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

by Peter Gesner

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PO Box 3300, South Brisbane 4101, Australia
Phone: +61 (0) 7 3840 7555
Fax: +61 (0) 7 3846 1226
Web: qm.qld.gov.au

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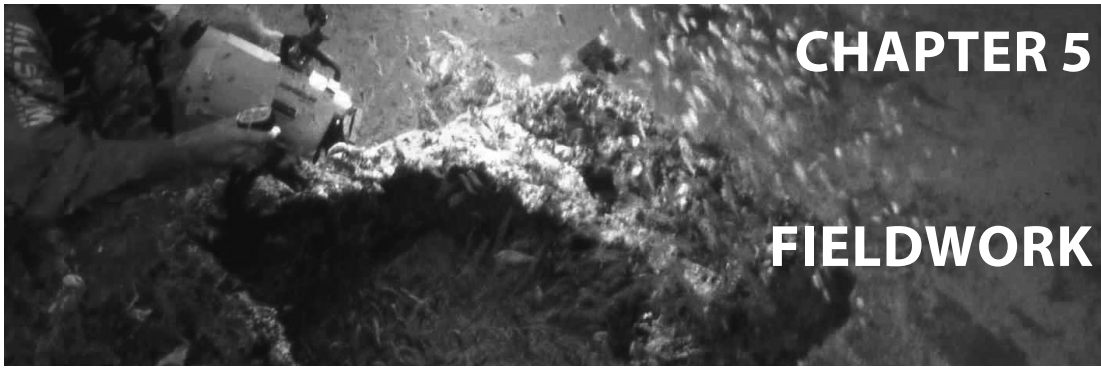

CHAPTER 5

FIELDWORK

The fieldwork planning, diving logistics, excavation methodology, finds registration and on-site conservation for Stage 2 of the Pandora Project consolidated the experience gained during Stage 1 (outlined in Chapter 1). The details of the excavation carried out during the 1990s are presented here. An artefact catalogue, with preliminary analysis of several artefact categories, is presented in the following chapters.

DIVING, LOGISTICS AND OPERATIONS

Located north-west of Moulter Cay, the wreck of the *Pandora*, lies well inside Pandora Entrance. It is exposed from the east to swells from the Coral Sea generated by prevailing easterly winds. Directly to the east, south-east and west, the wreck site is surrounded by two substantial reef outcrops and a pinnacle that offer some protection from those swells. The outcrops and pinnacle also deflect the flow of currents across the site. The pattern of these currents has not been determined as water movement includes gyres caused by random 'upwelling' of water from deeper parts of the adjacent Coral Sea, in addition to tidal currents (pers. comm Len Zell, 1997). Divers working on the wreck have experienced their sudden on-set, strength and unpredictability. Mid-water currents are also erratic and have been experienced moving in opposing directions to surface currents and seabed currents. Depths at the wreck range depending on tides, from 30 to 36 metres sea water (msw).

DIVING OPERATIONS

During the Queensland Museum's 1983-1986 *Pandora* expeditions divers used Self Contained Underwater Breathing Apparatus (SCUBA) for all diving on the wreck. During this early period all dive schedules were regulated by the US Navy Air Diving – No Decompression Stop tables. Using these tables for dives to the depth of >30 msw (100 feet) the maximum 'bottom time' allowed was restricted to 18 minutes. Depending on the diver, maximum depth and whether heavy or light work was being performed, effective dive time on Scuba could vary from between as little as 10 minutes up to a maximum of 18 minutes per dive. The limited dive time had a significant impact on available time for archaeological excavation.

Diving operations altered dramatically from 1993 onwards. Scuba dive operations were upgraded to the use of Surface Supplied Breathing Apparatus (SSBA) (Gesner 1993:14). SSBA operates with the diver being tethered to the support vessel by an 'umbilical' consisting of air supply hose, communications cable and safety line. The diver is in constant voice communication with the deck-bound dive

supervisor (full face masks were used) and have their compressed air supply monitored and controlled from the surface. On the site divers were tethered by over 30 meters (100 feet) of an umbilical.

From 1992 new legislation required that more stringent diving safety standards be adopted at the *Pandora* wreck site. The use of SSBA, combined with the changes to Queensland workplace health and safety legislation, stipulated that Australian Standard 2299 was to be applied to all occupational diving carried out by State agencies. The SSBA diving regime subsequently implemented at the *Pandora* site required all divers to be trained and certified to at least Australian Standard AS 2815.2:- *Training and Certification of Occupational Divers: Air Diving to 30 m* (Restricted) level (Australian Standard 1992: 12). Prior to 1992, occupational divers in Queensland required only recreational Scuba training and experience.

The technical diving operations required the concomitant upgrade in the dive tables used, and appropriate technology and plant to support operations. The US Navy Air Diving tables were replaced by the Canadian Defence and Civil Institute Environmental Medicine (DCIEM) Air Diving tables. The tables required all divers working at depths >30 m (100ft) to complete decompression stops at 9 msw followed by stops at 6 msw, then 3 msw while the diver continued to breath compressed air. Decompression stops are generally factored into diving tables to reduce the risk of the physiological complications of diving on air at depths >10 m. These complications are known as decompression illness (DCI) or colloquially as 'the bends'. The decompression stops required by divers are planned pauses during ascent. 'Decompression' is the combination of the gradual reduction in ambient pressure experienced by the diver during ascent, and elimination of accumulated, dissolved inert gases (nitrogen) from the diver's body. This occurs during the ascent phase of the dive, during pauses in the ascent (decompression stops), and after surfacing. Use of SSBA and the 'new' DCIEM tables created a distinct advantage for maritime archaeological excavation on the *Pandora* – it enabled excavators to spend longer times on the seabed, more than double what had been possible with Scuba.

Diving operations were carried out safely and effectively on the 1993 expedition although it was clear that the anchors carried by the mother vessel could not always be relied upon to hold the vessel in the required position over the wrecksite during initial SSBA diving operations.

Prior to the 1995 expedition further technical improvements in the dive operations occurred when the Queensland Museum was granted dispensation by the Department of Workplace Health & Safety to make further changes to the way decompression procedures were conducted at the wreck site (pers.comm. Colin Hodson, 1994).

This improvement was to conduct all SSBA dive decompression stops with the diver breathing 100% oxygen (instead of compressed air) at 9 msw. DCIEM tables controlled all dive schedules (DCIEM 1992:7-9). This new process required divers to proceed at the end of their dive to the decompression stop at 9 msw where the compressed air supply they had been breathing at depth was changed over to 100% oxygen. The dive supervisor on the deck of the support vessel controlled the delivery of breathing gases to the diver. Following completion of the prescribed decompression stop at 9 msw the diver proceeded to the surface. Incidental dives on the site for the purposes of for example photography or filming continued to be conducted using Scuba.

At the *Pandora* wreck site the typical SSBA dive profile provided for a maximum of

45 minutes 'bottom time', plus a 27 minute decompression stop at 9 msw (breathing 100% oxygen) followed by a one minute ascent (from 9 m) to the surface (Pandora Expedition Operational Procedures, 1998).[1] The upgrade to SSBA and oxygen decompression significantly increased bottom time and enabled safer (i.e. surface controlled) decompression diving.

To safely facilitate this SSBA diving routine two operational changes were required.

The first change was the 1994 installation of a four point spread mooring system[2] (figure 15). A vessel securely moored directly over the wreck site was a mandatory requirement under Australian Standard: AS 2299-1992 Occupational Diving (Standards Australia 1992), when divers were in the water tethered to the expedition vessel by the umbilical. Prior to the installation of the mooring system in 1994 the mother-vessel's anchors had often provided insufficient holding power to maintain a fixed position over the wreck while divers were in the water. This new mooring system prevented the vessel from moving due to wind, waves or current.

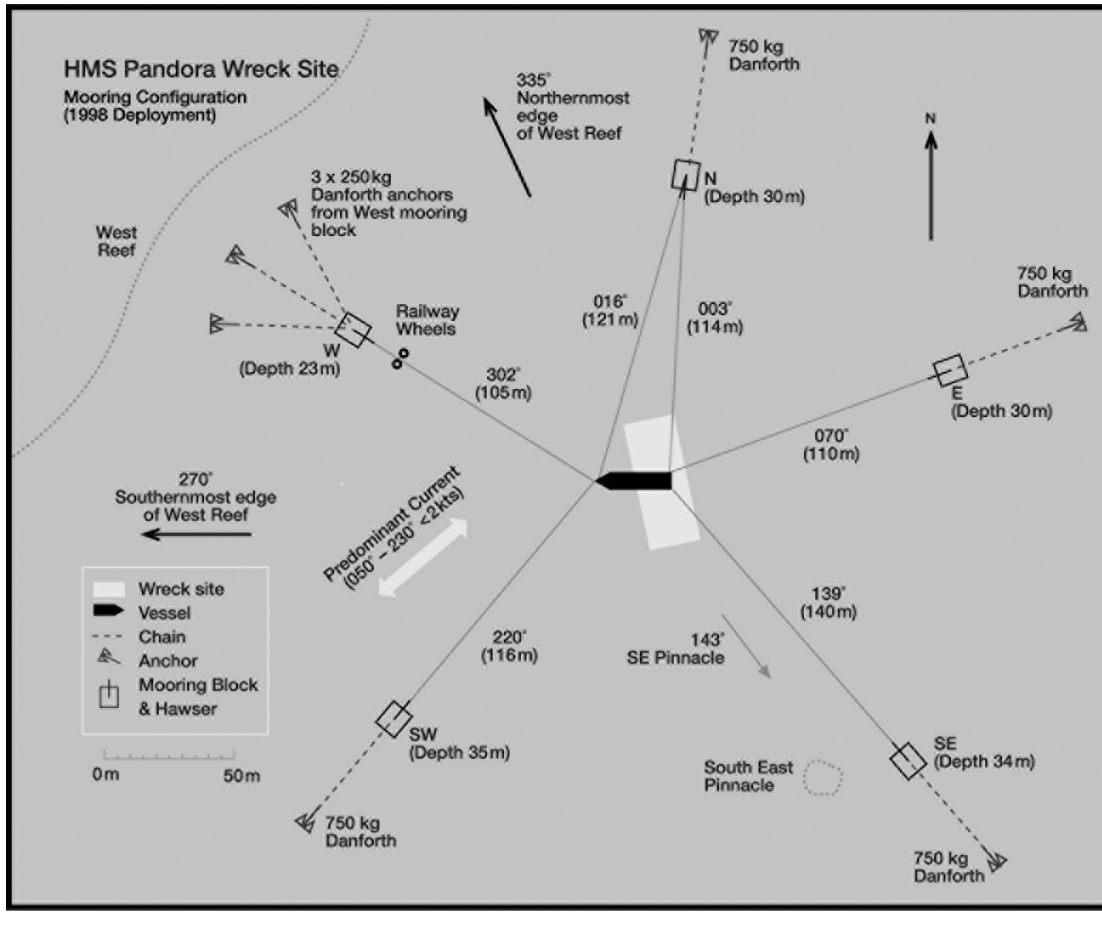

FIG.15.This diagram shows the improved (1998) moorings configuration, i.e. after addition of a fifth mooring point (at E) by *Pacific Conquest* skipper Mike St.James and crew. Extending from the SW, SE, E and N mooring blocks there are 55 m lengths of 22 mm stud link chain leading to 750 kg Danforth anchors. The W mooring block is anchored by three 250 kg Danforth anchors due to the obstruction formed by the slope off 'West Reef'.

With the vessel securely moored directly over the wreck site, it was also possible to rig a stable decompression stage from the hull of the vessel and safely complete decompression stops.

Having the decompression stage fixed at 9msw depth was critical when divers were undertaking decompression stops breathing 100% oxygen. Movement of a diver due to currents, wind or wave exposed the diver to increased partial pressure of oxygen, thereby increasing the chance of oxygen toxicity which also compromises diver's safety.

A vessel fixed in position by this mooring system also ensured the recompression chamber, required by the new regulations, was available immediately divers exited the water in the event a missed decompression stop or other underwater event occurred that may have required immediate recompression chamber access (Australian Standard 1992).[3]

The second operational change to occur during Stage 2 fieldwork called for expeditions to be carried out during the 'cyclone season' i.e. in January to April, instead of between September and December as had been the case during the 1980s. Generally south-easterly winds (i.e. the South East Trades)prevail in the Coral Sea from approximately May to late November. During the fieldwork conducted in Stage 1 of the *Pandora* Project, it was found winds could increase to >20 knots by midday. Because the site is fully exposed to a swell generated out in the Coral Sea[4] this frequently made for choppy surface conditions at the wreck site. Working conditions during the 1980s were often too rough or marginal for diving; safety considerations always prevailed and consequently considerable 'down-time' was experienced.

Conducting field operations during the cyclone season had some advantages. Cyclone season in this part of the Coral Sea can be characterized by frequent periods of exceptionally calm (millpond or 'glass-out') conditions. These conditions can last for 2 to 3 days. When 'millpond' conditions did not occur, winds during the cyclone season were frequently found to be light and more importantly, they generally blew from westerly and northerly directions, where fetch is not sufficient to generate swells to affect diving operations.

From the 1995 expedition onwards, considerably fewer days per expedition were unproductive due to adverse weather (table 8).

The four point mooring system installed prior to the 1995 expedition season was upgraded to a five point system for the 1998 expedition at the request and urging of Michael St. James, skipper of the expedition's mother-vessel. This improvement made it possible to stay securely moored directly over the wreck site even under marginal weather conditions (figure 16). Diving operations could continue, even when squalls arose (mostly westerly), sometimes gusting to 30 knots. During the expedition years of 1995-1999 only one cyclone interrupted excavation.[5]

Diving operations during the cyclone season were not without problems however. One negative aspect to excavation during the cyclone season was significantly reduced underwater visibility. This was attributable mainly to the debris and alluvial run-off, notably from the Fly River in Papua New Guinea[6] as well as from mainland (Cape York) rivers due to heavy seasonal rainfall.[7]

EXCAVATION AND RECORDING METHODS

In spite of SSBA, limited 'bottom' time remained the main constraining factor for excavation work.[8] Archaeological methods and procedures on the seabed therefore had to be fast, simple and effective. Tasks

Table 8: Number of days expended on various tasks and number of days lost due to weather or due to technical problems. Team sizes and number of artefacts recovered.

	October – December			January – March						
	1983	1984	1986	1993	1995	1996	1997(1)	(2)	1998	1999
Length of charter	61	39	47	28	24	23	14	25	37	29
Port of departure – return	S/pt – Bris	Tvl – Tvl	Cns – Cns	Tvl – Tvl	Tvl – Tvl	Tvl – Tvl	Tvl	Tvl – Tvl	Tvl – Tvl	Tvl – Tvl
Days underway to/from the wreck.	14	7	6	6	6	5	6½	5	5	5
Reprovisioning /team change over days	5	0	1½	0	0	0	0	0	3	0
Site set-up/break down days *	13	6	5	6	4	4½	7	4	10	5
U/water excavation days **	16	18	23	10	11	11½	0	15	16	17
Down-days (weather-affected)	5	6	5½	3	0	2	0	½	1	1
Down-days (due to technical problems)	8	2	7	3	3	0	½	½	2	1
#artefact records	310	257	787	33	170	418	0	446	701	431
Dive team size	18	21	24+9	14	16	15	8	16	32	36

S/pt - Southport (Gold Coast), Tvl – Townsville, Cns – Cairns, Bris - Brisbane

* Includes days spent backfilling at the end of each excavation

**i.e. days spent excavating, or on artefact recovery and/or recording of excavation work

FIG.16. *Pacific Conquest*'s dive deck, 1999 configuration. Photo: Gary Cranitch, Queensland Museum.

were required to be carried out precisely, particularly excavation with a water dredge, measurement of the artefacts *in-situ*, and preparation for artefact recovery.

Constraining environmental factors included localised current eddies from upwellings of deep water from the adjacent Coral Sea which could cause problems for divers at depth or mid-water. The same could also bring clear, colder water, increasing visibility to > 50 m. On overcast days, visibility could be reduced to < 2 m, making conditions on the seabed dark and gloomy. At times large schools of 'bait' fish were also a hindrance as they often blanketed the excavation area, obstructing visibility, hampering photography and causing 'larger' fish to dart in and out of view while they fed on the small fish and, perhaps disconcertingly, sometimes even larger fish preyed on the 'larger' ones.

EXCAVATION METHODOLOGY

Throughout the excavation seasons water-dredges proved to be the most efficient method to remove overburden, working in a similar fashion to a powerful vacuum cleaner (figure 17). Care was required not to accidentally dredge up artefacts with the sediment.

Despite the dredge operator's best efforts however, sometimes objects were inadvertently engulfed by the dredge.

FIG. 17. Dredge operations. Photo: Gary Cranitch, Queensland Museum.

Procedure during a dive therefore required excavators to spend some time at the end of their dive combing through the associated spoil heap to check if any artefact had been overlooked and caught in the dredge spoil. Artefacts discovered on the spoil heap were identified in records with the suffix 'Sph' and corresponding grid number on the field registration sheets. In some cases the grid number from which an object came was uncertain; in those cases the annotation was the grid number followed by a question mark.

Artefacts (except those found on spoil-heaps) were measured *in situ* from at least four grid reference points. All measurement sets (i.e. slope distances from the grid reference points) were subsequently transferred to an artefact record sheet and into a desktop computer program that converted the slope distance measurements into X, Y and Z grid coordinates (McCafferty, 1988). Each season of excavation had its unique set of grid reference points, depending on the location within the site's grid matrix.

Once recovered with their location noted, all artefacts were secured for transport to the surface (figures 18 and 19). Method of securing was dependent upon the size and fragility of an object. Smaller objects were packed in sand in a plastic container with lid or wrapped in hessian, placed into a crate to be lifted to the surface by crane or handwinch. The method of lifting large objects was also condition and size dependent.

ARTEFACT REGISTRATION

Immediate registration of recovered artefacts was an essential step in the archaeological process. As in previous years all recovered artefacts were allocated a permanent maritime archaeology (MA) registration number and accessioned into the collection. The finds' registrar's role was to create the field registration card noting

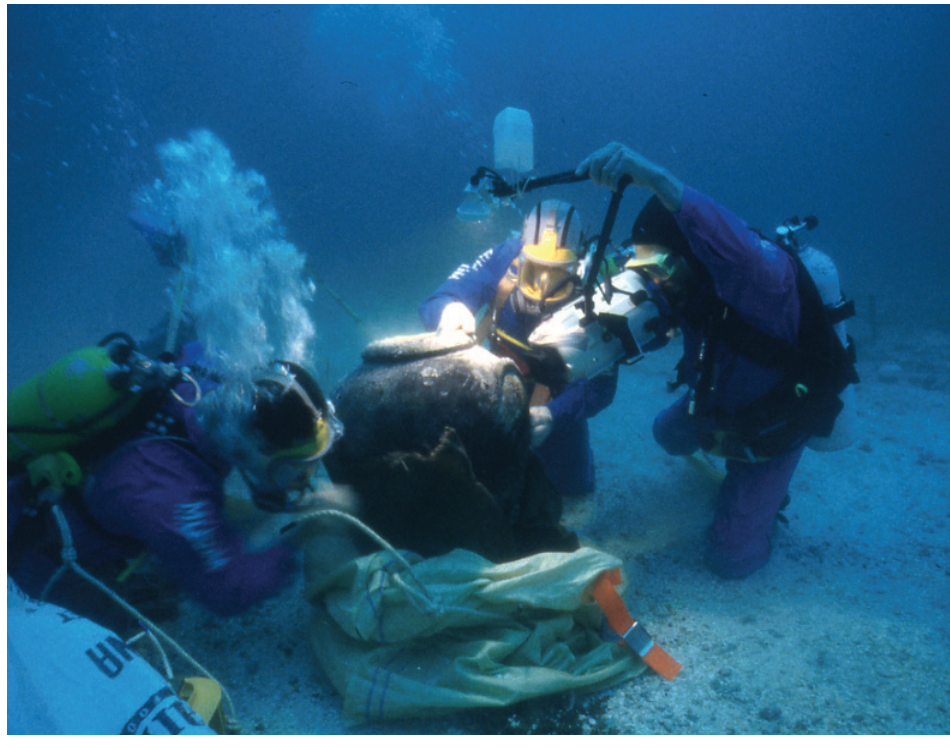

FIG. 19. Olive oil jar lifting operations. Photo: Gary Cranitch, Queensland Museum.

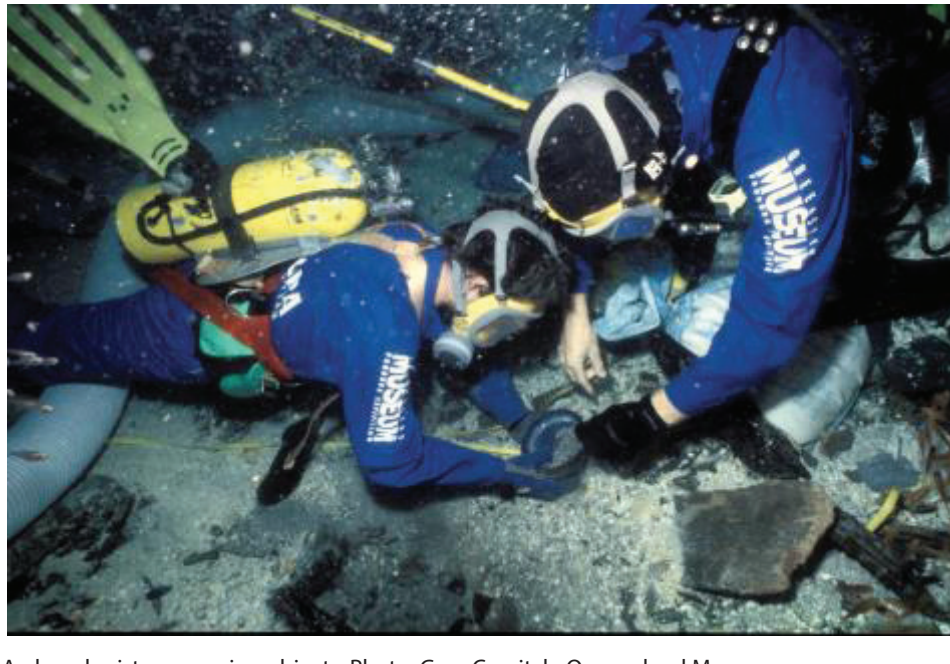

FIG. 18. Archaeologists recovering objects. Photo: Gary Cranitch, Queensland Museum.

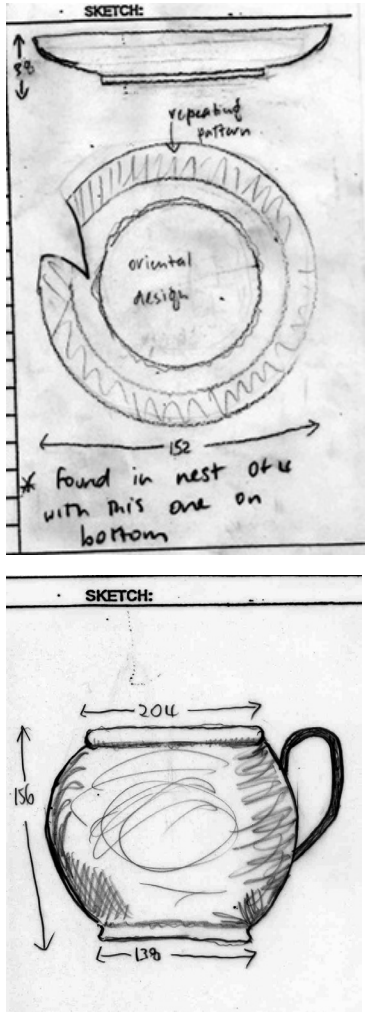

FIG. 20. Examples of artefact sketches on a field registration card.

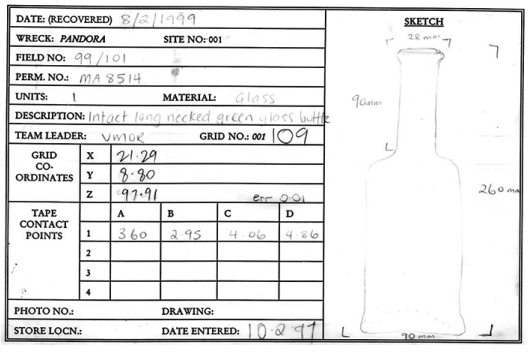

FIG. 21. Example of field registration card.

detail of the artefact that included a drawing or field sketch, basic, description dimensions and provenance details (figures 20 and 21). This information was then transferred from hardcopy to the digital site artefact register. Once diving had been completed for the day the registrar was responsible for creating and populating the artefact's digital record in the Maritime Archaeology Artefact Database. During Stage 2 of the project this was a Microsoft Access® database designed especially for Queensland Museum's Maritime Archaeology Section by QM IT staff member Justin Gough.

The finds' registrar worked closely with the expedition photographer. All artefacts were photographed as soon as practicable after recovery. Digital technology, available after the 1996 expedition considerably streamlined this process.

FIELD CONSERVATION

Artefact conservation commenced on the seabed. Once uncovered, recorded in-situ, secured, lifted to the surface, and registered, artefacts were handed to the on-site conservator(s) for condition reporting and packing. All objects were kept moist or fully immersed in sea water until off-loaded from the expedition support vessel and transported by road to the museum's conservation laboratory. For the 1996-1998 expeditions this required road transport across 1360 kilometres to the Queensland Museum in Brisbane. By the 1999 expedition artefacts were off loaded from the support vessel in Townsville and moved directly into the custom built conservation laboratory and wet storage facility at the rebuilt and expanded Museum of Tropical Queensland in Townsville.

PANDORA PROJECT STAGE 2: FIVE EXPEDITIONS (1996 – 2000)

Due to the remote and challenging location of the *Pandora* wreck and the experience gained during Stage 1 (1983, 1984 and 1986) the Queensland Museum's expedition teams required personnel with a broad mix of experience, qualifications, skills and talents (Gesner 2000b). During Stage 2 (1996 - 1999) expedition teams comprised:

- Expedition leader
- Archaeologists qualified to dive under AS-2815.2; between 7-14 personnel
- General divers qualified to dive under AS- 2815.2; between 7-19 personnel
- On-site conservator (one, minimum)
- Finds – or Artefact registrar and assistant
- Underwater photographer
- Underwater video camera operator
- Dive supervisor
- Dive technicians (2-4)
- Medical officer with hyperbaric medicine experience
- Recompression chamber attendant
- Registered nurse or emergency medical technician
- Crew of expedition support vessel(s)

By the 1998 and 1999 excavation seasons, the expedition teams had grown in number to comprise between 40 to 43 people.[9]

The rationale for the planned five expeditions to the wreck site has been detailed earlier. Following are reports for Pandora Project Stage 2 (1996-1999 seasons).

1996 EXPEDITION

The first expedition of Stage 2 started in January 1996. In addition to completing excavation in grids 70, 87 and 89, which had been the focus of excavation in the 1986 and 1995 seasons (Gesner, 2000: 44-47). A variety of other diving tasks were also scheduled, these included:

- Overall site inspection; involving Scuba dives to inspect features in less-frequented parts of the site, e.g. the memorial obelisk, located at X/Y coordinates 08/20, in the south-west quadrant of the site
- Site photography
- Site maintenance
- Moorings maintenance and excavation 'set-up' tasks
- Extending excavation into new grid squares, specifically into grids 88, 90 and 92 with a view to artefact recovery.

The expedition vessel *Pacific Conquest* departed Townsville on 31 January 1996, and arrived at Pandora Entrance on 3 February, a steaming time of approximately 56 hours. The journey was briefly interrupted – at Scott Reef (off Cape Grafton), and at South Direction Island (off Cape Melville) on 1 and 2 February – to enable the expedition's divers to carry out work-up dives.

The vessel spent the first three days in Pandora Entrance anchored near the wreck, while the expedition team completed various Scuba diving tasks to locate, buoy and attach mooring lines to the 4-point mooring system established by a marine engineering contractor in December 1994 (figure 15). At 15.35 on 5 February 1996 the *Pacific Conquest* was in position, securely moored directly over the wreck (figure 22). Archaeological diving operations with SSBA equipment, including Scuba gear for incidental non-excavation dives, were subsequently carried out between 6 and 20 February. Throughout this period, excavation teams consisting of 2 divers per team completed 244 dives and retrieved a total of 445 registered artefacts (Artefact catalogue: artefact nos. MA4500-MA4945).[10]

On 15 and 16 February tropical cyclone 'Dennis' passed approximately 80 miles south of Pandora Entrance, bringing 60 knot winds and interrupting diving operations for 36 hours. Prior to the cyclone's passage, the *Pacific Conquest* slipped moorings and sheltered in a protected anchorage approximately 4 miles to the north of the wreck. Aside from the

short period of cyclonic weather and some other minor interruptions caused by strong tidal currents the expedition was carried out safely and effectively.

Extent of excavation

The 1996 excavations concentrated in the areas believed to coincide with the commissioned officers' cabins and the wardroom on the lower deck. Archaeological excavation commenced in areas worked during 1995. Excavation continued in grids 70, 87 and 89 and in adjacent grids 88 and 90, along the starboard side of the aft lower deck (figure 23).

According to extant class plans for a Porcupine class frigate, the aft and middle of the three starboard cabins were those assigned to, respectively, the second and first lieutenants (McKay 1992) (figure 24).[11] Excavation confirmed that one of the cabins had very likely been occupied by the first lieutenant, John Larkan; as attested by the discovery of a stamp bearing Larkan's name among a cluster of personal possessions and professional equipment found lying on the lower deck planks (figure 25).

Immediately adjacent to this deck, on the inboard side of the wreck, excavators also uncovered an area thought to correspond with the *Pandora*'s magazine, situated one level below, directly under the first lieutenant's cabins (McKay/Coleman 1992: 58, D2/10). Here a timber partition, or bulkhead, was uncovered, as were two tiers of gun powder kegs aft of the bulkhead, identified as the bulkhead running under the lower deck between the magazine and captain's store

FIG. 22. Expedition mother vessel *Pacific Conquest* in position on the moorings under 'glass-out' conditions. Photo: Gary Cranitch, Queensland Museum.

(figure 26). At least two more tiers of powder kegs – largely intact – were seen lying under the uppermost two exposed tiers.

The upper edge of the magazine bulkhead was exposed intact, revealing a partition of 2-inch oak planking. The planking extended vertically a considerable depth into the seabed. Its' lower edge (i.e. where it joined the platform deck) was not uncovered during the 1996 season[12]. This provided another definitive indicator that the wreck was substantially intact along its starboard side, confirming earlier indications that approximately 25-30% of the original hull appeared preserved as an intact structure.

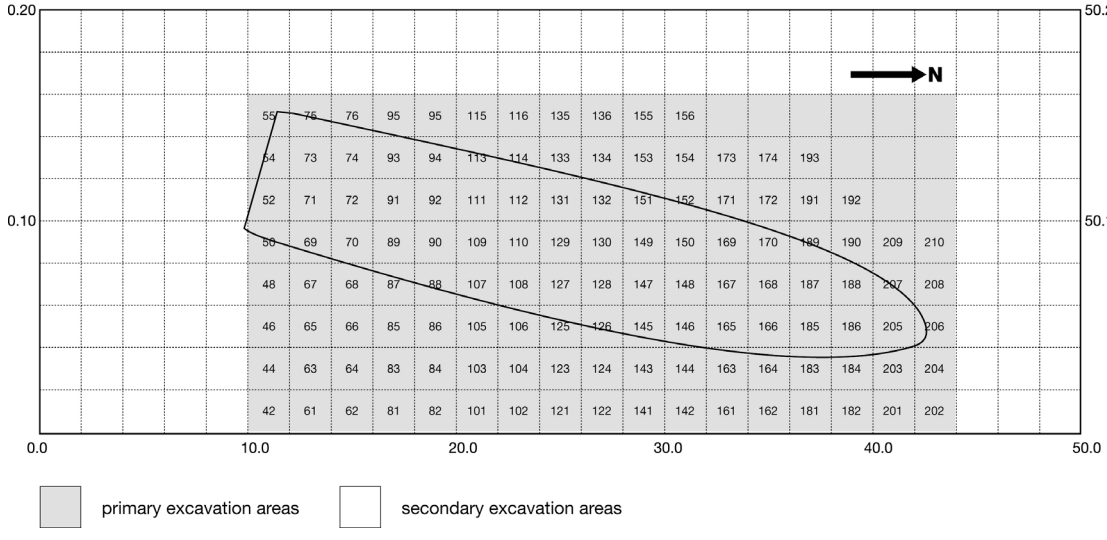

FIG. 23. Pandora excavation Grid Square Diagram

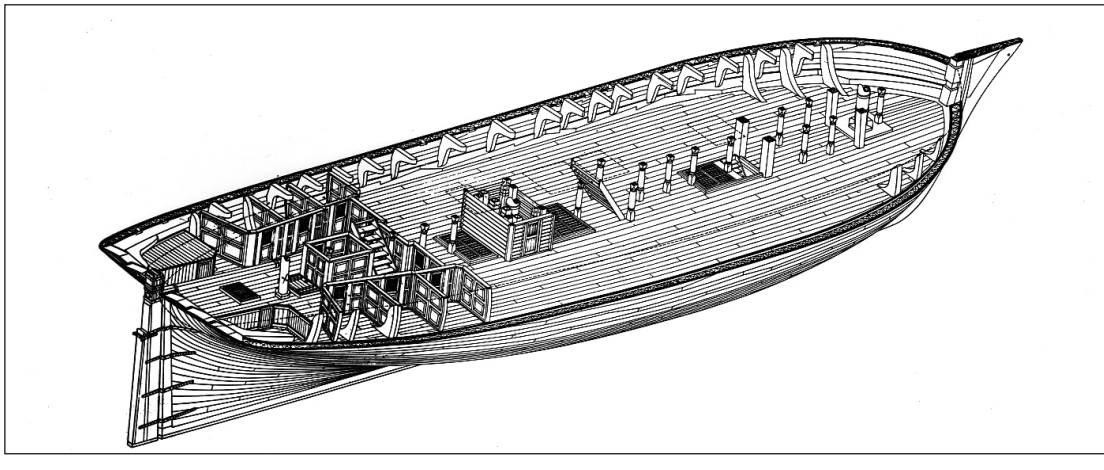

FIG. 24. Lower deck cabin arrangement; isometric view as drawn by John McKay (McKay 1992) based on archived 'class plans' for a Porcupine class frigate; the middle of the 3 cabins on the starboard side is thought to be the first lieutenant's cabin. This deck plan reflects that two forward cabins on each side were taken down at the beginning of the *Pandora*'s voyage. The wardroom is the area between the starboard and portside cabins; the portside cabins were respectively, the purser's, master's and surgeon's cabins. Image courtesy John McKay.

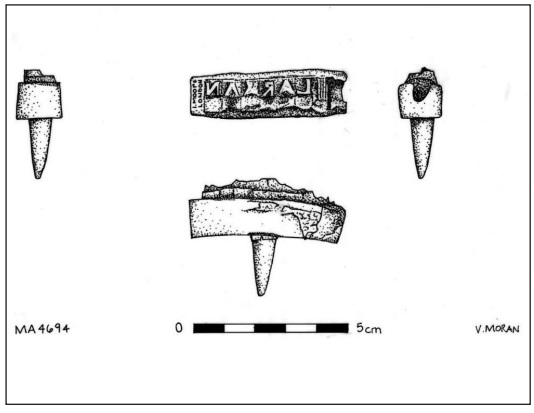

FIG. 25. Stamp bearing John Larkan's name (Catalogue # MA 4694). Drawing Viv Moran, Queensland Museum.

FIG. 26. Top edge magazine bulkhead with Cu alloy powder keg hoops in-situ in the foreground. Photo: Gary Cranitch, Queensland Museum.

FIG 27: Polynesian war clubs in-situ, located along the waterways and against the spirketting, on the lower deck in the area of Lieutenant Larkan's cabin. The deck planks slope from the top left of the image towards starboard. Photo: Gary Cranitch, Queensland Museum.

Material recovered

A cluster of objects made of diverse materials was retrieved from grids 70 and 89. The grid spanned the remains of the aft lower deck planking and starboard sides of the ship.[13] The condition of the artefacts, specifically some of the organic materials, was astounding. Of special note was a cache of Polynesian artefacts – six wooden war clubs (MA nos. 4809, 4810, 4821, 4822, 4852 and 4853) – apparently stowed in the cabin for the voyage to England. They were found in a bundle on top of (lower) deck planking, suggesting that they had been kept together, perhaps wrapped in sail cloth or sacking which had perished since the vessel sank (figure 27).

In addition to this collection of South Pacific 'curiosities', the objects from grids 70 and 89 included other personal belongings, which would have been used for professional purposes (e.g. an octant for navigation) and for private purposes (e.g. a creamware chamber pot, MA 4578). All of the objects recovered during the 1996 expedition were accessioned under MA numbers 4500-4945.

Human skeletal remains were also found in grid 89. These were more numerous and substantial than the human skeletal material recovered in 1986 from the adjacent grid 70. The bones appeared to represent another individual as well as most of the missing skeletal remains of the individual partially encountered and recovered during the 1986 expedition.[14]

Site maintenance and site inspection

Site maintenance work carried out in the 1996 expedition included:

- The protection of several, cardinal, aluminium grid reference poles by placement of 20kg concrete collars at their bases or by alignment of 2 x 2m aluminium

grid squares in two corners of the site to provide for long-term identification of cardinal grid reference markers. Concrete collars were sleeved over grid reference poles 14.6X/10Y, 16X/6Y, 16X/12Y, 40X/0Y and 50X/10Y. Aluminium grid squares were placed at 0.0X/0Y, 50.0X/0Y and 50.0X/20Y

- A general site tidy (i.e. removal from the seabed) of introduced, un-used hardware (iron star pickets, obsolete aluminium grid squares and aluminium poles etc.) and
- The establishment of swim-lines to the dumper blocks at each of the mooring points placed around the wreck in December 1994. Swim lines were extended from star pickets adjacent to survey poles 50/20 and 50/0 to, respectively, the W anchor dumper block and the N anchor dumper block (figure 15).

Discussion

By extending excavation into grids 89 and 90, another 'clustered' collection of objects was recovered from a part of the vessel that had been in use by the *Pandora*'s commissioned officers. The recovery of this object cluster – similar in diversity to the cluster found on top of adjacent lower deck planking in grids 68 and 70 during the 1986 and 1995 expeditions – confirmed the high degree of spatial coherence that had been hypothesized; especially within and directly around the starboard hull remains at lower deck level (figure 7, disintegration cycle 2).

These clusters of personal or professional possessions complemented others that had been recovered previously from areas thought to be associated with the wardroom and/or the adjacent (aft) starboard cabins. These areas have come to be considered, with increasing likelihood, to have been occupied by the first and second lieutenants, John Larkan and Robert Corner respectively. For instance, the cluster of three war clubs (MA 1351, MA1395 and MA1395) recovered from grid 70 in 1986 was found adjacent to the cluster of war clubs (MA 4743, MA 4809, MA 4810, MA 4821, MA 4822 and MA 4853) found in the contiguous grid square (89), as if they had been bundled and left there by their owner/collector. Given this apparent concurrence it is tempting to conclude that the cluster recovered in 1986 and 1995 from grid 70 came from the aft-most cabin – likely Robert Corner's. And that the cluster recovered in 1996 from grids 87 and 89, that came from the second starboard cabin, was part of a collection of 'artificial curiosities' made by John Larkan.[15] Finding Larkan's name stamp (MA4694) in the middle of this cluster should be regarded as persuasive evidence to support this inference.

However, although it is tempting to attribute definitively all of these as the property of one or the other of the lieutenants, some post-sinking 'scrambling' of objects (Muckleroy 1978:159) due to the partial structural disintegration and collapse at this level of the vessel should not be ruled out (cf. Cycle 2 in the hypothetical disintegration sequence, figure 7). It is possible that personal possessions from the wardroom or even some objects from the warrant officers' cabins, located along the portside of the lower deck and assigned to the purser, Gregory Bentham, the Master, George Passmore or to the Surgeon, George Hamilton, may well have intruded into the object clusters found on top of starboard lower deck planking in grid 70 or in grids 87 and 89. For example, a small stoneware pot containing mercury (MA 4016) found concreted to the carronade (MA 4190) in grid 89, may well have come from the surgeon's cabin (Campbell & Gesner 2000:94).

The proposition should be borne in mind that personal or professional possessions kept, used or stored in spaces on upper deck

levels – for instance, in the captain's sleeping quarters adjacent to the 'Great Cabin' or in the temporary accommodations for lesser officers under the half deck – had likely been subjected to considerably more 'scrambling' than material kept in lower deck spaces. As upper decks disintegrated, artefacts stowed or used on these decks may have subsequently dropped down onto the lower deck to be mixed in with objects in, for instance, the wardroom (figure 7, Cycle 2 hypothetical disintegration sequence). Alternatively these objects from the upper decks could have concreted onto the guns while they were still on the upper deck and later dropped onto lower deck clusters as the guns fell through the deteriorating and failing deck beams.

As far as lower (i.e. deeper in the ship) starboard deck spaces are concerned, it has been hypothesized that structural deterioration and collapse appears not to have occurred here. Scrambling with objects stored in the captain's and lieutenants' store rooms on the platform deck could therefore not occur readily because lower deck planking, especially along the starboard edge, presented a physical barrier 'overhead', which prevented intrusion of objects (i.e. 'drop down') from lower and upper decks into platform deck level. This will logically also apply to objects in spaces under the platform deck which are apparently almost wholly intact on the starboard side and have yet to be excavated, for instance the 'fish' and 'spirits' rooms under the preserved platform decking (figure 28). Objects found in starboard areas on the platform deck most likely reflect private or personal aspects of the captain's and the commissioned officers' life on board.

The proviso should also be noted here that storage spaces normally reserved for the captain's and the lieutenants' private stores, i.e. per Admiralty 'establishments'may well have been given up by them because of the special nature of the voyage. Surgeon Hamilton's observation about the cramped character of the ship is telling; it was due, he remarked, to the large amount of extra fittings, stores and provisions the ship was carrying (Hamilton, 1793:5). This observation indicates use of spaces during the voyage was not strictly per the 'establishments'. Hamilton observed that all of the officers, 'the captain not excepted', gave up space entitlements in deference to the voyage's unusual objectives. This was especially true, Hamilton notes, in relation to his 'worthy messmates' Corner and Hayward (Hamilton, 1998: 5, 18, 58).[16] In this respect one of prisoner James Morrison's observations is also telling, he mentions a uniform jacket belonging to the third lieutenant being stolen by an islander from his cabin 'under the half deck' (Rutter, 1935:125). This indicates that Thomas Hayward had

FIG. 28. Sloping platform deck at an angle of approx 32°. Platform deck (#17) with carlings, ledges and deck beams in the background. Photograph taken during 1999 field season. Photo: Brian Richards.

given up his cabin or at the very least the space where the cabin would have been erected per 'establishments'[17]. Probably it was one of the lower deck cabins taken down at the beginning of the voyage. Hayward, the most junior of the commissioned officers, had also been obliged to forego the comfort and privacy of a separate cabin on the lower deck (Logbook 20 Aug 1790); apparently finding a space for his 'cot' and sea-chest under the half-deck.[18]

1997 CITY OF TOWNSVILLE EXPEDITION

The expedition's objectives for this season included

- Continuing excavation in grid 89 and
- Commencing excavation in grids 88, 90, 107 and 109

Two expedition support vessels were required for the 1997 expedition. An advance party left Townsville on 13 January on board TSMV *Hero* to attach the moorings' hawsers to the dumper blocks and to carry out maintenance work on the site's mooring system. The TSMV *Pacific Conquest* departed from Townsville 21 January and rendezvoused with *Hero*, arriving at the wreck site on the 24 January at 0800hrs.

With completion of all work by the advanced party, it was possible to commence excavation immediately. Archaeological diving operations using SSBA, as well as Scuba for the non-excavation requirements, were carried out between 24 January and 14 February from the expedition mother-vessel TSMV *Pacific Conquest*. Work concentrated in the stern section in grids 88-90 and grid 109.

During this period the excavation team spent a total of 317.6 hours underwater, of which 167.4 hours ('bottom time') were spent on excavation work and other support tasks. This season resulted in the recovery of artefacts registered under 446 numbers in the Queensland Museum's Maritime Archaeology collection (Artefact Catalogue, MA 6200-6646).[19]

With the exception of "down-time" for health and safety purposes, one half day was unproductive due to unsuitable weather conditions. On several days diving operations were briefly interrupted for periods up to one hour due to strong currents (table 8).

The expedition team this season included IT personnel required on the *Pacific Conquest* to support the trialling of internet connectivity, and the uploading of daily bulletins on excavation progress through a Queensland Museum's website feature 'Expedition Leaders Chronicle' – now archived by the National Library of Australia – [http://pandora.nla.gov.au/pan/39012/20031128-0000/www.qmuseum.qld.gov.au/features/pandora/chronicle.html].

Extent of excavation

The extent of the 1997 excavation encompassed the lower deck area, grids 88 and 107 (cf. McKay 1992:55) and the third lieutenant's cabin area (figure 24).

The 2-inch bulkhead (figure 26) separating the magazine and the storeroom was relocated in grid 90 and used again as a convenient starting point for the excavation of this part of the lower deck where, according to the Admiralty 'establishments', the third lieutenant's cabin would be located. Situated, one deck level higher, mainly forward of the magazine bulkhead (coinciding with grid numbers 88 and 107), this lower deck space was also expected to contain a cluster of personal and professional material comprising the possessions and equipment kept there by that cabin's occupant.

After several days of excavation, during which excavators worked towards midships to expose more of the spirketting, the waterway and the lower deck planking, delineated by the

width of three deck planks, the anticipated concentration of professional and personal belongings was not found. What was located were the remains of the partition between the first and third lieutenants' cabins across the three deck planks on an athwartships' orientation, but no artefacts were located forward of this partition.

In light of this finding, it was surmised that the third lieutenant's cabin must also have been taken down at the beginning of the *Pandora*'s South Pacific voyage to make room for the extra equipment and stores the *Pandora* was carrying in anticipation of the need to refit and repair the *Bounty*.

This conclusion was considered convincing for two reasons. Firstly, an historical reference from one of the mutineers' journals referred to a theft from the 'lieutenant's berth' under the half deck (i.e. on the upper

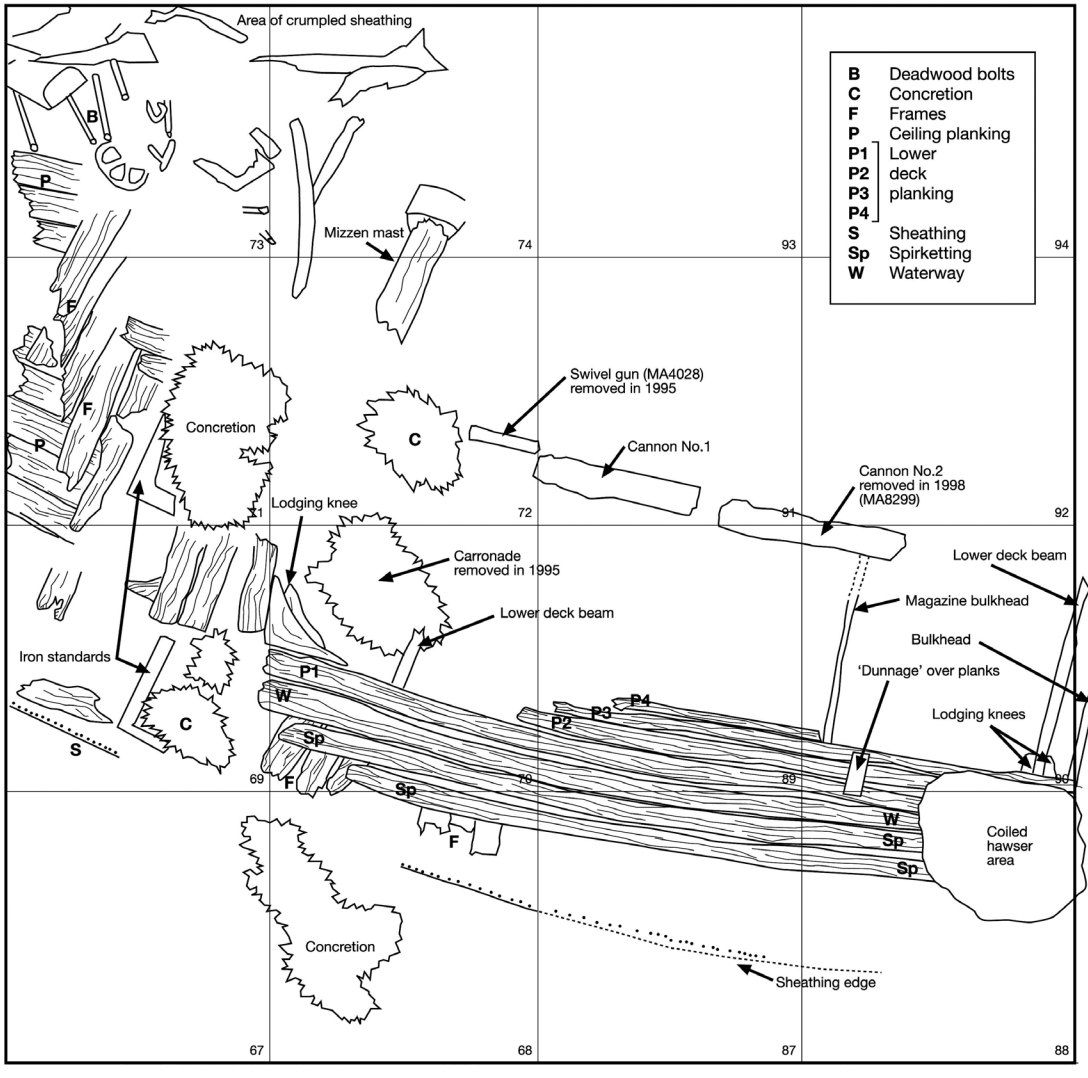

FIG. 29. The 1997 season excavation site plan (2 m x 2 m gridsquare). (Gun #3 in the adjacent grid 107 not shown).

deck) of a uniform jacket, belonging to Third Lieutenant Thomas Hayward (Morrison, 1935:125). Secondly, archaeological evidence indicated that forward of the remains of the partition between the first lieutenant's and third lieutenant's cabin (grid 88), the lower deck planks had been partially covered by soft wood boards (dunnage?) which appeared to have been either nailed down (athwartships) over the deck planking or attached to the planking with a tar-like substance (pitch?). These boards were apparently associated with a large coil of hawser rope (anchor cable?) stored in this part of the lower deck, the remains of which extended forward for several square meters, covering the lower deck planking in grid 107. When an attempt was made to recover a section of this rope, it was found to be nailed down either to the dunnage or through to the deck planks. One of the dunnage boards was recovered (MA 6340). The remainder of the coil of hawser rope was left *insitu*. As previously noted, it appeared to be attached or nailed to dunnage through to deck planking (figure 29). Given that the coil of hawser appeared to be nailed down to the deck planks, perhaps to prevent it sliding, it was possible that spare hawser/cable or condemned cable was being used for some kind of temporary cushioning purpose.

With no cluster of personal possessions to measure-in and recover from this lower deck area, more time was spent on the deeper excavation of the adjacent grid spanning the captain's storeroom.

Captain's storeroom, grid 90 (Platform deck area)

The intact 2" bulkhead between the captain's storeroom and the adjacent magazine (aft) served as a starting point for the excavation of this storeroom. Using this (athwartships) bulkhead as both a reference point and a convenient means of shoring the deposit in the adjacent grid, excavators worked down its forward facing side uncovering a large collection of personal possessions, including remains of clothing (buttons and buckles), part of a cream-ware dinner set, glass tumblers and wine glasses. This material appeared to have been stowed on shelving erected (fore and aft) along the sides of the storeroom. Most objects were located under the intact starboard lower deck planking, three planks of which were exposed and noted to be in good condition (figure 30 and 31).

Due to the complex configuration and fragility of the artefact assemblage inside the storeroom, progress was slow; moreover, buried approximately 0.5 m forward of the magazine bulkhead, a conglomeration formed by a number of large (tangled), mainly iron, concretions proved difficult to work around.

These concretions were contiguous with a jumbled assemblage located on the lower deck level and appeared to contain pump parts. These parts may have been laid down on the lower deck while repairs were being carried out on the pumps during the immediate aftermath of the ship running aground.

Human skeletal remains were also found in the storeroom. Although the identity of this individual has not been established, it was determined the bones constituted the skeletal remains of a third individual, i.e. they did not match either of the two individuals

FIG. 30. Tiers of spruce jars located within a compartment in the officers' store room. Photo: Brian Richards.

whose bones had been recovered from grids 68 and 70 during the 1986, 1995 and 1996 expeditions (Personal communication, Dr Stuart Lavender, expedition Medical Officer). The remains of this third individual were more complete and better preserved than those of the other two – especially as far as his skull and jaw bone were concerned (Steptoe, 1997).

Finding these remains in this part of the ship was unexpected, just as finding the first two skeletons had been. However, an additional element to the surprise was the realisation that one of the crew had apparently been well 'below-decks' – on the platform deck – around the time of the sinking. This immediately gave rise to the suggestion that he may have been one of the crew who had tried to make

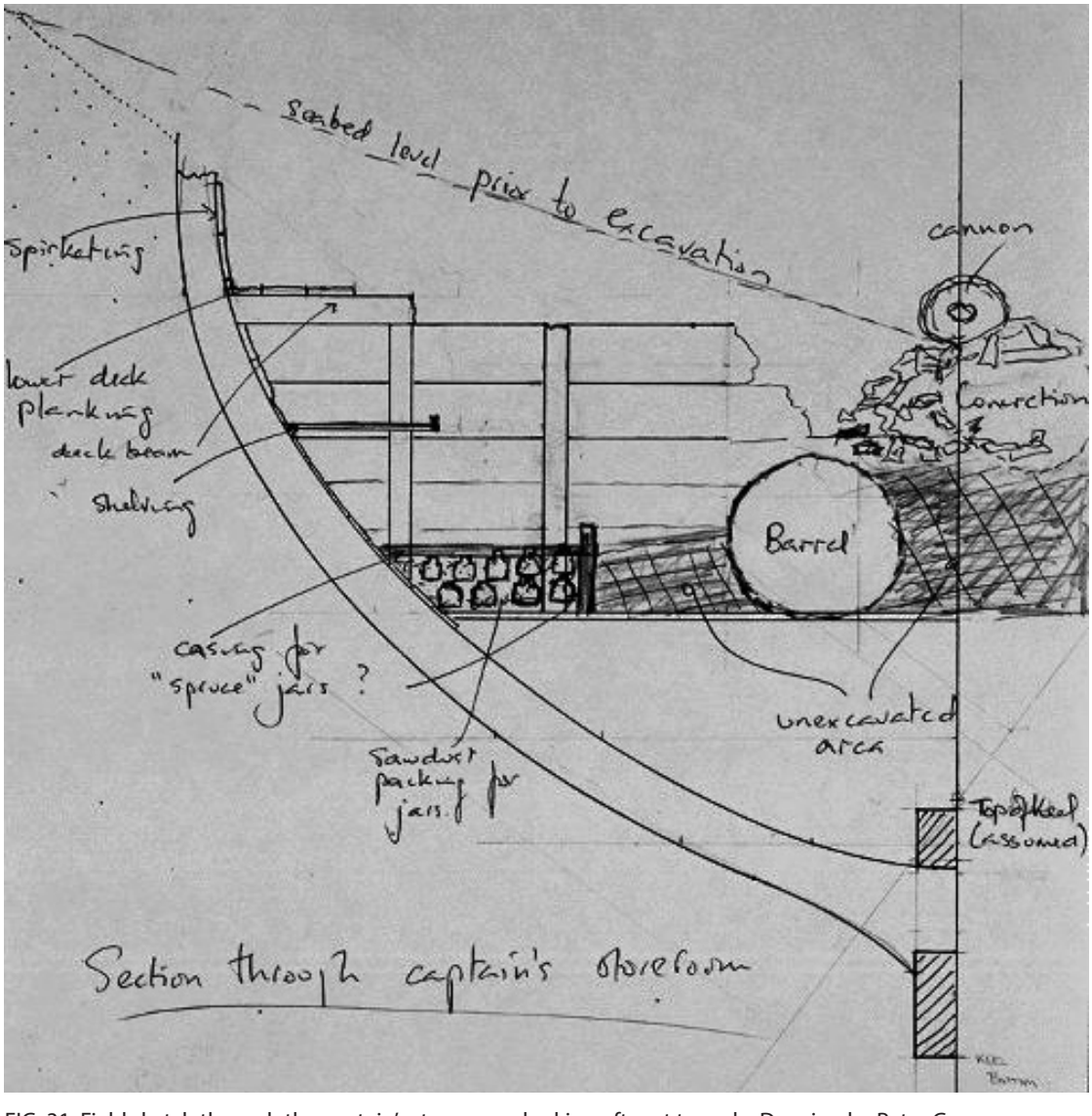

FIG. 31. Field sketch through the captain's storeroom, looking aft, not to scale. Drawing by Peter Gesner.

repairs to the damaged ship before it sank. However, this suggestion has become less tenable in light of a report recently discovered in an eighteenth century British newspaper, asserting that many of the crew had become drunk during the wrecking and had raided the storeroom (*Caledonian Mercury* 9 April 1792). The identity of the human remains is still unknown. An identity for this man may result one day through DNA analysis, as Y-chromosome sequences have been determined from the skeletal remains of the 3 individuals found to date. (pers.comm 2011, Dr Sheree Hughes, Bond University).

In addition to locating permanent shelving erected under the lower deck and along the sides of the storeroom, another compartmentalized space was uncovered inside the storeroom. It consisted of wooden casing which contained at least two, possibly three tiers of ceramic jars packed in sawdust. This wooden casing containing essence of spruce jars appeared to have been erected as a partitioning in the storeroom (figures 30 and 31).

It was considered possible that the casing may have come from elsewhere on the platform deck, i.e. been part of a crate which perhaps had been moved and placed on the storeroom floor as a temporary re-arrangement of cargo, carried out perhaps while some of the crew were below decks attempting to repair the damaged hull.

Material Recovered

Approximately 70% of the volume of the storeroom was excavated during the 1997 expedition. The recovered objects were accessioned under MA Numbers 6200 - 6646. Of particular note was unmarked crockery, i.e. not scratched by cutlery nor provided with an identifying letter 'C' or 'W' scratched on the underside (Campbell & Gesner 2000, 100-104). This crockery included parts of a creamware dinner set, a gravy boat, soup tureen, dinner plates, soup plates and utilitarian ware (e.g. a chamber pot). Clothing and foot-wear must also have been stored in the storeroom as indicated by a relatively large concentration of brass uniform buttons and shoe buckles found in the area.

Discussion

By concentrating again in the stern area of the wreck, another collection of material associated with the *Pandora*'s officers was recovered; this time from a part of the vessel designated for storage of personal belongings and private stores.[20]

Excavation provided more evidence that the hull remains were coherent and extensive. Closely related assemblages of artefacts were to be found in starboard spaces on the platform deck, strongly indicating they were located in similar arrangements to how they may have been stowed during the voyage. 'Scrambling' of artefact clusters, due to the hypothesised sequence of collapse and disintegration, apparently had not occurred in this part of the ship. This can be considered an indication that the depositional sequences posited for cycle 4 (pages 14-16 this volume) are feasible.

The evidence that indicated the absence of the third lieutenant's cabin on the lower deck (i.e. dunnage boards nailed across the lower deck planking) was initially unexpected. However, it subsequently proved easy to account for when re-considered in the light of descriptions of voyage events provided by surgeon George Hamilton (Hamilton, 1793:5) and prisoner James Morrison (Morrison, 1935:125).

Hamilton's metaphor likening the crew to weevils who first had to eat a hole in their bread before they had space to live in (Hamilton, 1793:5) should therefore be considered an apt comment on the unusually crowded state of the vessel. Some

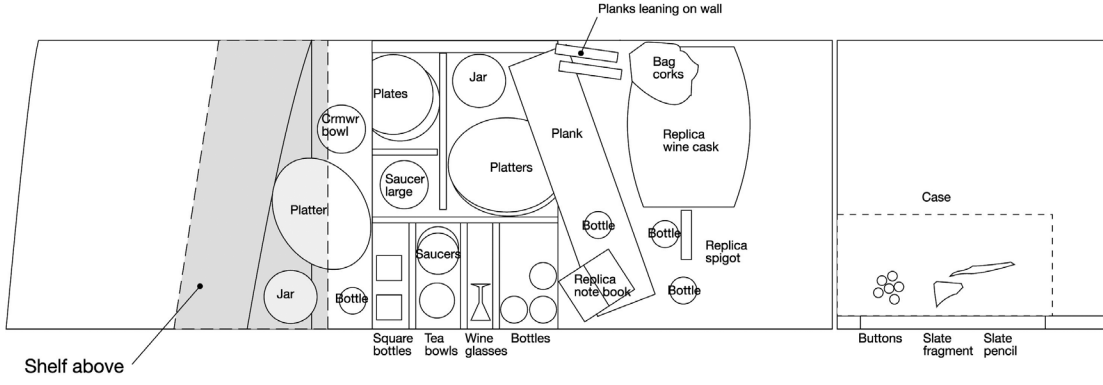

FIG. 32. Commissioned officers' store room: layout of a reconstruction in the Pandora Gallery at the Museum of Tropical Queensland (MTQ).

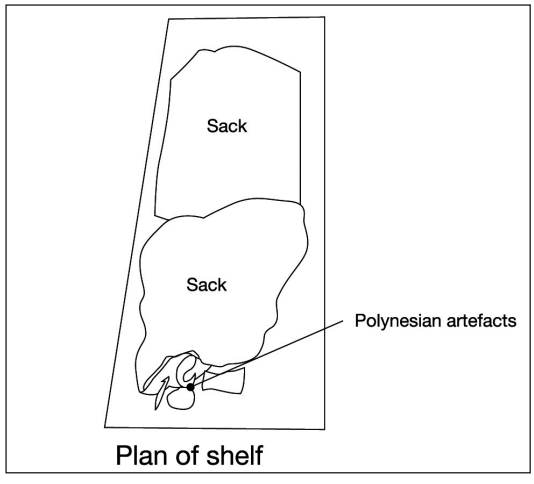

FIG. 33. Plan of shelf located in the Pandora's storeroom reconstruction in the Pandora Gallery (MTQ).

FIG. 34. Partial bulkhead between the captain's and lieutenants' storerooms. Note collapsed lower deck beam over the bulkhead. Photo: Brian Richards.

of the officers apparently readily gave up comforts and privileges in the interests of the voyage's extraordinary purpose, i.e. they gave up their entitlements, as per Admiralty 'establishments', to private storage and living spaces in order that spare equipment, fittings and stores for the *Bounty* could be stowed. Even the space normally reserved for the storage of the captain's personal possessions and victuals was apparently used to stow extra stores and victuals for the crew, in this case jars containing essence of spruce. George Hamilton's comments about his fellow officers – his 'worthy messmates' who gave up their entitlements in the interests of the voyage (Hamilton, 1793:18) – are accurate for the light they cast on the living arrangements on board during the voyage.

James Morrison's reference to a theft of a uniform jacket from the third lieutenant's cabin 'under the half deck' is corroborated by the 'missing' lower deck cabin bulkhead and the paucity of personal possessions turned up from grids 88 and 107.

A preliminary interpretation[21] of the situation encountered inside the storeroom was made of the exposed arrangement of shelving, bins and/or cases within the store room (figures 32 and 33). Due to the time required to measure-in and recover the objects from the storeroom,

insufficient opportunity was presented to also make a measured, detailed record of the store room's structural features.[22]

Evidence also indicated that the bulkhead between the captain's store room and the lieutenants' store room did not exist as a complete top to bottompartition. The bulkhead appeared to consist only of two rows of planking, instead of bulkhead planking spanning the entire space between platform deck and lower deck (figure 34). This represented a significant departure from the details of the technical drawings represented by McKay (Mackay & Coleman, 1992:57).

1998 NORQEB EXPEDITION

The 1998 expedition was divided into two periods: 12-27 January and 31 January-26 February. During the first period, an expedition team comprising 18 persons spent 11 days at the wreck, conducting diving operations from the TSMV *Pacific Conquest* On 2 February, after a change-over run to Thursday Island, the vessel was joined by a second expedition vessel, *Undersea Explorer*, which served as an accommodation vessel for an additional 16 expedition members. Both vessels remained on site until 23 February with the remaining 18-member team accommodated on *Pacific Conquest*.

Overall archaeological direction of the excavation was again by the Queensland Museum's curator of maritime archaeology Peter Gesner, assisted by the Maritime Archaeology Section's senior technical officer Warren Delaney who supervised the diving team accommodated on *Undersea Explorer*. Excavation diving and recovery work was again staged from the *Pacific Conquest* and concentrated in two areas. The Bow team was led by Warren Delaney and excavated exclusively in the bow section (See Warren's bow report Appendix 6). The Stern team was under the direction of Peter Gesner. The areas delineated for excavation were

- Stern section (grids 88-94 and 109-112; and
- Bow section (grids 161-165 and grid 185)

The expedition team again included IT personnel to support connection to the Internet, with daily uploads to the museum's website feature – *Expedition Leader's Chronicle* – with updates about progress on site.

Pacific Conquest arrived at Pandora Entrance on 16 January 1998. Seven days were allocated to conducting planned work on the reconfiguration of the moorings. This season saw an additional mooring point was put in place, the four point system upgraded to a five point mooring system[23] Diving operations were subsequently carried out until 27 January, when the *Pacific Conquest* departed for Thursday Island. After a scheduled three day interval at Thursday Island spent reprovisioning, effecting minor repairs and adjustments to expedition plant and a team changeover, the *Pacific Conquest* returned to the site with an 18-member team. Arriving at Pandora Entrance on 1 February, she was joined on 2 February by an additional 16 team members on the *Undersea Explorer*.

Both vessels spent 20 days (3-23 February) at Pandora Entrance engaged in archaeological diving operations. The *Pacific Conquest* spent the 20 days moored in position over the wreck. Depending on sea conditions, *Undersea Explorer* either spent time at anchor in the near vicinity of *Pacific Conquest* or at a temporary anchorage in the lee of a sand cay approximately 3 miles to the west of the wreck site. The excavation teams comprised 17 divers during the first period and 27 divers during the second period. Operating from the dive deck of the *Pacific Conquest* the divers spent a total of 637 hours underwater, of which 407 hours (bottom time) were spent on excavation, recording and recovering 701

registered artefacts. The divers were divided into two groups, each comprising 12 divers who worked in either the wreck's stern or bow section. Three extra divers using Scuba worked across the site for photographic or monitoring purposes.[24]

With the exception of down-time required for health and safety reasons, only two half-days were unproductive due to adverse sea conditions during the second period. On several days diving operations were briefly halted for short periods due to strong tidal currents.

Objectives

The season's expedition objectives centred again on two locations within the wreck – the bow and stern.

The stern excavation objectives were to excavate in areas adjacent to several guns (identified as guns #1, #2 and #3) located in grids 91, 92, 109, 110 and 72 respectively to confirm if guns #1 or #3 should be raised or relocated to another position on the site (figure 29). Relocation was considered as it was thought the guns may impede excavation if they were found to be concreted to the assemblage that had been encountered the previous season in grid 90.

Further excavation into the storeroom area (grids 90 and 109) and the steward's storage area opposite the captain's storeroom (approximately in grids 111-113), was continued after the delineation and orientation of a large concretion exposed during the 1997 excavation (approximately in grids 109 and 111).

The bow section team were tasked to locate the edge of starboard copper sheathing assumed to be located in grids 163/4 and 183, and to determine if the inboard starboard hull remains in the bow section of the wreck reflected the situation in the stern section of the wreck (cf. grids 68-70). If this proved to be the case, excavators should encounter extensive structural remains of the starboard lower deck planking and platform deck planking. The bow crew were also tasked to investigate spaces within bulkheads which may contain discrete clusters of functionally related artefacts kept in the various store rooms and known to be located at platform deck level in this area of the vessel, e.g. bosun's store room.

Extent of excavation

Stern area

After relevant new grid reference markers were established in grids 72 and 91, excavation (water-dredging) commenced in grid 90 on the starboard side of gun (cannon) #1 (figure 29).

The intact partition between the captain's storeroom and the gunpowder storeroom (magazine) was re-excavated. This 2″ oak bulkhead again served as a well-defined starting point. It also acted as a convenient physical barrier, delineating the limit of excavation along one side of the season's targeted excavation area. It also prevented slippage of sediment and destabilisation of artefact material in adjacent areas (in particular the magazine) which had not been designated as an excavation area. Thus the bulkhead performed a very useful practical function as a ready-made, *in situ* shoring.

Excavation was first carried out around the two concreted guns (#1 and #3) in grids 89 and 91, where a number of navigational objects were located in shallow strata (i.e. < 50 cm into the top sediment layer). This confirmed the initial expectation that the area probably contained material originally kept in the Master's (George Passmore's) cabin. Among the material recovered was a 'telltale compass' (MA7650) which would have been mounted (upside down) to one of the (upper) deck-beams in his cabin.

It was established that gun #1 was lying (fore and aft) across the magazine bulkhead, its

muzzle projecting approximately 60 cm into the storeroom and the trunnions and cascabel lying in the magazine area. After three days of excavation the sediment around gun #1 was cleared and the gun muzzle was found to be entangled with a concreted mass of objects lying underneath. This mass extended deeper into the storeroom area and appeared to be part of the large conglomeration encountered the previous season.

The stern team excavated the storeroom from a different direction to the one followed during the 1997 excavation. The rationale for changing direction had been to delineate the extent of the large concretion encountered during the previous expedition. This concretion had impeded progress. It was thought it could be removed in one piece however it was necessary to determine to what extent the conglomerate was connected to the concretion or was entangled with the muzzle end of gun #1.

Excavation established that the concretion extended a considerable distance into other areas of the wreck, notably into grid 112, which lay well outside the season's targeted excavation area. Fortunately it transpired that the concretion was not inextricably attached to the concretions anchoring gun #1 to the storeroom. This enabled gun #1 to be raised with relative ease, after underlying sediment had been cleared from the muzzle and several concreted contact points had been chipped free. Gun #1 (MA 8299), the second 6-pounder 'long gun' recovered from the wreck, was subsequently hoisted from the seafloor by direct lift to the *Pacific Conquest*'s work deck.

With this gun removed it was possible to excavate the storeroom area in grid 90 to a depth of over 1.2m until the floor (i.e. platform deck) of the storeroom was encountered. The deck planking was found to slope towards the starboard side of the hull remains at an angle of approximately 35 degrees. The sloping floor (figure 35) was exposed up to the edge of an upright manger, or 'bin' which had been erected fore and aft between the storeroom's bulkheads and subsequently was found to contain tiers of spruce jars packed in saw dust. These jars had been encountered from a different direction during the 1997 expedition (see figure 30). They had initially been identified as the contents of a case or crate, apparently with several tiers of spruce jars.

But this new evidence suggested a different scenario. It was evident this area of the store room had been sectioned off by the ship's carpenters prior to the voyage to accommodate the spruce jars and that they were not secured in a case or crate. Instead it appeared that a false floor had been created as the spruce jar's manger was found to be covered by fitted, removable pine boards (Logbook 20 Aug 1790).

This evidence also suggests there had been no significant disturbance in this part of the ship since wrecking. This deduction is plausible because the platform deck had very likely been flooded within a very short time of the vessel running aground on the reef. Captain Edwards' report states that within 15 minutes there was 4 feet of water in the hold, and that 90 minutes after running aground this level had risen to 8 feet (Edwards, in Thompson 1915:72). The storeroom would therefore have been inundated by then, possibly by as much as 3 feet of water, probably more if the vessel was listing to starboard.

Although the carlings and ledges (figure 35) associated with the scuttle to the fish and spirit rooms under the aft platform deck lobby were also located, no evidence of any door, scuttle or associated (iron) fittings, such as a lock, door knob, hinges, latch or handle, was discovered within the storeroom area. This was in marked contrast to what had been found during previous excavations in

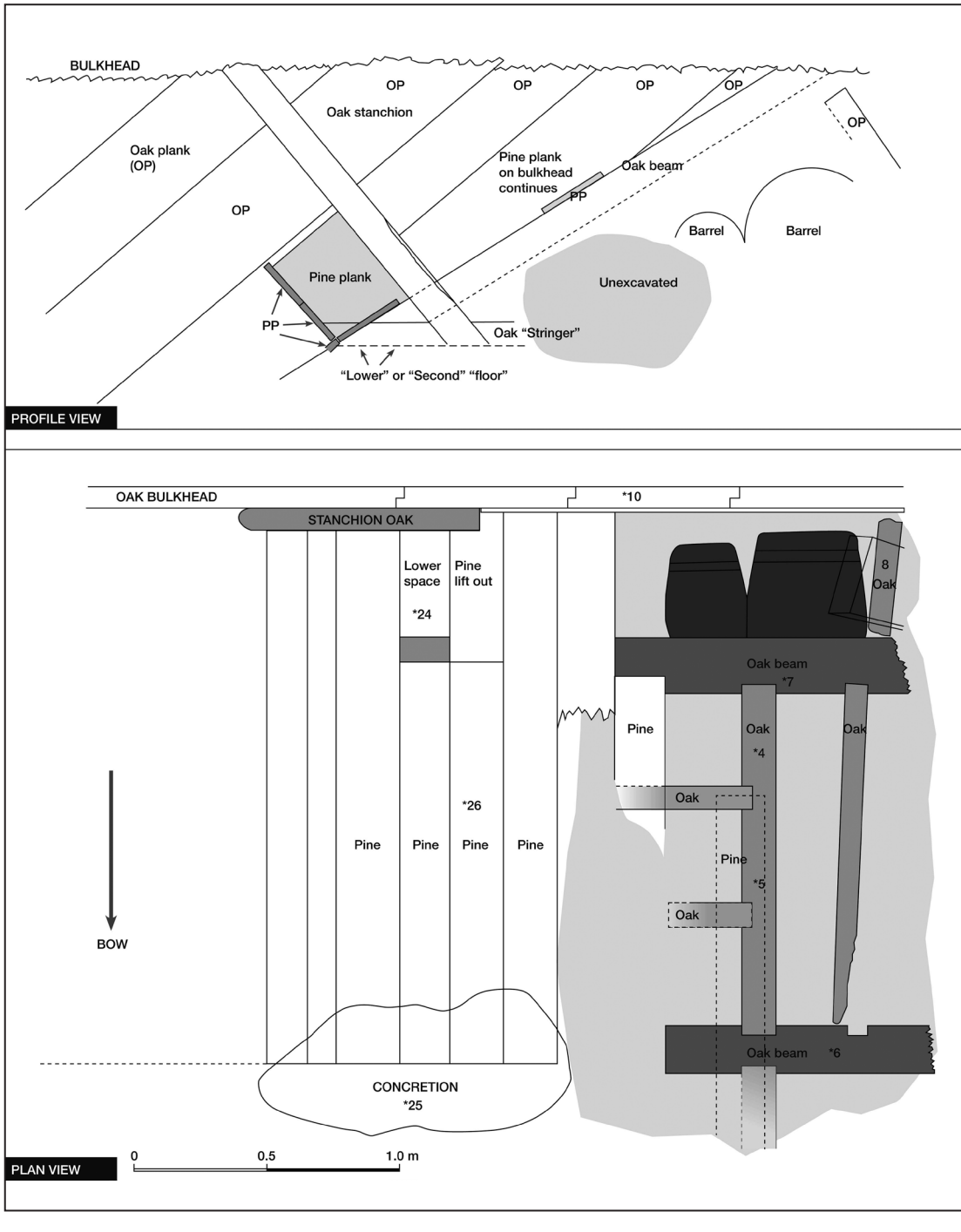

FIG. 35. Profile and plan drawing of the captain and officers' storeroom with exposed platform deck carlings and ledges. Drawing and plan by Nigel Erskine and Cos Coroneos.

sediment layers representing spaces which were located one deck up, i.e. where clusters of personal and professional possessions from the starboard cabins on the lower deck were found in tight spatial association with door fittings (locks and hinges) and, of course with the glass panes set into the lower deck cabin doors (Cf. McKay & Coleman, 1992: 46, D1/3 feature 66).

The absence of glass panes from strata representing the platform deck is easily explained. It is certain that natural light did not reach the platform deck. There would therefore have been no use for glass panes in platform deck doors. However, a lock of some description fitted to the storeroom door(s) would certainly have been required. It is therefore not unreasonable to expect evidence of (iron) locks and door hinges – especially if they originate from the (anaerobic) sediment layers in deeper areas of the wreck – or to find iron work fitted to scuttles in the platform deck

The apparent absence of locks, door hinges and other scuttle fittings may indicate that the configuration of partitioned platform deck spaces in the stern section – per drawings D2/9+10 (McKay & Coleman, 1992:57-59) – had been departed from altogether. Modifications, known to have been made to the platform deck before the voyage, may therefore also have included alterations to spaces in the stern of the vessel as well as in the bow[25]. This would appear also to explain the absence of a complete bulkhead, which normally, according to the ship's plans, would have divided the space reserved for the lieutenants' stores from the space reserved for the captain's stores (cf. McKay & Coleman, 1992:57-59). Given indications that these two spaces had in fact been made into one large space it may also indicate that only one door was fitted, thereby explaining the dearth of iron door fittings.

Bow area[26]

Excavation began in grid 181/83 and trended approximately athwart the hull remains into grids 164-166. The excavation was relatively shallow in grid 181 and along the baseline edge of grid 183 and deepened as it reached grid 185. The ring, the superior end of the shank and stock bands of a large anchor (one of the *Pandora*'s four bower anchors) were uncovered in grids 181 and 162 (figure 36).

Due to the progressive deepening of the excavation into grid 185, towards the centreline of the hull remains, the upper edge of the copper sheathing was encountered as well as the upper edge of the hull remains. These timbers were thought to be outer planking, parts of several frames and what could be one of the lodging knees bracing the lower deck beam. The exposed edge of sheathing and hull remains was followed aft for a distance of approximately 1.25m until it was obscured by a mass of concreted material, including lead sheet channelling (possibly associated with the scuppers) and iron mast bands.

As excavation moved aft, from grid 183 into grids 164+166, a tightly compacted sediment ridge, containing fragmented debris, hindered the excavators' progress. The ridge appeared to be approximately 30 cm thick and could be partially undercut.

Several substantial timbers were exposed in grid 165, some considered to be the remnants of frames. Grid 165 also contained what was suspected to be one of the iron standards from the lower deck.[27]

Before backfilling the excavated areas, some deeper exploratory probes adjacent to the Brodie stove in grid 185 were dredged, but neither timbers, nor deck planking were located there (figure 36).

Material Recovered

Stern area

Prior to raising gun #1 (MA8299), a variety of personal possessions and professional equipment was recovered from the upper deck strata and commissioned officers' store rooms. This area of the site most likely coincides with the cluster of objects from the cabin assigned to the master by Admiralty establishments. Finds such as navigational equipment (e.g. a 'telltale' compass) from the shallow strata included possessions which can possibly be attributed to George Passmore, the P*andora*'s master.

Bow area

In addition to cultural material and natural history specimens, e.g. shells, a shell adze (MA8144) and a stone adze blade (MA8270), several fish lures, an octopus lure, sea shells and coconut fragments, the probes in grids 166 and 185 also uncovered personal possessions, e.g. a semi-precious (intaglio) seal (MA8222), sealing wax, a one-gallon gin bottle and a small medicine vial (see appendix 6).

Discussion

Systematic excavation in the stern section continued to reveal more evidence confirming the structural integrity of a substantial part of the lower starboard hull. Exposure of intact decking of the aft platform deck lobby on the starboard side was ample indication that it would be possible to continue excavation into deeper (i.e. lower-lying) spaces in this part of the wreck; it appeared a substantial part – possibly as much as 75% – of the fish and spirit rooms, located under the captain's and lieutenants' store could still be intact, especially on the starboard side (figure 35).

Before excavating into the fish and spirit rooms, it was considered prudent to first excavate adjacent (overlying) storerooms areas (i.e. the lieutenants' store). Excavation into the deeper lying fish and spirit rooms would require substantial penetration and under-cutting of the hull remains – possibly to a sediment depth up to 2.5 m – largely requiring sunstantial undercutting' of storeroom remains. It was thought that excavation into the fish room would undermine as yet unexcavated overlying strata (i.e. the contents of the lieutenants' store) and cause considerable destabilisation and 'slippage' of the shallower store room strata. In this respect a conceivable worse-case undercutting scenario would be failure of platform deck beams, possibly causing collapse of the overlying structure. It was felt that an outcome would not only bring about a loss of archaeological context but from a diver safety perspective, could pose too much risk.. No information was available regarding the inherent strength – in particular its shoring capacity – of the bulkheads between the magazine and captain's store, the forward bulkhead of the lieutenants' store nor about the inherent strength (i.e. the load-bearing capacity) of platform deck timbers. Safe diving protocol prohibited penetration into enclosed spaces of the wreck. Excavation of the fish and spirit rooms was therefore deferred until the deposit on top of the platform deck timbers – i.e. the lieutenants' store – had been excavated and removed.

Excavation in the bow area indicated that hull remains were as extensive as in the stern area. No definitive evidence was exposed to indicate whether lower deck or platform deck level timbers had been exposed in the bow area. The high proportion of Polynesian objects among the artefact assemblage from the bow area at least appeared to indicate that, like the officers, the ordinary crew had also been engaged in 'curiosity' collecting (Delaney 1999).

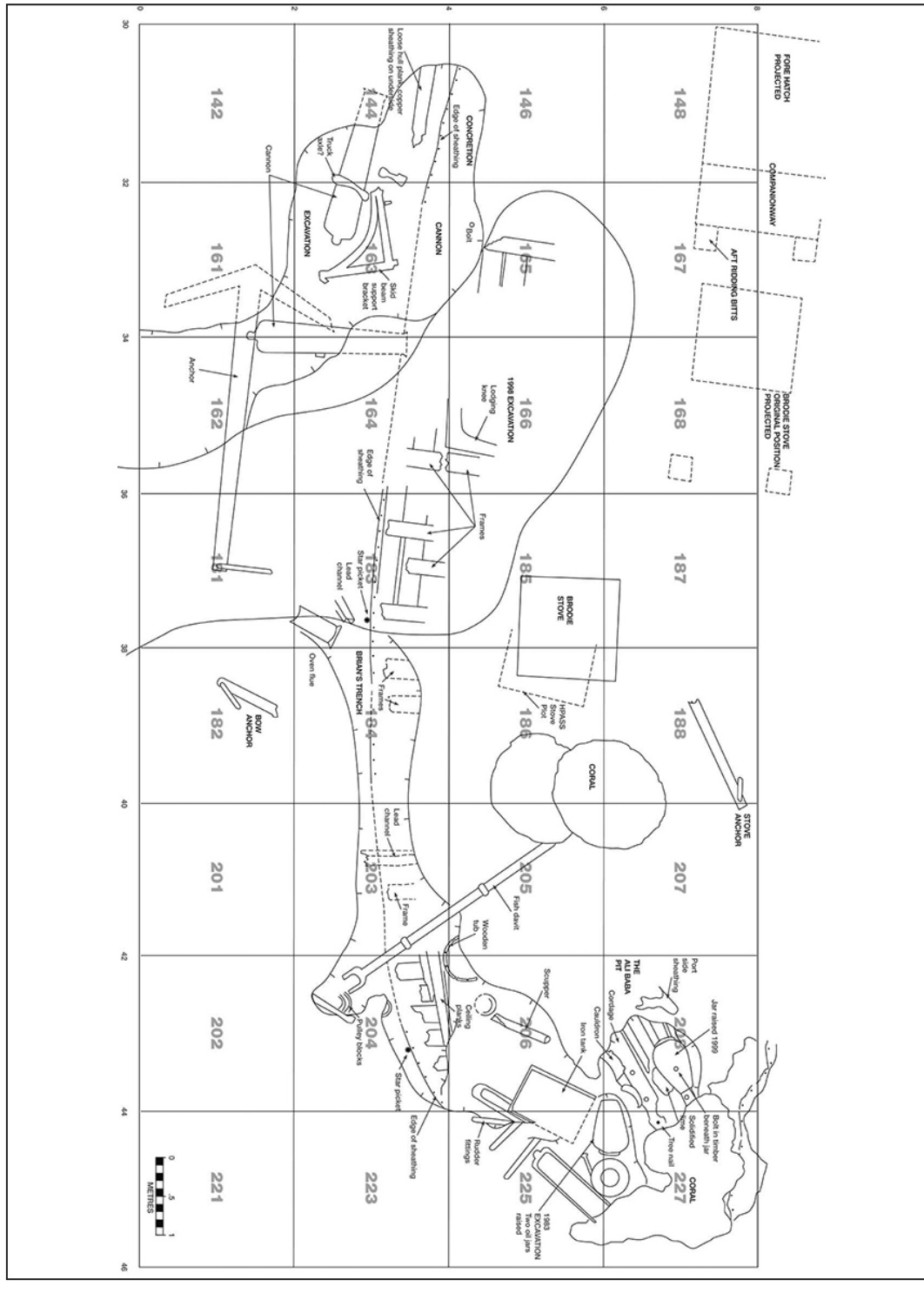

FIG. 36. Bow area excavation site plan (1998 and 1999). Plan by Warren Delaney *et al.*

1999 PORT OF TOWNSVILLE EXPEDITION[28]

The ninth expedition to the *Pandora* wreck was carried out between 31 January and 28 February 1999. Like the 1998 expedition, all diving and recovery operations were again staged from the *Pacific Conquest* moored to five mooring points over the wreck. Half of the excavation teams worked on the wreck's stern area and the other half worked concurrently on the bow area. Stern and bow groups each comprised seven teams – two divers per team – assisted by two surface attendants supervised by a deck officer. In each team the two divers consisted of an archaeologist and an assistant.

In spite of several days during which winds occasionally gusted to 25 knots from approximately SW to NW, the expedition vessel remained on site over the wreck during the entire expedition; enabling uninterrupted diving operations. A combined total of 575 (team) dives were carried out over a 22-day period by the bow and stern teams. Following the DCIEM dive tables, 'bottom time' was again restricted to 45 minutes at < 33 msw. Divers then ascended to the decompression stop, a stage suspended at 9 msw from the hull of the *Pacific Conquest*, for the 27 minutes breathing 100% oxygen. Underwater photographers carried out a number of scuba dives using standard dive tables. All scuba dives incorporated decompression stages on air within their profile. A total of 340 hours was spent working underwater and 193 hours decompressing.

A documentary film team visited the site for approximately 10 days to record material for a feature length documentary in the BBC's *Journeys to the Bottom of the Sea* series, directed by Sian Griffiths first broadcase in the UK in March 2000.

Like the 1997 and 1998 seasons, the expedition was once again connected to the internet, with daily uploads of bulletins about recent developments at the wreck site to the museum's Pandora website feature Expedition Leader's Chronicle.

Objectives

Stern area objectives

Excavation was focussed on the commissioned officers' storeroom area. Taking into consideration the findings after the 1998 excavation and in keeping with the research design for Stage 2, priority was again given to excavation of areas considered likely to contain evidence of the ship's social fabric. Thus, no matter how alluring and promising the prospect of the apparently intact 'fish and spirit rooms' located during the 1998 expedition, the 1999 stern area excavators remained focussed on the commissioned officers' store room area. Excavators set out to complete the excavation of the captain's and lieutenants' storerooms, i.e. areas containing material most likely belonging to Captain Edwards and lieutenants Larkan, Corner and Hayward. This included 'artificial curiosities' apparently collected by them during the voyage; as well as the equipment, instruments and every day 'household' items they used on board.

Another objective was to compile a stereo-photogrammetric record of a large section of the exposed hull remains; to this end a previously excavated, subsequently backfilled, area of about 36 m² (grids 68, 70, 87-92) was uncovered. This area contained the preserved portions of the starboard lower deck, the platform deck as well as bulkheads separating platform deck storerooms and spaces (referred to as the fish and spirits rooms) under the platform deck.

Bow area objectives[29]

1. To recover personal belongings of the crew, the 'artificial curiosities' they collected and their equipment, tools and instruments as well as the every- day ('household') items used aboard the vessel.

2. To record and recover this material in context with the ship's structure; and to make an effective record of intact structural details.
3. To focus on the lower and platform deck areas below the galley and to trace the starboard side of the intact bow remains to their forward extremity.
4. To resurvey critical areas in the bow using the High Precision Acoustic Survey System (HPASS) provided by the Centre of Excellence and to be carried out by the Western Australian Maritime Museum's Jeremy Green and Corioli Souter. (Green/Souter, 2001)

Extent of excavation (ship's structure)

Stern area

Excavation in the officers' store rooms revealed a collapsed lower deck beam, a truncated partition between the captain's and lieutenants' store rooms and the platform deck planking i.e. the floor of the store room. Where decking was degraded, carlings and ledges were sighted under them, especially along the centreline of the hull remains, in the area of the platform deck lobby (figure 37). Inner planking, spirketting and waterway planks along the starboard side of the vessel were also exposed.

Given that the work involved the removal of the overlying sediment, considerable excavation was required to expose these timber features. It also required removal of a large 'mat' of coiled, considerably degraded rope (hawser) and several substantial concretions, which appeared to be solidly attached to a bed of concretions under a cannon. This collection of rope and concretions was left in-situ. The cannon (Gun #3)[30] was located straddling the forward bulkhead in the lieutenants store and its removal considered but eventually left in position due to the anticipated length of time required to dislodge the gun from the bed of underlying concretions. Moreover, there was no compelling reason to recover the gun. It was one of the twenty identical 6-pounder long guns the *Pandora* was armed with; two of which had already been recovered during previous expeditions.[31] It was possible to work around the object although progress was impeded by the gun's presence. Removal of the object to a location outside the confines of the wreck remains was deferred to a following season.[32]

Bow area

The bow excavation commenced in grid 163, its purpose to expose the edge of the copper hull sheathing and trace the run of this feature forward to the stempost. The trench also required deepening to follow the external curvature of the hull down towards the keel in grids 144 and 163.[33] (figure 36)

Material Recovered

518 artefact records were created, comprising material from stern and bow areas. (Refer Catalogue nos. MA 8500-9018)

Stern area

The assemblage included creamware, identical to the form and design found during previous years; blue and white transfer ware, wine glasses and a telescope/ sighting device from an octant or sextant. This device could have come from the instrument (MA 8542) that was found concreted with the other conglomerates lodged onto or around the cannon (Gun #3) adjacent to the trench. A surprising find in one of the concretions was a small brass bell recovered from the captain's store (MA8843) – this bell was of the type likely used to summon a steward to the great cabin or ward room

Bow area

A range of objects associated with the galley and organic/animal material artefacts was recovered from the bow area. These included bricks used for stove insulation, seed pods, remains of coconut husks and animal bones.

Discussion

Of the artefacts recovered from the stern, the majority were located well inside the officers' store, buried at > 50 cm depth. They can therefore be considered as having been stored there at the time of the *Pandora*'s sinking.

However, among the artefacts there were a number of objects which may not have been at platform deck level at the time of sinking. The artefacts found in the first 50 cm seabed layer comprised a number of concreted objects, such as a 6-pounder cannon (Gun #2, not retrieved), a sextant, broken bottles, glass sherds, Polynesian artefacts, panes of glass from internal doors, rope, buttons, bricks, animal bone, metal baking trays, a pistol, lead shot, slate and ceramic sherds.

Considering the window panes, for example, it is reasonable to assume that those found in the top sediment layer inside the hull remains are from levels above the waterline – i.e. lower and upper decks – where there was penetration of daylight. Given the relatively low level of daylight penetration at lower deck level,

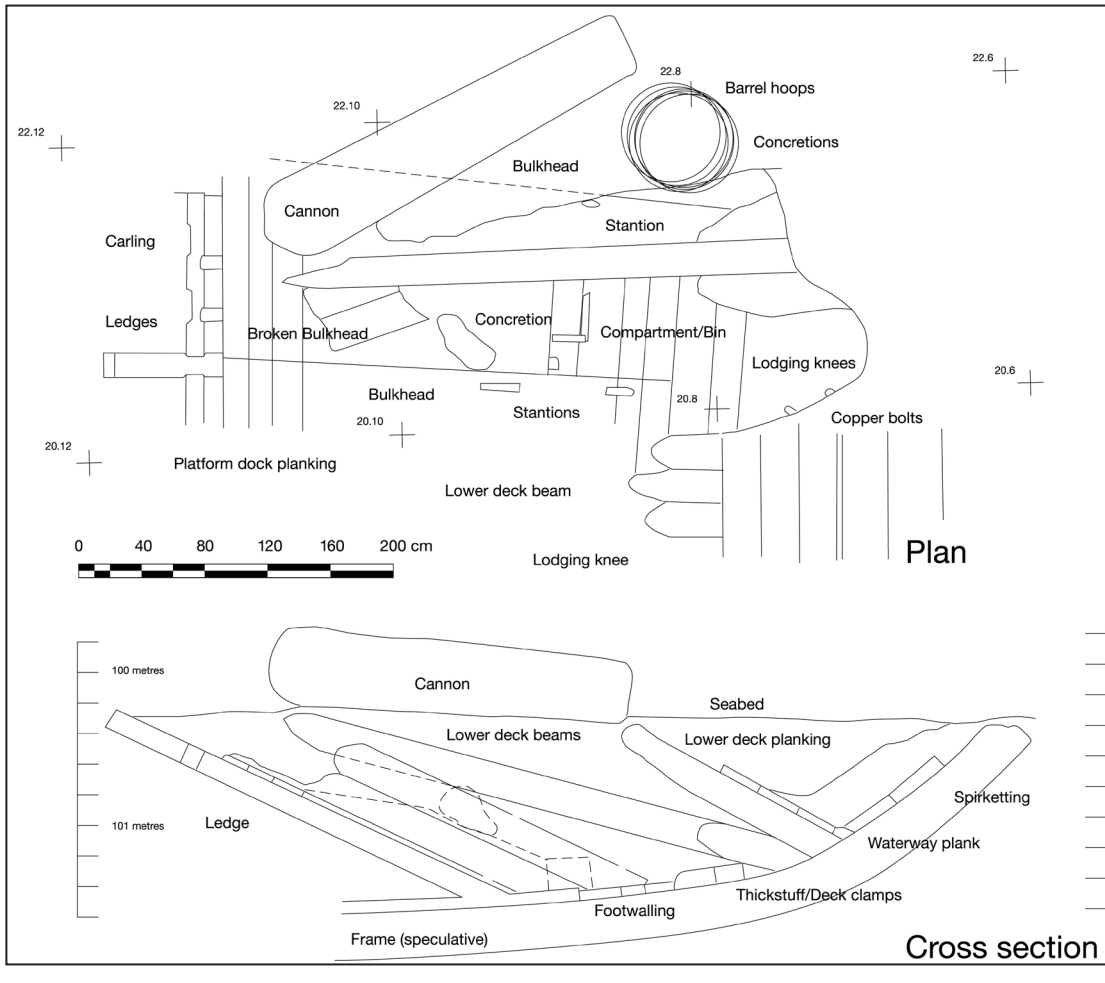

FIG. 37. 1999 stern trench officers' store plan view (grids 88, 90 and 92) and cross section looking forward. Drawing by Bill Jeffery.

the effectiveness of window panes in lower deck cabin doors may be open to question. However here was evidence from the wreck to demonstrate that lower deck cabin doors did in fact have glass panes.[34]

There is scope for discussion about stratigraphy, especially where artefact assemblages were not found in clusters and/or lying on top of intact lower deck planking[35]. Generally the wreck's hypothetical disintegration sequence proposes that the artefacts found in the first 50 cm layer of the seabed over the officers' store area most likely relate to activity carried out in the ship at lower deck level or above. Given that the lower deck spaces above the captain's and lieutenants' store-rooms were taken up by the lieutenants' cabins and that the gun deck (also refered to as the upper deck) was one more level above that, assemblages recovered from the first 50 cm layer should probably be related to functions carried out on lower deck. Thus, any of the lieutenants – the master as well – could have owned the sextant (MA 8542) and could have collected Polynesian material, owned a pistol or had uniforms and writing implements stored in their cabin. The baking trays (MA8613) are most likely to have come from the pantry also located on the lower deck (McKay & Coleman, 1992:54). Alternatively, these objects all could have been spares, and as such they may have been stored inside the platform deck store.

Analysis of all artefact locations suggests the deeper the artefacts were buried in the seabed, the better their condition and the more likely it was that they were stored in the lower parts of the ship at the time of sinking. It may have been the case that when large, heavy objects (e.g. the cannon and structural parts of the ship) collapsed and fell onto fragile material in lower deck levels, material from the upper decks appeared in the stratigraphy. Material from the upper-deck may also have been concreted to the guns well before their collapse occurred, in which case they would eventually have also been mixed with lower deck assemblages.

However the artefacts found deeper in the sediment, and therefore assumed to have been stored in the officers' store were found in stacks. For example, some of the creamware plates and the blue and white shallow bowls (MA8781-8789). In all of these situations, straw or sawdust 'packaging' (impact-absorbent) materials were found between the shallow bowls and plates. Other objects that were found packed in the store included fragile wine glasses. They were found lying on their sides, head to toe. A creamware dinner plate was found inside a compartment or 'bin' that appeared to be exactly the right size for the plate; it is assumed the bin was custom-made to suit what was to be stored (figure 34).

Conclusion

The 1999 Port of Townsville *Pandora* Expedition was the fourth major expedition sponsored entirely by the Pandora Foundation. While not as long in duration in terms of fieldwork as the two preceding expeditions, the 1999 expedition was a successful major maritime archaeological excavation. Again this success was partially attributed to the dedication and expertise of the team, most of whom had at least one season of experience on site – with six having at least five seasons' experience.

The value of promotion and publicity of the project was again demonstrated, this included live to air crosses from the site to local radio stations for interviews with expedition personnel. For a third consecutive season the project had an internet presence through the Expedition Leaders Chronicle.

In contrast to previous expeditions, the artefacts recovered during the 1999 season were not transported by road to the QM's Brisbane-based conservation laboratory. The wet storage area in the new conservation facility at the Queensland Museum's rebuilt and expanded

North Queensland campus, the Museum of Tropical Queensland, had become available. The entire 1999 artefact collection was housed in the purpose-built state of the art, wet storage facility in Townsville.

BEYOND 2000

The QM's tenth expedition to the *Pandora* shipwreck had been scheduled for January/February 2000; however, the expedition was postponed and eventually cancelled. It would have been the fifth and final expedition in the series of 5 seasons of fieldwork carried out as Stage 2 of the *Pandora* project.

Postponement was due to the unavailability of key staff, needed instead to work on fulfilment of the exhibition and interpretation outcomes for the *Pandora* Gallery (685m^2) and Great Gallery, then being re-built as QM's North Queensland campus, the Museum of Tropical Queensland (MTQ) in Townsville. Funded by the Queensland government, to the tune of $20 million appropriated to QM following the success of the *Pandora* Foundation's local $2.1 million fundraising campaign in greater Townsville, the new galleries in the entirely rebuilt, expanded and refurbished museum were scheduled to open in June 2000; in time to be an attraction in North Queensland for visitors to the 2000 Olympic Games in Sydney.

Curatorial input to the development of the MTQ's *Pandora* Gallery and Great Gallery was required on a part to full-time basis; it was provided by the same core team members usually participating in fieldwork. At the time this team comprised permanent full time QM staff Peter Gesner, Warren Delaney and Jessica Turner; and temporary *Pandora* Foundation funded contract staff Janet Campbell, Vivienne Moran, Bill Jeffery and Alison Mann. This team collaborated with QM's Public Program staff, led by Paula Murray, during a period spanning nearly 13 months, building-up to the new galleries' subsequent grand re-opening on 3rd June 2000.

Thus, during that year (1999/2000) all of the Brisbane-based archaeological team worked as a curatorial team – working to all intents and purposes on achieving the outcomes outlined in the 1995 management plan (see chapter 1) as a future Stage 3 of the *Pandora* Project devoting varying amounts of time to museum display development, i.e. content selection, research and interpretation etc.

Thanks to the dedication of the team, the new galleries subsequently opened, on time, to critical acclaim and substantial visitor interest. This permitted the team to return their attention back to archaeology matters. As well as planning for the next expedition – scheduled for January/February 2001 these included management and implementation of a relocation plan for the QM's maritime archaeology collection from the QM's Brisbane campus to its refurbished and expanded North Queensland campus – *The Home of the Pandora* – in Townsville's entirely revamped MTQ.

In the course of the following (financial) year (2000/2001) however, doubts arose about the prospect of conducting the final expedition on the same scale as the previous four *Pandora* Foundation-funded expeditions. Concerns were mainly expressed by the project leader (the author) who recognised that funds and human resources for on-going conservation and management of the *Pandora* collection were secure for the short-term only. Concerns were expressed about creating a highly undesirable collection-management problem by carrying out another full-blown expedition to recover another substantial artefact collection, but subsequently not be in a position to complete the required stabilisation work in a timely – i.e. 'best practice' – manner. Remaining work on the objects from previous fieldwork awaiting and/or undergoing conservation at QM's Brisbane laboratory and the large collection already in

wet storage at the MTQ's new conservation laboratory, were main issues of concern.

Doubts were expressed whether the financial resources that were still available would be sufficient to complete all the required conservation tasks. It became increasingly apparent that staffing needs, especially for conservation and collection management, had been underestimated. In September 2000 it was clear that almost half of the remaining project funds should be reserved to provide for continued contracting of technical and professional support staff over 24-30 months and to provide for conservation and collection management consumables (e.g. chemicals, packing materials etc .)

A scaled-down expedition in the summer (January/February) of 2001 was briefly considered as an alternative. It was always an option to consider, however, was never acted upon – partially because of the unavailability of several key team members, among whom the project leader, who went on two weeks' sick leave and 3 month convalescence leave following major heart surgery in March 2001.

Plans for the final season were eventually cancelled in 2002 in light of a QM-wide organisational review – conducted in 2001-02 – which resulted in plans for a different focus for the QM's 'Cultures & History' program.

The strategic direction of a maritime heritage program was reviewed and changed following this re-evaluation of the C & H Program. The strategic direction of the MTQ was re-assessed following the appointment of a new campus director whose priorities involved re-branding of the MTQ, with substantially less emphasis on a maritime/ nautical image and a greater emphasis on public programs and the addition of a major live insects habitat as a new theme for the MTQ – an insect habitat / display facility.

Consequently there was no archaeological excavation at the wreck of the *Pandora* since the 1999 expedition. Small QM-approved teams were, however, mobilised opportunistically to inspect and monitor the site's condition; these opportunistic visits were mainly conducted from dive tourism charter vessels availing themselves of an opportunity to offer their clientele a special wreck diving experience marketed as a 10 day live-aboard dive cruise called *In the Wake of the Navigators* during which visits were made to the *Pandora* and other historic locations associated with RN voyages in the Great Barrier Reef, Torres Strait and Coral Sea.

❑ ENDNOTES

1. Following the conservative dive tables published by the Canadian Defence and Civil Institute of Environmental Medicine (DCIEM).
2. Each point – except the W block- comprising a one tonne concrete dumper block and a 750kg Danforth anchor linked by a 50m length of 22mm stud link chain.
3. For instance, an omitted decompression situation, when it is imperative that divers are recompressed within a few minutes.
4. The swell rolls in unimpeded from the east through Pandora Entrance – a 6 mile gap in the outer barrier reef.
5. In 1996 the passage of Cyclone Dennis ca 100 miles to the south interrupted diving activity for 36 hours
6. Some 100 nautical miles north of Pandora Entrance
7. This time of year is colloquially referred to as 'the Wet' in northern Australia
8. Applying the DCIEM Tables and breathing surface-supplied air at a depth of 33 m, dive time (i.e. "bottom time") was 45 minutes per diver per day; followed by a 27 minute decompression stop at 9 m depth where divers switched to breathing 100% oxygen and lastly, a 1 minute ascent from the 'deco stop' to the surface on air.
9. Refer Acknowledgements, Chapter 1 for team members' names.

❑ ENDNOTES cont.d

10. Many of the registered numbers comprised more than one item – e.g. a cache of 12 shot (lead balls)
11. For the purposes of this discussion the designations used by John McKay (McKay/Coleman, 1992) are being followed here. Taking into account the so – called 'class plans' used by McKay, it is clear that five cabins were normally aligned along the aft lower deck – on the starboard as well as the port sides of a '*Porcupine* class' frigate, making ten lower deck cabins in total. Although the class plans describe the middle of the five starboard cabins as the "Marine Officer's cabin", McKay assigns this cabin to the third lieutenant, the one adjacent (aft) to the first lieutenant, while the aft-most starboard cabin is assigned to the second lieutenant.
12. It would not be exposed until the 1998 season (figure 3b).
13. Prominent internal timbers included three intact deck planks, the spirketting as well as the lower deck waterways; lower deck beams and knees were also sighted. The frames (scarphing between 2nd and 3rd futtocks?) and outer planking constituted other immediately recognisable timbers as well. The top edge of the top run of sheathing was also found to be buckled.
14. After locating the remains of a third individual in 1997, these individuals were subsequently nicknamed Tom (1996), Dick (1986 and 1996) and Harry, who was the third individual to be found; he was located during the 1997 expedition in another part of the wreck.
15. This notion is further discussed in chapter 7.
16. The discovery during the 1997 expedition of specially fitted 'bins', on the floor of the captain's store to contain 380 pots of spruce essence should be regarded as compelling evidence of this.
17. The forward-most starboard cabin in Figure 25 (Cf. McKay 1992:55).
18. Archaeological evidence to support this scenario would be encountered during the 1997 and 1998 expedition. (See chapter 7).
19. Every diver on SSB apparatus had an effective daily 'bottom time' of 45 minutes per dive.
20. However, the caveat noted earlier may still apply; in which case the material may have belonged to any of the other officers as well as to Captain Edwards (cf. Hamilton, 1998:5, 58).
21. This interpretation was subsequently included in the reconstruction of the officers' store built in the Museum's Pandora Gallery.
22. Detailed measurements were deferred to the 1998 expedition and were carried out by team members Cos Coroneos and Nigel Erskine.
23. Hence the high figure of 10 days against site set up/break down for this expedition. (Refer Table 9).
24. 'Bottom time' for divers using SSB apparatus was 45 minutes daily; SCUBA divers were limited to a 10 minute 'bottom time' and a 7 minute repetitive dive after the required surface interval.
25. ADM 3 /107 - Admiralty Board Minutes 1790, 18 August 1790.
26. For a more detailed report on the bow area, refer to Appendix 6 which contains Warren Delaney's field excavation reports and discussion of the bow excavation's findings.
27. Iron standards had also been uncovered in the stern section (grids 67-68) during the 1986 season, providing the first archaeological evidence of a major deviation from the architect's plans, i.e. wooden deck standards appeared not to have been used on the lower deck, as indicated by McKay & Coleman (1992: 54-56.) and following the extant 'class plans' and the 1782 'specifications for a 24-gun ship' (Adm. 168/147)
28. This section draws substantially on the standalone reports of the work conducted in the 1999 season written by Warren Delaney included as Appendix 6.
29. For a more detailed report refer to Delaney Appendix 6.
30. The location of gun#3 not indicated on Figure 30, only on Figure 38.
31. One was recovered in 1983 (Campbell/Gesner 2000:85) and another in 1998 (MA8299).
32. Consideration was being given to establishing a 'cannon corral' in shallower waters (< 21 msw) to the NW of grid reference pole 50/20, in the vicinity of the NW mooring (Figure 15) where sacrificial anodes could be attached to the cannon placed there and subsequently easily monitored by Scuba-diving conservators.
33. For a detailed report on the bow excavation, refer Appendix 4.
34. In this regard, the detail shown in the McKay drawings is supported by the archaeological evidence. (McKay/Coleman, 1992: 56) Refer also to Section 8.11.
35. This generally is the case where grids do not span areas of the wreck closest to or over the intact edge of the sheathing on the starboard side.