Memoirs of the Queensland Museum | **Culture**

Volume 9

Pandora Project Stage 2: four more seasons of excavation at the Pandora historic shipwreck

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PUBLISHED BY ORDER OF THE BOARD 2016

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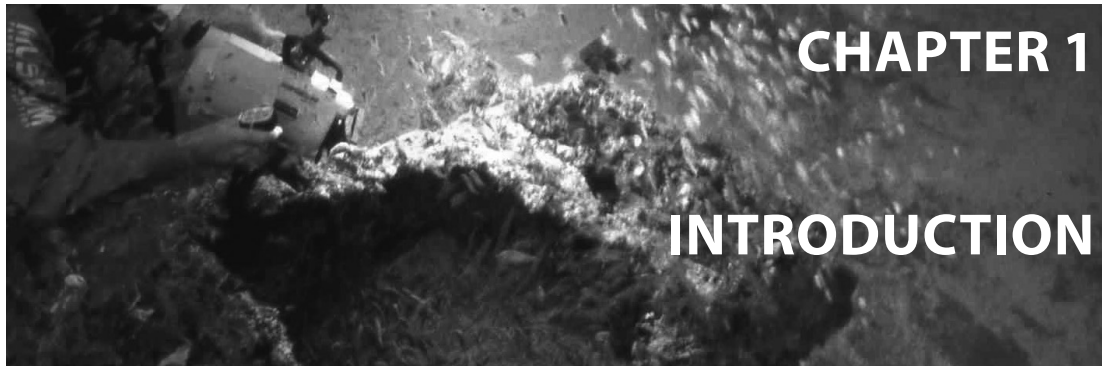
National Library of Australia card number
ISSN 2205-3220

COVER
Cover image: Ship-remains/photomosaic. Queensland Museum.

A Guide to Authors is displayed on the Queensland Museum website qm.qld.gov.au

A Queensland Government Project
Design and Layout: Tanya Edbrooke, Queensland Museum
Printed by Watson, Ferguson & Company



CHAPTER 1

INTRODUCTION

This publication has been prepared to present the findings of Stage 2 of the Pandora excavations conducted between 1996 and 2000 under the auspices of the Queensland Museum (QM) and largely funded by The Pandora Foundation. This volume builds on the work published in 2000 in Volume 2(1) of the *Memoirs of the Queensland Museum, Cultural Heritage Series* by Peter Gesner and Janet Campbell, covering the results of earlier QM fieldwork during five seasons of excavation at the wreck of HMS *Pandora*, the Royal Navy frigate sent into the South Pacific in 1790 to recapture HMAV *Bounty* and bring home to Britain for punishment the 'pirates' who had taken her from her legitimate captain.

This volume (Volume 9) has been prepared to ensure that the body of work from the Pandora project is published, and to encourage further access and research on the Pandora collection, the mainstay of the QM's Maritime Archaeology (MA) collection held in the Museum of Tropical Queensland (MTQ) in Townsville, North Queensland.

In this volume, an examination of the contextual history of the *Pandora*, expanding on historical research undertaken as background to archaeological work is presented (Chapter 2). Details of the people on board the *Pandora* are further explored using a range of archival resources (Chapter 3) and Chapter 4 presents a comprehensive extract of the Logbook of HMS *Pandora*, transcribed and annotated; these sections present an account of the *Pandora's* last voyage, wrecking and the subsequent travails of some of her crew.

Detailed reports of five seasons of fieldwork are presented in Chapter 5. The outcomes of excavation are reported in the Artefact Catalogue (Chapter 6) and preliminary analysis of artefact deposition and analysis (Chapter 7). Summary discussion is presented at the end of the volume. A range of appendices include additional research material and a report by Warren Delaney of the excavation of the bow section.

Our understanding of the *Pandora* collection is continuing to evolve with ongoing artefact analysis, conservation and research. As the collection contains more than 5600 records, and excavation was discontinued after the 1999 field season, it will be appreciated that this report is to be considered as a progress update rather than the final word on the *Pandora* collection. As such, the collection should also be considered a 'living' and changing entity.

To begin this next part of the documentation of the Pandora project, the context of the wreck's discovery and work during project Stage 1 (Gesner, 2000) are recapitulated in the following section.

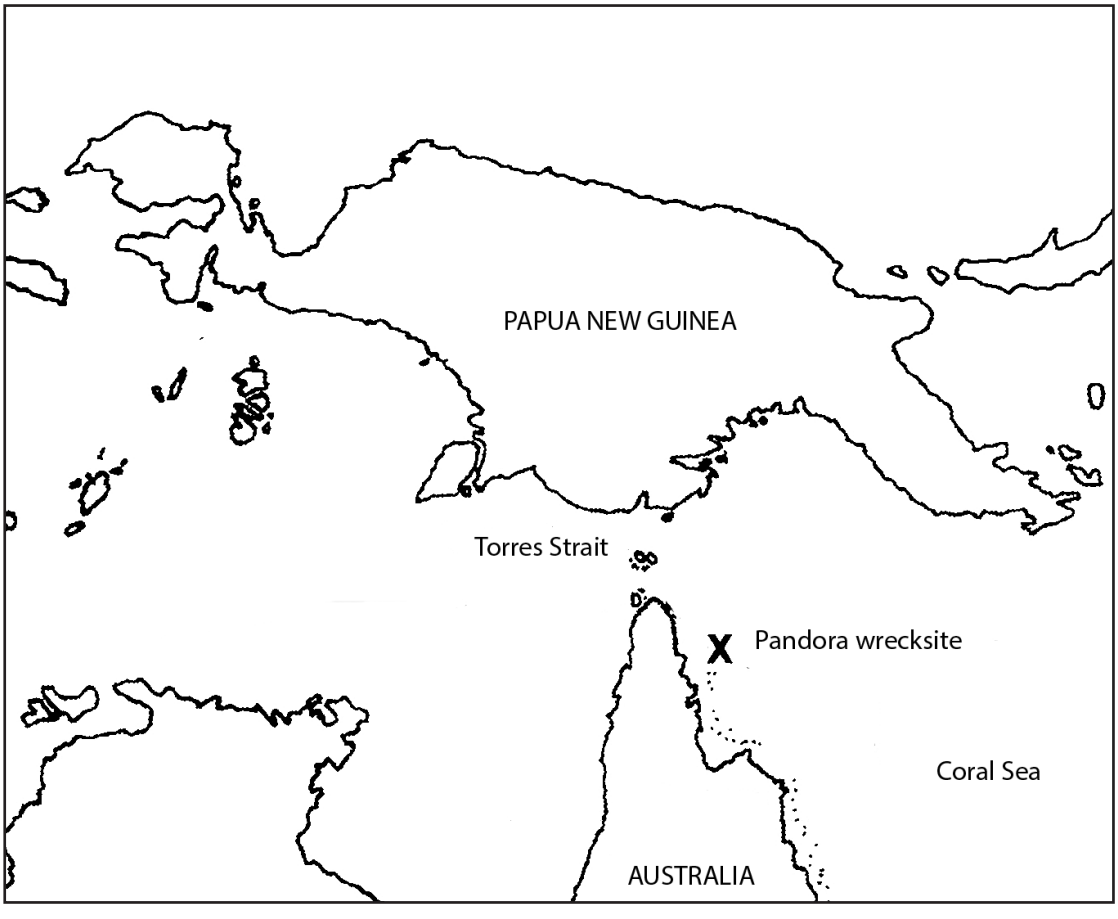


FIG. 1. Location of *Pandora* Wreck Site.

THE *PANDORA* SITE

In November 1977, 186 years after its loss, the wreck of the *Pandora* was officially reported to the Commonwealth's Minister for Home Affairs and Environment by Steve Domm, John Heyer and Ben Cropp. Its discovery was the result of a methodical search based on analysis of historical information that had been carried out by John Heyer and Steve Domm prior to their fieldwork; they had also arranged aerial assistance from the RAAF to locate the wreck. Eyewitnesses on the *Pandora*, Captain Edwards, James Morrison and George Hamilton, had mentioned that the survivors had made their way to a small sand cay several miles from the wreck. Morrison said this cay was between 2½ to 3 miles distant (Rutter, 1935:128), while Hamilton gave a distance of 4 miles (Hamilton, 1793:108) and Edwards had also given a bearing and an estimated distance. Based on this information, Heyer and Domm had delineated a search area for the RAAF aircraft within Pandora Entrance. Their reasoning proved justified in light of subsequent events, i.e. the wreck's location was accurately narrowed-down by the RAAF and subsequently pin-pointed within the delineated area inside Pandora Entrance (pers comm. John Heyer, 1994).

A magnetometer carried by an RAAF Neptune maritime reconnaissance aircraft indicated the approximate location of the wreck within the area that had been delineated by Heyer and Domm. The wreck's exact location – very near the spot where a flare had been dropped by the RAAF's Neptune – was discovered the next day by Ron Bell, one of the divers in Ben Cropp's team (Cropp, 1980:80). The site was immediately declared protected under the Commonwealth's, then recently promulgated, *Historic Shipwrecks Act* 1976.[1]

LOCATION

The *Pandora* wreck is located within Pandora Entrance, approximately 6km (3.4 nautical miles) to the north-west of Moulter Cay. Moulter Cay was referred to as 'Entrance Cay' by Captain Edwards to distinguish it from 'Escape Cay' where the survivors spent two nights after the wreck.[2] These cays are among three sand cays[3] lying within Pandora Entrance[4]; they are on the outer Great Barrier Reef, approximately 100 miles east-south-east of Cape York, on the edge of the Coral Sea (figure 1). Their location is remote. Lying in far northern Great Barrier Reef (GBR) waters, the site is geographically closer to Port Moresby in Papua New Guinea and to Thursday Island in the Torres Strait than to Townsville or Cairns, the two closest major mainland Australian ports. Depending on weather and sea conditions, it takes nearly three days (approximately 65 hours continuous steaming) for an expedition vessel to get to the wreck from Townsville; or approximately 50 hours continuous steaming from Cairns.

Raine Island, with its historic, convict-built and restored beacon[5], is 13 miles to the south of the wreck site; while the closest terrestrial islands – the Sir Charles Hardy Islands – are approximately 55 miles to the south-west, off Cape Grenville.

The *Pandora* struck an isolated cluster of small reef pinnacles, running aground on a larger, crescent-shaped reef which is unofficially referred to as Pandora's reef (figure 2). This was borne out by the discovery on the reef top of a bronze rudder fitting, pieces of copper (hull) sheathing, copper alloy tacks and an iron swivel gun. The distance between Pandora's and 'West' reefs is approximately 250 metres. The location of the first bower anchor, that was dropped immediately after the vessel got off the reef, has not yet been determined.

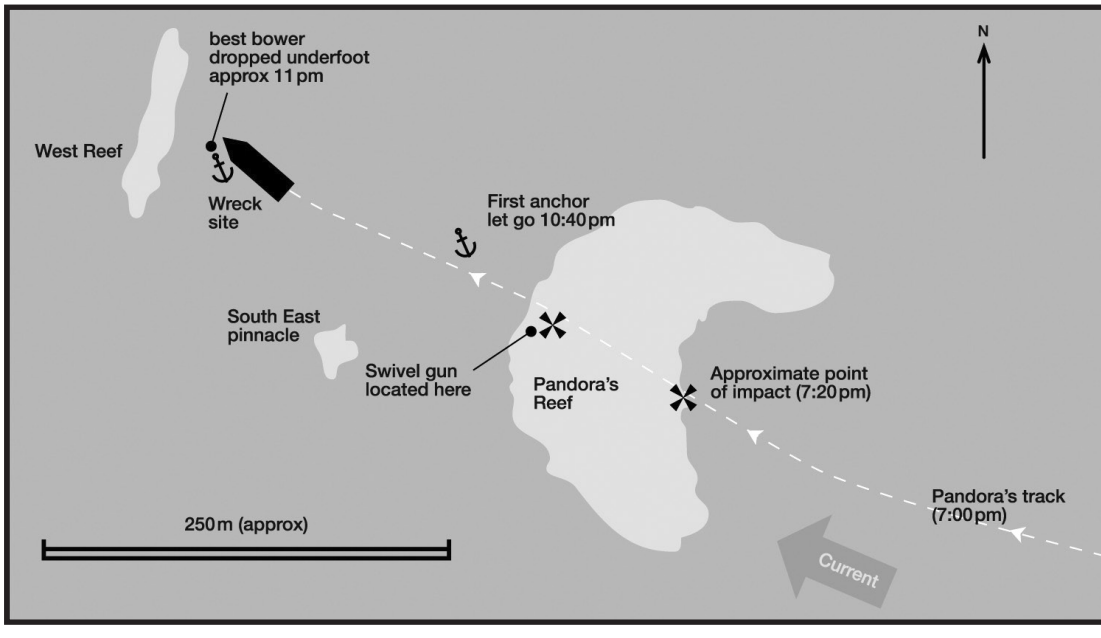


FIG. 2. The configuration of the three small reefs around the wreck, which is located approximately 75 metres to the east of 'West Reef'.

FIG. 3. Escape Cay, 1999. (Photo: Gary Cranitch, Queensland Museum).

ENVIRONMENT

Three relatively stable sand cays in Pandora Entrance represent the only 'land' within a 8 kilometer radius of the wreck. Based on James Morrison's account that Escape Cay[6] was the 'middle of three cays' inside Pandora Entrance (Rutter, 1935:128), Cay 11-091 is thought to be the sand cay (figure 3) the survivors stayed on for the two nights before leaving the wreck scene for Timor in the four remaining ships' boats (Gesner 2000b:13) see also figure 9.

Sea conditions

Although the wreck lies well inside Pandora Entrance, it is exposed in the east to swells from the Coral Sea generated by prevailing easterly winds, especially between May and December; which is the season of the South East Trade winds.

Directly to the east, south-east and west, the wreck is surrounded by two reef outcrops and a pinnacle that offer some protection by breaking-up to some extent the ocean swells that roll-in through Pandora Entrance. Moreover, the reefs and pinnacle also deflect the flow of currents across the site. The pattern of these currents has not yet been determined but divers working on the wreck have regularly experienced their sudden on-set, strength and unpredictability. Mid-water currents are also erratic; they have been experienced over the wreck setting in different directions to surface currents and to seabed currents. In addition to this, depths at the wreck range from 30 to 35 metres. All these factors make for challenging conditions for underwater archaeological work.

Seabed

The wreck lies on a south-eastward sloping seabed composed of granular to coarse carbonate sand, in which 'halimeda' is the predominant component. To date the depositional history of the seabed layer is imperfectly understood in spite of preliminary attempts at analysis (Carter & Hooper 1993; Ward *et al*., 1999).

IDENTIFICATION

A survey to confirm the identity of the wreck and to assess its archaeological potential was commissioned by the Commonwealth Department of Home Affairs & Environment and carried out in April 1979. The archaeologist who conducted the survey was Graeme Henderson, who was accompanied by photographer Patrick Baker; both from the Western Australian Maritime Museum (WAMM) (Henderson, 1979).

Rudder fittings, retrieved from the wreck by the finders in November 1977, were sent to the WAMM's Fremantle laboratory for conservation and further investigation. One of these fittings – a pintle – was subsequently found to be marked with a series of dots punched onto the surface in the form of the number '24'. It also had the name 'FORBES' embossed on it, in addition to a broad arrow, which indicated it as the property of the British government (Gesner, 2000:23). These were the first definitive clues that the wreck was a Royal Navy vessel of the *Pandora*'s size: a 24 gun frigate. Archival information later provided additional confirmation as a foundry operated by William Forbes was documented as a supplier of fittings to the yard in Deptford where the *Pandora* had been built. This evidence was conclusive: the wreck was definitely the *Pandora*.

After the 1979 survey, WAMM's photographer Patrick Baker compiled a photo-mosaic of the site (Gesner, 2000:21). By analysing the distribution of objects shown in the mosaic, Henderson concluded that the wreck had been more or less intact after it had settled onto the seabed; although clearly

it had suffered disintegration and sea-bed 'scrambling' (Muckleroy, 1978:160) since sinking. Nevertheless, Henderson surmised that it would be the most intact and coherent eighteenth century wreck in Australian waters (Henderson, 1979:36).

WHAT REMAINS OF THE HULL?

After sinking – damaged but substantially intact – the hull apparently settled into the seabed, resting on its keel and starboard bilge at an angle of approximately 32° (off vertical) where it subsequently appears to have deteriorated and gradually been buried over time, i.e. as layers of sediment were penetrating and accumulating in spaces within and around the lower hull remains, the exposed upper levels of the vessel began to disintegrate and gradually collapse as a result of marine borer activity, the physical effect of currents and, to a lesser extent, the destructive action of wave motion (figure 4). As Carter and Hooper (1993) explain:

> (…) the presence of the vessel as an obstruction on the seafloor will have significantly affected sediment transport and accumulation over the site in the last 200 years. In particular, sand transported across the site would initially have banked up on the upstream side of the wreck, later spilling over the sides and infiltrating spaces in the interior of the wreck, and finally (sediment supply permitting) burying the wreck.

In broad terms, essentially two environmental processes appear to have been in operation on the seabed: 1) deterioration and piecemeal disintegration from the top down, and 2) sediment accumulation and burial from the bottom up.

The distribution on the seabed of the visible features of the wreck attests these two processes. They probably went on for several decades, possibly as long as 90 to 100 years, until the wreck reached a relatively stable condition.

As the hull was disintegrating, i.e. as timbers such as deck beams failed and decking rotted away, it appears that objects from the quarter deck, fo'c'sle deck and the upper deck dropped down almost vertically inside the wreck as a result of failing deck beams and decking. This would have applied especially to spaces within the hull where heavy objects – such as guns or other large iron fittings and furnishings such as iron deck standards – had been placed or fitted onto the decks. Also, as the upper parts of the hull were deteriorating, many items – especially lighter ones that were more susceptible to water movement – probably tumbled out of the wreck and were deposited on the seafloor to either side of the hull remains. Most were subsequently buried by accumulating sediments, around and under the hull remains while others may have been swept some distance from the disintegrating hull by currents and the effects of wave motion (Ward *et al*, 1998). Alternatively, lighter objects especially may have been swept under the hull – in particular under the starboard transom – where they likely became trapped under the sweep of the counter in the space around the heel of the sternpost before the stern's final collapse on top of them.

However, as far as objects from lower and platform decks were concerned, it is surmised that these were subject to comparatively little lateral disturbance as a result of hull disintegration and exposure to currents; the majority of them simply becoming buried within the spaces they were actually in at the time of the wrecking. This would apply especially to the partitioned areas on the lower starboard side of the wrecked hull, in particular to the starboard store room areas on the platform deck and, to a lesser extent, to the lower starboard deck cabin areas (figure 4).

FIG. 4. Top edge of the bulkhead on the platform deck between the magazine and the captain's store, looking forward. Photo: Gary Cranitch, Queensland Museum.

The most recognisable and visible features of the wreck include several large iron objects on the sea floor – e.g. several guns, an anchor and the vessel's galley (Brodie) stove.

Using remote sensing equipment, several attempts have been made to determine the extent and condition of the hull's remains, but these have given indications only (Carter and Hooper 1993; Ward *et al*., 1999).

From what has been exposed by archaeological excavation to date, indications are that as much as 25%, possibly up to 30%, of the hull has been preserved (Gesner, 2000:42). The timber remains that have actually been seen so far – second or third futtock starboard frames, ceiling planking, outer planking, starboard lower deck planking, spirketting, waterways, magazine bulkhead (figure 4) and platform deck planking – appear to be in reasonable condition. But there is evidence of collapse of lower deck beams. However, there are still numerous unanswered questions about the structural cohesion of the surviving timbers, especially about the extent of preservation in the bow section given that excavation in that part of the wreck has not been as extensive as in the stern section. A definitive assessment of the extent, cohesion and condition of the surviving (buried) hull remains can therefore only be made after the remains have been comprehensively uncovered by excavation. It is clear that this requires retrieval of the entire artefact assemblage buried in the sediment that has accumulated in, on top of and around the hull.

In the 1995 excavation plan it was estimated that approximately 590 m^3 of the sediment in which the hull remains lie would require systematic excavation to expose all of the hull remains. By the end of the 1999 expedition,

approximately 205 m³ of the estimated total amount of sediment cover had been excavated – roughly 35% excavated to date.

LEGISLATIVE PROTECTION

In June 1981, additional legislative protection was invoked under Section 7 of the Commonwealth's *Historic Shipwrecks Act*, 1976. An area with a radius of 500m, centred at the intersection of latitude 11° 22′ 40″ S and longitude 143°59′ 35″ E was declared a protected zone (AUS 836).[7] Since that declaration a permit is required to enter the protected zone and to dive on the wreck. Permits can be applied for online from the (Commonwealth) Department of Environment.

The *Pandora* protected zone is regularly patrolled by Coastwatch (aerial surveillance) craft. Penalties apply to entering the zone without a permit and/or diving in or around the zone without a permit. Any disturbance activity – such as recovery of artefacts – is prohibited unless a permit has been issued.

QUEENSLAND MUSEUM PANDORA PROJECT

The *Pandora* historic shipwreck had been of interest to Queensland Museum (QM) since the wreck's protection in 1977. Following gazettal of the wreck under 'Section 7' of the *Historic Shipwrecks Act* in June 1981, the Queensland Government nominated QM's Director – ex officio – as the Commonwealth's Minister's delegated authority for the management of historic shipwrecks in Commonwealth waters off Queensland. Subsequently, a curator of maritime archaeology was formally appointed at QM in April 1982[8]; followed in 1986 by the establishment of another two full time maritime archaeology positions (i.e. a curatorial officer shipwreck survey and a technical officer maritime archaeology).[9]

By this time the wreck had already been inspected and assessed on behalf of the Commonwealth by an archaeological team from the Western Australian Maritime Museum (WAMM). Led by WAMM curator of maritime archaeology Graeme Henderson, this assessment had concluded that 'by virtue of the special background of the *Pandora* it is the most spectacular shipwreck in Australian waters and will no doubt prove to be the best preserved of the seventeenth and eigthteenth century shipwrecks in Australian waters' (Henderson, 1979:36).

The *Pandora*'s association with the *Bounty* story – as the sequel to arguably the most well-known episode from the annals of Pacific maritime history – constituted the 'special background' that Henderson referred to. Consequently he recommended archaeological excavation of the wreck because the location had become known. Based on experiences with significant historic wreck sites elsewhere, illicit disturbance at the hands of souvenir-hunting 'wreck-ratters' was considered a real threat to the archaeological integrity of the wreck (Henderson, 1979:39).

Additionally, Henderson recommended that all wreck material that had been recovered by the finders in 1977 be brought together at an appropriate single location (i.e. in a museum) to be conserved and housed in perpetuity as a distinct collection (Henderson, 1979:40). Queensland Museum was considered the most appropriate organisation for this, as its director had already been appointed as the Minister's delegate in Queensland for protection and conservation of the wreck's cultural significance, as provided for by the *Historic Shipwrecks Act 1976*.

Six objects recovered in 1977 were delivered to Queensland Museum in Brisbane in 1981 and subsequently accessioned as numbers MA001-006 in QM's embryonic maritime archaeology (MA) collection (Campbell & Gesner, 2000: 147).

PANDORA PROJECT STAGE 1

In 1983, with Commonwealth funding, QM was able to field the first of a series of exploratory expeditions involving limited archaeological excavation.[10] These would confirm the initial assessment by Henderson of the potential of the wreck as a 'class 1' wreck (Muckleroy, 1978:160-166).

QM's first expedition established that the remains of the wrecked hull and the bulk of the artefact assemblage were contained within an area of 20 by 50 meters.

In 1983, exploratory excavation (in two 2 x 2m and one 2 x 5m trenches) were carried out within a grid matrix (Coleman and Henderson 1984; Henderson, 1986:128-42).

Exploratory fieldwork continued in November 1984. It was carried out by a team similar in composition to QM's 1983 *Pandora* team[11]. It was again led by QM's maritime archaeology curator Ron Coleman, and archaeologically directed by the Western Australian Maritime Museum's Graeme Henderson.

The third QM expedition in 1986 was another national effort, jointly funded by the Commonwealth and Queensland governments, and again under the leadership of QM's maritime archaeology curator, Ron Coleman. Archaeological direction was by the West Australian Maritime Museum's Graeme Henderson, and co-direction by QM's assistant curator maritime archaeology, Peter Gesner. The museum's expedition team was assisted by a group of young volunteers ('venturers') participating in the UK-based youth adventure training scheme Operation Raleigh (OR). This was the largest expedition to the wreck, involving not only the museum team of 24, but also 19 OR 'venturers', 17 ship's crew and 20 OR staff (Gesner, 2000b).

Queensland Museum's next major expedition was not mobilised until January 1993. Significant funding shortfalls had ruled out continuation of excavation after the 1986 season. Consequently, during the early 1990s a decision to close down the site was in fact being considered. This was predicated by the realisation that on-going funding and staffing shortfalls would preclude implementation of a timely program of excavation, that brought with it long term responsibilities for conservation and curation of the internationally significant archaeological collection.

It was evident that any decision to close down the site would have to be based on careful consideration. This involved deciding on an impact mitigation strategy for the wreck's long-term in-situ conservation. The most important consideration arose from the realisation that a decision to 'close-down' could possibly expose the hull remains – and the artefact assemblage buried within and around it – to accelerated deterioration. This was recognised as a major risk, especially in areas where the seabed had been disturbed by excavation and had possibly been destabilised through excavation and subsequent backfilling during the 1980s.

It had therefore been considered important to try to determine whether – and if so, to what extent – biological deterioration of the buried organic remains had been accelerated by seabed disturbance through excavation. For instance, this could have occurred by re-exposing to oxygenated waters previously long buried parts of the hull remains, which had been well-insulated by a relatively stable layer of covering sediment before archaeological disturbance (Gesner in Bound 1998: 230-36).

However, by December 1992 the then Queensland Arts Minister – the Hon. Dean Wells MLA – had taken an active interest in the museum's proposed work on the wreck and urged the museum's Board and directorate to review the project and assess several options to continue archaeological investigation of the

wreck. Several strategic (re)assessments were made by the QM after the 1993 expedition.

The strategic review took into account the international cultural significance of the wreck, as well as its socio-economic potential and cultural significance as a museum object. Two of three options considered by the review panel included an appraisal of the feasibility of retrieval, conservation and display of the *Pandora* wreck along similar lines as the 'Mary Rose Project' in the UK. A third option considered excavation of the covering sediment layer only.

Initial assessment of the first two options indicated that any informed decisions about raising the hull could only be made with reliable information about the extent and structural integrity of the hull remains. Prompted by this realisation, a decision was made to concentrate on a third option, i.e. recovery of artefacts lying within the covering sediment layer and immediately adjacent or under the hull remains; especially in the stern area. Consideration of this third option involved assessment of recovery and conservation of the wreck's moveable contents only, especially the assemblage lying in the first 1-2 metre thick seabed layer over and adjacent to the hull remains. Consideration of the feasibility of the two other options – i.e. to recover the wrecked hull remains along similar lines as the *Mary Rose* project – was therefore postponed to another review; to be conducted at an unspecified time in the future, when more pertinent information about the extent and integrity of the hull remains would be to hand. The review's summary found:

'[It is] premature to discuss the potential of the *Pandora* in terms of a Mary Rose-like project because there is no definitive indication of how much hull is preserved … The two conclusions at this stage are:

- Raising the hull is considered unjustifiable, firstly in terms of its potential to advance knowledge and, secondly, in economic terms with respect to developing a viable tourist attraction; and
- Retrieval, conservation and display of the artefact assemblage is justifiable in terms of the cultural significance of the material and threats from vandalism or further inevitable weathering.'

The review's conclusions resulted in the Queensland government's commitment to provide additional resources to the QM to enable continuation of archaeological work at the wreck site; a subsidy of $1 million was promised as an incentive for the museum to establish in North Queensland (Townsville) a Pandora Foundation to raise additional funds ($2 million) to provide for a series of excavations to archaeologically recover more of the wreck's contents.

The objectives of the 1993 expedition had been management-oriented, in particular geared towards the collection of sediment samples (Guthrie *et al.* 1994). It was felt that this data would be useful to inform effective strategies for long-term conservation of the site.

The expedition's objectives included:

- Physical protection: experimentation with physical means of protecting the wreck from destabilising environmental impacts, in particular protection of backfilled areas deemed vulnerable to the physical effects of in-situ currents and wave motion;
- Sediment studies[12]: The gathering of sediment samples to assess biological deterioration rates within the sediments;
- Remote-sensing by JCU geo-scientists:

recording of more extensive sub-bottom profiles of the buried hull remains; and

- Trenching: limited probing to confirm, in the mid-ship and bow sections, that the starboard edge of the preserved hull lay where it was expected.

With articulation of this arguably more realistic and focussed project outcome and a financially more attainable objective, the museum's Curator of Maritime Archaeology (the author) was tasked to estimate what resources would be required for archaeological retrieval and conservation of the wreck's moveable contents only, and to draft a management and excavation plan.

These plans called for five expeditions – each of approximately six weeks duration – to be carried out by a multi-skilled team comprising up to 25 site-experienced professionals. The cost of these expeditions (in 1994-5 terms) was estimated at approximately $320,000 each, with additional outlays of approximately $180,000 per year to provide for extra specialist contract staff to bolster staff numbers to assist with implementation of a timely program of conservation and collection management. However, these estimates did assume continuation of the cost-neutral voluntary community and interstate peer group support that the Museum's previous *Pandora* expeditions had enjoyed. The estimates also assumed continued cost-neutral availability of core staff from internal QM human resources, in particular of personnel from QM's maritime archaeology, conservation, photography, marketing and public programs sections.

The museum's 1995 season was made possible by the Queensland Museum's Board of Trustees, which advanced funds for a 25 day expedition to keep the project in the public eye, in anticipation of funds to be raised in North Queensland by the Pandora Foundation. The 1995 expedition was conducted as a dress rehearsal for a projected series of five major expeditions to be carried out as Pandora Project Stage 2 between 1996 and 2000; and to maintain the project's momentum and high public profile, by providing publicity and promotional material for the Pandora Foundation's planned North Queensland fundraising campaign in 1995-96.

Several objectives were formulated to suit the short duration of the 1995 expedition, including the recovery of at least two large concretions located in grids 68 and 70 (figure 5) and the testing of a newly-established four-point mooring system. Installed by a marine engineering contractor in December 1994, the mooring system was designed to hold in position a substantial expedition mother vessel directly over the wreck.

The 1995 expedition team was also led by the author. It comprised the majority of personnel from the 1993 expedition. Excavation was conducted in two areas between 20 January and 5 February 1995. The result of this and the previous excavation were published in *Memoirs of the Queensland Museum Cultural Heritage Series* 2(1) (Gesner, 2000).

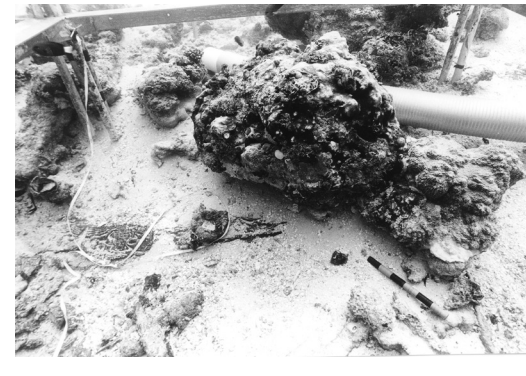


FIG. 5. A large carronade concretion in grid 70 (a 30 cm scale bar in the frame). Photo: Brian Richards.

PANDORA PROJECT STAGE 2

Pandora Stage 2 refers to the continuation of excavations as outlined by and following QM's strategic review of the project in 1992/93. Stage 2 commenced in 1996. The research, fieldwork, excavation, artefact recording and analysis carried out during Stage 2 are the primary basis for this publication.

Background

A management plan and an excavation plan for the *Pandora* wreck had been recommended by the project review which was conducted in 1992/93 by QM's Senior Management Group to determine whether continuation of archaeological investigation by QM's maritime archaeology section could be justified. The salient questions considered by the reviewers were:

1. To what extent, if at all, should archaeological excavation continue, and
2. What resources would be required to carry out in an efficient, timely and responsible manner archaeological excavation and concomitant conservation, curation and management of a substantial artefact collection?

The review considered the feasibility of several recovery options which had been mooted and decided on continuation of an archaeological recovery program, focussing solely on the wreck's contents, could be considered realistic because of the wreck's substantial international cultural significance and because of threats to the wreck's fabric posed by on-going, albeit gradual, environmental deterioration and/or by likely vandalism.

A management plan and an excavation plan were therefore called for. These two plans were based on the practical insights gained from conducting marine archaeological excavations at the wreck, in remote waters of the outer Great Barrier Reef, during Stage 1 of the Pandora Project. The three exploratory museum expeditions – in 1983, 1984 and 1986 – during Stage 1 had provided a broad understanding of operational requirements, as well as a sound working knowledge of environmental conditions affecting efficient and safe underwater-archaeological excavation work.

The management plan included an outline in broad terms of a series of 'stand-alone' project stages:

Stage 1: Completion of conservation, curation and collection management of the artefact assemblage recovered during the 1980s,

Stage 2: Implementation of a new series of major excavations (ideally, 5 seasons of excavation) to recover artefacts for research and display and to determine the extent and structural integrity of the wreck remains,

Stage 3: Conservation, curation, management, research, interpretation and display of artefacts recovered during Stages 1 and 2,

Stage 4: (if viable) A study to assess requirements associated with retrieval, conservation and display of the hull remains for future implementation as Stage 6,

Stage 5: (if viable) Continuation of archaeological excavation to clear the unexcavated hull remains of their contents prior to the raising and recovery of the hull,

Stage 6: (if viable/required) Recovery of the hull remains,

Stage 7: (if viable) Perpetual conservation, on-going curation, management and exhibition of the hull remains and the rest of the assemblage recovered during Stages 5 and/or 6.

Excavation Plan

The excavation plan for Stage 2 included an estimate of resources required to carry out a responsible and cost-effective archaeological project which would involve recovery, timely curation, conservation and management of a large, fragile and materially diverse archaeological collection, including crew's personal possessions and professional tools and equipment, as well as parts of the ship and its fittings and furnishings.

The excavation plan was based on the assumptions that:

- the core team of five permanent Queensland Museum 'back-of-house' staff positions allocated to the project for Stage 1 – i.e. curator/maritime archaeologist, collection manager /registrar, conservator, technical officer and photographer – would continue to be available to participate in fieldwork, as well as to carry out on a continuing 'as needs' basis on-going conservation, collection management and curatorial duties; it assumed that these 'back-of-house' positions would continue to be funded from the annual Queensland Government appropriation to the Queensland Museum; and that
- supplementary annual funding of approximately $0.6 million would be available from Pandora Foundation funds to provide for the five projected marine archaeological expeditions in 1996, 1997, 1998, 1999 and 2000, as well as provide for additional contract staff and resources to assist core 'back-of-house' staff with implementation of a timely program of artefact conservation and collection management, i.e. to assist with conservation, curatorial work, research and collection management. It was estimated this work would likely need to be continued well beyond the final expedition in the series; most likely well into 2002/3, if, as envisaged by the excavation plan, the final expedition in the projected Stage 2 series would be carried out in the summer (January-March) of 2000. It was thought the required additional professional human resources assistance could be provided for by the appointment of up to three full time, fixed term contract positions backing-up the museum's core team, especially in conservation and collection management in the museum's collection stores.

The plan also assumed continuation of the cost-neutral support for fieldwork hitherto received from volunteers as well as from specialist colleagues and peers seconded from other Queensland government agencies (e.g. Department of Health[13]) as well as from interstate and Commonwealth agencies.[14] This support from inter- and intra-state peers, colleagues and volunteers had been successfully canvassed at a special discussion forum convened during the 1993 Australian Institute for Maritime Archaeology (AIMA) Conference in Geelong (Victoria). However, it was understood that the annual Stage 2 Pandora project budget would provide for costs associated with fieldwork performed by inter-state colleagues and volunteers, e.g. for travel and temporary accommodation, as well as for special training in occupational diving to meet requirements of Queensland's then new Workplace Health & Safety (occupational diving) regulations.[15] It was thought that the supplementary budgets of approximately $0.6 million annually – a total of $3 million between 1996 and 2000 – would provide for the operational and team requirements of 5 seasons of fieldwork, as well as for three additional contract positions in key 'back-of-house' areas at the museum to bolster QM's core five person team already available to the project on an 'as needs' basis.[16]

The excavation plan was based on observations of the hull remains made during Stage 1 of the project, i.e. that the wrecked hull

appeared to have settled on its starboard side on a gradually sloping seabed. The bow was known to be bearing 005° (magnetic) and the hull lying at an angle of approximately 60°, i.e. heeling to starboard at approximately 30° off vertical. Based on this angle, it was thought possible that 25-30% of the original hull would be found reasonably well-preserved and buried within a sediment layer up to 2.5m thick (Gesner, 2000b:39-42).

Although much appeared to be known about the orientation and possible extent of the wreck remains, the structural integrity and internal cohesion of the hull's timbers and remains had not been established. The excavation plan was therefore based on a working hypothesis which postulated specific sequences (i.e. 'cycles', stages or phases) of hull disintegration, subsequent structural collapse and ensuing artefact deposition in and around the hull remains. This working hypothesis was based on observations of artefact deposition and of the resultant, i.e. observable, configuration of parts of the remaining ships' timbers and furnishings. These observations had been made during excavation in the 1986 and 1993 seasons in a trench through the starboard stern and mid-ship sections of the wreck, approximately around the mizzen mast (Gesner, 1991:22; Gesner, 2000b:36-37).

The hypothetical sequences had posited four main cycles of disintegration and collapse, each with a corresponding pattern of artefact deposition within and around the wreck remains (figures 6 and 7).

Cycle 1 (figure 7a): Mast, yards and rigging have broken off and been borne away by currents; weakened quarter-deck timbers and planking break off and are dispersed by currents or trapped against or under the hull (1); planking and timbers from the upper levels begin to disintegrate / deteriorate, small objects (e.g. tools, instruments, personal possessions) left in upper- and lower-deck cabins or other open spaces accumulate in clusters under the transom, against the internal sides of the hull and the intact internal partitions and bulkheads (2); Gradual internal silting-up begins as organic materials decay and fine water borne sediment particles are trapped within enclosed hull spaces, especially at lower deck and platform deck levels (3).

Cycle 2 (figure 6 and figure 7b): Quarterdeck and fo'c'sle deck have disintegrated or been borne away; parts of the upper deck deteriorate and collapse due to extensive marine borer activity. Some of the upper deck timbers fall away onto the seabed or get swept under the hull and over deposits created during cycle 1 (4). Light internal partitions and bulkheads deteriorate completely. Currents deposit coarser sediments (5) into semi-enclosed hull spaces and disperse light artefacts from exposed internal spaces; causing spillage or toppling of objects from the upper deck especially (6). Gradual seabed build-up intensifies under and around the hull (7). Fine water borne particle build-up continues, especially within (intact) confined spaces inside the hull, gradually mixing with current borne coarser – e.g. foramniferal – sediments. Mixing is more pronounced in spaces on upper deck levels than on lower deck level spaces where finer sediments predominate (8).

Cycle 3 (figure 7c): Processes started in cycle 2 intensify, with more collapse of upper structural timbers and dispersal, mainly under the transom, of small artefacts toppled or spilled out of the wreck from upper deck level (6). There is continued fine particle build-up in confined spaces at lower deck levels and mixing with coarser sediment (8) which has accumulated in semi-enclosed spaces on lower deck and platform deck levels. Seabed build-up (9) continues around the hull. Heavy iron objects – e.g. cannon – drop down into lower areas of the hull

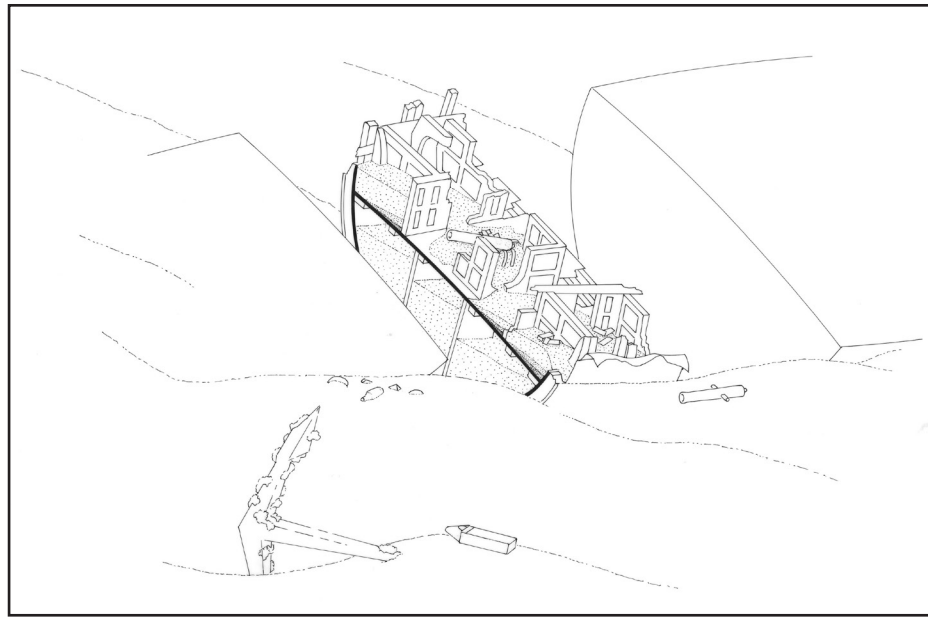


FIG. 6. Isometric view of the 2nd of the 4 hypothesized cycles of disintegration and collapse showing one section through the hull's stern at the mizzen-mast. (Diagram by Robert Brunke, Queensland Museum).

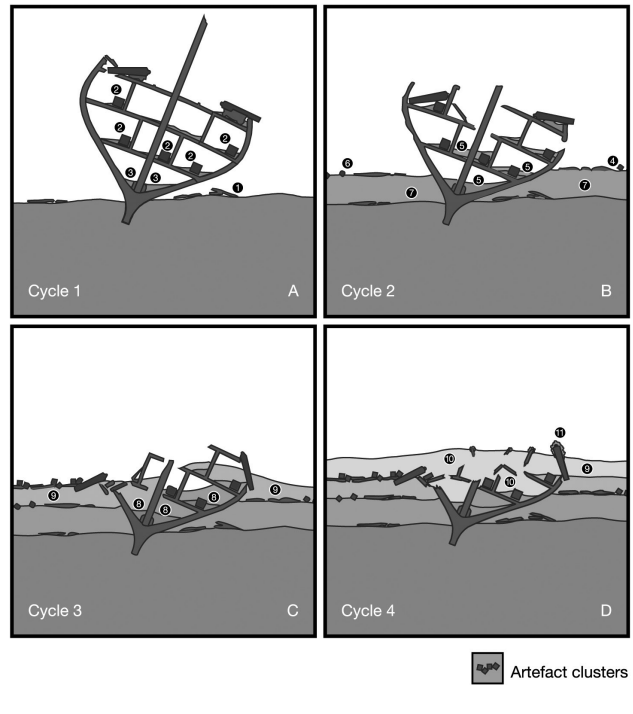


FIG. 7a-d: Four hypothesized cycles of disintegration and collapse – Sections through the hull at the mizzen-mast during the various hypothesized cycles of disintegration. (Queensland Museum).

because of collapse of weakened timbers, which are unable to support their weight. Fitted objects from the upper deck – e.g. the great cabin fire hearth – have tumbled out of the disintegrated hull. Marine bacteria and borer activity slows down due to greater, more effective sediment cover, especially at lower deck levels.

Cycle 4 (figure 7d): The wreck approaches stabilization. All spaces within the remaining hull are filled with compacted sediments (10). Sea bed build-up around the wreck reaches maximum levels. Marine borer activity is stopped, or significantly slowed-down, due to effective cover by sediments, which insulate timbers and other organics from oxygen-rich water. About one quarter of the hull has remained intact, containing artefact clusters in their original spaces on lower and, especially on platform deck levels, or, if artefacts had fallen out of the hull, where they were deposited by currents, especially if trapped under the hull's stern. Several pieces of wreckage protruded from the seabed where they were colonized by coralline algae to form concretions (11).

Research design

The decision to recover and further investigate artefacts from the wreck during Pandora Project Stage 2 was predicated on the international cultural significance of the wreck. Archaeological investigation during Stage 1 of the project had demonstrated that it was a "class 1" wreck (Muckleroy, 1978), i.e. a wreck with substantial, structurally coherent hull remains, which would contain unique material evidence reflecting the practices and conditions on board a Royal Navy vessel engaged on a long distance voyage to the South Pacific in the late eighteenth century Although not explicitly for discovery and exploration, it was postulated that the *Pandora*'s voyage should be likened to a voyage of discovery. After all, British participation in mid to late eighteenth century Pacific discovery – the so-called 'Grand Age of Discovery' – was sanctioned and to a very large degree materially supported by the Admiralty and carried out by a succession of RN vessels.[17] Physical conditions of life on board, material voyage requirements and practices in those vessels were arguably more than comparable to life on board the *Pandora*, if not identical. Also, any changes and adaptations that were made during the period, as European experience of long-distance 'discovery' voyaging broadened, would therefore likely be reflected in archaeological assemblages. Excavation of the *Pandora* would therefore result in an archaeological collection enabling in-depth investigation into the material culture of late eighteenth century British naval vessels engaged on a long-distance voyage of exploration and discovery in the South Pacific.

Research initially would focus on:

- Documentary sources – Admiralty records and digital newspaper databases;
- A social and cultural contextualisation of the officers and crew; and
- Investigation of the crew's interactions and exchanges with the Pacific islanders they encountered during their voyage.

Although research would mainly concentrate on the officers, about whom archival information was known to be more readily available, a similar study of the rest of the crew was considered to have equal potential. It was thought the crew should be regarded as a typical, 'run-of-the-mill', late eighteenth century Royal Navy crew which happened to be bound on this extraordinary (policing) mission because of the Admiralty's decision to select the *Pandora*[18] and dispatch it to the South Pacific in pursuit of the 'pirated' *Bounty*. It is evident (see Chapters 2 and 3) that very few of the crew had in fact been 'hand-picked' for the mission, except third

lieutenant Thomas Hayward and possibly the ship's purser Gregory Bentham.[19] Both of these men had already served in RN ships in the South Pacific; respectively with Bligh in the *Bounty* and with Cook in the *Resolution* during Cook's third Pacific voyage. Second lieutenant Robert Corner may also have been especially appointed, possibly because of his military background and special (management) skills.

Thus, it was evident that the artefact assemblage to be recovered from both the stern and the bow areas of the wreck, would provide an archaeological data set for the study and reconstruction of the 'life on board' conditions pertaining to an ordinary naval crew which could by and large be considered as typical of Royal Navy crews on the eve of the French Revolutionary Wars (1792-1802).[20] It is also worth acknowledging in this regard the potential of comparative studies with assemblages from the wrecks of other late eighteenth century naval ships which were also on long-distance voyages; in this respect the wrecks of British and European naval vessels come to mind – in particular the wreck of HMS *Swift* (1770) (Elkin *et al*., 2011) off Patagonia and the wrecks of the La Pérouse expedition (1788) off Vanikoro (Sledge *et al*., 2004).

FIELDWORK, REPORTING AND FINDS PROCESSING

The results of these analyses, contextual research and the various data, field work reports for field seasons 1996-2000 are the main substance of this publication and are presented in the following chapters.

Artefact conservation and cataloguing continues at the Museum of Tropical Queensland (MTQ) and can be considered a long term project.

THE PANDORA FOUNDATION

The Pandora Foundation was established in 1995; its purpose was to carry out fundraising in North Queensland so the Queensland Museum could capitalise on the subsidy offer made by the Queensland Government, which promised a $1 subsidy for every $2 raised by the Foundation, up to $1 million to a reinvigorated and redefined Pandora Project.

The Townsville-based Pandora Foundation Committee oversaw the establishment and management of the fund and was invaluable in seeing this important project proceed. The Committee Members were drawn from business and community leaders in Townsville: Ald. Tony Mooney, Richard Power, Keith Brazier, Jennie Roberts, David Carmichael, Richard Ferry, Lindsey Plante, Fay Barker, Clive Scott, Stephen Paul, Chris Boyle and Marion Nancarrow.

Queensland Museum and the author wish to acknowledge the generous contributors to the Pandora Foundation:

Benefactors
Townsville City Council ($500,000)
Ansett Australia ($150,000) *
Ergon Energy Corporation Ltd. ($100,000)
Thuringowa City Council ($100,000)
Townsville Port Authority ($100,000)
Ten Queensland ($100,000*)

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Mike Carney Toyota
Northwest Constructions Pty.Ltd
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Retireinvest
Roberts (CBE), George V.
The J F Gleeson Family Trust
Townsville Thuringowa Water Supply Board
Wilkins, L.E.

**in kind support*

Donors (to $1000)
Badgery, Mr R M
Brazier, Keith & Jennifer
Broomhead, Richard & Rose
Butler, Trevor & Margaret
Byte Centre
Crossland, Chris & Jan
Curtain, Michael & Jennifer
Edwards, Ms Wendy
Goodsell, Mary
Gro Sea Pty. Ltd
Hoff, Barbara
Hooper, Max & Palm
Hugh E Urquhart Real Estate
Kipco Pty. Ltd
Lyons, John
MacCallum & Partners
McArthur, Jon & Margaret
Nadicprint Services Pty. Ltd
Paul, Stephen & Mary
Pearse, Elizabeth
Pickard Associates
Power, Richard & Gillian
Pure Pleasure Cruises
Ray White Kirwan
Ringwell Pty. Ltd
Roberts, Susan

Santalucia Group
Short, Jan & Warren
Talbot, Prof. Frank
Toohey, Ms Robyn
Townsville Slipways
Townsville Trade Waste Pty. Ltd
Trojan Insurance Brokers P/L
Turl, Peter & Michele
Wallace, Dr Carden
Watson, Sir Bruce
Zell, Mr Len

ACKNOWLEDGEMENTS

In addition to financial support from the Pandora Foundation, people from all over Australia and overseas gave freely of their time or services by participating in and/or supporting the Queensland Museum's Pandora Project. Queensland Museum gratefully acknowledges the financial assistance, professional assistance and/or support in kind, including staff, provided by:

Western Australian Maritime Museum (Graeme Henderson, Geoff Kimpton, Pat Baker, Mack McCarthy, Scott Sledge, Jon Carpenter, Dena Garratt, Brian Richards, Jeremy Green and Corioli Souter)

Australian National Maritime Museum (Antonia Syme, Sue Bassett, Kieran Hosty)

AMOL (Sarah Kenderdine and Thomas Hoffman)

Tasmanian Department of Primary Industries, Water & Environment (Mike Nash)

Heritage Victoria (Ross Anderson, Peter Harvey)

NSW Heritage Office (David Nutley)

South Australia Department of Environment & Heritage (Bill Jeffery, Terry Arnott)

Townsville General Hospital (Drs Stuart Lavender, David Griffiths, Tom Fallowfield)

Environment Australia (Heritage & Conservation Office)

Royal Australian Navy (HMAS *Moreton*)

Royal Australian Air Force

Queensland Rail

The Dive Bell (Colin Hodson)

Oceaneering Australia P/L

James Cook University (Peter Veth and John Campbell)

National Tidal Facility,

National Geographic Society

National Photo

King Gee Clothing

Concut P/L

BP Australia P/L

NEC Information Systems, and by the following **volunteers**:

Pandora Volunteers & Friends: Len Zell (aka Kev Kluge), Kaye Walker, The Dive Bell, Peter Sullivan, Heath Bell, Cos Coroneos, Annabel Wood, Mark Lawrence, Peter Illidge, Elizabeth Evans-Illidge, Howard Smith, Coleman Doyle, Nigel Erskine, Ian Lawrence, Vivienne Moran, John Read, Dennis Lee Sye, David Wood, Stirling Smith, Malcolm Venturoni, Brad Duncan, Jaco Boshoff, John Gribble, Rhiannon Walker, Colin Ward, Jane White, Brian Richards, David Bell, Gavin Ericsson and Sean Rubidge.

MTQ Volunteers: Jan Guyers, Lynn Christie, Jackie Angrove, Lester Qualischefski, Bronwyn Jewell, Zollie Florian, Mick Jackes, Sue Rogerson, Vic Singleton, Patti Martin, Beth Thorne, Laurie Willoughby, Florence Yates, Jenny Stephenson, Jenny Askey-Dooran, John & Dorelle Jewell, Peter Wallen, Fiona Gregory, Lyn Entriken, Hanna Whiska, Leeza Goon-Chew, Marlene Trennerry, Bobbie Cox, Beth Herron, Bill O'Sullivan, Geraldine Hermann, Katrina Bartlett and Rikke Hammer

The author would also like to acknowledge the contribution of former colleagues in the QM's maritime archaeology/history, photography, conservation, IT,

graphics, library, marketing, publications and public programs sections at QM's Southbank campus and at MTQ in Townsville. Special mention should be made of Pandora Foundation-funded, temporary staff Janet Campbell, Freya Bruce, Jessica Blaxell-Turner, Peter Illidge, Susan Kennedy, Vivienne Moran, Alison Mann, Bill Jeffery, Alexandra Durani, Megan Absolon and Louise Jorgensen. Thank you also to the QM team on this publication: Geraldine Mate, Alison Mann, Tanya Edbrooke and Vivienne Moran who also drew the artefacts.

Finally, the author's very special personal thanks go to Dr Nigel Erskine and Graeme Henderson who commented on an earlier draft of this report. Also to Richard Power, Jennie Core-Roberts, Dru Hartley, Gareth and Helen Hunt (Dulwich, UK) Stuart Lavender, Jennifer Freeman, and Len Zell; and to John McGregor, Denis Toy and Mike St James who skippered the expedition vessels *Undersea Explorer* and *Pacific Conquest* and their crews during the 1996 – 1999 expeditions.

And of course to all of the members of the QM's 1996, 1997, 1998 and 1999 expedition teams. Boy o' boy, did we all do well, or what? I'll look back at those years and count them among the most exciting and rewarding of my life – my most cordial thanks to all of you for being there and 'making it so'!

1996 QM Expedition team

Peter Gesner	Kieran Hosty
Janet Campbell	Bill Jeffery
Gary Cranitch	Len Zell
Warren Delaney	Mike Nash
Freya Bruce	Peter Veth
Tom Fallowfield	Howard Smith
Dena Garratt	Peter Illidge
Colin Hodson	Libby Evans-Illidge
Geoff Kimpton	John Read

1997 QM expedition team
Advanced party (14/1 - 22/1/97)

Leonard Bowie	Hans Jussiet
Bob King	Peter Illidge
Dave Bell	John Read

Main party

Kieran Hosty	John Read
Janet Campbell	Dena Garratt
Len Zell	Antonia Syme
Gary Cranitch	Colin Hodson
Stuart Lavender	Cos Coroneos
Vivienne Moran	Freya Bruce
Nigel Erskine	Peter Gesner
Jessica Turner	Warren Delaney
Michael Nash	Paula Tomkins
Kay Walker	Peter Illidge

1998 QM Expedition team

Bill Jeffery
Janet Campbell
Annabel Wood
Dave Bell
David Griffiths
David Hallam
Warren Delaney
Jessica Turner
Gary Cranitch
Christine Ianna
Peter Gesner
Ross Anderson
Vivienne Moran
Nigel Erskine
Ian Lawrence
Len Zell
Dena Garratt
Kieran Hosty
Mark Lawrence
Stuart Lavender
Sue Bassett
Mike Nash
Cos Coroneos
Peter Illidge
David Nutley
Brian Dermody
Geoff Kimpton
Alison Mann
Coleman Doyle
John Read
Per Akeson
Terry Arnott
Maurie Vierow
Denis Lee-Sye
Freya Bruce
David Wood
Malcolm Venturoni
Howard Smith

1999 QM Expedition team

Janet Campbell
Peter Gesner
Dave Bell
Jaco Boshoff
Greg Chappelow
Warren Delaney
Len Zell
Kieran Hosty
Coleman Doyle
Gary Cranitch
John Gribble
Jeremy Green
Thomas Hofmann
Stuart Lavender
Vivienne Moran
Brad Duncan
Simon Adey-Davies
Amanda Pagliarino
Bill Jeffery
Geoff Kimpton
Dennis Lee-Sye
Alison Mann
David Nutley
John Read
Gavin Ericson
Graham Schulz
Jessica Turner
Sue Bassett
Colin Ward
Sean Rubidge
Brian Richards
Corioli Souter
Rhiannon Walker
Jane White
Ross Anderson
Annabel Wood
Peter Illidge
Kevin Hubbard
Mark Lawrence

❑ ENDNOTES

1. Commonwealth of Australia Gazette, S 270 (25 November 1977) declaration under Section 5, *Historic Shipwrecks Act* 1976.
2. 'Entrance Cay' was officially renamed Moulter Cay in 1984, in recognition of William Moulter's humanitarian deed towards the trapped prisoners in *Pandora*'s Box.
3. Moulter Cay, Cay 11-088 and Cay 11-091.
4. The third cay is designated as Cay 11-088 by the Great Barrier Reef Marine Park Authority and as Carmichael Cay by DERM, but is unofficially referred to (by the Queensland Museum's excavation team) as 'Melbourne Cup Cay'; GBRMPA refers to 'Escape Cay' (also referred to as 'Unfortunate Pandora's Cay') as Cay 11-091.
5. Built in 1844 and restored by the Queensland Government in 1994.
6. Also referred to as *Pandora's Unfortunate Cay* (cf. Atkins in Primary Source 5).
7. Commonwealth of Australia Gazette, S 110 (5 June 1981) declaration under Section 7 (*Historic Shipwrecks Act* 1976).
8. Ron A. Coleman.
9. Peter Gesner and Warren Delaney respectively.
10. Later referred to as Pandora Project Stage 1, this series comprised five expeditions involving some excavation – during 1983, 1984, 1986, 1993 (Gesner, 1998) and 1995 (Coleman & Henderson, 1983; Henderson, 1986; and Gesner, 2000).
11. R. Coleman, P. Gesner, C. Ianna (QM) G. Henderson, P. Baker, J. Carpenter, B. Richards, M. McCarthy, S. Sledge (WAMM), B. Jeffery (SA Heritage), P. Clark, , B. Turner, A. Darroch, T. Drew, D. Bosisto; Volunteers: R. Gerrard, S. May, Warren Delaney, D. Norman, T.C. & M. Good (MAAQ).
12. A project organised in conjunction with UQ's Department of Microbiology PhD student Jodie Guthrie and Dr Linda Blackall (Guthrie 2002).
13. Since the 1993 expedition, the Queensland Dept of Health seconded to each QM expedition team a hyperbaric medicine specialist from Townsville General Hospital.
14. Specifically the Australian National Maritime Museum, the Western Australian Maritime Museum, Heritage Victoria, the NSW Heritage Office, the South Australia Heritage Office and Tasmania National Parks & Wildlife Service.
15. The following team members were trained by the Pandora Project in occupational diving – as required by Queensland WHS legislation: Janet Campbell, Gary Cranitch, Freya Bruce, Jodie Guthrie, Christine Ianna, Paula Tomkins, Vivienne Moran, Sue Bassett, Nigel Erskine, Stirling Smith, Ross Anderson, David Bell and Michael St James.
16. Core QM Pandora Project team staff in 1995/6 and 1996/97 were Gesner, Delaney, Cranitch, Campbell, Ianna and Bruce.
17. From Anson's *Centurion*; Byron and Wallis' *Dolphin*; Carteret's *Swallow*; Cook's *Endeavour*, *Resolution* and *Discovery*; Vancouver's *Discovery*, to Flinders' *Investigator*.
18. Selected at the time from a number of vessels being refitted (for Channel service) in Chatham, during the RN's "Spanish armament of 1790".
19. It has been suggested that Bentham's position as the purser – i.e. one of the *Pandora*'s 'standing' officers – may have been the reason the Admiralty actually selected, at Sir Joseph Banks' behind the scenes behest, the *Pandora* for this mission. As one of Banks' protégés, Sir Joseph thereby had ensured that Bentham would be well-placed to collect 'curiosities' on his behalf (Campbell & Gesner, 2000: 126-7).
20. Or 'Nelson's Navy' – being a frequently used label to describe the Royal Navy during this period.