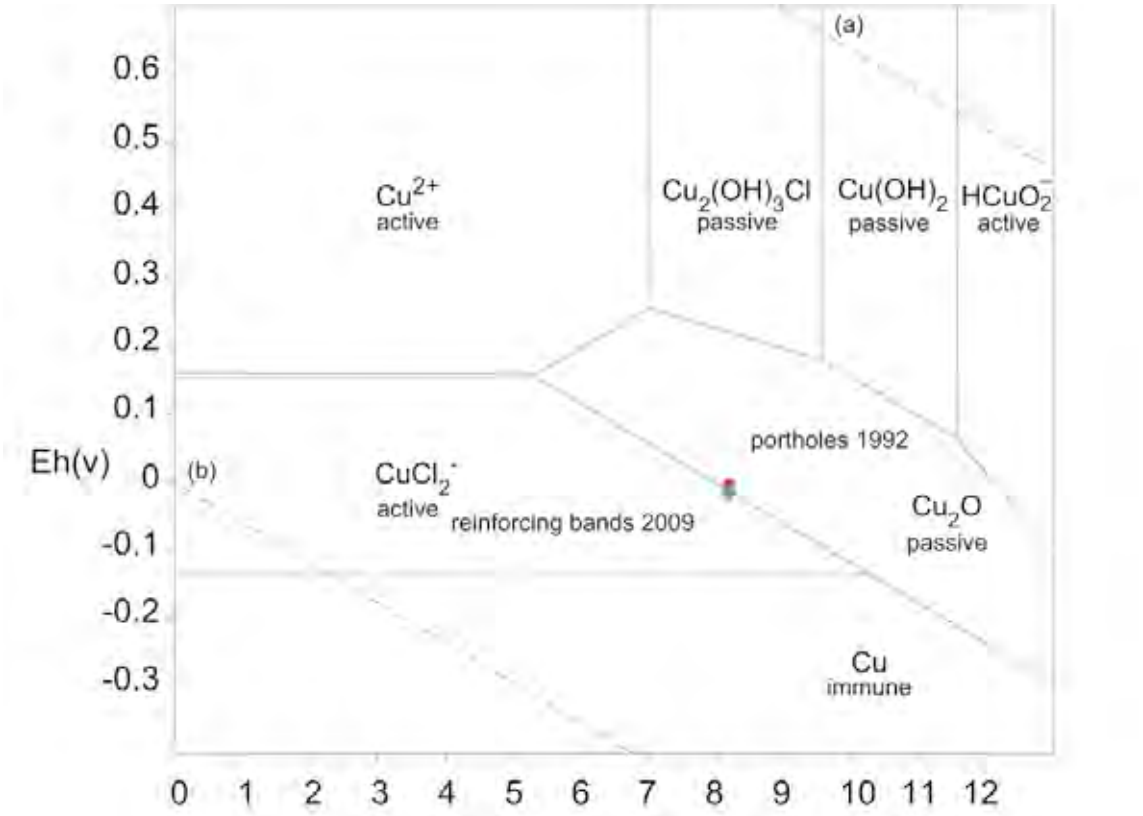


Figure 147. The Pourbaix diagram for copper (10^{-6} molar) in aerobic sea water at 25° C indicating the intercepts of the copper alloy structural features measured on the *Benan* wreck site in 1992 and 2009 (Vicki Richards).

Wood identification

Ian Godfrey

The sample was sectioned and then polished to a 1200 grit finish (end grain, radial longitudinal and tangential longitudinal surfaces).
End grain analysis (microscopic examination x 10) revealed the following features:
Rays = narrower than pores.
Soft tissue = surrounding the pores in irregularly spaced bands.
Pores number = moderately numerous; size = intermediate/large.
Pores arrangement = ring porous predominantly solitary.
Tyloses abundant.
Radial longitudinal surface analysis = presence of alternate bordered cross-field pits.
Ray/vessel.
Tangential longitudinal surface analysis = multiseriate rays.
Wood sample is *Tectona grandis* (Teak).

SS *Perth* 1887

Jeremy Green

Newspaper reports

The West Australian Monday 19 September 1887

WRECK OF THE STEAMER PERTH
NO LIVES LOST.
SEVERAL FIREMEN INJURED.

The community was startled on Saturday morning by the receipt of intelligence to the effect that the well known steamer *Perth* had gone ashore on the north west coast and become a total wreck. Fortunately the news was accompanied by the assurance that grave as the disaster was, it had not been attended by a more serious catastrophe, and that there had been no loss of life. The *Perth*, which was owned by the Adelaide Steam Navigation Company, left Fremantle on the 8th September, bound for all northern ports as far as Wyndham. All appears to have gone well until after the vessel left Carnarvon on her voyage to Ashburton. She left the first named place on the 12th instant, and should have reached Ashburton the following day. Nothing, however, was heard of her for five days, until, in fact, the whole community was startled by the news of the wreck of the vessel. As there were many passengers on board, most of them having relations or friends in Perth or Fremantle, the most painful feeling of suspense was endured by a great many people.

THE ANNOUNCEMENT OF THE WRECK.

The following intelligence of the disaster has been received by telegraph from our correspondents:-

Carnarvon, Saturday.

The *Perth* was wrecked, on a reef on Point Cloates. The *Australind* picked up the *Perth*'s boat off North-West Cape.

The *Australind* stood off the wreck for two days, and picked up three passengers. The others are supposed to be on shore. The *Australind* is unable to get closer in than five miles from the wreck.

The following additional details quickly followed :-The *Australind* arrived this morning and reports the *Perth* stranded at Point Cloates. The passengers and crew were landed safely. It was arranged to signal if they required assistance otherwise they would proceed to North-West Cape. Some had proceeded there in small boats inside the reef. The *Perth* is in a dangerous situation and likely to break up shortly. The *Australind* fell in with the boat on the way to the North-West Cape, and took from the shore Messrs. Snook, Kirk, Caullie, and Cave, passengers, and Connolly, fireman. The passengers and crew have plenty of provisions, and should arrive at the Cape on Monday. News of their arrival is expected from Ashburton on Tuesday. Some of the passengers rescued their effects. Messrs. May and Brookman saved their instruments and other articles. The *Australind* stood by till three o'clock on Friday afternoon.

The lady passengers showed great coolness and bravery in the trying situation.

Later in the day our correspondent telegraphed the following:-,

Carnarvon Saturday.

The steamer *Perth* was wrecked off Point Cloates, about one hundred and fifty miles from Ashburton, and the same distance from Carnarvon. Captain Parkes thought he had cleared the North-West Cape and struck a course accordingly. The steamer was heading straight for land when she struck the reef at the best possible place. Had she struck on either side of the spot where she grounded all lives would have been lost.

Narrative of a Passenger.

Mr Snook says: I was passenger per the steamer *Perth*, bound for the North West. I was asleep on the night of the 12th instant when I heard a noise as if the steamer had struck. I could not get on deck for a time on account of the motion of the vessel, but succeeded at last. A terrific scene ensued. The steamer had struck heavily on some reef. The boats were lowered and the passengers immediately got into them though the surf was breaking, and got ashore without much difficulty. They obtained plenty of rations from the ship. The steamer was going full steam ahead at the time she struck. The passengers found water ashore. When she first struck I heard one shriek, but only one. Mrs. McRae rolled her infant in a lot of clothing and threw it into the boat. It was saved though almost dead.

Another Statement.

Mr Kirk says: I was passenger from Carnarvon for the North-West. On Monday night I heard a noise as if the vessel had struck. I went on deck and found the vessel had struck on the reef off Point Cloates. A little confusion ensured among the passengers, but all soon calmed down. The boats were lowered and immediately the passengers were got into them. We were all landed in safety, though a surf was running pretty high Captain Parkes was the last man to leave the vessel. We were rationed out ashore in case provisions did not last. A native found water. I went in the first boat that went to the *Australind.* The passengers ashore were overjoyed at seeing her. The crew of the *Perth* behaved bravely.

Statement of the Captain of the *Australind.*

Captain Grey of the *Australind* says: I left Ashburton at two o'clock on the 14th instant. I knew the *Perth* was overdue, and was anxiously watching for signs of her. Towards sundown, I saw a boat off North West Cape, and bore down to her and found her to be a boat belonging to the *Perth*, Mr Calder (mate) in charge. She was making for Ashburton to report the stranding of the *Perth* at Point Cloates. I took them on board with the boat, and proceeded to Point Cloates, and saw the *Perth* on the reef. There was a big sea running, and tremendous breakers breaking constantly over the wreck. The *Perth* is completely wrecked, but her masts are standing. We hove too off the scene. As the *Australind* was drifting towards the reef, we dropped anchor and a boat came off from shore, Mr Tate (second mate) in charge. The passengers, Snook, Cave, Connolly, Kirk, were on board, and I took them on board of the *Australind*. They had tremendous difficulties in getting off on account of the surf. They report the passengers ashore all right. Two of the *Australind*'s boats were sent ashore and manned by the *Perth*'s crew. I made arrangements with Calder that if the *Australind* was required we should be signalled from shore. No signals were seen and I presumed they were all right. The scene of the wreck was terrible. The roar of the sea was fearful on the day we pulled our boat up at the Cape. Being unable to do anything more for the wrecked people we proceeded on to report the matter, and arrange that assistance should be sent to the North West Cape.

Further Details.
All the passengers on the *Australind* who were on the *Perth* speak highly of Captain Parkes's conduct in the trying situation. The scene of the wreck, Point Cloates, is where the Austrian barque was wrecked. The beach is covered with wreckage from the *Perth*, and other old wreckage of unfortunate vessels. Captain Gray evinced throughout an anxious interest in the *Perth* and the passengers. The mails are said to have been landed safely. The *Perth*'s engines burst after stranding, and seriously injured several of the firemen.
Further Telegrams.
Mr James Lilly has received the following telegram from Mr Boston, at Carnarvon: *Perth* total wreck on reef at Point Cloates. Boat picked up by *Australind* with chief mate near Murron [Murion] Island; making for Ashburton. After, picking up boat *Australind* proceeded to the scene of the wreck:- One boat put off from the *Perth* to the *Australind.*

After the arrival of the boat from shore three, boats manned by the *Perth*'s crew and passengers left the *Australind* for the shore. The *Australind* arranged that if they were coming off they were to signal by rockets and fires. Next morning it was very thick, and the *Australind* not being able to see the signals stood in towards the shore of the reef as far as prudent. Finding no signals she imagined the boats must have left for the North West Cape. She waited till 3 pm and then left for Gascoyne. Mails and lives reported safe. Would advise *Australind* proceeding to North-West Cape to rescue. Arrange how long she is to remain at North West Cape.

Mr Bethell has received a further telegram from Capt. Gray of the *Australind* as follows:

Do not think it possible to save any of the *Perth*'s cargo, excepting there is very fine weather. The *Perth*'s bottom is out and her engines are lying against the port side. She is dry at low water. The masts are still standing, but the decks are gone. There are provisions for the people in plenty. Water only doubtful. Shall we go back to North West Cape? Could send relief parties ashore and perhaps save boats. No hope of getting *Perth* off.
Joseph Gray, Master s.s. *Australind*.
The s.s. *Perth*, 298 tons registered, and 70 hp, formerly known as the *Penola*, was built at Port Glasgow, N B. in 1863. For several years after the purchase of her by the Adelaide Steam Ship Company, she was employed in the South Australian trade, and on being placed on the West Australian service, in 1885, her name was changed to the *Perth*.
Despatch of "*Australind*." Our Fremantle correspondent telegraphed on Saturday night that the agent of the Adelaide Steam Ship Company as made arrangements for sending assistance to the shipwrecked passengers and crew. The *Otway* left Fremantle on Saturday evening for the scene of the wreck. The cutter *Dolphin* sailed from Ashburton on Saturday afternoon for North-West Cape, with water and provisions. She was expected to reach the Cape yesterday morning.

The wreck of the *Perth* inquiry
A preliminary inquiry into the wreck of the s.s. *Perth* at Point Cloates on the North West coast of Australia, on the 15th of Sept. last, was held at Carnarvon on the 4th October, before the Sub-collector C.D.B. Foss, and John Brockman, J.P. Frederick Lee Parkes, examined said: I was master of the s.s. *Perth*, and held a Board of Trade certificate, No. 214. On Monday, September 12 last, at 8.10 am, I left the Gascoyne, at 2 pm I was off French Cape Cuvier bearing E 5 miles; put over the log showing 48 miles. At 3.20 p.m. English Cape Cuvier

bearing E 5 mile, log showing 60 miles; course by standard compass N by E 1\4 E; by bridge compass, N 3/4 E True magnetic N. 3/4 E. northerly; weather was fine, trysail set, light NNW. breeze blowing. Tuesday, September the 13th, at 12 am, moderate NW breeze, cloudy to the SW. At 12.30 am, log 42 miles, course standard compass NE by N 3/4 N, bridge compass N by E 3/4 E; magnetic course N by E 3/4 E. I had been on the bridge since 11 pm of the 12th at 1 am of the 13th, seeing no sign of land, I left orders with the second mate to be called at 5.30 am I left the bridge then, and turned in at 1.30 am Was awakened by the vessel rolling heavily. On rushing on to the bridge I found the vessel in the breakers; asked the second mate if the helm I was starboard; he replied 'yes, and the engines full steam astern'. Seeing no breakers on the port bow, and not hearing the engines, kept the helm starboard, and rung telegraph full steam ahead. Sent the second mate to clear away the boats, and the man at the wheel, taking the wheel myself, to |enquire if the engines were moving. The answer was 'no'; the engines had stopped I directly on the vessel striking while the engines were going full steam astern.

By the Court: I must have been on the bridge, or coming along the deck, when the vessel struck, when at the wheel I was thrown over it.

The helm was useless, I kept a patent log towing astern. The log runs slow. I made no allowance for that. The log ran about 1 mile short in thirteen. I produce my chart, showing the courses. [The witness here traced the vessel's course from the Gascoyne until one am on the 13th September.] I cannot say what time elapsed between the first and second striking. As soon as the vessel struck heavily, she stopped. I tested the accuracy of the log last, between French and English Cape Cuvier. The second mate corrected the bridge compass on the N 3/4 E course; it had a westerly tendency. I last set the log at French Cape Cuvier. The vessel had been making about 8 3/4 knots in; that kind of weather. The *Perth*'s compasses were last adjusted on the vessel leaving Adelaide. I attribute the principal cause of the wreck through hazy weather and also to the SE current. I have held a master's certificate since the 20 January, 1885. I kept further from the land on this passage than on any previous one, making allowance, for any lee way the vessel might be making on account of the northerly weather.

James Tait, examined, said: I was second mate of the ss *Perth*, and hold a Board of Trade first-mate's certificate No 249. I was in charge of the deck when the ss *Perth* stranded. I had been on deck an hour and a half before she struck. When I took charge of the deck the course was N 3/4 E by the bridge compass; by the standard compass N by E 1/4 E. There were two trysails set when the vessel struck.

It was a moderate breeze, about NW, and the weather very hazy when she struck. The vessel was going full speed astern when she first struck. As soon as I heard the breakers I telegraphed the engines full speed astern. I did not notice the vessel striking until the captain came on the bridge. The vessel stopped immediately she struck. The steamer's course when she struck was N by E 3/4 E by the bridge compass, I produce the bridge book. The last entry shows—Tuesday, Sept. 13th, 0.30 am, course N by E 3/4 E by bridge compass, NE by N 3/4 W by standard compass. Log, 42 1/2 miles.

By the Court: I have made previous voyages in the *Perth* with captain Irvine and captain Parkes. I think that this voyage we steered 1/4 point to the westward of the last one. The course of the vessel was altered during my watch by the captain. It was altered at 12.30 am the log showed 42 1/4 miles when the course was altered. I attribute the stranding of the *Perth* to some unusual current, and to the hazy weather preventing the land being seen.

Gustave Carlson, said, I was an abled-bodied seaman on board the *Perth*. I was on the look out on board the *Perth* on the night she stranded. I had been on deck about 20 minutes before she struck. It was very hazy weather, and as dark as pitch. I could see nothing; I did not see anything. The first thing I knew, I felt the vessel commence to roll heavily. I sung out to the second mate breakers ahead, as I could just make something out white after she commenced to roll. The second mate sung out to me to call the captain. Before doing so I told a seaman to call all hands on deck. About two minutes elapsed after she first commenced to roll until she struck, I saw no danger until about two minutes before she struck.

Charles Zetterberg said, I was an able-bodied seaman on the ss *Perth*. I was at the wheel the night she stranded, I took the wheel at 12 midnight. The man I relieved told me to steer N 1/4 E. The second mate was on deck; I was told to put the wheel hard a-starboard. I cannot say how often the vessel struck before she stopped. The captain told me to go and see if the engines were stopped, and he took the wheel himself. The second mate was in charge when the vessel struck, and I could not see the man on the look out from the bridge.

After some deliberation the Court found that no blame attaches to the master or any of the officers of the ss *Perth*, and that the stranding of the vessel was due to a strong current setting to the south east, and the weather being thick and heavy.

Historical background to SS *Perth* (1863–1887)

Ross Anderson

The screw steamer *Perth* was originally named the *Penola,* and was built by Laurence Hill and Co. shipbuilders of Glasgow as a 349-tons gross steamer with dimensions of 170.5 x 22.5 x 12.6 ft. In 1877 it was lengthened to become 414 tons gross, 194.6 x 22.5 12.6 ft. The vessel underwent further extensive alterations in March 1885 making it 449 tons gross, and was renamed *Perth* (Parsons, 1981: 150).

The *Penola* was especially built for its owner George Ormerod, a major business identity in South Australia's south-east. For most of its life it operated in the south-eastern Australian colonial trade, sailing between Adelaide and Melbourne while stopping at intermediate ports such as Guichen Bay (Robe), Port MacDonnell and Portland. On 19 November 1865 the *Penola* famously collided with the SS *City of Launceston* in Port Phillip, Victoria, causing the total loss of the *City of Launceston*, while losing its bow in the collision. No lives were lost, and the bow of the *Penola* remains to this day embedded in the intact hull of the *City of Launceston,* now one of Victoria's most significant shipwreck sites (Arnott, 1996; Anderson, 2010: 24–25).

At the time of its loss the *Perth* was owned by the Adelaide Steamship Company and operating along the Western Australian coastal passenger steamship run. A regular steamship service to the north-west of Western Australia was made possible only the year before the *Perth*'s wrecking, when gold fever broke out following discovery of the Kimberley goldfields, and Derby in 'The Gulf' was the main port of entry. As maritime historian Ronald Parsons writes:

> The area was difficult to negotiate and access to the alluvial fields was such that only the most determined made the trek. Yet supplies were needed and the Adelaide company found it necessary to increase sailings while almost any steamship visiting any Australian port, that was not immediately committed to a set route, made at least one voyage to Derby with gold-seekers (Parsons, 1973: 39).

The Kimberley gold-rush was the start of a number of mineral discoveries in the Pilbara (1888), Ashburton (1890), Murchison (1891) and Coolgardie and Kalgoorlie (1893) that stimulated the Western Australian economy. The Western Australian coastal trade became increasingly profitable and was run mainly by eastern colonial business interests, including the Adelaide Steamship Company (Parsons, 1973: 40). Other Adelaide Steamship Company shipwrecks in Western Australia include the *Franklin* (1902), *Colac* (1910), *Kepler* (1910), *Koombana* (1912) and a number of coal hulks.

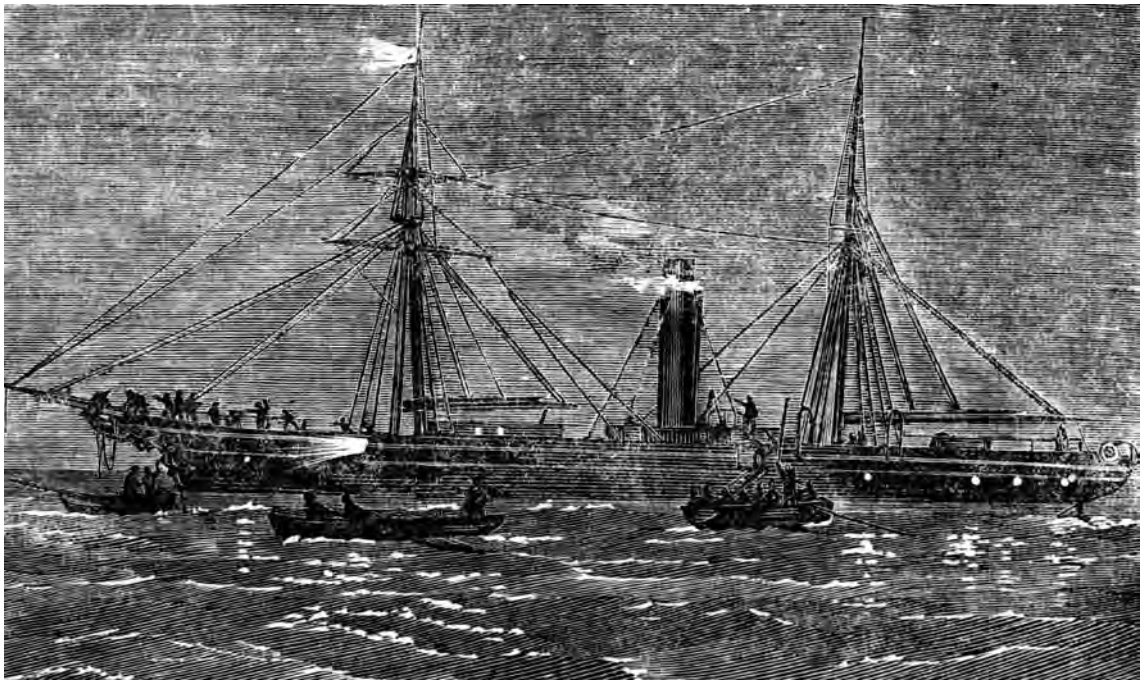


Figure 148. The SS *Penola* shown in the illustration after its collision with the *City of Launceston* in Port Phillip (Artist: Samuel Calvert, Pictures Collection, State Library of Victoria).

Figure 149. Part of the *Perth* engine on reef in 1992 (Patrick Baker).

Figure 150. The disintegration over time of the *Perth* (Patrick Baker).

Fin 1923

Myra Stanbury (Reprinted from the *Bulletin of the Australian Institute for Maritime Archaeology*, 1984, **8.**1: 1–4)

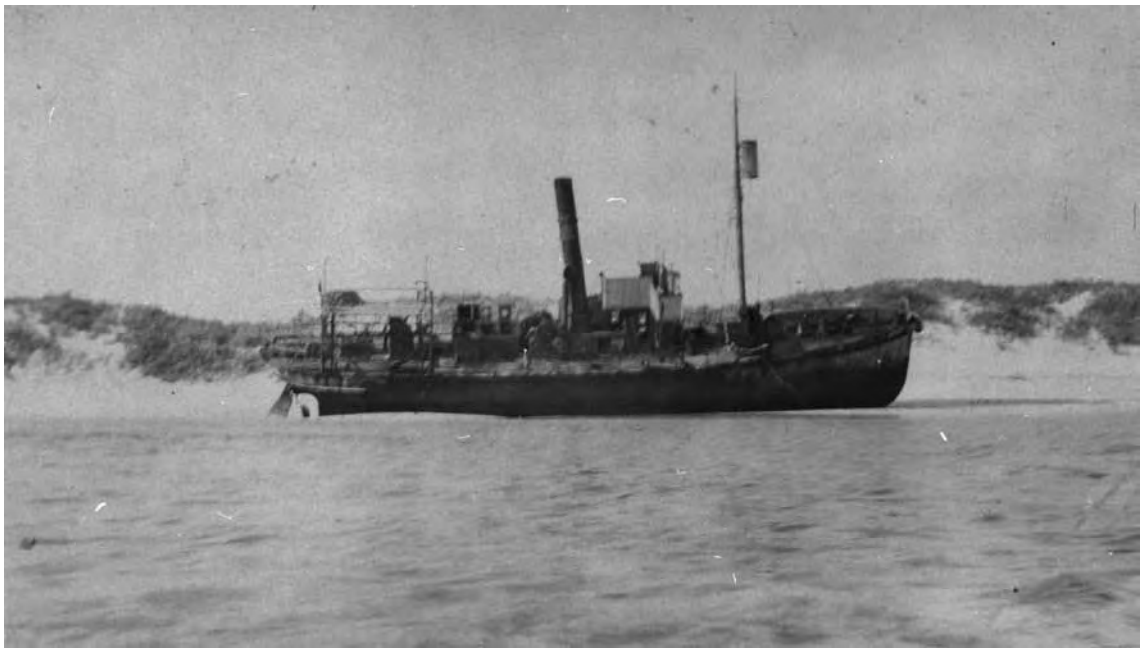


Figure 151. The Whaler SS *Fin* aground on Fraser Island *c.* 1924 (John Morrissy Collection, Western Australian Museum).

Introduction

The identification of a shipwreck can often prove a time-consuming and difficult task, particularly when documentary evidence is sparse, access to Registers and other archival material is limited, and information has to be sought from overseas sources. Such has been the case with the wreck of an iron whaler lost off Fraser Island, Norwegian Bay, Western Australia.

Fraser Island

Fraser Island is a small sand cay situated at the southern end of Norwegian Bay in the north-west of Western Australia. The island lies within the gazetted precincts of Norwegian Bay and is currently under Commonwealth Government tenure. The exact position of the island is difficult to specify as it is constantly changing shape and at times, (following cyclones), has been known to have completely disappeared from sight. It is, however, approximately 6.5 n miles SW of the derelict remains of the Norwegian Bay whaling station situated in latitude 22° 35.7'S, longitude 113° 40.1'E (see Australian Admiralty Chart AUS 72).

On the south-west side of the sand cay lie the semi-submerged remains of an iron whaler. About 40 m to its east, is an overturned iron-girder light tower which once stood on the island itself, but collapsed when the island was swept away during a cyclone in 1965.

Figure 152. The Whaler SS *Fin* aground on Fraser Island *c.* 1924 (John Morrissy Collection, Western Australian Museum).

Figure 153. The *Fin* wreck site in 2009 (Jeremy Green).

1980 site inspection and gazettal

When the site was last inspected, in 1980, by McCarthy *et al.* (WAM File MA-22/80), a two-cylinder compound engine, condenser, a large whaling winch, boiler, steering gear and iron propeller, were all visible above water. The machinery was well preserved and the engine still upright and intact, but for the copper tubing and gauges. Lying in 2–3 m of water, the hull itself was intact from the turn of the bilge.

Although neither the hull nor the machinery are unique, their unusually good state of preservation make them an excellent example of a small whaling steamer associated with modern whaling in Western Australia. For this reason, recommendations were submitted to the Minister for Home Affairs and Environment by the Western Australian Museum, that the wreck should be protected under the Commonwealth *Historic Shipwrecks Act 1976*. Protection was duly granted, and the wreck's historic status gazetted on 21 July 1981.

At this time, however, there was some debate as to the correct identity of the wreck. The site had originally been inspected by Scott Sledge in 1974 and again in 1978 (Sledge, 1979), and was known to local informants as the *Fin.* Former employees of the whaling station had photographs of the vessel after it had run aground on the island, yet little information could be found about the whaler. The question was then raised as to the possibility of the wreck being another whaler with a similar sounding name, the *Fynd*. Until further research could confirm the identity one way or another, the wreck was gazetted as the SS *Fynd* or SS *Fin.*

Background research

In 1923, two vessels were recorded in the HM Customs *Register of Wrecks and Casualties 1897–1942* as having foundered on Fraser Island in January of that year. On 12 January 1923, the SS *Fin*, owned by the North West (Aust.) Whaling Company Ltd, was stated to have been 'totally wrecked' on Fraser Island. Five days later, on 17 January 1923, the SS *Frey*, a Norwegian vessel owned by the same company, was also 'blown ashore' on Fraser Island, though no indication is given as to her ultimate fate. Apart from the name of the owners, no other details are given about either vessel.

A preliminary search through *Lloyd's Register of Shipping* for the years 1921–25 failed to locate a steam vessel named *Fin*, although a whaler named *Fynd* was listed. This, together with other evidence, raised the question as to whether there may have been some confusion over the spelling of what are two similarly sounding names. In addition, the fact that the fate of the *Frey* was at that time not known, raised the question as to whether the wreck off Fraser Island could in fact be the *Frey*.

With these questions in mind, various literary and documentary sources were consulted in an attempt to clarify the situation.

In 1911, several Norwegian whaling companies obtained licences to whale in West Australian waters from Esperance to Cape Lambert. They erected shore stations at Norwegian Bay in the North-West and at Frenchman's Bay in the South-West. Until 1916, when they temporarily ceased operations, Norwegian whaling fleets were a common sight in West Australian ports.

At Albany, the Royal Norwegian Vice Consulate kept records of the Norwegian vessels visiting that port, the discharge of seamen, notes on oil shipments and so on. Listed in these *Particulars of Shipping* for the years 1913 and 1914 is the SS *Fynd*, a vessel of 56 tons net (57.1 t) under the command of Master Jorgensen. Also appearing in the 1914 list are

two 'launches', the *Fin* of 1 ton net (1.02 t) (Master H.E. Larsen), and the *Frey*, also with a net tonnage of 1 ton (1.02 t) (Master M. Melson). All three vessels formed part of the 'Norwegian Whaling Company's Fleet at Point Cloates'.

Of these three, the *Fynd* features prominently in W.J. Dakin's book *Whalemen Adventurers* (1934). For, it was on this whale chaser that Dakin most often went out during his stay in the North-West around 1913–16. He describes the *Fynd* as being 'somewhat like a small trawler in size' having a gross tonnage of 167 tons (170.3 t), length of 104 ft (31.6 m), and beam of 20 ft (6.1 m) (Dakin, 1934: 194).

Prior to its arrival in Western Australia in 1912, the *Fynd* had been employed by her owners, the Spermaceti Company of Larvik (Norway), off the western coast of Africa (Dakin, 1934: 189). This information, together with the specifications given by Dakin, clearly associate the whaler with that listed in *Lloyd's Register* for 1913–14 under the Official Number 1541100.

The details of the vessel are as follows:
Name: *Fynd* O/N 154110 (Steamship).
Build: Steel, screw (whaler); 1 deck.
Registered tonnage: gross 167; underdeck 154; net 56.
Built: 1911 by Porsgrund mek. Vaerks, Porsgrund, (Norway).
Port of Registry: Larvik, Norway.
Owners: Spermacet Company (C. Nielson and Co. Mgrs), Larvik.
Length: 104.0 ft; Breadth 20.2 ft; Depth 11.8 ft.
Triple expansion engine: 3 cylinders — diams. 12 ins., 20 in and 32 ins.
Stroke: 24 ins: 50 hp.

It will be seen from these specifications that the net tonnage (56 tons) agrees with that of the SS *Fynd* listed in the *Particulars of Shipping* of the Royal Norwegian Vice Consulate at Albany. Hence, it may be concluded that the vessel being referred to in these records, and in Dakin's account of whaling, is the Lloyd's registered whaler SS *Fynd*, O/N 154110.

Having established this fact, it then becomes easier to trace the activities of this vessel post 1916.

Although *Lloyd's Register, 1921–22* shows the owners of the SS *Fynd* to be Hvalfangerselsk, Nordhavet A/S (H. Pedersen, Mgr.) of Tønsberg, Norway, at some time during 1922 the *Fynd* must have been purchased by the North West (Aust.) Whaling Co. Ltd. This Australian company attempted to re-commence whaling operations at Norwegian Bay in 1922, but after two unsuccessful seasons was forced into liquidation. Stewart-Dawkins, the catch-manager's secretary, reports in his history of the station from 1913–1929 that the cost of the SS *Fynd* to this company in 1922/23 was £7 264 5s 11d and the duty thereon $799 1s 5d (Stewart-Dawkins, 1929).

The presence of the SS *Fynd* in West Australian waters at this time is confirmed by entries in the *Shipping Register for Fremantle* (Harbour and Lights Department, Battye Library, Perth, Acc. No. 1076, Vol. 10). The SS *Fynd* is noted in the arrivals and departures lists as coming to and from Point Cloates at least until 4 December 1923. After this date, there is a gap in the entries until 14 October 1925. *Lloyd's Register* for 1924–25 gives the owners as Skibs A/S Fynd (Stephansen and Torgersen), which suggests the North West (Aust.) Whaling Company re-sold the vessel prior to its liquidation in 1925.

Already, it becomes apparent that the SS *Fynd* was still operational after January 1923 and must, therefore, be discounted as being the wreck on Fraser Island. This fact is further

substantiated by Dakin (1934: 226) who comments on the return to Point Cloates of his 'old friend' the *Fynd* as one of four whale-chasers belonging to the Norwegian Bay Whaling Company. This Norwegian whaling company agreed to lease the station at Norwegian Bay from the Australian company in liquidation in order to demonstrate the viability of whaling in the area.

Once again, the SS *Fynd* contributed to the success, as Stewart-Dawkins (1929) notes that she was responsible for catching 206 whales during the 1928 season. He also gives the specifications of the whalers operating at Point Cloates in 1928. Apart from a change in the horse power from 50 hp to 71 hp, and gross tonnage from 167 tons to 168 tons, his specifications for the SS *Fynd* correspond with *Lloyd's Register* and those given earlier by Dakin (1934: 194).

Following up the history of the SS *Fynd* (O/N 154110) through *Lloyd's Register* and the *Mercantile Navy List and Maritime Directory*, we see that in 1929 the Norwegian Bay Whaling Company sold the *Fynd* to a British company, Irvin and Johnson (South Africa) Ltd, which operated from Cape Town. It remained operating under their ownership until 1929, after which date, no more listings were found.

Having confirmed that the SS *Fynd* was still operational at least until 1939, thus discounting it as the wreck at Fraser Island, the questions remain as to firstly, what evidence is available to support the identity of the wreck at Fraser Island as the *Fin*; and, secondly, what happened to the *Frey*?

The *Fin* and *Frey*

After considerable searching through the Harbour and Lights Department files, a reference to the wrecks of the *Fin* and *Frey* was located on the Wrecks and Casualties File (Harbour and Lights Dept., File No. 460/51: 117, Acc. No. 1066, Battye Library [BL], Perth). However, no details were given, only a reference that papers relating to these 'wrecks' were on the Boiler and Machinery files of these vessels. Unfortunately, no individual files for these vessels could be located, but a reference to both vessels was found in a register recording the issue of Sea Going Certificates, Licences, types of Boilers and Machinery etc. (Harbour and Lights Dept., *Register of Certificates, Boilers and Machinery etc.*, Acc. No. 1316, V.3, BL).

On 6 June 1922, a certificate of sea-worthiness was given to the whaler *Fin*, Official Number (O/N) 3538, owned by the North West (Aust.) Whaling Company. The tonnage of the vessel is given as '93/1.34' and the port of registry as Larvik. Likewise, on 12 June 1922, a similar certificate was issued to the whaler *Frey*, Official Number 3537, also owned by the above company. Again, the port of registry is given as Larvik, and the tonnage as '80/218'. Fees of £1.00 were charged to each vessel.

A photograph of the whaler *Fin* was then located in the pictorial section of *The Western Mail*, 26 October 1922, along with other scenes of the whaling station at Norwegian Bay. It was also noted that amongst the property belonging to the North West (Aust.) Whaling Company, as listed on the liquidator's list of 1925 (Stewart-Dawkins, 1929, Acc No. 1497A, BL), were a spare gun, gun stand and trigger for the whaler *Fin*.

Clearly then, a vessel of this name did exist. But, how did it come to be wrecked on Fraser Island?

The loss of the *Fin*

On 17 January 1923, *The West Australian* (p. 7g) reported that the bureau of meteorology had announced a 'willy willy' at 3 pm on 12 January and had sent advice to every North-West port. Subsequent papers, however, gave no indication of any shipping losses in the shipping columns.

On 10 February 1923, *The Northern Times* (p. 2g) issued a story entitled 'The Recent Blow: Effects at Point Cloates Whaling Station'.

The blow struck the station on 15 January and continued with 'intense fury' throughout the 16th leaving a considerable amount of damage in its wake. Two of the whaling boats the *Fin* and '*Fry*' [*sic*] (presumably the *Frey*) broke their moorings and went inshore on Fraser Island. The *Fin*, 'a boat of about 10 ft. [3.5 m] draught', was reported to be standing high and dry on the island at low water, with little hope of getting her off.

The *Frey*, however, did not appear to fare so badly. It went aground on a sand-bank and there seemed to be a good chance of refloating it. This, indeed must have occurred for the *Frey* appears regularly in the arrivals and departures lists in the *Shipping Register for Fremantle*, along with the *Fynd*, from 4 December 1923 to 19 October 1926.

Although no official number accompanies the entries, the tonnage of the *Frey* is given as 80 tons (81.6 t) which corresponds with that given for the *Frey*, O/N 3537, issued with a sea-worthiness certificate on 12 June 1922.

On checking with the Commonwealth Register of Shipping, the official numbers given for the *Fin* and the *Frey* are not British Registry numbers. Since the *Frey* was referred to in the *Register of Wrecks and Casualties 1887–1942* as being Norwegian, it is probable that these are Norwegian registration numbers. Accordingly, an approach was made to the *Norske Veritas* and the Customs Registry at Larvik for registration details for both these vessels. At the time of writing, replies were still awaited.

Zvir 1902

Corioli Souter

Wrecking event and inquiry

The steel screw steamer *Zvir*, Port of Registry, Rijeka, Croatia, was in tramp service for the shipping company, 'Societe in Aziono Ungaro-Croata per la nar Libera' on a voyage from Passaman (Java) to Port Adelaide, when it wrecked at Point Cloates on 27 November 1902. The *Zvir* was carrying a cargo of sugar under charter to the Colonial Sugar Refining Company (*The West Australian* 22 December 1902). The ship initially grounded and extensive damage resulted in the vessel's total loss at this location (–22.6092° S, 113.626° E, WGS 84). With no lives lost, the crew left the wreck in the life-boats, landed on the shore and walked into Carnarvon. Two weeks later, as reported in *The Morning Herald* (13 January 1903), the vessel was in 'the same position intact but heeled over to a heavy degree to starboard, the rail and upper deck being awash. Cargo valued at £50 000 being lost, swell breaking over decks, nothing could be saved owing to the bad weather and that the steam lighter *Beagle* which was still standing off was unable to get alongside'. All crew were rescued and repatriated to Austria (Croatia), via Melbourne.

At the beginning of June 1903, the Harbour Authority of Rijeka undertook an investigation into the conduct of Captain Ivan Randic and senior officers, including Martin Sica-Susak, on duty when the wrecking occurred. Outcomes of this investigation have not been located in the archives. *Zvir* was built by J. Priestman and Company in Sunderland in 1900 as a 2-deck (one steel, one part iron) screw steamer. The dimensions for the vessel were 100.58 x 14.16 x 7.72 m and gross tonnage was 3353.64. The name '*Zvir*' translates to 'spring' or 'well' (Rado Barbalic, 1982, pers. comm. 15 March).

Site description

The wreck site was discovered by skin divers Frank Paxman, Barry Paxman and Glynn Dromey in 1978. The site lies on a east/west orientation in 8–10 m of water and located on a coral bottom, shoreward of a sandy patch, approximately 400 m from a breaking reef. The site is generally oriented NNE/SSW. Following the line of the drive shaft from the rudder assembly to the forward end of the thrust block/condenser unit, the orientation is 50°. The keelson is separated forward of the boilers and lies at a 60° angle towards the bow. The vessel sits virtually upright on the keel, canting slightly to starboard. The hull has fallen away on both sides to reveal a complete set of propulsion machinery. A triple expansion engine is lying on its side (Figure 161) along with the crankshaft and condenser system, located in the middle of the wreckage. Directly forward of this machinery, running athwartships, three boilers can be seen (Figure 158). These are no longer in the same position as at the time of wrecking, presumably rolled by dynamic underwater conditions. The drive or propeller shaft which runs approximately 40 m aft to the propeller is twisted to starboard forward of the thrust block (Figure 159). This starboard twist is seen throughout the line of the visible

Figure 154. The *Zvir* wreck site showing the boilers (Geoff Kimpton).

Figure 155. The *Zvir* wreck site showing the stern section (Patrick Baker).

Figure 156. Photomosaic of the *Zvir* wreck site (Patrick Baker).

Figure 157. The bow windlass of the *Zvir* (Patrick Baker).

Figure 158. The *Zvir* boilers (Patrick Baker).

Figure 159. The *Zvir* propeller shaft (Patrick Baker).

Figure 160. The *Zvir* propeller (Patrick Baker).

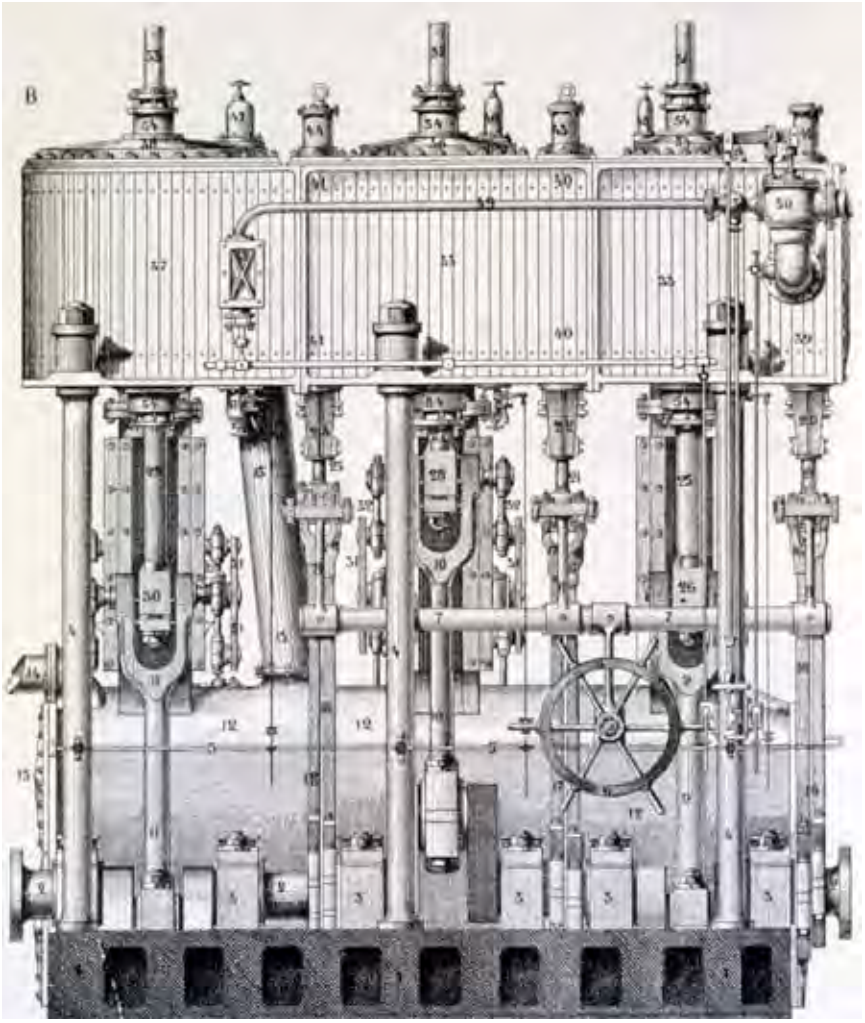


Figure 161. Triple expansion (Tryckare, 1973: 154).

wreckage indicative of the wrecking event and subsequent post-depositional forces, most likely dominated by the prevailing swell.

The propeller and rudder assembly are also in fairly good condition with the lower part of the rudder still in its original position, standing proud of the seabed and leaning to starboard (Figure 160). The rudder frame is broken 4 m above the keel and the stern-post marks the shallowest point on the wreck site. Part of the steering quadrant is still visible and attached to the rudder assembly.

Damage to one blade of the four-blade propeller was evident, with only half of that blade remaining. It is not possible to determine whether the damage to the propeller and rudder quadrant occurred subsequent to the wrecking, or whether the damage was sustained and/or contributed to the loss of the vessel (Sledge, 1979). A spare, intact propeller was located lying flat, 22.4 m forward of the one in use.

Two stockless anchors (Halls/Inglefield patent) are located at the north-west extremity of the site, with chain attached passing through hawse-pipes. The anchors are in such a position to indicate that they were still in position at the bow and were not deployed during the

wrecking of the vessel.

There are four winches or windlasses with both integral and ancillary warping head units, one at the stern and two at the bow (Figure 157). Deck plating is strewn all over the site often obscuring the machinery and other hull components. Hawse-pipes and bollards are found at both ends of the site. At the stern these bitts lie forward of the rudder frame.

Site survey

An offset survey was undertaken over two dives to plot the main features of the vessel. These measurements can then be integrated and assist in scaling the photomosaic of the site. The zero point was located approximately midships, between the thrust bock and aft end condenser to allow two baselines to be set. This would account for the slight change in orientation of the keel/prop shaft across the site and allow for more accurate measurements.

Site significance

The site is representative of a moderate size iron steamer of the period. The intactness of the propulsion gear makes it an important archaeological example of engines in use for this period. It is easily accessible to divers and is also considered a valuable recreational and educational resource.

Table 15. The *Zvir* survey measurements.

Midships to Stern		
Baseline (m)	Offset (m)	Description
0	0	Thrust block
16.6	6	Spare propeller
21.5	1.3	Winch/windlass 1 (starboard)
39	0	Main propeller
41.8	6.2	Upper end of propeller aperture
45.5	6.25	End of rudder
Midships to bow		
3.7	0	Condenser
8.4	8.2	Boiler 3 (stern end port side)
11.7	7.5	Boiler 3 (bow end port side)
13	3.4	Boiler 2 (stern end starboard side)
15.9	4.5	Boiler 2 (bow end starboard side)
35.9	9.1	Winch/windlass 2 (starboard)
36.9	6.8	Winch/windlass 3 (starboard)
44.9	2.6	Bollard
50.5	4.3	Winch/windlass 4 (starboard)
51.2	5.2	Hawse-pipe 1 (port)
58	6.3	Hawse-pipe 2 (port)
60.7	10.2	Anchors

Features

Feature	Dimensions in m
Winch/windlass 1 (starboard)	4.5 length
Winch/windlass 2 (starboard)	6.9 length
Winch/windlass 3 (starboard)	4.0 length
Winch/windlass 4 (port)	2.3 length

All boilers	3.6 length x 3.4 diameter
Propeller blades	2.4 length x 1.05 width
Rudder	11.0

Conservation report 1992

Jon Carpenter and Vicki Richards

Date of Inspection: 10 September 1992.
Weather Conditions: Fine with SSE winds.
Sea Conditions: Sloppy seas with a slight swell.
Underwater visibility: >10 m.
Water Temperature: 20° C.
Site Depth: 6 m.
Site Description: The site is open to prevailing sea and weather conditions. The wreck rests on a relatively flat seabed with higher reef structure on either side and at the vessel's stern. The seabed is hard coral/limestone with sand areas towards the seaward end of the site.
Wreck Description: The wreck lies stern onto the reef and has completely opened up. Dominant features are the large steam engine (resting on its side) and three equally large boilers. The propeller shaft remains *in situ* and there is a large upright four-bladed propeller at the vessel's stern. Along with the propeller the dominant stern structure is the framework of the clearway through which it rotated. Parts of the steering mechanism lie on the higher reef to starboard stern of the vessel. Situated approximately midway between the engine and stern there is a spare propeller. In and around these features lie structural members and comparatively small machinery. A great cluster of tubes project out from behind the engine. Copper alloy piping is visible on the site. An anchor was located in what would have been the bow region. Maximum height of wreck material above the seabed is approximately 3 m. The wreck is relatively free of marine encrustation with the exception of the occasional isolated coral growth. The exposure of the site and lack of concretion will inhibit more extensive colonization by marine life.
Artefact Condition: An assessment of the extent and rate of corrosion of the iron artefacts will be required to determine their present condition and to enable predictions to be made on longer term survival potential. The dominant objects mentioned appear to be in sound condition. Damage is apparent as a consequence of the wrecking and subsequent collapse of the vessel. Iron is not heavily encrusted with concretion. Substantial strength remains in the metal of the objects examined i.e. propellers and boilers. Interestingly the spare propeller was corroded to a greater extent and possessed thicker concretion/corrosion products than the *in situ* example.
Electrochemical Survey: Corrosion potential measurements were successfully acquired from artefact material on site and the results are outlined in Table 16. The positions of the artefacts measured on site are shown in Figure 162. Only one pH measurement was obtained as the corrosion layer on all but the spare propeller was too thin to prevent mixing with ambient sea water. The depth of concretion plus corrosion on the spare propeller was 10 mm and the pH of the residual metal surface was 7.65. The depth of concretion plus corrosion

was estimated at 4 mm on all boilers. The sea water temperature was 20° C and the pH was 8.2. The water depth was 6 m.

Table 16. Corrosion potential measurements (1992) of some exposed artefacts on the *Zvir* wreck site.

Description	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)
Ferrous materials		
Boiler 1	-0.348	4
Boiler 2	-0.330	4
Boiler 3	-0.357	4
Main propeller	-0.358	nd
Spare propeller (pH = 7.65)	-0.348	10
Copper alloy materials		
Pipe (bright metal)	-0.107	nd
nd = not determined		

Conservation report 2009

Kalle Kasi and Vicki Richards

Date of Inspection: 15–16 May 2009
Environmental Conditions: The temperature, salinity and dissolved oxygen concentration of the water column are shown in Table 17. There was no significant change in salinity and temperature with increasing water depth, which is typical of the hydrology of well mixed near coastal waters. The average water temperature was 27.6 ± 0.1° C and the average salinity of the water column was 37.3 ± 0.1 ppK. The usual salinity range for the open ocean is 32–36 ppK, however salinity will increase with increasing water temperature so 37 ppK is within range for warmer, shallow coastal waters. The average dissolved oxygen concentration of the sea water was 6.26 ± 0.13 ppm (77% saturation at 28° C), however there was a decrease in dissolved oxygen content with increasing water depth (Figure 164).

Table 17. Salinity, dissolved oxygen content and temperature of the sea water measured on the *Zvir* wreck site.

Water Depth (m)	Salinity (ppK)	Dissolved Oxygen [ppm(S)]	Temperature (° C)
0.0			27.8
0.5	37.0	6.50	27.7
1.0	37.2	6.42	27.6
1.5	37.2	6.34	27.6
2.0	37.3	6.28	27.6
2.5	37.3	6.29	27.6
3.0	37.3	6.29	27.5
3.5	37.4	6.31	27.5
4.0	37.4	6.23	27.5

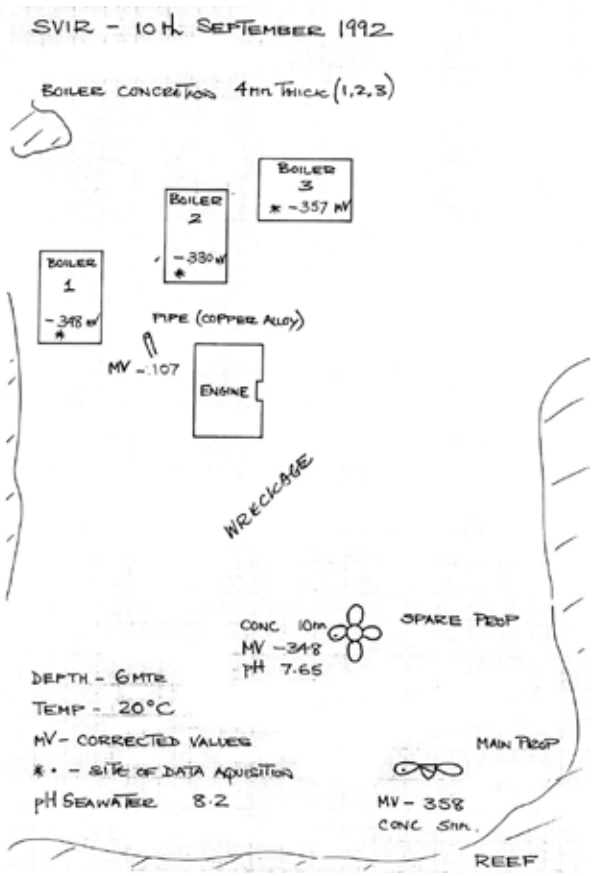


Figure 162. Sketch plan of the *Zvir* wreck site indicating the positions of the structural features measured in 1992 (Jon Carpenter).

4.5	37.4	6.23	27.5
5.0	37.4	6.27	27.5
5.5	37.4	6.27	27.5
6.0	37.4	6.14	27.5
6.5	37.4	6.00	27.5
7.0	37.4	6.05	27.4
Average	37.3 ± 0.1	6.26 ± 0.13	27.6 ± 0.1

For open ocean environments, there is usually a surface maximum in the dissolved oxygen concentration. This maximum is a direct result of absorption from the atmosphere interface, increased water movement and photosynthetic activity by plants and cyanobacteria. However, the salinity was over range for the initial surface measurement (0 m) so the dissolved oxygen content, which is salinity compensated, was erroneous. Hence, that data was not included in the graph.

Typically, after this surface maximum the dissolved oxygen concentration of the water column will decrease with increasing depth. Factors contributing to this trend are decreasing water movement, which leads to less oxygen exchange with the atmosphere, decreasing photosynthetic activity due to less light penetration and increasing aerobic respiration of plankton in the photosynthetic zone. Therefore, this general decrease in dissolved oxygen with increasing water depth on the *Zvir* site is typical for an open circulation, oxidising

Figure 163. Measurement location (x) on the boiler 1 on the *Zvir* wreck site (Kalle Kasi and Patrick Baker).

marine environment.

Corrosion Survey: The corrosion parameters of six ferrous alloy features (boiler 1, Figure 163; boiler 2 and 3, Figure 165; main propeller, Figure 166; spare propellers, Figure 167; upright pipe, Figure 168) were measured on the *Zvir* wreck site. The on-site positions are shown in Figure 169 and the results are presented in Table 18. At the time of the survey, the average water temperature was 27.6 ± 0.1° C and the pH of the sea water was 8.01 at 7.4 m. Five of the same features (boiler 1, 2, 3, main and spare propellers) were measured in 1992 (Figure 162), allowing direct comparative analysis of the corrosion data possible.

Table 18. Corrosion parameter measurements (2009) of some exposed ferrous alloy features on the *Zvir* wreck site.

Description	pH	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)	Depth of concretion (mm)	Depth of corrosion (mm)	Corrosion Rate (mmy^{-1})	Water Depth (m)
Boiler 1	6.91	-0.307	8	0	8	0.075	7.3
Boiler 2	5.64	-0.294	20	16	4	0.037	8.3
Boiler 3	4.64	-0.320	21	14	7	0.065	8.2
Main propeller	7.11	-0.316	15	10	5	0.047	7.3
Spare propeller	7.24	-0.307	16	12	4	0.037	8.7
Upright pipe	5.42	-0.299	22	5	17	0.159	7.4

In order to compare the corrosion data collected in 1992 and 2009, the corrosion potentials

and surface pHs of the ferrous alloy structural features were plotted on the Pourbaix diagram for iron in aerobic sea water (Figure 170). Only one pH measurement of the residual metal surface (spare propeller pH = 7.65) was collected in 1992 so this pH was used as the default for the other 1992 measurements. The pH of the surrounding sea water (8.2) could not be used as the default because, unlike the iron elements measured on the *Benan* site, the *Zvir* iron possessed thicker concretions. The average concretion thickness measured on the *Benan* iron alloy features in 2009 was 1 ± 1 mm, whilst on the *Zvir* iron elements it was 10 ± 6 mm. This thicker, semi-permeable concretion layer separates the anodic and cathodic sites and changes the corrosion mechanism to film free oxidation, which produces an acidic, chloride and iron rich micro-environment at the residual iron surface and hence, a noticeable decrease in pH occurs at this interface in comparison to iron artefacts covered with thin concretion layers where the pH will be closer to that of the surrounding sea water. In addition, it has been observed that the pH of corroding residual metal interfaces decrease linearly with increasing total thickness of the corrosion product layer and the encapsulating concretion (MacLeod and Richards, 2011). That is, generally the thicker the concretion, the lower the pH.

All intercepts of the iron structural features measured in 1992 and 2009 lie in the active corrosion zone, where ferrous ions are the thermodynamically stable chemical species and corrosion will continue until all iron is consumed (Figure 170). The dominance of the ferrous ion also indicates that the micro-environment under the concretion is low in oxygen (reducing

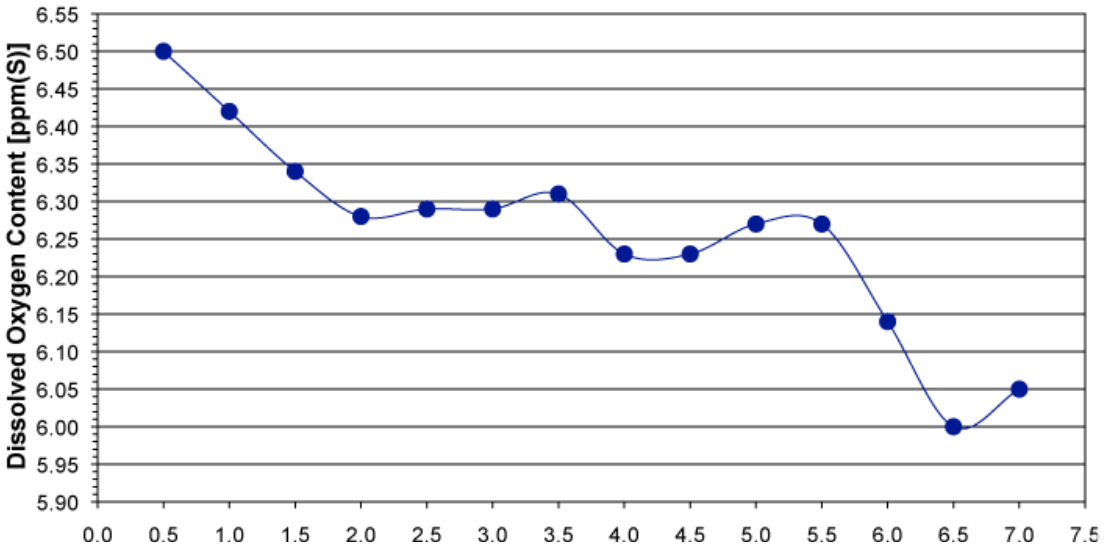


Figure 164. Change in dissolved oxygen concentration with increasing water depth measured on the *Zvir* wreck site (Vicki Richards).

in nature), whereas the seaward side of the concretion is associated with a strongly oxidising environment. Generally, with film free corrosion mechanisms, such as occurs on concreted iron artefacts, an increase in the corrosion potential (tending more positive) indicates an increase in the corrosion of the metal. The average corrosion potentials of the same five iron features measured in 1992 and 2009 were –0.348 ± 0.011 V and -0.309 ± 0.010 V,

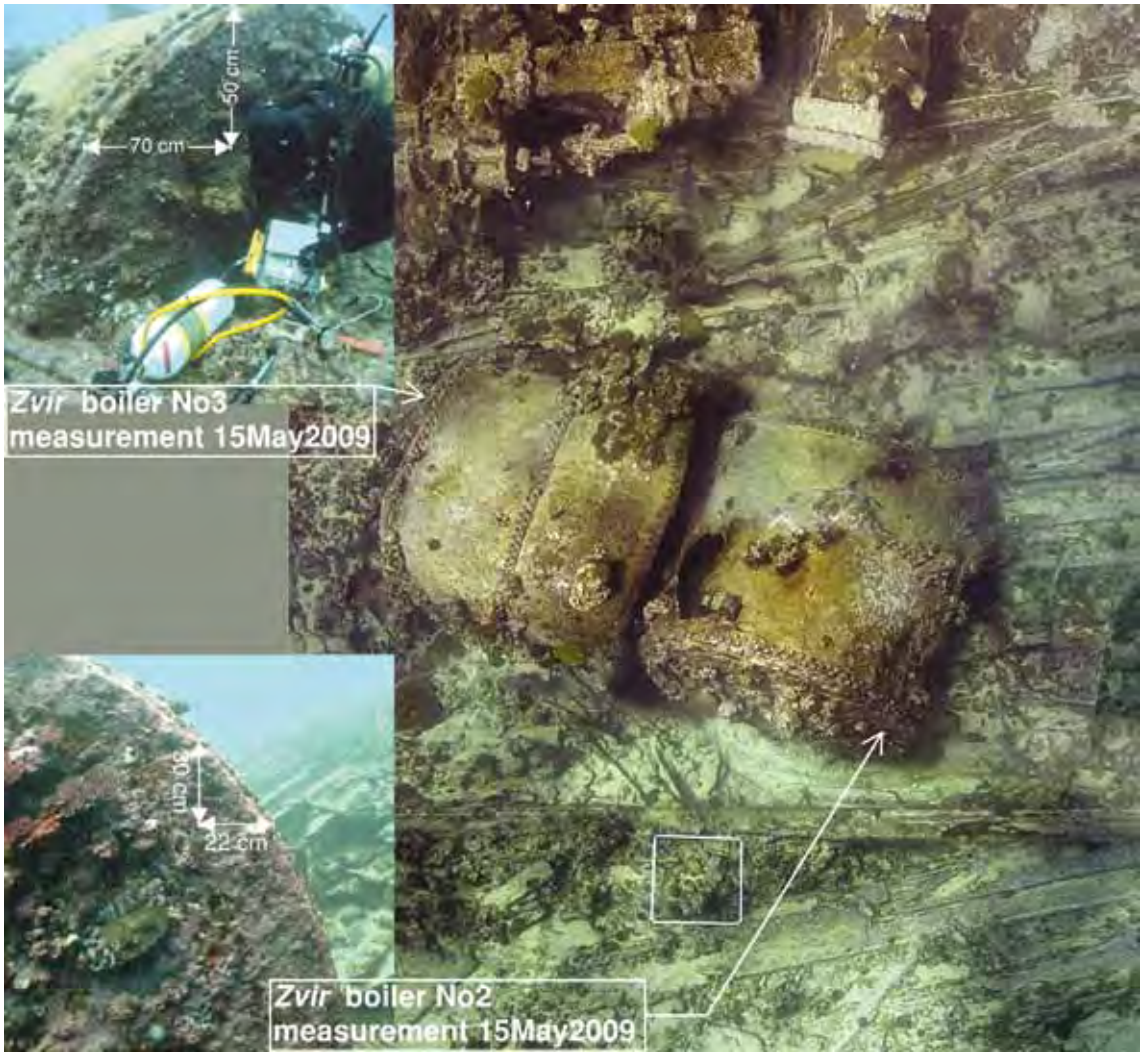


Figure 165. Boiler 2 and 3 on the *Zvir* wreck site (Kalle Kasi and Geoff Kimpton).

respectively. This is a 41 mV increase in the average voltage by 2009 and is indicative of a relatively small, but statistically valid increase in the corrosion of the iron on the *Zvir* site over the past 17 years.

Corroding concreted iron on shipwrecks have characteristic potentials that are a mixed voltage due to the combination of the oxidation (metal dissolution) occurring underneath the concretion and oxygen reduction occurring on the outer surface of the concretion that characterise the overall corrosion process. After decades of immersion, metals are in a quasi-equilibrium state and the data represent a steady long-term rate of decay but only if they remain essentially undisturbed (i.e no damage occurs to the protective concretion layers). The potential differences between the boilers measured in 1992 using the potential of boiler 2 as the zero point because it had the most positive potential were –0.018 V for boiler 1 and –0.027 V for boiler 3. Applying the same calculation to the boilers measured in 2009, the potential difference from boiler 2 was –0.013 V for boiler 1 and –0.026 V for boiler 3. Similarly the voltage differences between the spare and main propellers measured in 1992 was –0.010 V compared to –0.009 V in 2009. These potential differences measured

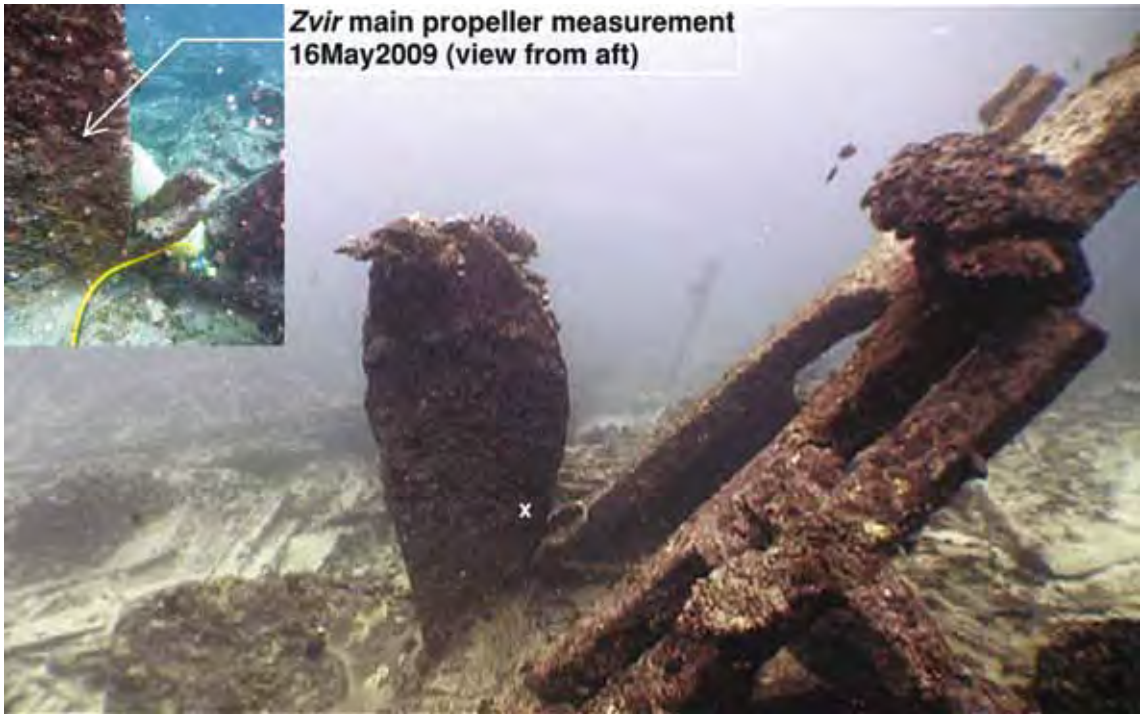


Figure 166. Stern section with the main propeller on the *Zvir* wreck site (Kalle Kasi and Patrick Baker).

Figure 167. Measurement location (x) on spare propeller on the *Zvir* wreck site (Patrick Baker).

Figure 168. Upright pipe, adjacent to the engine on the *Zvir* wreck site (Kalle Kasi and Patrick Baker).

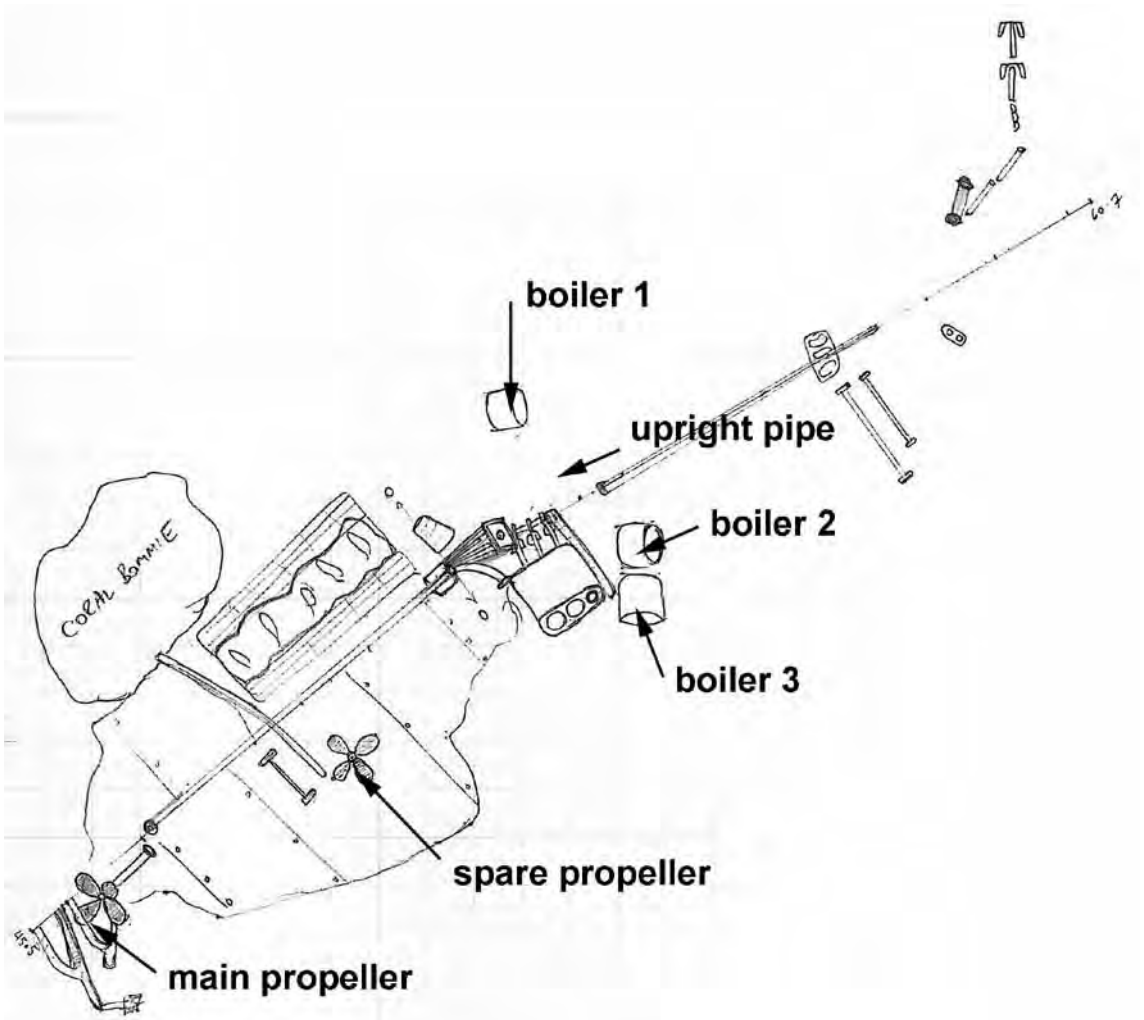


Figure 169. Sketch plan of the *Zvir* wreck site indicating the positions of the structural features measured in 2009 (Kalle Kasi and Corioli Souter).

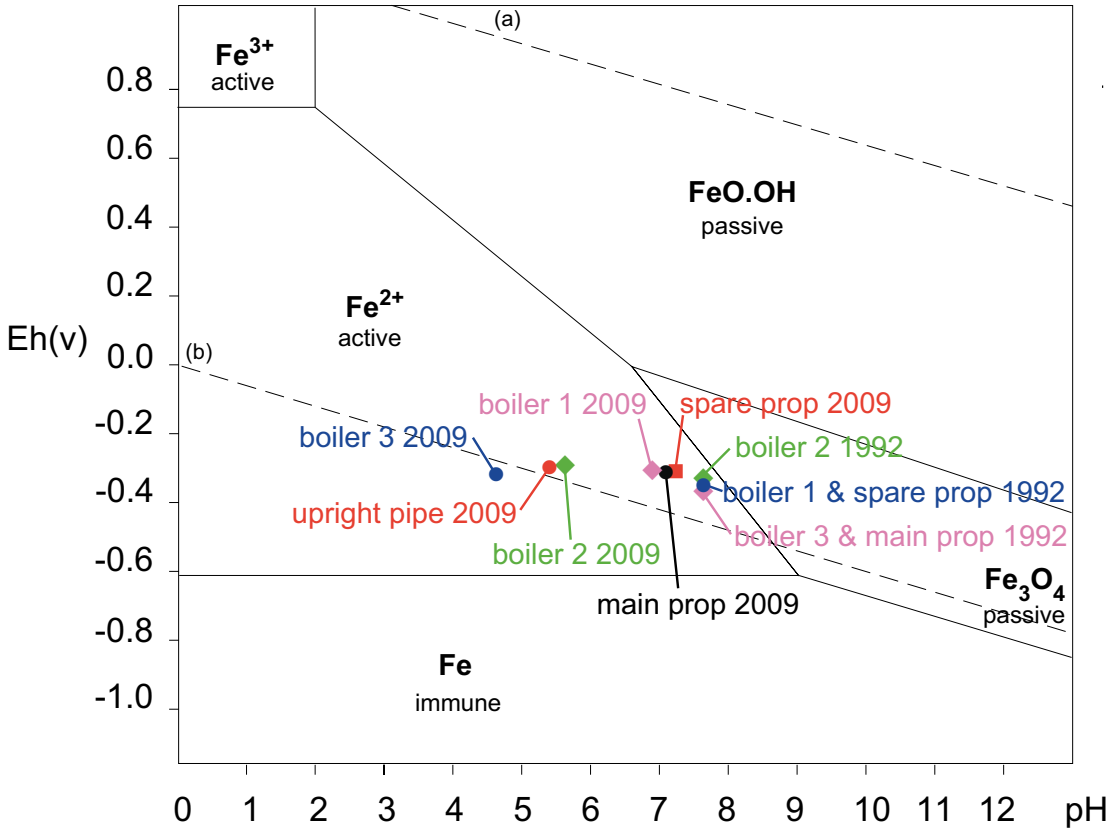


Figure 170. The Pourbaix diagram for iron (10^{-6} molar) in aerobic sea water at 25° C indicating the intercepts of the ferrous structural features measured on the *Zvir* wreck site in 1992 and 2009 (Vicki Richards).

17 years apart are essentially the same, which indicates that the micro-environment on the iron features has remained essentially unchanged over this period of time and the boilers and propellers are indeed corroding at a steady long-term rate.

Since E_{corr} data describes the electrochemical environment of the iron alloy that is electrically connected to the measurement point, it is not as sensitive to localised corrosion processes as the value of the pH recorded at the same point. It has been shown that pH data is a useful guide to the corrosion rate, since the pH is controlled by the dynamic equilibrium (Equation 1) between the concentration of the Fe^{2+} ions (represented as $FeCl_2$ in Equation 1) and their acidic hydrolysis products and is therefore, more sensitive to changes in apparent corrosion rate.

$$2FeCl_2 + 2H_2O \rightarrow [Fe(OH)_2.FeCl_2] + 2H^+ + 2Cl^- \quad (1)$$

So, generally as corrosion increases the concentration of Fe^{2+} ions underneath the protective layer of concretion increases, correspondingly the extent of hydrolysis increases producing more hydrogen ions causing the pH to fall.

The average pH of the five iron surfaces measured in 2009 (excluding the upright pipe) was 6.31 ± 1.13 and the pH of the spare propeller was 7.24. In 1992 the only pH measurement taken was on the spare propeller (pH = 7.65). This value was used in the comparative analysis. Based on this data there has been a decrease in the average pH of 1.34 and a decrease of 0.41 pH units for the spare propeller since 1992, indicating that there has been a significant

increase in corrosion on this site over this seventeen year time period.

In 2009, the *Zvir* had been submersed for 107 years. Using the depths of corrosion (d_c) of the iron features measured in 2009, the annualised corrosion rates for these elements were calculated and the results presented in Table 18. The mean annualised corrosion rate for all measured iron structural features was 0.070 ± 0.046 mmy^{-1}. The corrosion rate for the upright pipe was 0.159 mmy^{-1}, which is more than twice the second highest corrosion rate calculated for boiler 1 (0.075 mmy^{-1}). Therefore if the pipe data is removed, the average corrosion rate in 2009 for the five elements measured in 2009 was 0.052 ± 0.017 mmy^{-1}. Since depths of corrosion of the iron features were not measured in 1992 the annualised corrosion rates cannot be calculated directly and therefore it is not possible to quantify any measurable increase in the corrosion rate over the past seventeen years. However, there was an increase in the total depth of concretion plus corrosion (d_{total}) over this time period and because pH decreases linearly with increasing d_{total} and a decrease in pH of a residual metal surface indicates an increase in corrosion then it may be surmised that there has been an noticeable increase in corrosion of the structural iron features since 1992.

The corrosion behaviour of iron in a marine environment is controlled by a large number of factors, the major variables being the water depth, the amount of dissolved oxygen in the sea water, the amount of water movement, the salinity, the temperature, the composition of the metal and concretion formation. However, at any one time on a particular site, the water temperature and salinity will not vary and these factors, which dominate the amount of dissolved oxygen in the marine environment, are not major site variables. Hence, the corrosion rate of metals on the *Zvir* site measured in 2009 will be very dependent on water depth, the amount of water movement and thus the flux of oxygenated sea water over the objects lying proud of the seabed and, obviously the metal composition and extent of concretion formation. As mentioned previously, corrosion potentials are not as sensitive to localised corrosion processes as pH and depth of corrosion (d_c) measurements. Therefore, grouping the iron features on the *Zvir* site according to metal composition and concentrating on the pH and d_c data measured in 2009 (Table 18, Figure 170) and their overall depths and location on site, some differences in corrosion rates of individual features may be explained.

It appears that boiler 3 is corroding faster than boiler 2 based on the more acidic pH and greater corrosion depth. The corrosion parameters on boiler 1 were measured at a completely different location (flange located on the end of the boiler) compared to boilers 2 and 3, where the measurements were taken on the actual fabric of the boilers. There was no encapsulating concretion on this flange associated with boiler 1 so it is not surprising that the pH was more alkaline despite the depth of corrosion being similar to that of boiler 3. Comparison of the pH measurements and corrosion rates of the propellers indicate that the main propeller is corroding at a slightly faster rate than the spare propeller. This is probably caused by the more upright and shallower position of the main propeller on the site (Figure 166) where it would be subjected to greater water movement and oxygen impingement increasing the overall corrosion rate as compared to the spare propeller that lies flush with the bottom of the hull remains (Figure 167). The upright pipe possesses a relatively acidic pH and is corroding at more than twice the rate of the other iron features (0.159 mmy^{-1}). This may be explained by the fact that this pipe lies in a shallower, very exposed location in the middle of the site where it would be subjected to greater water movement and oxygen impingement increasing the localised corrosion rate. Also, the surface area of the pipe is much less than the other iron

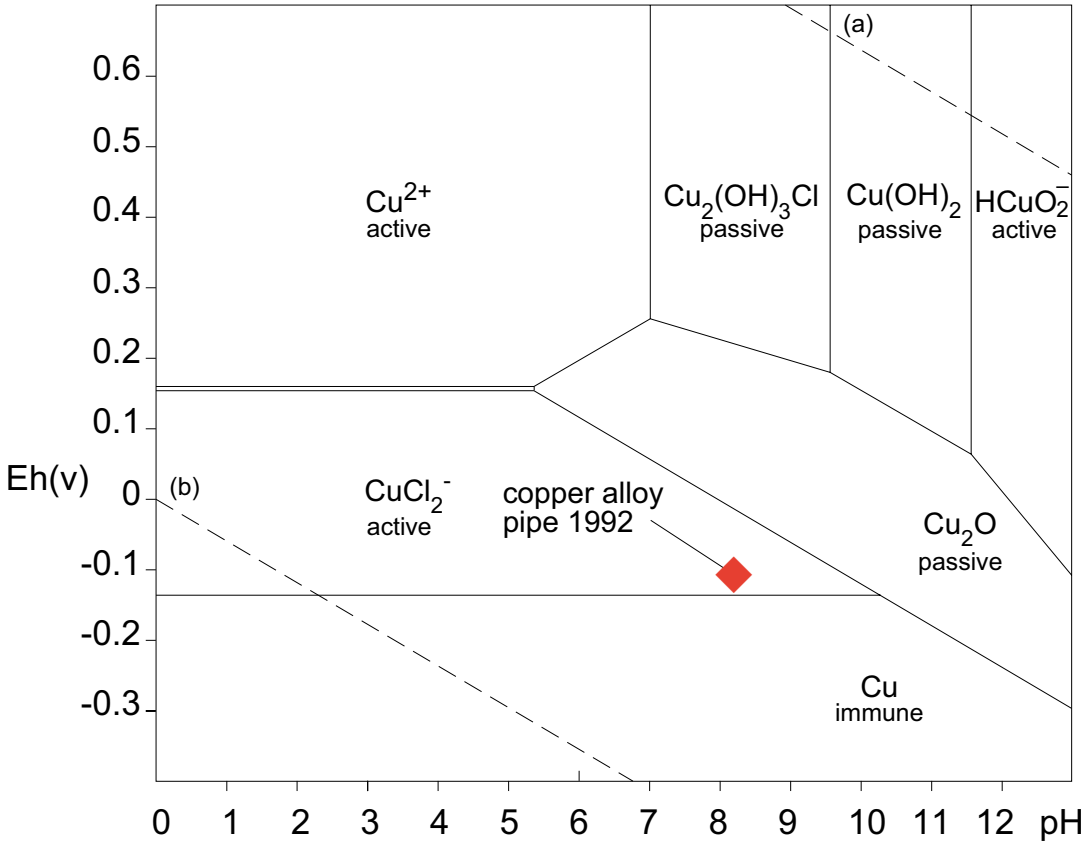


Figure 171. The Pourbaix diagram for copper (10^{-6} molar) in aerobic sea water at 25° C indicating the intercept of the copper alloy pipe measured on the *Zvir* wreck site in 1992 (Vicki Richards).

structural elements measured on site and hence, the current density is concentrated over a smaller area, which would in turn, increase the overall corrosion rate.

By plotting the measured voltage and the corresponding surface pH of the copper alloy measured in 1992 on the Pourbaix diagram for copper at 10^{-6} molar in aerobic sea water at 25º C, the thermodynamic stable state of the copper can be ascertained (Figure 171).

The copper alloy pipe measured in 1992 possessed a bright metal surface with no concretion. Subsequently, the pH of the surrounding sea water at the time of the survey (8.2) was used as the default. The intercept of the pipe lies in the active corrosion zone of the Pourbaix diagram (Figure 171), where the soluble cuprous chloride ions are the thermodynamically favoured state of copper indicating that this copper alloy is corroding freely in the absence of any protective layer of cuprite (Cu_2O).

Based on the corrosion survey results there has been a significant increase in the corrosion of the iron on the *Zvir* site over the past seventeen years and the corrosion of both the iron and copper alloys is likely to continue until no residual metal remains, assuming on-site conditions and the associated micro-environments remain essentially unchanged. In addition, these results reinforce the importance of measuring structural features of similar metal composition and collecting corrosion data from the same general position on all similar artefacts if truly comparative data is to be collected and analysed.

Chofuku Maru 1931 and the *Shunsei Maru*

Michael McCarthy

On 5 February 1931, after running onto a reef described as being 'about 3–4 miles north of the North West Whaling Station', the 7939 ton SS *Shunsei Maru,* owned by the Tomamohosaji Kisen Kaisha (Shipping Company), of Kobe, sent out distress signals. These radio signals were answered by the 4498 ton SS *Chofuku Maru*, owned by Kawasaki Kisen Kaisha (KK Line), also of Kobe. Both ships were carrying a cargo of bagged wheat to Japan.

On reaching the coast, the *Chofuku Maru* initially mistook SS *Fin*, which was aground at Fraser Island, for the *Shunsei Maru* and headed in towards it, before anchoring offshore. A heavy southerly wind caused the anchors to drag and the ship's stern struck a reef, damaging a propeller blade. Realising that the *Shunsei Maru* lay further north, the ship then moved up the coast, despite the vibration caused by the damaged propeller. Though safely anchored outside the reef in deep water, the anchor chain caught on a ledge or reef and the cable parted. Another anchor was let go, but it was lost and the ship drifted onto the reef in strong south-westerly winds. An attempt was made to lower a life-boat and it too was lost. For a while the two ships remained on the reef less than a mile apart, both salvable, until a fire broke out on the *Chofuku Maru*, causing its complete abandonment.

A full account of the events that transpired (with some important observations about the Indigenous people then inhabiting the region) were recorded some forty years later when Maurice MacBolt gave a presentation to the Augusta Historical Society (MacBolt, 1976). In a transcript of his lecture entitled 'The Story of Two Ships', MacBolt recalled that an Aboriginal man the Europeans called 'Long Tommy' and his wife 'Mary Ann' first reported the stranding of the *Shunsei Maru* to the whaling station. MacBolt, the Chief Engineer at the whaling station, and two workers then went out to the stranded ship in a small launch. On boarding the ship they found that the crew of around fifty men were, in MacBolt's words, 'not happy about coming ashore as they could see about twenty Aborigines—they had spears as they had been fishing and getting turtles'. When MacBolt went ashore and related this to the Aborigines, they treated the fears of the Japanese who they called the 'Jerridy-Jerridies' (Rice eaters—'Jerridy' apparently meaning rice in the local dialect) as a 'huge joke'. MacBolt subsequently returned to the ship and after allaying their fears piloted the crew in their life-boats to the beach. The Captain apparently remained on board and according to MacBolt was later found in his cabin contemplating suicide. After MacBolt threw his pistol overboard, the Captain went ashore and joined the crew where they remained for a short time before returning to the ship (MacBolt, 1976).

Figure 172. Photomosaic of the *Chofuku Maru* wreck site (Patrick Baker).

Figure 173. The *Chofuku Maru* aground on the reef (WA Museum).

When *Chofuku Maru* also got into difficulties, it was 'Long Tommy' and his wife 'Mary Ann' who again reported the event to the whaling station. In another important observation MacBolt records that their group was led by a man known as 'Dingo Charlie' and that all twenty in the group were 'full-blood' and all could speak English. Again MacBolt went to the rescue, finding a 'much happier captain and crew' than those who were on board the *Shunsei Maru*. All were subsequently taken ashore where they were cared for at the whaling station, though their supplies were bolstered by food taken from the ship, augmented with clam meat which the Japanese found in the shallows. During their absence a fire broke out in the coal bunkers of the *Chofuku Maru.* It had also taken on a list to port destroying the superstructure and leaving the exposed starboard side either in flames or smouldering in the heat. MacBolt reboarded the ship soon after, and went down into the engine room to try and recover a small lathe, only to be forced out by rising waters in the engine room. Apparently water also got into the wheat causing it to swell and ferment. According to MacBolt (1976), 'extreme pressure had been building up, completely distorting the decking of the ship above and around the holds. Some time after she had keeled over and sunk, gases were rising and an unpleasant smell was around'. The crew of the *Chofuku Maru* remained at the Station for around two weeks and after customs and immigration officials had completed their work, they were all transported to Carnarvon, and went from there by ship down to Fremantle and then back home to Japan.

The salvage of *Shunsei Maru*

In the interim the *Shunsei Maru* crew assisted the Dutch Tug *Kraus*, which had been sent down from Batavia (Jakarta) in an attempt to free their ship. When this failed, with the exception of 'two or three' who had been left onboard 'to prevent the *Shunsei Maru* being claimed

Figure 174. Part of the *Chofuku Maru* engine (Patrick Baker).

Figure 175. The main hull with steam-driven winch in foreground (Patrick Baker).

Figure 176. The rudder and propeller blade (Patrick Baker).

Figure 177. The *Chofuku Maru* winch mechanism (Patrick Baker).

as salvage' and to act as watchmen, they were all taken off and went down to Fremantle in the tug. From there, they boarded another Japanese ship for the voyage home (*The West Australian*, 10 March 1931). In the interim a marine surveyor, Captain R. Sinclair, had been sent up from the Fremantle Office of Lloyd's of London, the ship's underwriters. After electing to proceed on a 'no cure–no pay basis' rather than to take a retainer and bonuses, MacBolt surveyed the inside of the ship, finding it did not look at all promising. The frame was twisted in places, rivets had sprung along the bilge, and 'in the engine room the water was waist high, reaching to the level of the bottom fires and all the holds were nearly full of water'. The engine's bearings, the dynamo and other machinery had to be examined underwater, and over a number of weeks were repaired and made ready by MacBolt's team. A diver Frank Ball, who had been sent up with his equipment from Fremantle, commenced a survey of the hull at this same time. He found that the ship was not holed and began inserting bolts to replace the sprung rivets. He also applied cement (presumably hydraulic cement which sets underwater) to repair the damaged seams.

In order to haul the ship off using its own steam-powered winches, chains and blocks were sourced from the whaling station and a number of anchors and further lengths of chain were recovered from the *Chofuku Maru*. Anchors and chain that had been recovered from the wreck of the SS *Lygnern*, which stranded at Fremantle in 1928, and a number of pumps were brought up by the State Shipping Service. A total of seven anchors and a large amount of chain were laid around the *Shunsei Maru* to assist with manoeuvring the ship clear of pinnacles and reefs. *The West Australian* ran the following story:

> The two Japanese freighters ran on the reefs within a short distance of each other, the first vessel to run aground being the *Shunsei Maru*. In answer to wireless calls the *Chofuku Maru* rendered assistance but got out of hand in a heavy swell which forced her on to the reefs. A fire, which broke out on the *Chofuku Maru*, destroyed much of the superstructure.
> On a Burning Ship
> When Captain Sinclair first reached the scene in an aeroplane he charted numerous submerged pinnacles of rock in the vicinity of the *Shunsei Maru*. Later on, the salvaging party boarded the second vessel, where the fire continued to smoulder. It was necessary to dismantle gear, and remove anchors and cables for use in the salvaging of the *Shunsei Maru*. With the *Chofuku Maru*'s port side awash in the swell, and the starboard side on fire, the salvaging party worked under difficulties. Much of the gear recovered had to be dipped in the sea for several minutes before it was cool enough to be handled, and the rigging screws were so hot that they burned a rope guy. The ship's iron superstructure was twisted by the intense heat. After five days' work two anchors, each weighing 3½ tons, a smaller anchor, and several fathoms of chain and steel rope were removed with the assistance of a punt from the Point Cloates whaling station and a lifeboat fitted with an engine from an old motor car. The conversion of the lifeboat into a self-propelled craft was effected by Mr. M.M. Macbolt, engineer at the whaling station, who joined the salvaging party as chief engineer. While being loaded with a portion of the gear the lifeboat was caught in the swell, and capsized, throwing its four occupants into the water. Eventually the gear was either transferred to the *Shunsei Maru* or attached to portions of the reef to seaward of the stranded vessel. The blasting of the pinnacles of rock, and the laying of the seven anchors and lines was risky work in the enormous swells which raced over the reefs.

> The diver (Mr. Frank Ball) made several fruitless attempts to lay charges of explosive in the rock, and, after he had repeatedly fallen into crevices, or been almost washed off the pinnacles into deep water, the charges had to be dropped into position by those in the punt. Tons of rock were blown away to a depth of 12 ft over the channel through which it was proposed to take the *Shunsei Maru*. Buoys were set down to denote the position of a dozen pinnacles and certain portions of the reefs.
> Hauled Off the Reef
> The stage now being set for the final act, the pumps were started, and the water drained from the holds and engine room of the stranded vessel. The salvage pump of the Adelaide Steamship Company, with a capacity for drawing 250 tons of water with a 20 ft lift, was shifted from one hold to another in the process of lowering the water level. The engine room was flooded to the main columns, and one of the boilers was awash. Mr. Macbolt worked up to his chest in water for several hours. After the water had been pumped out the furnaces were lit. To further lighten the ship about 300 tons of coal were thrown overboard. 'Mr. Macbolt is one engineer in a thousand,' Captain Sinclair said, when referring to the work of the engineer, who, single handed, got the main engines and the auxiliary gear working. The ship's forward tanks were emptied by Captain Sinclair who moved the vessel's head 60 ft clear of a pinnacle of rock. Then the vessel was tipped by the head so that the stern would be lighter on the reef. After much' manoeuvring the freighter was pulled off the reef, and, while her movements were checked by the slackening or tightening of the cables, she was hauled into the channel. The vessel went astern with her own engines, and the cables were slipped one by one. A big factor in the success of the operation was the efficient and quick handling of the lines.
> Men Collapse from Exhaustion
> When clear of the rock pinnacles the vessel's head was swung out to sea, but when about three miles from the reefs, the engineer collapsed and had to be carried on deck. Some of the men had not rested for nearly three days. The stokers were also exhausted through fatigue, and the engines finally stopped when the pressure of steam failed. Captain Sinclair said yesterday that he had visions of disaster when the boat began to drift towards the reefs. Sounding was undertaken continuously, until the depth of water permitted the dropping of the anchor, which dragged along the ocean bed for some distance before taking a hold on a ledge of rock.' Much-needed rest refreshed the party, and Captain Sinclair set out next day for Carnarvon. After berthing at that port the freighter was blown from the jetty, in a gale, and the mate (Mr A. Davis) was injured. An anchorage off the end of the jetty was sought until the weather moderated, and the *Shunsei Maru* was then rebearthed. Repairs to the bottom of the vessel were effected, and the voyage to the dock at Surabaya commenced (*The West Australian*, 25 May 1931).

Then after being joined by a radio operator and two experienced Scottish engineers, who were sent up to assist MacBolt, the ship proceeded to a dry dock in Surabaya under her own steam, arriving three months after the initial stranding. There, it was handed over to her original Japanese crew, who had been sent down to take over the ship. Later in the year MacBolt received a letter of thanks from the Kawasaki Kisen Kaisha Line, another from the Sydney branch of the ship's agents, Yamashita and Company of London, and also a money order for £50, then a considerable sum. This was sent from the Captain of the *Chofuku Maru*

'for services rendered'. One letter read:

> We are writing you this letter to express and convey our sincere thanks for your best endeavours and kindness you showed toward the unfortunate crew to comfort them or to give them facilities for salvage and repatriation. Although the ship and the cargoes were to be abandoned the crew was very happy and grateful that none of them had any accident and all safely arrived at Japan toward the end of March and went back to their respective happy home[s] (Quoted in MacBolt, 1976).

Tenders were called for the purchase of *Chofuku Maru,* but none were received (*The West Australian*, 2 May 1931).

A tragic sequel to these events involved the well-known ex-US Navy submariner, Tom Snider. He was lucky to been invalided off the USS *Harder* during the war and he was apparently devastated when it was lost with all hands off the Philippines. After the war Snider stayed on and married a West Australian to eventually become famous for his work on many wrecks around the coast, including the Liberty Ship *Michael J Goulandris* (1944). He also searched for the wreck of the SS *Pericles* (1910) off Cape Leeuwin, and recovered much of its cargo of lead ingots. Later Snider lost his life in a plane crash near Exmouth. He had flown there with the intention of examining the former American submarine refuelling base at Onslow, to recover the copper and copper alloys on the *Chofuku Maru* and possibly to salvage the anchors and chain from the *Shunsei Maru*. MacBolt, though keen to accept Snider's invitation to join them on the survey, was prevented from doing so, and appears lucky not to share his fate (MacBolt, 1976). Partly because of Snider's untimely death, *Chofuku* Maru and the *Shunsei Maru* anchors and chain were never salvaged. They remained virtually untouched until the *Shunsei Maru* anchors were located by W.J. Moffett in 1972. In September 1974 they were inspected by museum photographer Patrick Baker assisted by P. Barrett-Leonard who described the 'most notable feature of the site' as:

> A length of heavy barred chain lying E–W across the seaward side of the reef top and some distance further comprising 100 metres. On the reef top, or East end, of the line the chain was found attached to an iron-stocked Admiralty patent-type anchor in 4 m of water whose shank length was approximately 2.45 m. At the west end a larger anchor (approx. 3 m shank) with hinge type flukes [a close stowing anchor] was attached lying in 9 m depth…The chain has been overgrown in places by the living coral. Two additional anchors were located lying in line with the aforementioned anchor on the reef top, one to the south and one to the north. Also on the reef top near the anchors coils of heavy wire rope were noted. No evidence of other ship's fittings was noted.

In May 1977, D.J. Morrissy and G.A. Rykers, reported to the Museum a steamship wreck in the Point Cloates vicinity. They described it as 50–60 m long, lying in 15–20 feet (*c*. 6 m) of water approx. 3–4 km offshore. It was described as being on the Ningaloo Reef broken up with no superstructure, a large propeller having a 4 m diameter with 4 blades, drive shaft, steam engine, with 4 winches and 2 boilers. Two years later, in 1979 a team led by Frank Paxman reported a steamship wreck at the entrance to Norwegian Bay. It became known as the 'Norwegian Bay Unidentified' and for a while the two reports were believed to be of the same vessel.

Both wrecks were inspected in May 1980, by a team led by M. McCarthy and reports were

filed. The different sizes of the remains, the location of each wreck and the number of boilers and grates per boiler recorded in the Lloyd's registers led to the identification of the Morrissy and Rykers find as the *Chofuku Maru* and 'The Norwegian Bay Unidentified' as the SS *Zvir* (see page 194) which was lost in 1902 (McCarthy, 1980b). The wrecks, that had been 'fixed' using sextant angles and bearings from the shore, were subsequently relocated and then fixed to modern GIS and DGPS parameters by J. Green. In 2009 both wrecks were inspected by a team led by Ross Anderson and the reports filed.

Inspection report 2009

Ross Anderson

The remains of the *Chofuku Maru* are extensive and make for an interesting dive. As it is in deeper water, off the outside reef, it can be dived with swell up to 1.5–2.0 m in conditions that are unsuitable for the NRU, *Benan* and *Correio da Azia* sites. The overall length of the wreck site is 98 m oriented with the bow 45º north-east, and its starboard side lies against two large coral bommies on the outer reef. The stern area, in a depth of 8 m, has the rudder, stern-post and steering quadrant, four-bladed propeller (with only three blades visible) and propeller shaft with its plummer blocks and thrust block near the engine. The propeller shaft has broken in two places at the plummer blocks. The double bottom of the vessel has broken into at least three main 'platforms' over the uneven reef bottom, with scattered hull plating and deck beams. The amidships section has the collapsed triple expansion engine lying on its port side and the two boilers, one of which has eroded and collapsed and the other is intact. A donkey boiler is visible on the starboard side just astern of the engine area. The forward section and bow is in deeper water up to 10 m, and features deck winches, capstan and a steam windlass, hawse pipes and the partially intact stem/ bow. The site was inspected on 11, 12 and 18 May 2009 with GPS points of bow and stern recorded and a site plan, video, photogrammetry and photomosaic of the site produced.

The wreck site and associated relics of the *Chofuku Maru,* and anchors related to the SS *Shunsei Maru* stranding and salvage are protected by the Commonwealth *Historic Shipwrecks Act 1976*.

Conservation report 2009

Kalle Kasi and Vicki Richards

Date of Inspection: 18 May 2009

Corrosion Survey

The corrosion parameters of seven structural features (propeller and rudder, Figure 180; propeller shaft, Figure 181; boiler, Figure 182; engine block, Figure 183; deck plate, Figure 184; mast spider band, Figure 185) were measured on the *Chofuku Maru* wreck site. The on-site positions are shown in Figure 186 and the results are presented in Table 19. At the time of the survey, the average water temperature was 26° C and the pH of the sea water was 8.09 at 8.0 m. In order to compare the iron corrosion data collected in 2009 on the *Chofuku Maru*

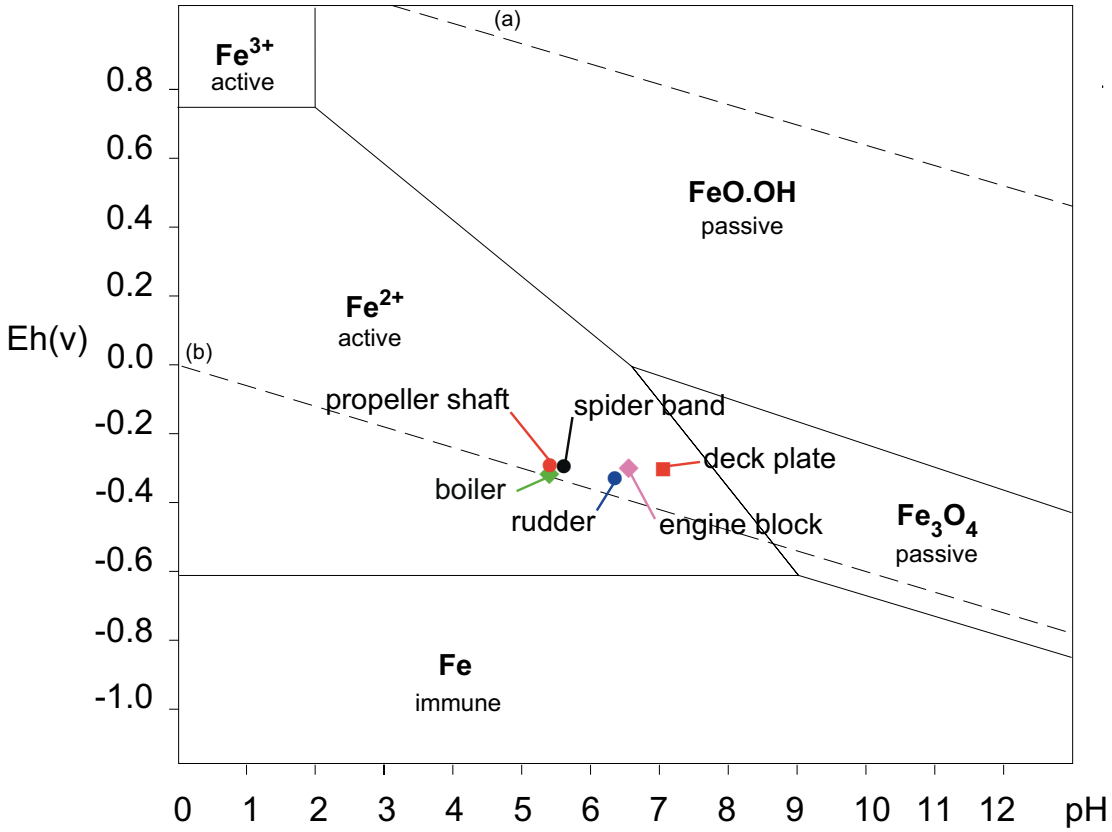


Figure 178. The Pourbaix diagram for iron (10^{-6} molar) in aerobic sea water at 25° C indicating the intercepts of the ferrous structural features measured on the *Chofuku Maru* wreck site in 2009 (Vicki Richards).

site, the corrosion potentials and surface pHs of the measured ferrous alloy structural features were plotted on the Pourbaix diagram for iron in aerobic sea water (Figure 178).

All intercepts of the iron structural features measured in 2009 lie in the active corrosion zone, which indicates that the iron is corroding freely in the absence of any protective oxide layers (Figure 178), which is the basic corrosion mechanism occurring under concreted iron. Generally, with film free corrosion mechanisms, such as occurs on concreted iron artefacts, an increase in the corrosion potential (tending more positive) indicates an increase in the corrosion of the metal. However, the average corrosion potential of the six iron features was –0.309 ± 0.015 V. This 15 mV standard deviation is comparatively small and within experimental error for the equipment and measuring procedure making it more difficult to interpret changes in corrosion rate based on the E_{corr} data.

Table 19. Corrosion parameter measurements (2009) of some exposed structural features on the *Chofuku Maru* wreck site.

Description	pH	E_{corr} vs NHE (V)	Depth of concretion + corrosion (mm)	Depth of concretion (mm)	Depth of corrosion (mm)	Corrosion Rate (mmy^{-1})	Water Depth (m)
Ferrous materials							

Rudder	6.37	-0.332	7	0	7	0.090	6.3
Propeller shaft	5.42	-0.296	12	4	8	0.102	8.0
Boiler	5.41	-0.318	10	2	8	0.102	8.0
Engine block	6.56	-0.300	24	0	24	0.308	6.1
Deck plate	7.07	-0.302	14	0	14	0.179	7.3
Mast spider band	5.63	-0.294	16	3	13	0.167	10.2
Copper alloy materials							
Propeller (1)	7.75	-0.306	15	15	0	na	8.0
Propeller (2)	7.61	-0.306	20	20	0	na	8.0
na = not applicable							

It has been shown that pH data is a useful guide to estimating corrosion rates of concreted iron, since the pH generally decreases with increasing corrosion rate. However, the average depth of concretion on these iron features was very thin at 2 ± 2 mm and three of the iron features possessed no concretion at all again making it difficult to predict corrosion rates using these pH measurements. It should be noted, however that the iron features covered with thin layers of concretion (propeller shaft, boiler and mast spider band) had much lower pHs (average pH = 5.49 ± 0.12) than the rudder, engine block and deck plate that were devoid of concretion (average pH = 6.67 ± 0.36) suggesting that the latter iron structural features possessed lower corrosion rates. On the other hand, the annualised corrosion rates ($d_g^{\bar{}}$) (Table 19) calculated from the measured depths of corrosion and the years of submersion (78 years) indicated that the rudder, propeller shaft and boiler possessed the lowest corrosion rates, with the average being 0.098 ± 0.007 mmy^{-1}, which is similar to the standard corrosion rate for isolated mild steel in sea water (0.11 mmy^{-1}). The deck plate and the mast spider band were corroding at 0.173 ± 0.009 mmy^{-1}, which was almost twice the rate of the rudder, propeller shaft and boiler. Finally the highest corrosion rate was 0.308 mmy^{-1} for the engine block.

It has been previously reported (MacLeod, *et al.,* 2007) that the thickness of concretion is an important factor in determining how effective the marine growth is in establishing separation of the anodic and cathodic sites of the corrosion cell and this, in turn will be reflected in the pH values. On wreck sites where there have been episodes of natural deconcretion events during storms it takes some time for the marine organisms to regrow and the rate of regrowth is dependent on a variety of interrelated factors. Thus when measurement points are accessed there is a chance that the pH recorded is not fully representational of the underlying degree of corrosion. This, in turn, causes the pH values to be more alkaline than the underlying long term corrosion rates would indicate. In simple terms, more recently deconcreted and recolonised areas tend to present more alkaline pH values whereas the fully matured sections possess more acidic values. It is important not to confuse alkaline pH values with low corrosion rates for without knowledge of the corrosion thickness and the environmental history of the vessel it is not wise to apply simplistic interpretation of the data as this can imply that the rate of corrosion is low whereas it can be quite high in these particular areas. For example, the engine block was devoid of concretion and had a relatively high pH value (pH = 6.56) suggesting a lower corrosion rate but in reality, the engine possessed the highest corrosion rate of all measured structural features on the *Chofuku Maru* wreck site. This may be explained by a slightly different corrosion

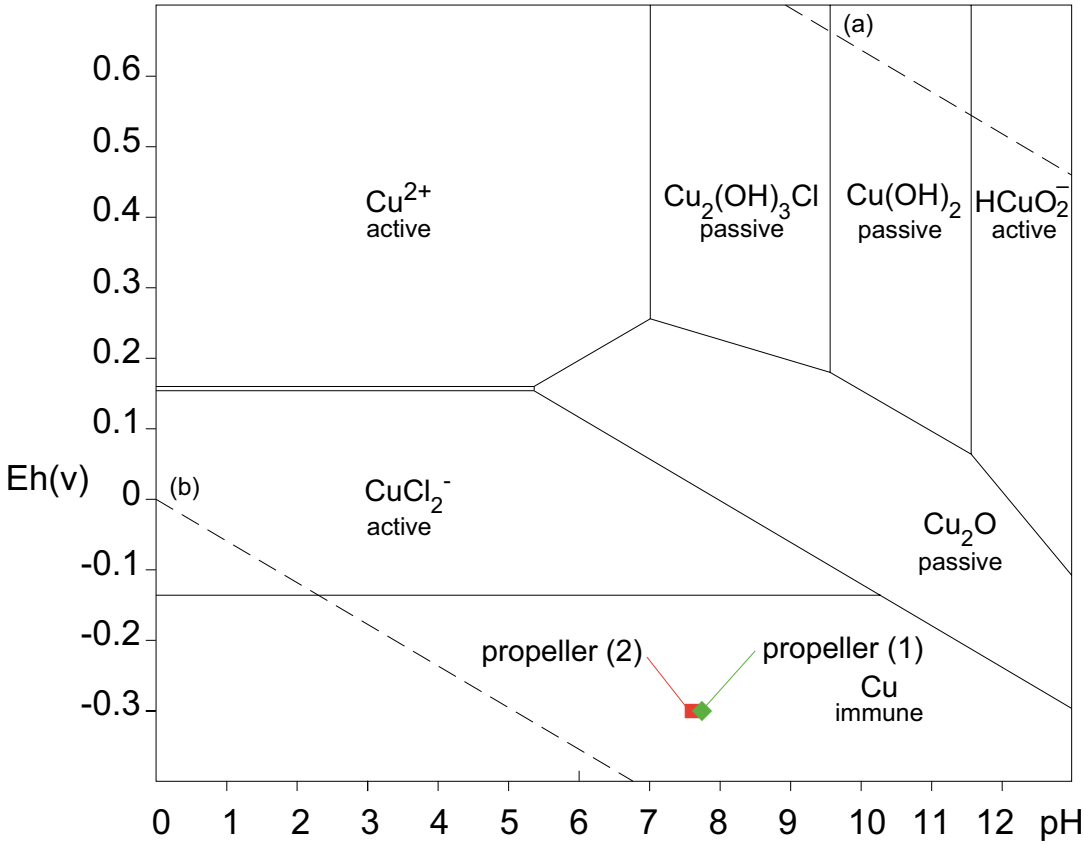


Figure 179. The Pourbaix diagram for copper (10^{-6} molar) in aerobic sea water at 25° C indicating the intercept of the copper alloy propeller measured on the *Chofuku Maru* wreck site in 2009 (Vicki Richards).

mechanism occurring on the engine due to the different metal compositions of the engine parts in direct electrical connection causing increased corrosion through galvanic coupling.

The lower corrosion rates observed for the rudder, propeller shaft and boiler could be due to their increased size and possible direct electrical contact with other large structural features on the wreck site, where the current density of the corrosion process would be spread over a much larger surface area, effectively lowering the corrosion rate as compared to isolated iron artefacts, such as the mast spider band, which will corrode at a much faster rate.

The copper alloy propeller on the *Chofuku Maru* site was measured twice in 2009 and the results plotted on the Pourbaix diagram for copper in aerobic sea water (Figure 179).

There was absolutely no variation in the corrosion potential of the propeller measured on two separate locations, which was steady at –0.306 V. However, there was some variation in the pH and the depth of concretion (d_{conc}), where the average pH of the two measurements was 7.68 ± 0.10 and the d_{conc} was 18 ± 4 mm. This is not surprising as these corrosion parameters are more sensitive to small changes in micro-environment and corrosion processes.

Inspection of the copper Pourbaix diagram showed the propeller on the *Chofuku Maru* wreck site lay in the immune region, where copper metal is the most stable species and corrosion does not occur (Figure 179). Corrosion rates for isolated copper samples in oxygenated temperate sea water (approx. 15° C) is about 0.02 mmy^{-1} and this rate appears to increase by a factor of two with every 10° C increase in water temperature. However, copper is usually found only in this immune

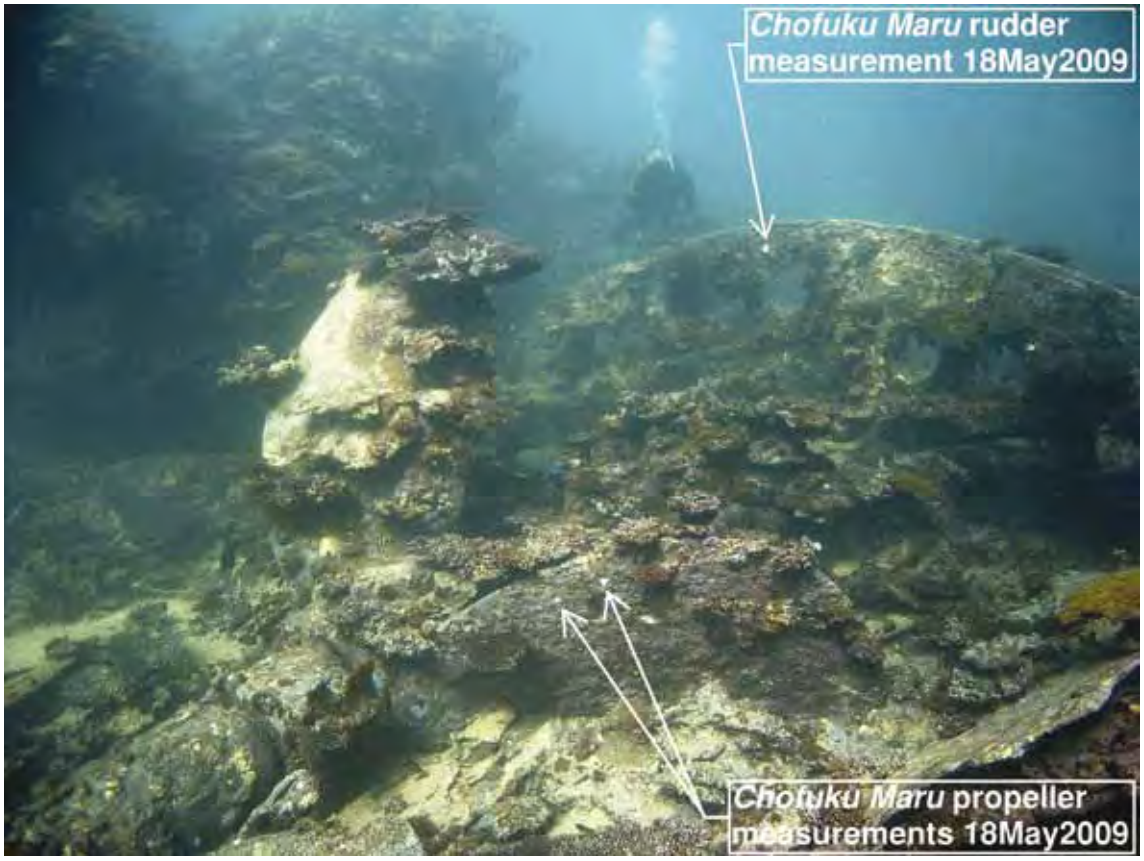


Figure 180. Propeller and rudder measured on the *Chofuku Maru* wreck site in 2009 (Kalle Kasi and Patrick Baker).

Figure 181. Propeller shaft measured on the *Chofuku Maru* wreck site in 2009 (Kalle Kasi and Patrick Baker).

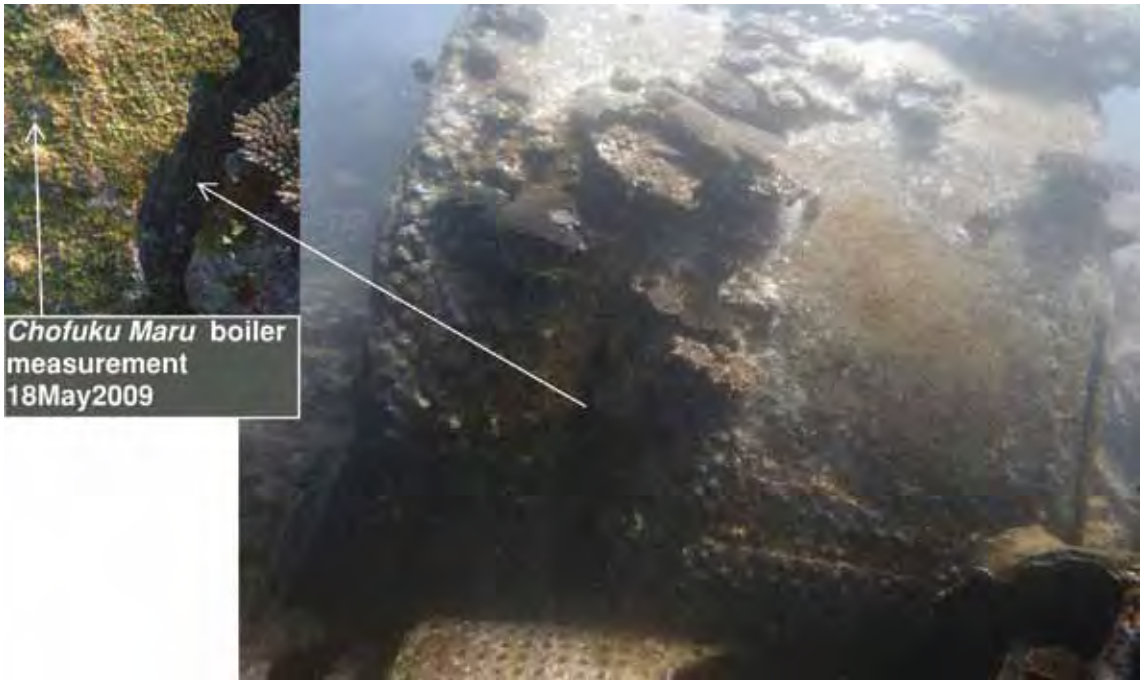


Figure 182. Boiler measured on the *Chofuku Maru* wreck site in 2009 (Kalle Kasi and Patrick Baker).

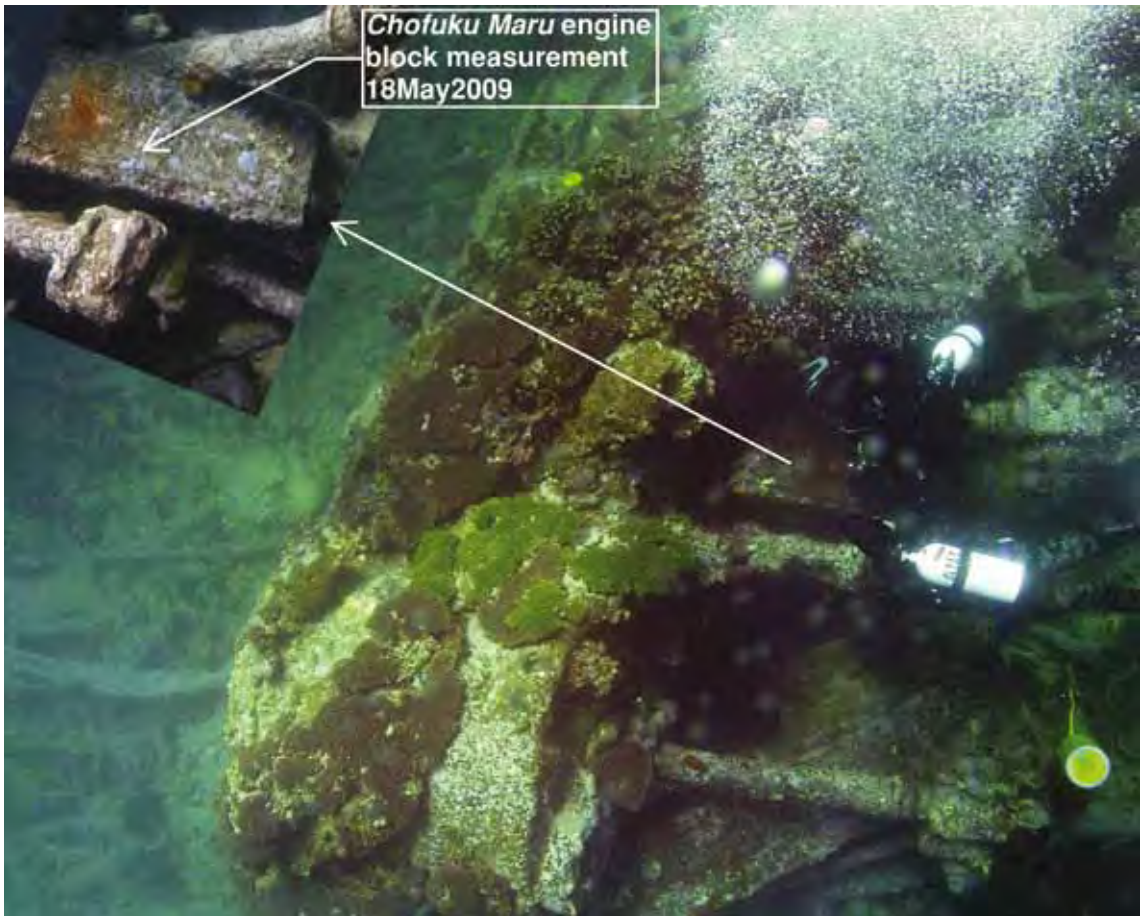


Figure 183. Engine block measured on the *Chofuku Maru* wreck site in 2009 (Kalle Kasi and Patrick Baker).

Figure 184. Deck plate measured on the *Chofuku Maru* wreck site in 2009 (Kalle Kasi and Patrick Baker).

Figure 185. Mast spider band measured on the *Chofuku Maru* wreck site in 2009 (Kalle Kasi and Patrick Baker).

Figure 186. Photomosaic of the *Chofuku Maru* wreck site indicating the positions of the structural features measured in 2009 (Kalle Kasi, after photomosaic by Jon Carpenter and Patrick Baker).

zone if it is in direct physical contact with a more active metal, such as iron. If copper and iron are in direct electrical contact then the iron, which has the lower E_{corr} (most negative) will corrode faster than normal and the copper alloy with the higher E_{corr} (more positive) will be cathodically protected. Generally the greater the difference in E_{corr} values between the two dissimilar metals the more pronounced the galvanic corrosion and protection. The extent of galvanic corrosion also depends on the relative surface areas of the two metals; the effect being more pronounced in the metal with the smaller surface area. There has been a decrease in the corrosion potential of the copper alloy propeller of more than 150 mV, which is a significant drop in voltage, therefore it could be speculated that the propeller must be electrically connected to a significantly large area of the vessel, implying that the vessel remains at the stern at least, are relatively intact.

In addition, the propeller was covered in a thick concretion layer (18 ± 4 mm) that usually only forms on copper alloys galvanically coupled to iron. The major cathodic reaction for the iron/copper alloy galvanic couple (equation 2) occurs on the metal surface of the copper alloy and the production of hydroxyl ions, increases the pH, which can lead to the precipitation of calcite (equation 3).

$$O_2 + 2H_2O + 4e^- \rightarrow 4OH^- \quad (2)$$

$$Ca(HCO_3)_2 + 2OH^- \rightarrow CaCO_3 + H_2O \quad (3)$$

In normal sea water calcium is close to its solubility limit and only a small increase in pH can result in the precipitation of calcium carbonate (calcite). Once an inert layer of calcite has been formed on the surface of the copper alloy, the biological toxicity of the surface decreases considerably and secondary colonisation by marine organisms, such as coralline algae, molluscs, serpulid worms, and so on, can occur resulting in a relatively thick concretion layer on the copper alloy structure, as was evident on the *Chofuku Maru* propeller. This concretion still allows some oxygen to reach the corrosion front next to the residual metal surface where corrosion of the copper, albeit very slow, produces hydrogen ions and therefore, the pH will decrease at this metal/corrosion layer interface (7.68 ± 0.10) compared to the pH of the surrounding sea water, which was 8.09 on the *Chofuku Maru* site.

Based on these 2009 corrosion survey results, iron corrosion rates on the *Chofuku Maru* site are higher, on average (0.158 ± 0.082 mmy^{-1}) than those measured on the *Benan* (0.045 ± 0.018 mmy^{-1}) and *Zvir* (0.070 ± 0.046 mmy^{-1}) sites the same year. The corrosion of the iron on this site is likely to continue until no residual metal remains, assuming on-site conditions and the associated micro-environments remain essentially unchanged. The copper alloy propeller on the other hand, is cathodically protected by the iron vessel and is not corroding at all. This galvanic coupling of the copper alloy propeller to the stern area of the vessel remains may partially explain the increase in corrosion rate of the *Chofuku Maru* compared to the other wreck sites on the outside of the Ningaloo Reef.

The Norwegian Bay Barge

Jeremy Green

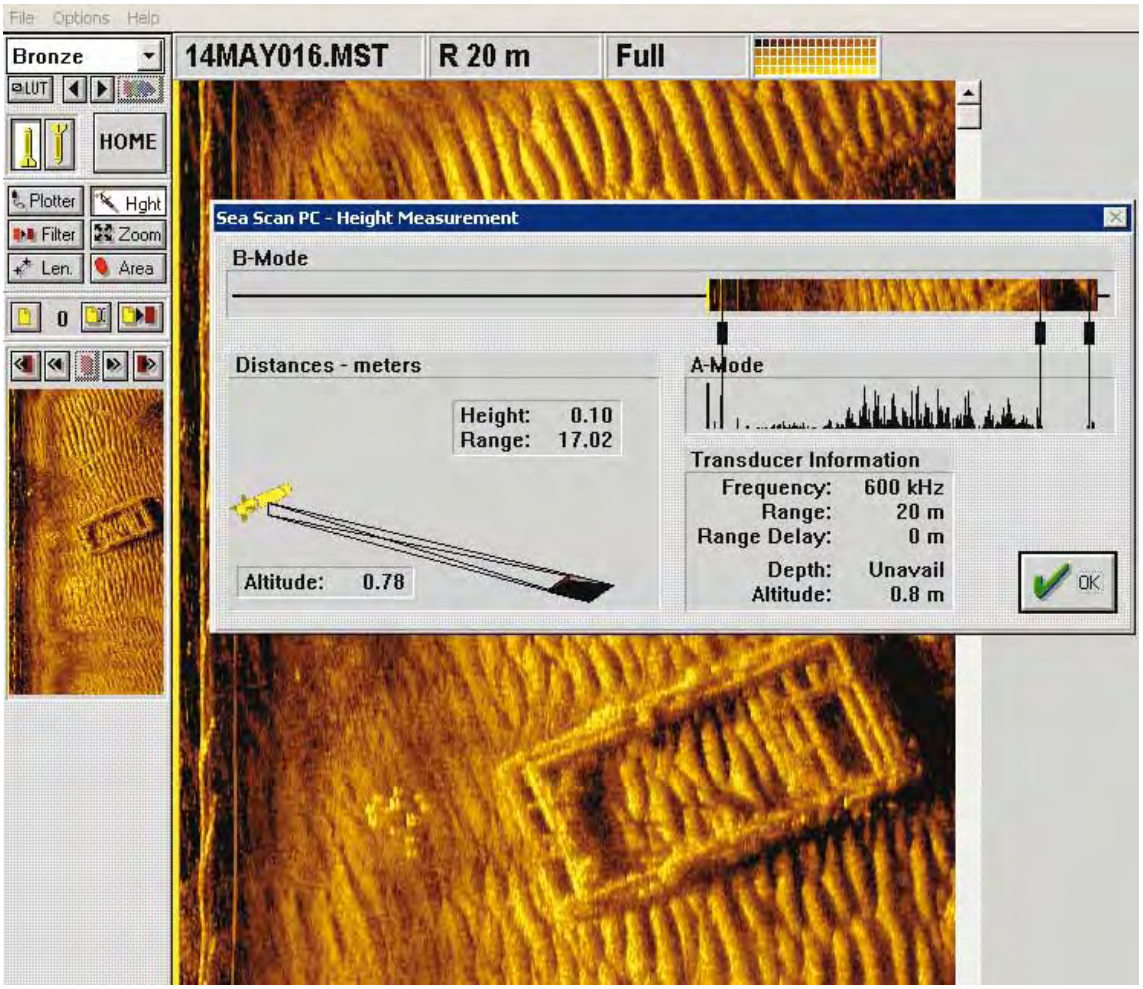


Figure 187. Marine Sonic software showing the height calculation from the sonar shadow giving a height above the seabed of 0.1 m (Jeremy Green).

During the development of the Western Australian Geographical Information System (GIS) an inspection of the aerial photography of Norwegian Bay showed a small barge a few hundred metres north of the main jetty infrastructure associated with the whaling station (Figure 189). The site was visited in 2008 and a plan of the barge was made (Figure 188). In 2009 a detailed side-scan sonar plan was made of the barge which provided details of the vessel (Figure 187).

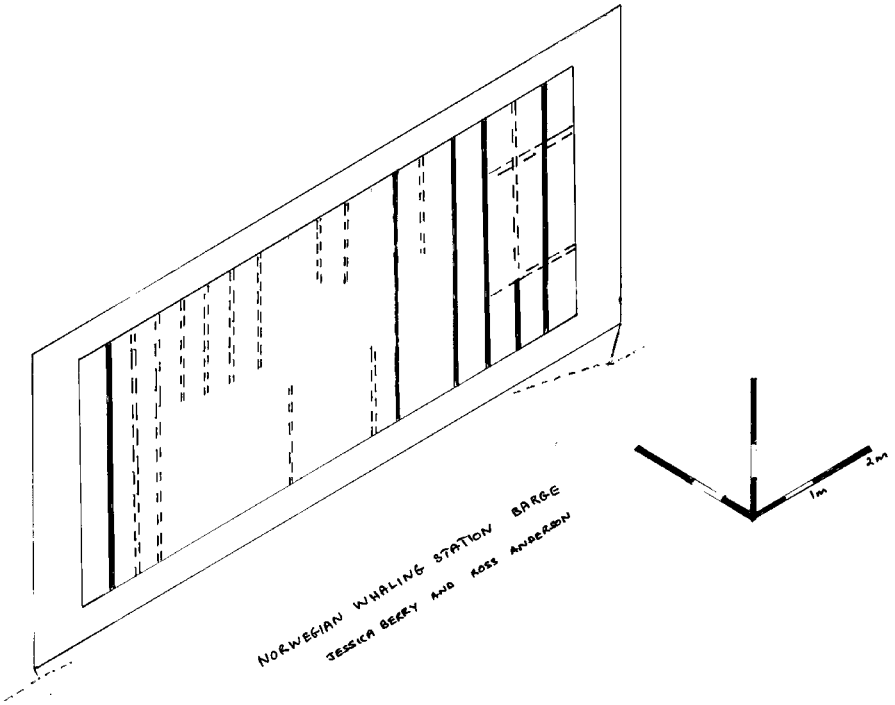


Figure 188. Isometric drawing of the Norwegian Bay barge (Jessica Berry and Ross Anderson).

Figure 189. Aerial photograph of barge (Jeremy Green).

Mildura 1907

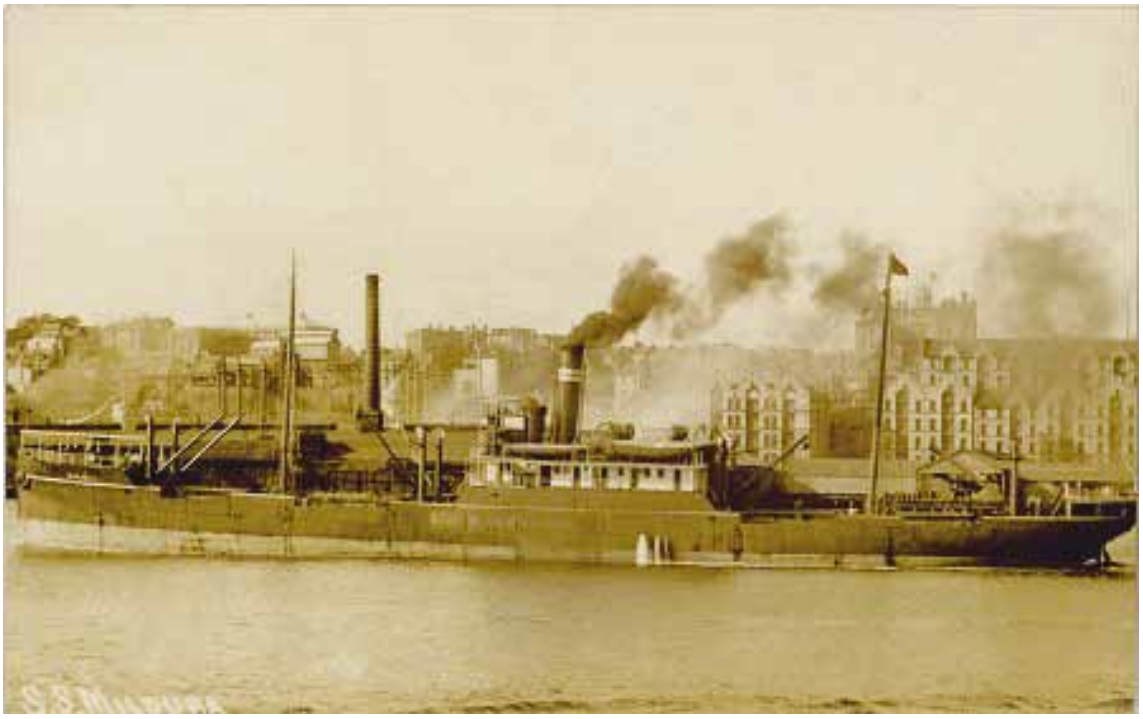


Figure 190. The SS *Mildura* at a port in New South Wales (State Library of New South Wales).

Michael McCarthy

At around 9 pm on Tuesday 12 March 1907, the SS *Mildura*, under the command of Captain Charles Thorpe, struck a rock, apparently on the outer reef at tip of North West Cape. It then ran up into the shallows, where it remained hard aground. Owned by the Australasian United Steam Navigation Company (AUSN), but under charter to the Adelaide Steamship Company, SS *Mildura* was carrying just under 500 bullocks from Wyndham to Fremantle (estimates vary, with 498 the highest figure). There were also two passengers on board, one the representative of the Kimberley pastoralists, Messrs Connor, Doherty and Durack, who owned the cattle. Since 1904, during the 'season', which ran from around March or April through to November each year, the SS *Mildura* and the SS *Moira* were taken off the eastern states run and put into the Kimberley cattle trade. There they proved 'very successful', becoming noted for the 'low mortality rates' amongst their livestock. *Mildura* averaging only 0.5% losses until its final voyage, and *Moira* slightly lower (McKellar, 1977: 242). Built by J. Reid and Co. of Glasgow in 1901, the *Mildura* was 300 ft 4 in (91.5 m) long, 42 ft 1 in (12.8 m) in beam and 13 ft 8 in (4.2 m) deep.

Though 'heavy weather' was experienced over the following three days after *Mildura* went

Figure 191. The *Mildura* wreck site (Scott Sledge).

Figure 192. View of the *Mildura* wreck site showing the Harold Holt Naval Communication Station showing the very low frequency transmitter aerials in the background (Patrick Baker).

ashore, there was reported to have been calm amongst the 29 crew and the two passengers on board thoughout the ordeal. On the following Sunday, after two days of calm weather, the first mate and the crew left for Onslow in the ship's gig.

On receipt of the news, the SS *Burrumbeet*, under Captain Steer, was ordered to proceed to the wreck to take off Captain Thorpe and the remainder of the ship's company. On his return to Fremantle, Captain Steer advised the *West Australian* newspaper that there was 13 ft (*c*. 4 m) of water in the holds, rendering the fresh water tanks inaccessible. He also advised that races leading from the holds and the 'tween decks' were erected and the bulwark doors opened to allow the cattle to escape from below 'so that they might have a chance of swimming ashore'. Around 100 cattle that were originally housed on the upper deck were driven over the side, but only one made it ashore. The others apparently swam out to sea and were drowned. Both Captain Thorpe and Captain Steer felt the ship could not be refloated, resulting in the *West Australian* of 22 March carrying the heading 'Vessel breaking up. No hope of salvage'.

On the following day, the *West Australian* carried details how the ship found itself so far east of its intended track on the voyage from Wyndham down to Fremantle. It also told of arrangements made for the accommodation of the officers and the paying off of all the crew, bar two, who had subsequently been hired to accompany P. Ridley (the West Australian manager of the AUSN Co.) and A. Ramage (the Lloyd's Surveyor in Fremantle) back up to the wreck. En route they were to pick up the M*ildura*'s Chief Engineer who had been instructed to wait in Geraldton.

Under the heading 'The famished cattle' the newspaper added that some of the crew had found it 'heart-breaking to see the poor beasts' who had been without water for some days before the crew left the ship. Two days later, concerns about 'tick-infested' cattle getting ashore were aired, together with advice that, while the Chief Inspector of Stock felt there was no real danger of an outbreak (because there were only sheep in the region and they did not provide suitable 'host' for the cattle), an officer was being dispatched to shoot any strays that did get to land.

Nearly a week after the officers and crew left the ship, men employed by a W. Hancock, storekeeper of Onslow, boarded the deserted ship and claimed salvage rights. According to Axel Hansen master of Hancock's 16-ton cutter *May*, he and his crew reached the wreck on the morning of 20 March. Seeing three men from the schooner *Florence* pull away from the wreck in a small boat, Hansen spoke to them, finding they were on a voyage to Broome. In being short of provisions they had gone on board where they obtained some supplies. When they left, Hansen and his crew also went aboard, and found the wreck deserted. He reported it as 'solid on the rock' with the ship's anchor 'on the ground' in around six feet of water and with 'a little slack chain swinging'. Using keys he found, 'either in the doors themselves or else lying about', he then examined all the cabins, including the Captain's which was locked. While the compass was sound, he reported that the sextant and chronometer were missing. Confident that salvage was possible, Hansen elected to remain on board with an eye to claiming salvage rights and sent his men back to Onslow to report to Hancock. Finding plenty of hay and chaff and nearly 1 000 gallons of water on board (apparently the tide had receded, allowing access to the freshwater tanks), he commenced feeding and watering the remaining stock. These he estimated to number around 300. Messrs Ridley and Ramage, who came aboard a day or so after, quickly ordered Hansen off the ship, accusing him of trespass.

He remained nonetheless, and on 27 March Hancock's 30-ton cutter *Cossack* arrived with feed and water, with the intention of stabilizing what remained of the herd and of eventually transferring them to another vessel. Aware of the intention to claim salvage of both the ship and its cargo, initially Ridley would not let the *Cossack* alongside and he drew up the ship's ladder to prevent its crew boarding. On finding there was a police constable on board the cutter he relented. Hansen subsequently presented an horrific picture of the state of the cattle around this time:

> The cattle were suffering very severely, and were dying daily from March 20 to March 27. Mr Ridley the manager of the AUSN Co. and Mr Ramage ordered some of the cattle to be released into the water. Witness [Hansen] shot several of them, and Constable Fogarty shot about 56. He [Hansen] could have saved some of the cattle between March 20 and March 27. He would have killed the others and saved the hides…He knew that the cattle came from a tick-infested district and that they were not allowed to land there.

While Constable Fogarty, had orders to shoot the cattle to prevent them landing due to fears of spreading the ticks, for their part Ridley and Ramage focused their attention on preserving the ship, rather than the cattle, which were covered by insurance. As a result they felt it was better they died in the water rather than being left to rot onboard. There they not only raised a terrible stench, but also represented a great health danger to those on board. While this appalling state of affairs did not escape the notice of the authorities, they were in effect powerless to act, given the distance and the dilemma with the risk of spreading a Kimberley tick infestation south. The *West Australian* of 28 March, for example in the Notes and News Section read:

> Cattle on the *Mildura*. According to the latest advices received by the SPCA [Society for the Prevention of Cruelty to Animals] in reference to the cattle upon the wrecked steamer *Mildura*, the steamer has been seized as an abandoned wreck by Mr Hancock, of Onslow, and the cattle are being cared for by him.

In the interim a preliminary Court of Inquiry into the loss of the *Mildura* was held. On the basis of the evidence submitted, the Chief Harbour-master (Captain Irvine) who conducted the proceedings, advised the Colonial Secretary that Captain Thorpe should be charged for being guilty of neglect in the navigation of the ship in laying a faulty course too close to Vlamingh Head on a dark night and also for failing to come up to the bridge when land was first sighted in order to 'judge for him self the true position of the vessel'. A final Court of Inquiry was held on 28 March, finding despite Thorpe's claim that there was a 'set in towards the land' he was guilty of neglect (*Kalgoorlie Western Argus*, 2 April 1907). His certificate was duly suspended for three months. The Third Officer, who was on the bridge when the ship struck, was found to have been negligent in not keeping a proper lookout and was duly censured. (*The West Australian*, 29 March 1907).

Having assessed the possibilities for salvage Ridley and Ramage left the wreck around this time and arrived back in Fremantle on 17 April, where it was reported they had spent nine days on the wreck 'under circumstances, the reverse of pleasurable' (*The West Australian*, 18 April 1907). Though some cattle still remained alive, they were soon followed off the ship by Constable Fogarty. Hansen remained on board and on Fogarty's request he 'also shot a few' cattle when their condition deteriorated further. He was forced to leave on 20 April after

being served with an interim injunction 'directing him, his officers and servants to leave the SS *Mildura* and prohibiting them from returning thereto'. By then all the cattle were dead.

The newspaper account of the serving of the injunction stated that Hancock, who had taken 'legal advice as to his claim for salvage', had been advised that the vessel was worth between £50–60 000. In being called to given evidence at the hearing, Captain Bell master of the schooner *Florence* gave evidence, stating that he had boarded the *Mildura* before Hansen, finding that the ship was safe, with her anchor down and 'all the gear' intact. From this he understood that 'it was evident the owner's servants were returning to the vessel'. As a result he ordered his men 'not to touch anything'. In advising that he also found the steward and Captain's rooms locked and the compasses intact, in his opinion the owners were simply 'procuring salvage appliances for themselves' and had not abandoned the vessel. He added that according to his experience of Admiralty decisions and from 'expert' advice he subsequently received, the original ownership held good. Hancock was not to be denied, however, and in responding to the injunction which was effective until 3 June, he was given a subsequent hearing before Justice Booth seeking a dissolution to the injunction.

While much of the chronology above is based on the hearings, the events that transpired remain sketchy, for the court looked more to the claim for salvor-in-possession, than to establishing a logical chronology of events (*The West Australian*, 20 April 1907). What appeared of great interest to the court, for example was the distinction arising from the notion of salvaging a 'derelict', rather than a ship in danger. Inquiry also centred on whether Hancock, Hansen and their men were credible salvors of a ship so large as the SS *Mildura.* Questions about their prospective salvage methods were also raised. The master's decision to let an anchor go and securing the ship, yet failing to leave a caretaker on board was also discussed. Of wider legal interest, questions about the limits of the state and its territorial waters and whether the court had jurisdiction to hear the case were all raised. The newspaper carrying the story, then reported on the judgment thus:

> His Honour remarked that he was convinced that his judgement would not give satisfaction in the case, and that the matter would be carried further. He had not the faintest doubt that this ship was in every sense a derelict. She had been abandoned with her cargo and both were derelict. He did not think that the vessel was on the seashore of the State, but he considered in the sense in which the Courts used the expression: that she was at sea. He was not going to consider the question of whether he had jurisdiction over the extra territorial waters of the State. He thought it was probable that he had but he did not know. Were these men competent to perform the salvage service? With reference to the ship, he might have his doubts, but he had no evidence that anybody else could have saved the ship. It might be that the vessel was fixed in such a position that she would not be moved, and he supposed that in that case the salvors were entitled to take the ship to pieces and bring her piecemeal to shore. He had no evidence that the steamer could be floated at all. With respect to the cargo, so far as the cattle were concerned, he did not think anything could have been done to save them. There appeared to be other cargo on board, however, and he did not think there was evidence to entitle him to say that those men were not competent to save that cargo. He would, therefore, dismiss the injunction. The injunction was accordingly dismissed with costs.

In the interim discussions were held in the Eastern States by Captain Trindall, acting

Marine Superintendent for the AUSN Co. and Captain Taylor, the Lloyd's Surveyor re the feasibility of salvage. Plans were to off-load 1 000 tons of coal, and 'a large quantity of ballast' in order to lighten the vessel and then after refloating it to take the ship to repair facilities at Brisbane or Sydney via the Torres Strait. The newspaper also reported that the steamer is in no danger whatever of breaking up, as she is resting easily on a smooth coral bottom well inside the North-West reef'. (*The West Australian*, 19 April 1907). This when combined with the strength of the vessel's double bottom and the relatively small amount of water in the hold all boded well for success. A short while later the question of ownership was resolved when after taking more evidence, on 22 May Justice Rooth decided that 'the defendant Hancock had established his right to the ship' (*The Argus*, 22 May 1907).

Little is known about the events that followed immediately after this decision, though on 30 May the SS *Paroo* on rounding the NW reported seeing the 'salvage schooner' *Hampton* ashore near the *Mildura*. It appears to have been beached in preparation for being converted to a 'pontoon' (*The Argus*, 30 May). Hancock appears to have been in charge at this time for on 17 June he advised: 'Of one thing I am confident, and that is that the vessel will be salved successfully, and from the position in which she is lying I do not anticipate that the salvage operations will entail a very heavy expenditure'. He had earlier advised that the ship would be salvaged by securing a tarpaulin around the hull and after pumping it out using the tide to float it free. This clearly did not work, for in early August a team headed by Lloyd's surveyor Captain Taylor arrived in Fremantle with a 'number of salvage experts' including a diver accompanied by the former chief officer of the *Mildura*. In the newspaper report, the wreck was reported to be 'practically in the same position as when she struck, and has sustained no further appreciable damage'. Apparently it was intended first to clear the carcasses of the dead bullocks, a process expected to take a week. According to Taylor 'investigations will then be conducted from the interior of the vessel to ascertain the extent of the damage to the keel and until this is done it is impossible to give any definite opinion as to whether the scheme will be a success or not'. Taylor also stated that more men and the salvage gear sourced from the east coast would travel up to the wreck in the tugboat SS *Una*. Compared with Hancock and his men, Taylor's team were apparently capable and experienced, for in the inventory of gear assembled for the attempt included three large 10-inch (25 cm) centrifugal types, condensers, 'surf boats', and a motor launch. (*The West Australian*, 2 August 1907). They also had some successes and on 19 October it was reported that the ship was afloat in 'deep water in the centre of a small basin' inside the outer reef. The report also stated that they were expecting to be able to dynamite the reef beyond the basin in order to free the ship. Though the AUSN company history records that by this time the ship had been moved about 100 m to seaward, all other the attempts to move it further failed. As a result salvage was deferred until early in the following year (McKellar, 1977: 243). On 22 January 1908, the *Hobart Mercury* carried advice that in now 'acting under instructions from London' the management of the AUSN had 'organised another party' to effect the salvage. Captain Taylor remained as leader, and was expected to arrive on the west coast with 'engineers, tradesmen and labourers', who had been hired in Sydney. Again this appears to have been unsuccessful, and to some it appeared a hopeless task. On 24 February, for example the *West Australian* carried an article refuting the rumours 'which gained currency' in the previous week that the wreck was to be abandoned. Some remained confident and it readiness the *Una* transferred about 40 tons of cargo and the winches from the stern of the ship to lightening it further. The tides were not as great as

expected and the salvors again failed to refloat the ship.

In April 1908 the ship was abandoned as a total loss by the owners and the underwriters (McKellar, 1977).

It was then apparently sold for £25, to a newly-formed venture the Fremantle-based SS *Mildura* Company Ltd who set about funding yet another set of potential salvors. 'Sanguine that success will attend their efforts' they succeeded in dynamiting away some of the coral preventing the ship from getting to sea. In preparation they were also shipping a 12 inch suction pump capable of moving 800 tons of water an hour and other machinery up in the SS *Pilbara* (*The Argus*, 23 May 1908). Based at 4 High Street, Fremantle, the company are found advertising in the 'Wanted to Buy' column for four anchors weighing from around one and a half to two tons and in the 'Situations Vacant' for a marine engineer to overhaul a salvage pump and to assist in the salvage. They also engaged more expert salvors and on 28 July 1908 the company received a report from a Captain Melsom who, with a Captain Jorgensen, were conducting 'refloating operations' timed for the very high tides 'on or before 23 September'. Again they were unsuccessful but they remained hopeful nonetheless.

Work continued and in January of 1909 the Company received a letter from Jorgensen advising that in the face of a 'fierce NE storm' he 'sank the steamer at 3 pm on Sunday the 18th being afraid that the cable would break, the storm blowing the vessel on towards the reef'. Here he is referring to the accepted practice of settling a floating or nearly floating ship back onto the seabed in order to prevent it moving in a severe storm. Jorgensen advised that the procedure 'gave the ship 900 tons of water above the ballast tank top', but did not prevent the storm shifting the ship's bearing to S.E. by E. a half E. to W. of S. dragging 220 fathoms of chain and anchor securing it and breaking the four-inch wire hawser on the stern has broken, and she has dragged the 220 fathoms of chain and anchor. The stern only shifted 'about 1 ft shoreward' he reported and the vessel was 'no worse off than before she was before the storm, and we are just as hopeful as before. We hope to get her off in the high waters of March'.

This indicated that while they had succeeded in floating the ship in its basin, they still could not get tides high enough to allow them to float over the outer reef. Attempts at each high water spring tide to move it out to sea were also draining the SS *Mildura* Company of both funds and resolve such that in their meeting of 26 February the company board were considering winding up the company. The ship was still stable however and a 'private report' was received by the *West Australian* to the effect that the ship was 'in a safe position, and that there was every probability of it being floated off without further expenses by the Equinoctial tides' expected around the middle of March. A meeting of shareholders was held on 5 March and at its conclusion, the Chairman of the Company informed the reporter that the company had decided to go into 'voluntary liquidation'. Apparently a report expected from a Captain Dundee who was at the wreck had not arrived and 'as the funds of the company were running low, it was thought advisable to wind up. H. Coombs was appointed liquidator'.

That appears to have signalled the end of all salvage attempts and the ship would have been gradually stripped of anything salvable in the ensuing years. Timber and iron from the wreck are reported to have been salvaged for renovations to the Yardie Homestead, for example. On the positive side questions began to rise concerning the need for a lighthouse in the area. Originally four were to be established; at Cape Inscription, Point Cloates, Bedout Island and at Cape Leveque. Initially there was not much call for a light in the Exmouth region and this

assessment appeared in the *West Australian* around the time that *Mildura* was lost.

> It was commented upon in Fremantle yesterday that the section of the coast in which North-West Cape is situated is badly lit; but it was pointed out that the lighting of a coast is generally governed by the quantity of shipping, and that in this particular section, the shipping is very meagre, the only vessels, besides a few ketches being the Singapore and the Adelaide Company's North-West boats. SS *Burrumbeat* in the area (*The West Australian*, 29 March 1907).

The loss of SS *Mildura* changed that perception, and in early April the board, inquiring into the 'most suitable points' where lighthouses need be erected, added Vlamingh Head as a fifth (*The West Australian*, 6 April 1907). The building of the lighthouse commenced at the end of June 1910 and was completed on in 1912 and its light first shone on 10 December.

Remaining upright on a hard bottom, the wreck appears to have remained relatively intact for decades. During WWII it was used for bombing practice by aircraft operating out of nearby airfields. In 1943 the wreck was used as target practice by the submarine USS *Crevalle*, after refuelling at a fuel barge anchored in the Gulf. Other allied vessels may have used it for similar purposes. According to the memoirs of the commander of USS *Flier*, they also used the ship as target practice and he recorded that: 'This ship had the distinction of being shot at by more submarines than any other ship in the world. Every sub that passed would fire at it' <http://www.ussflierproject.com/tags/ss-mildura/>.

> By 15.35 the *Crevalle* was underway and headed back out to sea. On the way and at flank speed, the four inch gun crew fired ten rounds at a derelict freighter that was aground on Northwest Cape near the entrance to the gulf. Four brightly flashing hits at 4,200 yards range on the old hulk, indicated that the Crevalle's 1919 vintage gun was well aligned for long range engagements (Rune, 1994).

Contemporary salvage, these wartime events and the effect of cyclones, including one on 2 February 1945 that producing wind gusts of up to 190 km/h and others in 1953, 1964 and 1970, are expected to have reduced the wreck to the state recorded by museum staff in 1978.

After accessing the wreck from the sea as part of the Museum's Wreck Inspection North Coast (WINC) expedition, Scott Sledge reported that

> …the wreck lay on N–S axis, bows to the beach. The extremities are not easily distinguishable. So much of the hull has broken away, falling on either side and into the middle, that we could only identify the stern by the row of prop[ellor] shaft mountings which [lie] upon the keelson at the northern end, and the bow by the discovery of the port and starboard hawsepipes each in 2 m of water on their respective sides of the stem post, inshore a metre of so. The cylindrical boilers both measured 3.55 m in length and 4.10 m in diameter. The condenser tank appeared also to be cylindrical and measured 2.53 m in length by 2.64 m diameter. A few common fire bricks were seen concreated to the wreck and a number of curious grate-patterned whitish-grey slab bricks. Nothing else of a small artifactual nature was found—nor is likely to be found without great effort and some danger.

In his report, Sledge also advised that he was told by Cec Piesse (a retired pearling master, widely regarded as an expert on north coastal waters) that the *Mildura* struck on the reef just north of NW Cape, and was later shifted to the present position by a cyclone. He also noted

that on landing ashore his team found eroded cattle bones 'scattered just above the beach' (Sledge, 1979: 10–12).

Fairy Queen (ex *Rhio*) 1875

Michael McCarthy

Figure 193. Colin Powell with the *Fairy Queen* cannon (Graeme Henderson).

The 115-ton, wooden-hulled, two-masted Dutch vessel *Rhio* was built in Singapore at an unknown date. It was sold in July 1875 to Messrs W.E. Marmion, (Aubrey) Brown and Gill, of the Swan River Colony. It sailed from Singapore on 3 August 1875 for the north-west pearl fishery. There were 37 divers and crew on board and one stowaway. One diver was named 'Sahber'; another was called 'Allie' who was from Muscat and had been engaged by Marmion at Singapore. The pastoralist and pearler William Marmion was the managing owner and the master was Andrew Edgar. Few details of *Fairy Queen* survive, and though it appears also described as a 'schooner', Edgar describes it as being 'brigantine-rigged' (Andrew Edgar, 1875, Letter to the Sub-Collector of Customs, Roebourne, 19 October, Acc. No. CSR 809: 147–150, BL, Perth; copy on WAM File MA-354/77).

While in the 'China Sea' they were beset by a heavy squall and sustained damage to the fore topmast which was repaired. In early September in the Sunda Strait, under reduced sail, another storm hit and the tiller and rudder head were damaged; a jury rig was fabricated in

order to keep the schooner on course. In the traverse south across the Indian Ocean, they again suffered damage to the rigging and in gales nearer the coast in 25–26° S they were beset with strong south-westerly winds, forcing them to head west during the night, and lie 'snug' till dawn. Although they had travelled as far south as Cape Cuvier, by 7 October the conditions forced Edgar to abandon his attempt to make Shark Bay and to seek shelter in Exmouth Gulf.

After running northwards all night, they sighted Point Cloates bearing ESE 'about 18 miles' and continued north. At 6 pm Edgar went up on the foreyard to keep watch and by 6.45 pm visibility was so bad he could 'scarcely see the land' forcing him to take a star sight to ascertain his position.

> I came down from the foreyard and took a meridian altitude of the star Aquila—I found it gave me 21 ° 49' the latitude of the Cape being 21° 47' (Edgar, 1875, Letter).

At around 9 pm, on 7 October, the reef at North West Cape was seen abeam and they rounded the Cape and with the land still barely visible Edgar looked for shelter in its lee. Finding the seas too rough to anchor, they proceeded into the Gulf under reduced sail in order to ride out the night. At midnight, deducing he was somewhere nearby Y Island, Edgar headed back west on a port tack, again under reduced sail. Confident they were still well out in the gulf he went below at 3 am to rest. Before doing so he issued orders for soundings to be taken continuously and for him to be called back on deck before the hour was up so they could 'wear ship' with the land still 'a good way off'. As instructed he was recalled to the deck by the mate at 3.45 am and after taking the helm, and with the schooner still coming into the wind, Edgar felt that there was a malfunction with the jury tiller. He describes that he had felt it knock about his legs and realising something had gone wrong with the wheel, put his hand on the Barrel, and on feeling around in the dark he realised the wheel ropes had slipped off rendering the brigantine again rudderless. Edgar then describes the events that followed:

> Before I could get things right the mate sung out 'breakers ahead'. I sung out 'let go the anchor' and before it would hold she struck heavy on the starboard bilge… at around 4 am the vessel washed up on to the beach the sea breaking over her (Edgar, 1875, Letter).

Edgar was not sure whether they were on a sand-bank or on the shore, and to make matters worse, as the dawn broke, deck planks began to open up. Realising that they were shorebound on an ebbing tide, the crew set about lightening the ship by taking everything they could ashore. The divers also 'carried the starboard anchor out underwater' and hove on the cable in order to keep the wreck from driving further up the beach. The port anchor, which had been earlier let go, was retrieved and connected with a 'new 5-inch hawser' and carried out over the stern into deeper water by boat in readiness for an attempt to refloat the ship at high tide.

It was all to no avail, as the rising tide revealed that the hull planks had also opened up, and that some of the copper sheathing had fallen off and that the ship had began to sink in the sand with its port gunwales underwater. Over the next two days they 'stripped the ship and got everything above high water mark'. There they found that their fresh water casks had been contaminated by the sea and they had only one cask left from which to drink. With this, and the fact that the vessel was clearly breaking up, in mind, all thought of a successful refloating evaporated. Soon after midday on 12 October they abandoned the brigantine and

Figure 194. The *Fairy Queen* anchor arriving at the Western Australian Museum, Department of Materials Conservation in Fremantle for treatment (Patrick Baker).

the equipment on the beach and set off in the 5 boats for Tien Tsin (as the Port Walcott and Cossack region were then known). They all succeeded in reaching the Mary Anne Patch two days later, but not without considerable difficulty and one boat capsizing. Edgar and some of the crew were then taken by the cutter *Swan* to Cossack arriving on 18 October, where Edgar provided the details recorded above, in a letter to the sub collector of Customs. The *Fairy*

Queen and the equipment ashore were sold at an auction held at Cossack on 21 October, for what was then described as a 'trifle', the successful bidders apparently acting on behalf of the owners.

On 8 November, a formal court of Inquiry was held before Resident Magistrate (R.J. Sholl, who was also the Sub-collector of Customs), a JP assisting and a 'nautical assessor' (A.E. Merrale, the master of the pearling schooner *Flower of Yarrow* which was then in port). On hearing the evidence, which provides further detail to Edgar's letter above, the court deliberated and produced the following verdict:

> We find that the weather at the time was squally with strong puffs of wind and that the night was very dark. We also find that previously the steering gear had been carried away and temporarily repaired, and that it was carried away again when the *Fairy Queen* was close to the reef, rendering her unmanageable at the time. We find that the position of the *Fairy Queen* at the time was wholly due to an insufficient knowledge of the tides and currents on the part of Capt. Edgar, but in the absence of reliable directions and charts we cannot recommend the suspension of either Captain Edgar or the Mate (Evidence at Court of Inquiry into the wreck of the Fairy Queen, Cossack, 8 November 1875, Acc. No. CSR 809, fol. 154–158, BL Perth; copy on WAM File MA-354/77).

The Cutter *Albert* is known to have been dispatched to recover the goods on the beach, and that the salvage of whatever remained at the site thereafter, would have been extensive over the years, especially given the number of pearlers that frequented Exmouth Gulf through to the mid 1880s. Other than a note about *Albert*, little else appears about the wreck than a reference to Captain Tuckey recovering the two survivors from the wreck of the *Stefano* at a place close to the then still visible wreck of the *Fairy Queen*.

Fairy Queen in modern times

On 23 May 1972, the Director of the Museum, Dr W.D.L. Ride, received a note from the Civil Commissioner for the Commonwealth Government at Exmouth confirming that a wreck had been located in the 'Exclusive Use Area of the United States Naval Communications Station Harold E. Holt…approximately 50 yards from shore' (J.K. Murdoch, Civil Commissioner, 1972, pers. comm. to W.D.L. Ride, 23 May, WAM File MA-354/77/1). In forwarding underwater photographs taken by members of the Cape Underwater Diving Association, the Commissioner also advised that it lay 'adjacent to the United States Navy pier at Point Murat' and that the divers were keen to carry on investigations and probably bring ashore one of the anchors, or alternatively a piece of wreckage.

J.A. Labnowski, an American at the base, had first sighted the wreckage, but in preparing to leave for home soon after, he advised the local historian and curator of the North West Cape Museum, Doug Bathgate. T.J. Coleman, a well-known local diver, then reported the wreck to the Western Australian Museum on their behalf and, like Labnowski, provided a plan showing the whereabouts of the site. Henderson and his assistant museum diver, Colin Powell, recovered the gun, resulting in an article in the *West Australian*.

Two anchors were also seen on the trip. Later on, being deconcreted at the Museum's Conservation Laboratory in Fremantle, the cannon was found to have the inscription 'SJS' and a crown on its barrel. On inquiring of HM Armouries in the Tower of London Henderson was advised that the cannon was most likely British and likely to have been constructed *c.* 1860.

The Smithsonian Institution, National Museum of History and Technology, Washington DC, agreed on the date and added that:

> Your gun was no doubt carried on the pearling schooner for several reasons. First for signalling, second for throwing a line in an emergency, and last possible defence against pirates. That it may have been used to 'impress' the natives is another good guess. Signalling with a gun was standard practice at sea at that time and most vessels were equipped with at least one small gun for that purpose (Mendel Peterson, Director Underwater Exploration Project, 1973, pers. comm. to Graeme Henderson, 6 March).

In examining the use of the term 'impress' in this instance, Henderson found that islands near North West Cape and elsewhere, including Shark Bay, were regularly used as 'Barracoons', or depots for kidnapped Aborigines. A small signalling cannon or swivel gun kept on pearling vessels would 'doubtless have made it easier for the pearling masters to suppress their divers'. Further advice from Brigadier O.F.G. Hogg was that the 1.37 m length and the bore size indicated that it was a 2-pounder cannon manufactured between 1790 to 1860, and that the letters were derived from the Portuguese Order of St James of the Sword, which was introduced into Portugal from Spain in 1290. It was also considered possible that the gun could have been bought from an arms dealer in Singapore or from Portuguese sources in Timor.

Despite this conflicting evidence, by using his card index listing all the known losses in the region, and cross referencing it against the size of the anchors, Henderson succeeded in identifying the wreck as the *Fairy Queen.* His research showed that it was carrying indentured labourers; however, it was unlikely to need the gun to help suppress the crew and it was most likely for signalling or for defence.

Subsequent to the confirmation of identity, it was resolved at a meeting of the Museum Trustees in December 1973 to 'recommend to the State Government that the historic wreck known as *Fairy Queen* be vested in the Museum on behalf of the crown for the purposes of the *Museum Act 1969*' (Res. 326/73). The finders were given a reward of $100 by the Trustees of the Museum, a reasonable sum for the time. The *Maritime Archaeology Act 1973*, which superseded the *Museum Act 1969*, then vested the wreck in the Museum under Section 6 (1) of the Act.

On 10 June 1974 Scott Sledge, the then Inspector of Wrecks, and Warren Robinson, another of the museum divers, joined local diver Peter Burbage of Exmouth in the recovery of an anchor. Burbage had earlier located two anchors, one of which was apparently buried in the sand when the museum team arrived. They recovered the remaining anchor which they found about 10 m from shore in 3 m of water at low tide. This anchor, which was found in a 'stowed position' with the stock not set and in a stowed position (laid back along the shank) with no cable attached, was raised using large fuel drums. Its configuration, and the finding of several ballast stones and some ceramic sherds concreted to it, indicate that it was lying within the wreck and that it had not been deployed during the loss. Despite excavating down to 12 inches (*c.* 300 mm) around the site, no other wreckage was seen. With the assistance of the Civil Commissioner, the Museum was able to have the USN deploy one of its cranes at the jetty and the anchor was loaded onto Sledge's vehicle for transport to the WA Museum, Department of Materials Conservation in Fremantle (Figure 194). The police were subsequently requested to investigate the loss of the other anchor.

In October 1977 the missing anchor was located during construction for the boat ramp. It was described by the Civil Commissioner as being 'encrusted in coral, and its condition appears reasonable, except for bad corrosion on the outboard end of the stock'. Then in the late 1980s it was learned that another anchor had been found by local divers, Peter and Rodney O'Halloran, and that it had been raised by diver Peter Lake. This caused the original finders some concern, for it had become a popular dive site. As a result the author, who by then had succeeded Sledge as Inspector of Wrecks, proceeded to Exmouth to try and resolve the matter. After meeting with local stakeholders, it was then resolved, in a similar fashion to the popular Museum–Public Works Department 'Anchor Walk' at Fremantle, that the anchor would not be returned to the sea. Rather, together with all others then lying around town and two anchors known to be lying under the Jetty at the Harold E. Holt Base (that were believed to have been earlier recovered from the SS *Mildura* at a time and by persons unknown), were to be gathered together, conserved by local interests under the direction of museum conservators, and then put on exhibition in the town.

After having apparently been uncovered by Cyclone Orson, another cannon was also reported to the Museum, along with what appeared to have been previously buried wreckage. In company with the finder, Henning Neilsen, of Neilsen Diving, Exmouth, the author recovered the gun which was identical to that earlier raised and conserved. It was then recommended that on conservation, one gun be returned to Exmouth for exhibition there. Cmdr J.F. Cooper, RAN, at the Harold E. Holt Base, then wrote seeking to obtain the cannon and offered to mount it on a suitable carriage to a design produced by the Museum. After conservation, the cannon recovered in 1972 (FQ 2674), was duly loaned for display in the foyer of the main administrative building of the Base. It was set on a carriage built by P.A. Hall, the Facilities and Works Officer at the Base with advice from the Museum.

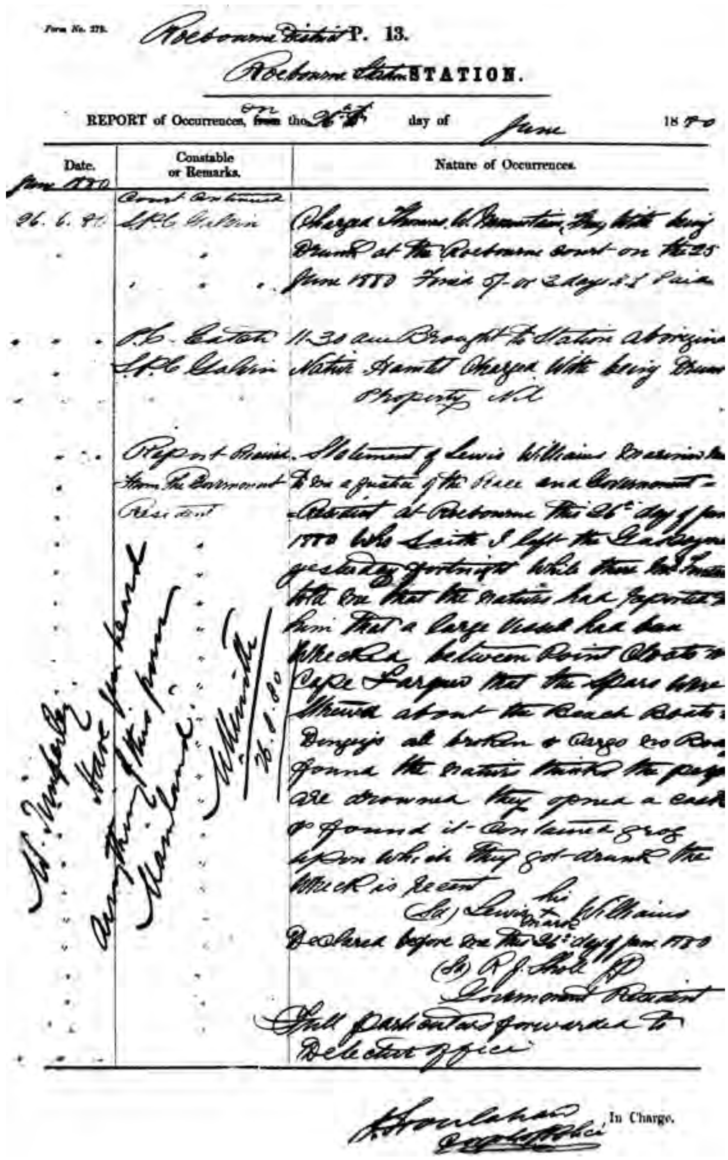
It remained there until the decision by the RAN in 2002 to withdraw from the Base and the gun was returned to the Museum. The various anchors, however, were gathered together, conserved with the Museum's supervision and placed at various locations around the town.

The site was revisited in September 1992, although it was largely buried. Subsequently, with the aid of historical aerial photographs, the wreck has been accurately located.

PART 3

Undiscovered sites in the Ningaloo Reef area

(Author Jeremy Green except where otherwise indicated)



Form No. 278. Roebourne District P. 13.

Roebourne Station STATION.

REPORT of Occurrences, on the 26th day of June 1880

Date.	Constable or Remarks.	Nature of Occurrences.
June 1880	Court Continued	
26. 6. 80	L.P.C. Galvin	Charged Thomas W. [illegible] with being Drunk at the Roebourne Court on the 25 June 1880 Fined 5/- or 2 days [illegible] Paid
"	P.C. Eaton L.P.C. Galvin	11.30 am Brought to Station Aboriginal Native Hamlet Charged with being Drunk Property Nil
"	Report Received from the Government Resident	Statement of Lewis Williams [illegible] before me a Justice of the Peace and Government Resident at Roebourne this 26th day of June 1880 who saith I left the [illegible] yesterday fortnight while there [illegible] told me that the natives had reported to him that a large vessel had been wrecked between Point Cloates & Cape Farquar that the spars were strewed about the Beach Boats & Dengys all broken & cargo no [illegible] found the natives thinks the people are drowned they found a cask & found it contained grog upon which they got drunk the wreck is recent (Sd) Lewis his x mark Williams Declared before me this 26th day of June 1880 (Sd) R. J. Sholl J.P. Government Resident Full particulars forwarded to Detective Office

In margin: W. [illegible] Have you heard anything of this from [illegible] W. [illegible] 26.8.80

[illegible], In Charge.

Figure 195. Report of Occurrence, dated 26 June 1880, from the Police Inspector's Office, Roebourne, reporting that Lewis Williams had reported that natives had told him that a large vessel had been wrecked between Point Cloates and Cape Farquhar (State Records Office of Western Australia, Police Records: 28–870).

Mercury 1833–4

The *Mercury* departed Calcutta on 3 October 1833, bound for King George Sound. The vessel has never been found; however, it was initially thought by Henderson that the Point Cloates site was the *Mercury*; later research found the site to be the *Rapid* (see page 142). This highlights the problem that there may well be unknown sites, like NRU, and also undiscovered sites, like the *Mercury*, that could be in the area. The *Mercury* is simply included here to highlight the problem.

Occator 1856

Michael McCarthy

In January 1856 the 27.2 m, 145-ton brigantine *Occator*, chartered by J.F. Jones of Melbourne (who also was a passenger on board), left Melbourne to examine reportedly rich guano deposits on the Muiron Islands off the North West Cape. By the afternoon of 4 February, the *Occator* was at an estimated 80 km west of the Cape. Her master, Captain Place, then set a course towards the east, expecting to sight land in the morning. Around midnight Place went below, leaving the mate at the helm. At about 3.30 am, somewhere in the region of Carbaddaman Passage, breakers were sighted and, as the helm was put hard over, Place came on deck, seeing the vessel 'in stays' (not coming around). After giving orders to haul the yards round, the vessel began to head back out to sea, but as it did so the keel touched, and a heavy sea broke over the deck and threw the *Occator* onto the reef, damaging the hull. With water rising in the hold and the rudder unshipped, the crew began to abandon ship.

The first boat launched was destroyed by the seas. This forced the crew to send off the longboat in which the mate, Jones and four crew went ashore. Three others of the crew remained onboard and Captain Place went below for provisions. On the boat's return they all departed the stricken ship, reasonably well-provisioned and with some navigation equipment. When they regrouped, the ten men sailed an estimated 90 km north to Muiron Island, where they expected to find another vessel. After four days, and with no relief in sight, they elected to return to the wreck for more water. In being unable to launch the boat due to the topography and conditions, they dragged it nearly 3 km across the island. After finding a suitable place on the eastern side, they then set off south for the wreck.

After proceeding down the coast they found that a group of 'about 40' Aborigines were following the boat. While all went well initially, they reacted angrily when a cask of water, that had been washed ashore, was put into the boat. They then followed it out, armed with stones and spears. When the water got too deep about ten of them began swimming after the boat apparently with the intention of seizing it. A spear was thrown without causing any injury while 'others cast stones with slings'. Jones then shot one man, causing the Aborigines to retire to the hills where they lit a fire.

The crew then departed for Shark Bay, taking eight days to get to Dirk Hartog Island, where they lived for around a month on crabs, wallabies and drinking turtle blood, as a substitute for water. After unsuccessfully trying to depart for Fremantle, they crossed over to what they thought was the mainland with the intention of walking to safety. On returning to Dirk Hartog Island, 42 days after they had been wrecked, they saw the schooner *Favourite* at anchor off Bird Island where they had been collecting guano and were saved. The wreck has

yet to be found.

In June 2004, Albert Gorman reported an acquaintance he called 'the Yank' finding what appears to have been an iron knee 10 ft long, by 6 in wide by 3 in deep, with a bronze fastening, at the 'drop off' north of Yardie Creek south past the homestead near where the reef comes within 200 m of shore. As *Occator,* which was built on Prince Edward Island in 1853, was copper and iron fastened, sheathed in yellow metal and with 10 pairs of iron hanging knees, it is possible that Gorman had seen part of the *Occator,* though equally they may be from another vessel. (See the list of other as yet undiscovered wrecks following.)

***Brothers* 1867 Cutter lost all six on board**

The Perth Gazette and West Australian Times Friday 12 June 1867

But the list of probable losses, also includes the cutter "*Brothers*" which sailed from Fremantle on the 19th Feb., master, J. Williard, passenger, G. Francisco, and a crew of four men, which vessel had not reached her destination, although the "*Morning Star*" a smaller craft, which left here in March had arrived in safety.

Cape Cuvier site *c.* 1874

Recorded by Pemberton Walcott by Aboriginal man 'Tony' that: 'about two winters ago, a very large steamer had been wrecked down at his country [Cape Cuvier] and all hands lost including a woman'.

***Bertha* 1874**

Roebourne: I have to report for the information of the superintendant of Police that on the morning of the 2 August 1874 the cutter *Fortescue* arrived in Port Walcott from the Westward with the master, crew and passengers of the cutter *Bertha*, a vessel of 5 tons that left Sharks Bay on the 16 July 1874 and was wrecked on her passage from Sharks Bay to Port Walcott, on a reef of the rocks off Point Cloates to the South of the North West Cape on 20 July 1874.

The cutter was lost and every thing in her except the people, in all, viz. the Master Joseph Mariah, George Tower, George the Lorin, Charles Love and his wife Elizabeth Love.

They left the wreck in a dingy the same night as the wreck occurred, the dingy is about 15 ft long over all, and proceeded towards Port Walcott, they were six days without food or water they then got to a place called Toobridge (?) in Exmouth Gulf, they then found three natives who gave them some water and turtle meat.

The man Charles Love was then so much exhausted, and so far gone, for want of food and water, that he died shortly after they got to the water, he could not drink any water, he died calm and quiet.

When the water was offered to the man Charles Love, he tried to drink it but could not, and threw it out again, (saying it is to [*sic*] late). He died that night about 12 o'clock, so far as I can learn it was the 26 July.

The natives dug a grave and they buried the man Charles Love at Toobridge.

They then came on towards Port Walcott, they met the cutter *Hampton*, Charles Tuckey (?) Master near Cape Preston, he gave them every attention by giving them food water and every refreshment that he had on board.

He took them to Mardi Creek to the cutter *Fortescue*, George Duff Master, who brought them to Port Walcott.

The man Charles Love navigated the vessel to where she was wrecked. I have been informed that he could not navigate a vessel.

The man Joseph Mariah could neither read or write.

The woman Elizabeth Love was in a very exhausted state when she arrived in Port Walcott. She was so weak that she had to be carried from the boat to the Goursun (?) Wild Hotel at Cossack. She was very ill from dysentery had been so for three months. The remaining three men are much better than they were, the Woman has since died.
R.W. Vincent Sgt.

Cock of the North 1879

The Inquirer and Commercial, News 7 May 1879

There has been another wreck in the neighbourhood of the North West Cape, at a place called Point Cloates. The *Planet*, on her last trip from Fremantle put in there, the Captain having described some wreckage on the beach. Upon landing he found the beach strewn with coconuts, Manilla rope, and rigging which indicated that the wrecked vessel was a brig. No traces of survivors were discovered. There is no doubt that many disastrous wrecks occur on this coast and are never heard of. A lighthouse on North West Cape is greatly needed; but it is feared that nothing will be done in this direction until we get a telegraph.

The Inquirer and Commercial, News 14 June 1879

Miscellaneous: Wreckage at North West Cape. It is surmised in Melbourne and Adelaide [see below] that the wreckage and cargo of island produce (rope, coconuts, etc.) found recently in the neighbourhood of North West Cape belonged to a brig named the *Cock of the North*. No particulars are given to her port of departure or destination.

The *South Australian Advertiser* 9 May 1879

News has been received of the recent wreck of a vessel, supposed to be the brig *Cock of the North*, on the west coast, which is strewed with produce of the East.

The Maitland Mercury and Hunter River General Advertiser 13 May 1879 [Evening News]

News of a wreck having occurred on the West Coast has been received. It is supposed to be the brig *Cock of the North*. The beach is strewn with cocoanuts, ropes, and quantities of wreckage.

Henderson and Henderson (1988: 263) refer to this vessel with a note that 'no particulars were given as to her port of departure or destination'. It is odd that the site was identified in Melbourne and Adelaide, not Western Australia; presumably it was destined there.

Queen 1892 (1880)

Western Mail Friday 12 December 1913

In 1880 The *Queen*, 3 ton cutter, was wrecked, on a reef opposite Point Cloates. One Chinaman was drowned (or killed by his shipmates—Malays).

SRO 430 ITEM 0262/1892 Sergeant Beresford to Commissioner, 6 February 1892, Police Records.
Thomas Carter to Resident Magistrate, Carnarvon, 24 October 1891, Police Records 262/1892.
Corporal Taylor to Inspector Troy, 18 January 1892, Police Records 262/1892.

Don Joseph 1899

The West Australian Thursday 11 May 1899

THE WRECK AT POINT CLOATES. FURTHER PARTICULARS. SHIP'S IDENTITY STILL UNKNOWN.

Much curiosity is being manifested by shipping people in Perth and Fremantle regarding the identity of the vessel which is reported to have been wrecked at Point Cloates, near the North West Cape. The Collector of Customs (Mr Clayton T. Mason) received a further wire yesterday from Mr T.R.V. Foss, the sub-collector of customs at Carnarvon, stating that additional news of the wreck had come to hand, beyond a report that the vessel was ashore in the Black Rock passage. The telegram also contained information that the news had reached Carnarvon through Mr G.J. Brockman, of Minilya station, and that Mr Carter, the owner of a sheep station within a few miles of Point Cloates, had left for the scene of the wreck. Mr Foss further suggested that the telegraph line repairer stationed at Winning Pool could be instructed to proceed to the wreck and telegraph particulars from his station. The Collector of Customs on receiving Mr Foss's message communicated with Mr Snook, Superintendent of Telegraphs, and arrangements were made for the lineman at Winning Pool, which is about 65 miles from the coast and the nearest telegraph station to Point Cloates, to visit the wreck and despatch particulars as soon as possible.

The Commissioner of Police has telegraphed instructions to the police at Onslow to charter a boat and proceed to the wreck. On Tuesday evening Mr Chamberlain, boatbuilder, of Fremantle, received a telegram from the master of the schooner *Anne*, which is owned by Mr Chamberlain, stating that he had called in at Carnarvon for water, and, having heard of the shipwreck at Point Cloates, desired to know 'whether he should proceed to the site. Yesterday morning Mr Chamberlain wired back to the master of the *Anne* to sail at once for the wreck.

Western Mail Friday 19 May 1899

The Point Cloates Wreck

The speculation indulged in by members of the shipping community regarding the identity of a large ship reported to have been wrecked near Point Cloates, on the Nor'-West coast, was checked on Monday afternoon, when definite information concerning the disaster reached the city and port. It now transpires that the vessel wrecked was not a large ship, but the pearling lugger *Don Joseph*, which left Fremantle for Broome on April 30. The Collector of Customs (Mr Clayton T. Mason) is in receipt of the following telegram from Mr C.D.V. Foss, Sub-collector of Customs, at Carnarvon:— "Lugger *Don Joseph*, 13 tons, wrecked about seven miles south of Point Cloates; all hands saved. Miles master. The master and one of the crew just arrived. Lugger wrecked 30th last month. This is the large ship reported by

Mr Julius Brockman as being wrecked at Point Cloates". Mr A.E. Brown, shipbuilder, of Fremantle, also received message from Captain Miles to the effect that the *Don Joseph* was totally wrecked at Point Cloates at 9 pm on the 30th ultimo, and all hands were saved…she had more than the usual quantity of gear on board,…She also carried a big supply of stores. The vessel was built of jarrah with karri decks, and she was registered 18 tons.

The West Australian Tuesday 16 May

THE POINT CLOATES WRECK

All doubt as to the identity of the vessel reported last week to have bean wrecked off Point Cloates were set at rest yesterday afternoon by the receipt of a telegram by Mr G.F. Eliot, the acting Under-Secretary, from the Resident Magistrate at Carnarvon(Mr Foss). The message stated that the wreck occurred at a point five miles south of Point Cloates, and that the vessel proved to be the lugger *Don Joseph*, of which Mr Miles is master. All hands were saved.

The West Australian Wednesday 24 May and the *Western Mail* Friday 26 May 1899

The schooner *Annie*, 71 tons register, which arrived at Fremantle with wool and sandalwood from Maud Landing, visited the scene of the wreck of the pearling lugger *Don Joseph*, whilst in the Nor'-West. Captain Schroder, the master of the *Annie* states that he received instructions when in Carnarvon on the 10th instant to proceed to the wreck at Point Cloates, and leaving that port at 11 pm on the same date he reached the vicinity of the spot where the big ship was reported to be on shore, on the following evening. Next morning he entered the passage between the reefs and the shore, and instead of finding a large vessel ashore he was surprised to find only the wreckage of the lugger *Don Joseph*. The boat had drifted over the breakers onto the inside of the reef, on the edge of which she was lying on her beam ends, full of water. The vessel was a total wreck. Captain Schroder is of the opinion that by this time she has disappeared altogether. At the spot where the lugger struck there is an indentation in the line of the reefs, and the position being less exposed than elsewhere the breakers were comparatively smooth, otherwise the captain and crew would have had great difficulty in reaching the shore. He heard that those on board the lugger got ashore by means of a 10 ft. dinghy belonging to the *Don Joseph*, and that they were running short of water when a native from Mr. Carter's station came across them, and guided them to that gentleman's homestead. Captain Schroder says that he remained about the vicinity of the wreck for three days, but he saw no sign of the police boat, which was despatched from Onslow to Point Cloates.

GSS 1901 Lugger

The West Australian Saturday 9 February 1901

Wreck of a Lugger. The following telegram from Winning Pool has been received by the Postmaster-General, dated 7th February: Messenger just arrived here from Point Cloates reports lugger *G.S.S.S.* [*sic*], from Fremantle to Broome, H. McKalls, master, washed over reef at Point Cloates 30th January; now a total wreck, with large hole in side, lying in about 3 ft. of water. No lives lost.

Don 1902 Schooner

The West Australian Thursday 10 April 1902

Wreck of the Schooner *Don*. The following is a copy of a telegram received from Winning Pool by the Deputy Postmaster-General, Mr R.H. Sholl, yesterday. Man named William McJannet just arrived here from Maud's Lauding, reports having met Captain Dunbar, of schooner *Don*, 60 tons there on Sunday morning who informed him schooner struck reef about 9 pm on Thursday last, about three miles west from Maud's Landing, and is now fast on reef, and likely to become total wreck. One boat swamped, which contained food and men's clothing. No lives lost. Captain Dunbar, two men, and boy left for Onslow on Sunday, in another boat, and two men proceeded on foot to Point Cloates Station. Schooner was from Broome for Fremantle in ballast.

Wyndham 1910 Lugger

The West Australian Wednesday 16 February 1910

Capt. Foxworthy, of Fremantle, received the following telegram from Mr Arthnr Male, of Broome: Lugger *Wyndham* wrecked six miles south of Point Cloates on January 19. Crew saved. The *Wyndham*, it will be remembered, left Fremantle for Broome on January 15 in company with the lugger *Retreat.*

Queen of the Seas 1916 Motor Sailer

The vessel was wrecked in a cyclone somewhere off Point Cloates. The vessel was driven onto a reef and the owner, Henry McLeod, and two crew came ashore not far from Ningaloo Station. The engine was said to have been salvaged from the reef and sold for £10.

Langdon Lugger B3 1942

430 ITEM 1942/2729 Police Dept Geraldton Missing lugger B3 *Langdon* wrecked Fraser Is. Fleet of 31 luggers departed Onslow for Carnarvon on 02/05/1942. B3 *Langdon* missing. Lugger found by Ningaloo station part owner Mr MacBolt total wreck. No survivors seen. Crew of 5 (Koepangers) of Dutch E. Indies nationality. Lugger reported wrecked 06/05/1942. Wreck reported 1.5 miles S of Fraser Is lighthouse in heavy breakers mast only showing. Vessel hull completely submerged in a hole in reef, vessel facing North.

Kittyhawk aircraft 1943

Michael McCarthy

While escorting a PBY Catalina that was heading into Exmouth from the west, Australian air ace K.W. 'Bluey' Truscott was killed on 28 March 1943 when his aircraft crashed into the sea. Australia's second highest air ace, Truscott was apparently performing a practice attack on the Catalina as it approached the coast. With a glassy sea affecting his height perception, Truscott passed underneath the aircraft and hit the water. His body was later recovered. A bullet ridden seaplane float found at the Coral Bay resort in recent years is from this era. During WWII it was taken from a Catalina destroyed in Exmouth Gulf in a cyclone, used by the Lefroys of Exmouth Station as a canoe and for target practice before being abandoned.

American Submarine Chaser *SC-751*, 1943

Michael McCarthy

Wrecked 22 June 1943 on the Ningaloo Reef

This wreck was first brought to the Museum's attention by Vic Jeffrey, then Public Relations officer of the RAN. One of 435 110-ft (33.5 m) wooden-hulled submarine chasers built in American yards during World War II for use by the US and allied navies, *SC-751* was one of seven that operated for the USN in Australian waters as coastal convoy escorts. From the outset, *SC-751* was in command of 34-year-old Ensign B.C. Davis USNR a highly experienced yachtsman and navigator. He had been appointed to the ship while under construction and after its commissioning on 22 November 1942 he took it on a 'shake down cruise' to Florida and then to Panama. There he was joined by Ensign Thomas K. Parkinson USNR as Executive officer with Ensign W.D. Goldfarb USNR as third officer. Eleven of the type entered the Pacific in convoy early in 1943 and after arrival in Nouméa split up for different destinations, including the Solomons and Australia. Carrying three officers and 24 enlisted men *SC-751* arrived at Brisbane in company with *SC-739* (Figure 196) in March 1943 and the two sailed down the east coast and across the Australian Bight to Fremantle. They then patrolled its outer harbour and approaches and escorted convoys on the west coast. One of these was the famous Royal Shell tanker *Ondina.*

After being attacked in the Indian Ocean by two armed merchant raiders, *Aikoku Maru* and *Hokoku Maru*, on 11 November 1942, *Ondina* a Defensively Equipped Merchant Ship replied with its 4-in gun and scored a direct hit on *Hokoku Maru*. This resulted in an explosion which blew the Japanese ship's stern off. For its part, *Ondina* was torpedoed and set on fire. After initially abandoning ship the *Ondina* crew realised it was not in danger of sinking and they re-boarded it and eventually made Fremantle where temporary repairs were effected. After a decision to base it in Exmouth Gulf as a stationary fuel depot for US submarines operating out of Fremantle, on 16 June 1943 *Ondina* set off north with USS *Isabel* and *SC-751* escorting.

From the outset the convoy was beset with turbulent seas, heavy rain and high winds sometimes gusting at Force Six and Force Seven. According to T.R. Treadwell, a wartime submarine chaser commander who in 2002 produced a history of the type, conditions were so bad with the storm blowing around 30 knots and at times with only 500 m visibility in daylight (Treadwell, 2002). On board *SC-751* they succeeded in getting a 'fix' at 1525 hrs on 21 June to what they thought was Maud Landing and then they headed due north. The conditions were so bad, however, to produce serious errors when navigation by Deduced Reckoning and this proved disastrous as they turned after 0200 hrs on a heading of 084° True when a full 10 nautical miles south of North West Cape. Though expecting to turn east on a clear track past the Cape into the Gulf, instead they hit the Ningaloo Reef at an estimated 21° 56'S.

> At 0555 the ship struck and grounded fast…Up to the moment of impact, no one had seen any white water breaking over any of the reefs…Reaching the deck while the ship was still bouncing, Captain Davis…tried throwing both engines in reverse, but the ship was

Figure 196. The submarine chaser 736 (Treadwell, 2002: 132).

listing to port. The starboard propeller was beating mostly at air and the port propeller, in contact with the reef wouldn't budge. The ship was pounding on her bilge and taking water in the engine room and sound room (Treadwell, 2002: 127–8).

Liferafts were then launched and secured alongside.

At dawn the coast was visible and estimated 'three and a half miles away' (*c.* 4 km) and a 12 ft 'wherry' (dinghy) was sent ashore with Ensign Parkinson and three crew as the wind dropped to *c.* 12 knots and the sea inside the reef reduced to a short chop of about 0.5 m high. Seeing USS *Isabel* heading north about a mile to the west they tried to attract its attention with gunfire from its 20-mm guns and flares from a Verey (Very) pistol. The Wherry then got into difficulties as the wind again picked up to 30 knots offshore, capsizing half way in. In being unable to upright it, all bar Ensign Thomas Parkinson, who would not leave the upturned dinghy swam back to the reef landing south of the stricken ship. They then swam and waded back. Still clinging to the boat in the offshore winds Parkinson was swept out to sea past the breakers into deeper water. He then let go of the dinghy and tried swimming back but was last seen swimming outside the breakers, at 1330 hrs as a heavy rain squall descended.

Throughout the afternoon guns were fired and flares sent off at regular intervals and towards evening the tide rose causing the ship to roll badly to port. Australian troops soon

came to investigate the gunfire, thinking 'there might be some sort of invasion' but on seeing the Verey flares realised that a ship was in distress.

The Americans remained on board until 0830 hrs the next day, when in fear of the ship breaking up Davis ordered all to abandon ship. They then walked the rafts over the reef and began 'half swimming and half paddling' to shore. After making some progress the offshore wind took control and they were blown back towards the reef where they were again beset by the surf.

A PBY Catalina then appeared, and after acknowledging their presence, left to unload excess fuel. At 1430 hrs it returned and made a difficult landing in choppy seas. The men 'most of them completely exhausted, badly cramped and chilled' were taken off and flown to the Bay of Rest in Exmouth Gulf where they were sent on board the seaplane tender USS *Childs* for treatment and rest.

On 24 June Davis and Goldfarb went aboard USS *Chanticleer*, a submarine support vessel and they proceeded down to the site. After launching a 'surf boat' they then approached the wreck from inside the reef. Together with officers and crew from *Chanticleer* they inspected the wreck and hopes for possible salvage rose, when they found it lying on a flat reef that nearly dried at low tide. The ship was intact bar a hole in the port side at the engine room. They then salvaged all records and 'gear of a vital nature' and developed a plan that would entail salvaging everything movable and then hauling the lightened and patched up hull off the reef where it could be towed to port for repairs.

Work started from a salvor's camp on the beach on 4 July 1943. The main and auxiliary engines were removed, as were all the sonar gear, guns, ammunition and other heavy equipment. After initially failing to float the ship off *Chanticleer* went to Fremantle for more equipment and on return they found the wreck had been pushed a quarter of a mile north by the seas. Though work still remained difficult and dangerous in periods of low water, they removed the fore and mainmast, pilot house, shafts, struts, rudders and propellers in order to further lighten the hulk. This work took over two months. At extreme low tides they got tractors out to the reef and proceeded to push the ship onto its starboard side in order to effect repairs on the port side. Aided by 40 fuel drums hung on the starboard side and progressively filled with water they succeeded in making the vessel roll and thereby to expose the holes. These were patched and what were described as 'Billy pumps' were started up to keep water flow to a minimum. After a number of unsuccessful attempts they were able to manoeuvre the wreck through the reefs using a landing barge, twice grounding and twice getting it off. The drums, after being emptied were then stowed below deck to help keep the ship afloat. Two and a half months after commencement the *SC-751* was back as sea and was taken out towards *Chanticleer*. The heavy seas and swell did not allow it to be lashed alongside as planned, however, and a tow was commenced. Just as they got underway *SC-751* began to sink and as the stern rose out of the water it sank in what was described as 'fifty-five fathoms'. This all occurred in apposition then estimated as at 21° 56'S, 113° 53'E.

At the subsequent Court of Inquiry many discrepancies in the evidence emerged. In mitigation, one expert witness also 'testified that the strong winds and tides could have played havoc with anyone's estimated fixes since currents in that area were always capricious, affected by the varying phases of the moon and whether the tide was ebbing or flooding' (Treadwell, 2002: 132). Davis was not held culpable and he was later transferred to the 7th Amphibious Force and given command of *SC-746* taking part in MacArthur's return to the Philippines.

Goldfarb remained in the *Chanticleer*, eventually rising to Executive Officer and navigator.

The wreck site and the salvors camp are yet to be found. According to Gerry Lefroy of Exmouth Station legend had it that the ship 'hit rocks and was blown up 12–15 miles south of Yardie Creek, North of Carbaddaman Passage' (WAM File MA-440/71, North West Cape). In another possibly unrelated account Ted (A.G.) McCavana wrote advising of 'Articles found on Beach north of Point Cloates 1951–52 or 53'. He stated that 'Ted [A.G. McCavana, i.e. himself] and "Ken"…an ex-navy person decided to take a water-bag and rifle and walk along the beach north. After walking 4–5 miles [presumably from the whaling station] they discovered a torpedo and wooden boxes which were embedded in the sand; they were not able to remove the boxes by digging with the rifle butt; they also saw rusted wire circles, which they felt may have been from HMAS *Sydney*'. Apparently they spoke of reporting this when the whaling season was finished, Ted never reported it and he lost touch with "Ken"'. It is possible, despite the considerable distances that the torpedo was a paravane or similar device and that the boxes were related to the salvage of *SC 751* (North West Cape File, WA Museum).

Details: Length: 110 ft 10 in (33.5 m); Width: 17 ft (5.1 m); Draft: 6 ft (1.8 m). Machinery: Two 1000 bhp diesels; Top speed 15 knots. Armament: 1 40 mm gun; 2- or 3 20 mm Anti Aircraft guns; Depth charges.

***Three Sisters II* 1976**

The gaff rigged ketch *Three Sisters II* went aground on a reef in Carbaddaman Passage while on route from Queensland to Fremantle in September 1976. The vessel ended up on the beach and was ultimatly burnt in August 1979; all traces of the vessel were destroyed.

Undated site Cape Farquhar

In May 2010, diver Serge Katarski reported finding a 'large steel wreck' just south of Cape Farquhar, off Warroora Station, consisting of 4–5 'huge hoops of steel' and tangled frames. He did not get to see much more of the site as the seas were too rough. Inquiries are continuing (Serge Katarski, 2010, pers. comm. to R. Anderson, 20 May, WAM File MA-209/80, Point Cloates).

Undated site at Butterfly Bay

About 10 km south of Yardie Creek at Butterfly Bay the Callen Family reported wreckage in 1994 of a small 5–10-ton, late 19th century coaster, through to the pre-war period. They described part of a small grapnel anchor, an axe and handle visible at low water, some chain with 3/8 in link, just south of a prominent point concreted iron rigging ¼ in diameter, indicating of a 5–10 ton boat (WAM File MA-209/80, Point Cloates).

Norwegian Bay Whaling Station boat

In June 1990, Conrad Groen, a member of MAAWA, reported that a boat had been uncovered at the Norwegian Bay Whaling Station following a recent storm. Later that month staff from the Museum visited Ningaloo Station and inspected the site (WAM File MA-209/80, Point Cloates). The boat was lying near the whaling station jetty about 10 m north of a concrete pile. One metre of the stern of the vessel protruded from under a sand dune several metres

Figure 197. The *Three Sisters* wrecked and then burnt (Brian Stagg).

high. The vessel had been fitted with a propeller, possibly as a later addition. The stern-post was 6 x 4.5 in (152 x 114 mm). The vessel was carvel built with laminated ribs and copper sheathed to the water-line. It was estimated the vessel was about 7 m long.

General conclusions

This report has attempted to gather together all the information that is currently available for the Ningaloo Reef area. It is acknowledged that there is a lot of variability in the level of research and fieldwork that has occurred. The report has in fact highlighted a number of potential research areas, particularly the sites that have been discovered in the archives as a result of this initiative.

The obvious outcomes of this report can be summarised as follows:

1. The Jane Bay Unidentified site requires urgent re-examination. In particular there is a need to select a time when there is a spring tide, when the low water is during the day time. At that point it ought to be possible to uncover the site and record the existing timbers.
2. Following the discovery of the Jane Bay Unidentified hull structure on the beach, the evidence from the Walcott map of more vessels on the beach at Jane Bay needs to be investigated. This investigation should include: a metal detector survey of the beach area, both to the north and south of the Jane Bay Unidentified site; and a magnetometer and side scan sonar survey of the shallow water off-shore in the same general area (noting that the area is very difficult to survey using divers and visual survey methods).
3. There is a need to further investigate the NRU site and correlate this with further analysis of the known, but undiscovered sites of the area.
4. The wreck of the *Don Joseph* should be located in the Jane Bay area. The account (see page 252) gives fairly clear indication of the general area of the site, which is not likely to be greatly affected by swell conditions.
5. A number of small magnetometer targets in the Fugro survey remain to be identified, in particular the target in the shallow reef area, north of the *Correio da Azia* site, has never been investigated. There are also some small targets to the east of the site. The as yet unlocated anchor from the *Correio da Azia*, recorded in de Freitas' account, needs to be located with a sea-borne magnetometer. Possibly a further investigation of the small magnetic anomaly to the south of the site, originally thought to be the anchor should also be investigated.

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