Archaeology of *Pandora*


shell armband

There are many reasons why the *Pandora* is regarded as one of the most significant shipwrecks in the Southern Hemisphere.

Excavating such an historic wreck is a painstaking process.

Unlike the majority of historic ships that ran aground on the Great Barrier Reef, the *Pandora* did not break up on the reef. Refloated by her crew, she later sank virtually intact and settled into the sea bed. Covered by sand, the bulk of the artefacts remained more or less undisturbed in their original setting inside the ship.

Archaeologists use the term 'Pompeii effect' to describe this kind of wreck setting. Just as in Pompeii, during the heyday of Imperial Rome, daily life on the *Pandora* came to a sudden halt as a result of a catastrophe. Pompeii was destroyed by an earthquake and was subsequently covered by a layer of volcanic ash; the *Pandora* sank after striking a submerged reef and was covered by a layer of sand. Both covering layers acted as a perfect preservation medium.

Archaeological excavation of the *Pandora* will provide artefacts to reconstruct:

- aspects of daily life onboard, such as diet, recreation, hygiene and medicine — not only does this tell us about life onboard an 18th century British warship, but we can also make wider inferences about society and life in general during the period;
- the cultural background of many of the crew, because many artefacts can be attributed to individuals onboard;
- the extent of exchanges between the *Pandora*'s crew and the inhabitants of the Pacific Islands whom they encountered on their voyage;
- 18th century customs in the Royal Navy and maritime exploration of the Pacific.

The Pandora's real-life objects are material evidence that can shed new light on a host of questions about late 18th century European culture and maritime exploration in the Pacific.

Thus, the intact wreck remains offer archaeologists a unique opportunity to retrieve, from a functional context, a precisely dated collection of late 18th century British material culture and nautical technology.

Significance

The significance of the *Pandora* wreck has been assessed in terms of its historical, scientific and social values.

Historical significance

The *Pandora* wreck is of historical significance due to its direct association with the mutiny on the *Bounty*. The mutiny can be characterised as one of the most well-known (perhaps over-dramatised and romanticised) sea stories in the annals of maritime history-a saga that continues to attract attention and historical investigation.

The *Pandora*'s last voyage and the exploits of her crew are also well documented. The primary sources relate the details of the voyage-for instance, the capture and imprisonment of 14 *Bounty* mutineers and the circumstances of the *Pandora*'s wrecking-and also provide material for research of 18th century European maritime discovery in the Pacific Ocean.

European maritime discovery in the Pacific during the 18th century was a multi-national matter and is well documented. As far as the British role is concerned, it began with William Dampier's voyage in the *Roebuck* to the South-West Pacific in 1699 and ended in 1803 with Matthew Flinders' circumnavigation of Australia in HMS *Investigator*.

The published and unpublished accounts and illustrations by the host of sailors, scientists, artists and scholars who took part in these voyages contributed to the radical social and cultural changes that occurred during the 18th century in Europe. Many of

the changes in philosophy, literature, the arts, humanities and in natural history can be directly attributed to findings and insights gained from this discovery activity.

Archaeological significance

The *Pandora* wreck site is of archaeological significance for three key reasons:

- it contains an extremely well-preserved and coherent artefact assemblage.
- it presents a good opportunity to study marine archaeological site formation processes in tropical waters.
- It contains an assemblage of 18th Century Royal Navy material culture.

The wreck offers archaeologists a unique opportunity to retrieve, from a relatively undisturbed context, a precisely dated collection of 18th century British material culture and nautical technology. As such, the *Pandora* wreck provides material evidence with which to answer a host of questions pertaining to 18th century European material culture and maritime discovery in the South Pacific, specifically related to the Royal Navy

For instance, study of the artefacts from the wreck can reveal detailed aspects of early contact and exchange between European and Oceanic societies, or of the minutiae of the material culture, nautical technology and organisation of life onboard European sailing ships engaged on long inter-ocean voyages. Thus, it is also of relevance for comparative studies with assemblages from other RN wrecks sent on long inter-ocean voyages in the 18th Century - for instance the wreck of HMS *Swift* (1770) off Patagonia- and for the investigation of the early Australian colonial period.

The *Pandora* was a British naval vessel which was equipped, provisioned and manned by the same organisation-the Royal Navy-that played a prominent role in 18th century Pacific exploration and in the management and implementation of plans to send out the early convoys to the fledgling colony of New South Wales. Like the *Pandora*, HMS *Sirius*-the flagship of the First Fleet-was a Royal Navy ship also operating far from home in the same period.

Significance to conservation science

The *Pandora* wreck is of significance to conservation science as the wreck offers a unique opportunity to determine the efficacy of methods to preserve in-situ a man-made wooden structure in a tropical marine environment.

In particular, the effects of human impact-such as through archaeological excavation-on the longevity of a wooden ship's hull remains can be assessed and experiments carried out to determine the most effective and cost-efficient ways of counteracting or mitigating impacts (for instance, accelerated bio-deterioration caused by human disturbance of the seabed-in particular by the reintroduction of oxygen-rich waters into more or less stable anaerobic environments).

Educational significance

The *Pandora* wreck is significant to education as it provides material evidence that can illustrate many facets of daily 18th century shipboard life.

Imaginative interpretative programs provide resources for educational projects designed to relate learning to real-life historical experiences, and to encourage curiosity and cross-cultural awareness. Through such projects, children and adults alike can be made aware of the role of historical research, archaeology and conservation as a means of preserving and presenting tangible information about past life ways and past cultural values.

By the way, the fireplace recovered from the *Pandora*'s great cabin served as a model for that of the *Endeavour* replica as well as a reconstruction of a fireplace for the Great Cabin in HMS *Victory*.

Significance to cultural tourism

The *Pandora* wreck is significant to tourism due to its potential to be developed as an important resource for cultural tourism.

Imaginative museum exhibits of the *Pandora*'s artefact assemblage have the potential to diversify the range of tourist attractions. The wreck, as well as archaeological activity at the wreck site, also has the potential to be featured as a major item

of interest in cultural tourism itineraries. With the development of an appropriate on-site interpretation program, visitors to the site (divers and non-divers alike) can obtain first-hand experience of the role of archaeology and conservation.

Research design

In 1994, a rationale for Stage 2 of the *Pandora* Project was formulated in a management plan, written by the Museum's Curator of Maritime Archaeology, Peter Gesner. Stage 2 was devised as a series of five major excavations to focus primarily on the stern and bow sections of the wreck-both areas were known to contain objects reflecting the personal lives and professional activities of a crew on a late 18th century British warship in the South Pacific.

Archaeological excavation there was expected to reveal evidence of "real life" material culture, objects in daily use during a period in British history which was undergoing far-reaching social and economic change-i.e. during the so-called "commercial revolution" which had given rise to a consumer society in Britain from around 1740, and was a pre-condition for the Industrial Revolution.

Analysis of the personal possessions and professional equipment used by the *Pandora*'s crew presented an archaeological means to interpret the tastes and requirements of a typical late 18th century British naval crew. The artefact assemblage would provide useful evidence to assess to what extent seafarers-sub-cultural groups, also described as fringe dwelling groups-participated in, or were susceptible to, the same economic, social and cultural changes influencing other strata of late 18th century British society.

Methodology

Consolidating the excavation techniques and perfecting the artefact recovery procedures developed in the 1980s during the *Pandora* Project's exploratory expeditions (Stage 1), the excavation plan for Stage 2 envisaged five major seasons of excavation, primarily in the wreck's bow and stern sections

In 1995, it was thought that upon completion of three major seasons (1996-1998) in the stern area, a fourth season (1999) would see excavation start in the bow section; and perhaps also to begin on the area under the wrecked hull's stern, where it is was considered likely that objects that had toppled off the disintegrating upper deck would have been deposited.

A fifth season (2000) would continue in the bow and also envisaged a preliminary probe in the midship section. Here the expectation was to recover a representative sample of the items carried in the *Pandora*'s holds (i.e. items reflecting the *Pandora*'s nautical technology). Although information on this type of material was known to be of interest to nautical archaeologists and historians of science and technology, it was not given the same priority as the objects reflecting the *Pandora*'s social fabric and crew's day-to-day life, known to be located predominantly in the stern and bow sections.

There were several good reasons to prioritise. One was because other, very comprehensive archival and printed sources about 18th century nautical technology existed; there was therefore less urgency to work amidships. It was felt that a small sample of material from the midship section would provide the desired information about nautical technology.

Another reason for prioritisation was the expense of fieldwork and conservation. It was estimated that at least A$3 million (in 1995 figures) would be needed to carry out a consecutive series over five excavation seasons (1996-2000) and to provide for conservation and curation. Also to provide for extensions of temporary staff contracts for several years beyond 2000, to continue assisting the Museum's Maritime Archaeology section with their stewardship, analysis, development and interpretation of the *Pandora* collection.

Fieldwork

Due to the remote and challenging location of the *Pandora* wreck, expedition teams have always included people with a mix of experience, qualifications, skills and talents.

During the 1990s, expedition teams usually comprised:

- eight to ten diving archaeologists
- six to fourteen assisting divers
- at least one conservator

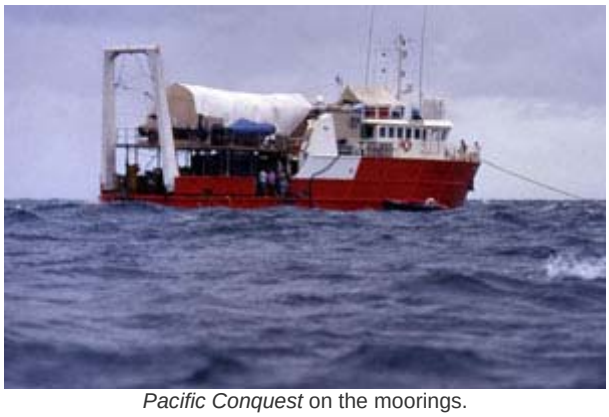
- a finds registrar
- an underwater photographer
- an underwater video camera operator
- two dive technicians
- a dive supervisor
- a medical doctor with experience in hyperbaric medicine.

In 1998 and 1999, the expedition teams comprised 40 to 45 people.

Moorings and Diving

Moorings

A four-point mooring system was installed in 1994, providing a means to secure the expedition support vessel over the site in a fixed position. Having the mother vessel TSMV *Pacific Conquest* securely moored directly overhead was a critical factor for effective and safe use of Surface Supply Breathing (SSB) equipment. Each mooring point comprised a 750 kg Danforth anchor, approximately 55 metres of 20 mm stud link chain and a one tonne dumper block.



Pacific Conquest on the moorings.

The 1998 expedition saw excavations continue in the stern section with additional excavations being conducted in the bow section. These were carried out at the same time by two teams diving simultaneously.

The mooring system was adjusted and improved by Michael St James, the skipper of the *Pacific Conquest*, by the addition of a fifth mooring point. The team working in the bow of the wreck dived from the mother vessel's stern, while the team working in the stern of the wreck were deployed amidships.

Diving

From the 1993 expedition onwards, all divers were trained in the use of Surface Supplied Breathing (SSB) equipment. This was the preferred diving equipment as it enabled excavators to spend longer times on the seabed than possible with SCUBA.

Divers on the 'deco' stop (Photo: Brian Richards).

During the 1980s, museum excavators had only used SCUBA gear. This had limited the length of time divers were able to stay underwater, either because of a limited air supply or because most recommended dive tables indicated (non-decompression) dive limits not exceeding 17 minutes. Depending on the diver, the maximum depth (36 m) and whether heavy or light work was being performed, effective dive time on SCUBA was only 11 to 17 minutes per dive.

With SSB gear, however, as long as air was pumped to them, divers were able to stay underwater longer. Theoretically, they could be submerged for hours, however, this never happened as eventually the divers would get too cold (even in tropical waters) and, more importantly, would be exposed to another complicating (physiological) factor associated with diving on air: decompression sickness-or the "bends" as it is commonly known.

At the *Pandora* wreck, a typical SSB dive profile using the Canadian DCIEM Decompression Tables, allowed 45 minutes of "bottom time" and a two minute ascent from the seabed to a decompression stage ('deco stop'), rigged at exactly 9 metres depth under the hull of the mother vessel. Here, divers subsequently decompressed for 30 minutes breathing 100% oxygen; lastly there was a one minute ascent from 9 metres to the surface.

This 78 minute dive was performed once a day by each diver. However, after six consecutive days of diving, every diver was rostered off for one day of so-called "nitrogen de-gassing"-as an added safety precaution against "bending" the divers.

On the dive deck


The work deck, the RCC and dive staging areas.

Although SSB equipment delivered safer, more effective and cost efficient diving operations, it did mean that more equipment had to be taken onboard to support the diving operation. One item of absolute necessity was a recompression chamber (RCC) with all of its auxiliary plant (such as liquid oxygen tanks and compressors).

This had to be kept on the dive deck in case of emergencies, when immediate access to the RCC would be required. Hence the need for a large, uncluttered work deck capable of accommodating the chamber, as well as the rest of the gear needed to stage two SSB dive teams (four divers) simultaneously.

Along with all the other equipment to be taken-such as the pumps to operate two water dredges, the small three metre inflatable boats as tenders, fuel, liquid oxygen tanks and cylinders, tools, a portable field laboratory for on-deck conservation, artefact registration and artefact processing-it is obvious why a large mother vessel like the *Pacific Conquest* was required. The expeditions required a vessel capable of carrying equipment to support an expedition team of up to 45 people.

Excavation


Recording hull detail inside the wreck (Photo: Gary Cranitch).

Often the water was warm (about 26°C) but at other times relatively cool (19°C). At times bait fish were prolific. In fact they were a huge nuisance as they often blanketed the excavation area, obstructing visibility and causing larger fish to dart in and out of view while they fed on the small fry!

Recording equipment such as tapes and slates were used underwater-even an ordinary pencil to write with. Each artefact was measured-in from at least four grid reference points. All this data was then transferred to an artefact record sheet and into a computer program that converted the slope distance measurements into X/Y/Z grid coordinates.

The archaeological methods had to be simple and effective. Also, all the work needed to be carried out carefully and precisely, whether it involved removal of sediment to uncover the ship's remains and the artefacts, or measuring-in, or the recovery of artefacts.

When artefacts were being excavated, they could not always be seen, either because they were very small and difficult to distinguish, or sometimes hidden in concretions. A small area could contain a wide variety of objects, ranging from tiny and fragile to large and robust, so-called, concretions.

At an average depth of 33 metres, and "digging" up to 2 metres into the seabed, diving time (using surface supplied breathing gear) was only 45 minutes per diver per day-followed by 30 minutes decompressing on a stage at 9 metres depth breathing 100% oxygen. All in all, a diver was underwater for approximately 78 minutes every day. Sometimes there were strong currents. Clear water could enable visibility of up to 50 metres; but sometimes visibility of as little as two metres made conditions on the seabed a little dark and gloomy.

A water dredge was used to gently remove sediment. Because it works like a vacuum cleaner, care had to be taken not to accidentally "clean up" artefacts. Occasionally, however, objects were inadvertently sucked up the dredge. At the end of each dive, excavators would spend time sifting through the spoil heap to see if any artefacts had been overlooked. And some were found there-surprisingly no worse for wear, despite the unceremonious journey through the water dredge's exhaust pipe. Not recommended practice however!

Bowls in situ(Photo: Brian Richards).

Field conservation

Conservation starts on the seabed. Once uncovered, the objects are secured by the archaeologists (sometimes wrapped in hessian cloth) in sturdy containers.

Then they are packed in crates and raised by winch to the expedition vessel. On deck, the registrar and registration assistants subsequently do their work, before handing over the documented objects to the on-site conservator(s) for further handling and packing. After this, the objects can safely make the journey from the expedition vessel to the museum's conservation laboratory.

The *Pandora*'s artefacts have been immersed in salt water for over 200 years. They differ greatly in their material composition-ranging from wood, leather and hemp, to brass, iron and glass. Many are so-called "composites"-made of more than one material; this makes conservation more difficult. They have been impregnated with salt and are often degraded. Hence, they are very delicate and will deteriorate at a rate several thousand times faster when brought to the surface and exposed to air.

Conservation processes-including cleaning and salt removal-can take many years. There are no shortcuts; especially large ferrous objects like cannon and anchors take a very long time (sometimes years). All stages are carefully documented and monitored; only then can the artefacts be studied and put on public display. Sometimes so-called "de-concreting" can be started in the field.

Securing a delicate object underwater (Photo: Brian Richards).

Registration

Immediate registration of the recovered artefacts is an essential element of any archaeological fieldwork.

The site registrar has an important role, ensuring that provenance details (the location of an object) are immediately recorded. This also includes documenting the object, for instance by making a sketch, and recording basic dimensions, as well as transferring locational details to the artefact register.

The registrar works closely with the expedition photographer, whose job includes photographing the objects as soon as possible after recovery and ensuring that images are scanned and digitised for record purposes.

All these details, and a photograph of the object, are kept on the artefact record sheet, which represents one of the core data sets for each object.

The registrar also works closely with the on-site conservator who ensures that objects will not deteriorate while basic registration tasks are being carried out.


Registrar at work.