

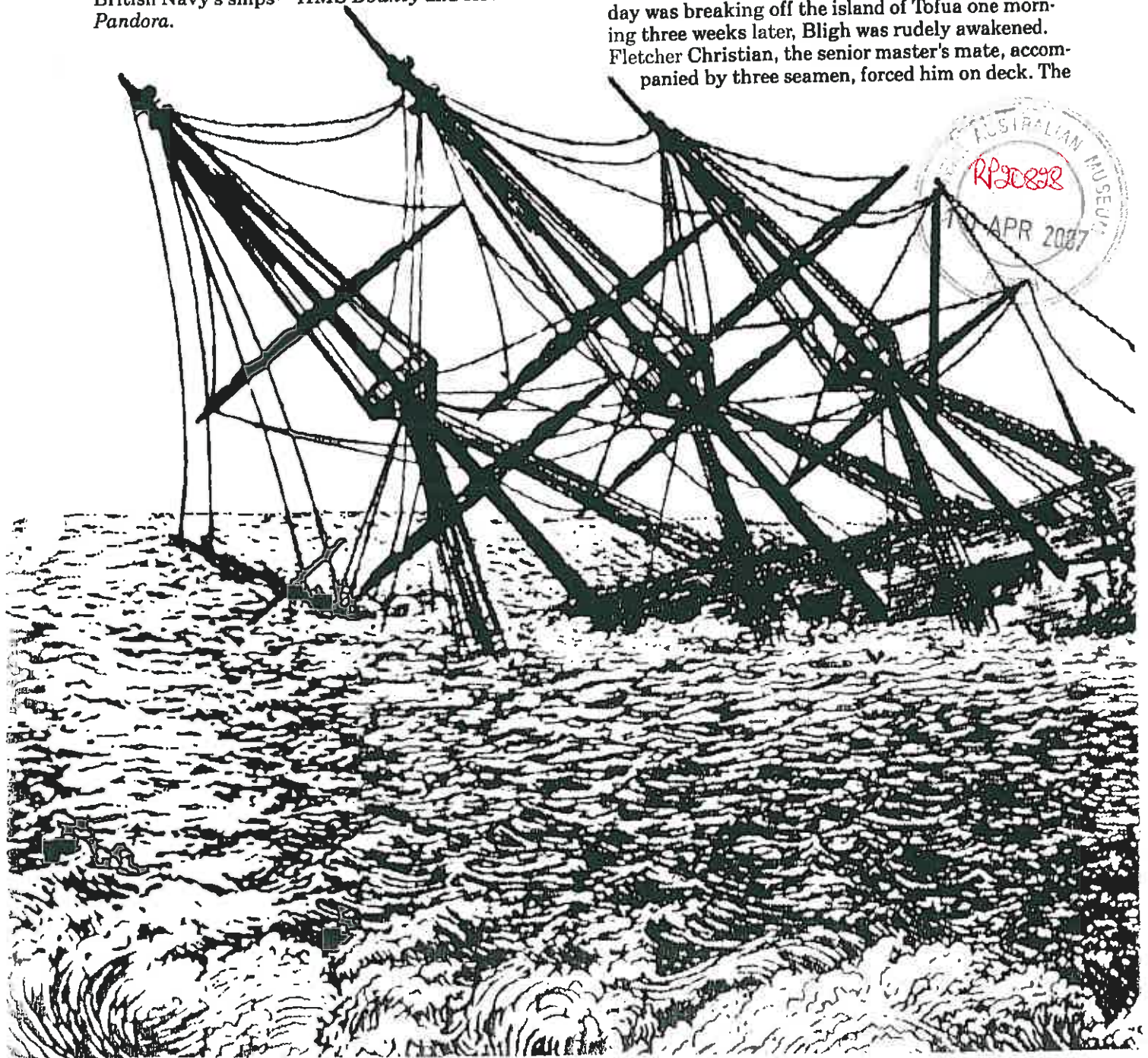
# HMS Pandora: Lost and Found

by GRAEME HENDERSON, DAVID LYON and IAN MACLEOD

The British government sponsored some extraordinary voyages to the South Seas during the second half of the eighteenth century. Perhaps the best known and most successful was Captain James Cook's expedition, which set out in the bark *Endeavour* to observe the transit of Venus at Tahiti on the 3rd of June in 1769. Having carried out his principal objective, Cook then went on to discover and explore the east coast of the Australian continent, setting the stage for the British occupation of 1788. Almost as well known, but entirely unsuccessful, was Captain William Bligh's plant gathering expedition. This resulted in one of the most infamous of all mutinies and the loss of two of the British Navy's ships—HMS *Bounty* and HMS *Pandora*.

Bligh had sailed with Cook on the last of his voyages of discovery in the Pacific, and was an eyewitness to Cook's death. In 1787 he was given the command of a small armed transport, HMS *Bounty*, for an expedition to Tahiti to gather breadfruit trees. These were to be taken to the West Indies sugar plantations as a potential food supply for the slaves. Bligh arrived at the island toward the end of 1788, but had to wait there for five months until the seedlings were mature enough to be planted in pots and taken on board. During that time, the *Bounty* crew formed strong attachments with Tahitian women.

The plants were eventually loaded and the *Bounty* left Tahiti on the 4th of April in 1789. Just as day was breaking off the island of Tofua one morning three weeks later, Bligh was rudely awakened. Fletcher Christian, the senior master's mate, accompanied by three seamen, forced him on deck. The



crew of the *Bounty* had mutinied, exasperated by Bligh's harsh discipline and allured by the promise of a life of dissipation on the beautiful islands they had left behind. They set Bligh and 18 loyal men adrift in an open boat. But with great determination and skill, Bligh sailed the 23-foot boat through Torres Strait to safety on Timor. When the ordeal was over, the exhausted men had sailed 3,618 nautical miles in 41 days without the loss of a single life. When Bligh's dispatch with news of the mutiny reached the Admiralty only one course could be taken. Mutiny was anathema to the eighteenth-century British navy, and exemplary punishment was the only thing for mutineers. A larger and more powerful ship would have to be sent to deal with the errant ship and seamen.

The 24-gun HMS *Pandora* went out late in 1790 under the command of Captain Edward Edwards to search for the mutineers and make another attempt to bring back breadfruit trees. Fourteen men were captured at Tahiti. They told Edwards that Fletcher Christian, with eight of the mutinous crew and some Tahitians, had sailed for an unknown destination. Their refuge was in fact Pitcairn Island, 1,300 miles southeast of Tahiti, where the mutineers burned the *Bounty* ashore in January 1790. It was not until 18 years after the mutiny, when the Boston whaler *Tbpaz* touched at the island, that the mutineers' refuge was finally found. Only one mutineer, John Adams, had survived the quarrels with the Tahitians. Captain Edwards never did find the mutineers, and his only option was to set a course for home, with some of the *Bounty* mutineers and a load of breadfruit. The prisoners were confined in irons in a specially built wooden cell, 3.35 by 5.49 meters, situated on the quarterdeck and referred to

as "Pandora's Box." The entrance was a 0.51 meter square scuttle on top, which was bolted down at all times.

On August 28, 1791 the *Pandora* was approaching Torres Strait. Edwards sent the yawl to examine an opening in the Great Barrier Reef—the world's most extensive coral reef. At 5 p.m. the boat crew signaled that a passage had been found. But night was coming on so they were ordered to return to the ship. At that time the soundings gave 110 fathoms. By 7 p.m., however, the lead line gave only 50 fathoms. Suddenly the vessel struck so hard on the reef that with every surge it appeared to the crew that the masts might come crashing down.

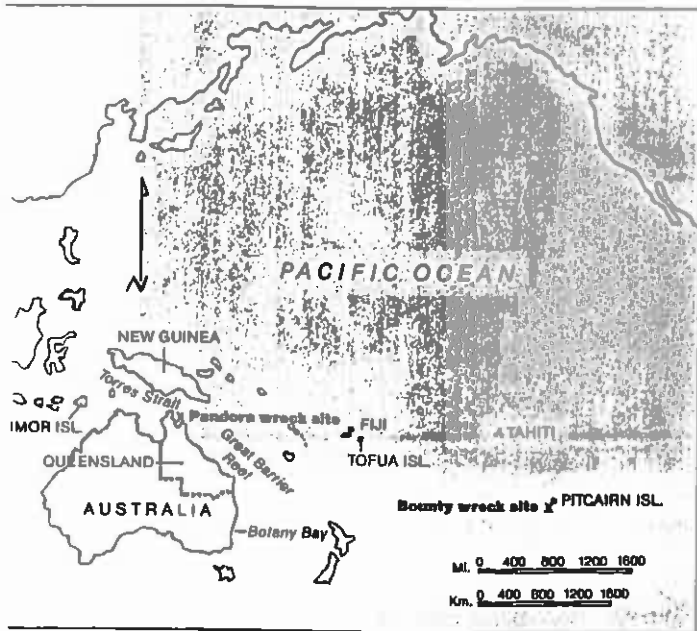
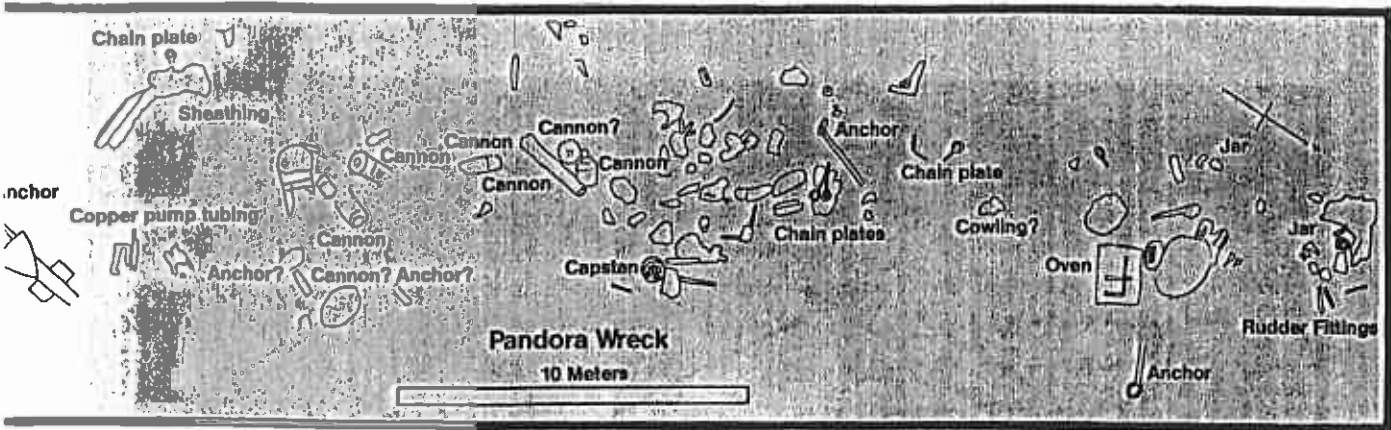
Soon there were three meters of water in the hold and the prisoners, fearful that the ship was going down, broke their irons in readiness. But the unfeeling Captain Edwards ordered them to be handcuffed and leg-ironed again with all the iron that could be mustered, while sentinels were ordered to fire into the box if the prisoners moved. Captain Edwards' conduct can be understood, if not condoned, if he is considered in the context of his time. Earlier in the year Britain had nearly gone to war with Spain. The French Revolution was in full swing on the other side of the Channel. International tension was high and social tension even more so. Ideas of equality were presenting a real threat to established authority. The result was that the Royal Navy, Britain's main line of defense, could not afford a show of weakness under any circumstances.

The crew threw some of the guns overboard to lighten the ship, but during the night several of the pumps broke down and it became clear that the ship could not be saved. As the *Pandora* went down, Captain Edwards leaped from the stern and swam to the pinnace. The bosun's mate threw the scuttle overboard, allowing those of the prisoners who could rid themselves of their hand and leg-irons to scam-

*The sinking of the Pandora as sketched by Midshipman Peter Heywood, one of the Bounty mutineers.*







Divers from the *M.V. Lumen* (inset, left), the vessel used to survey the Pandora wreck site, discovered a large coral-encrusted anchor with one arm rising from the seabed. Above) The plan of the site shows an ordered distribution of the Pandora's wreckage.

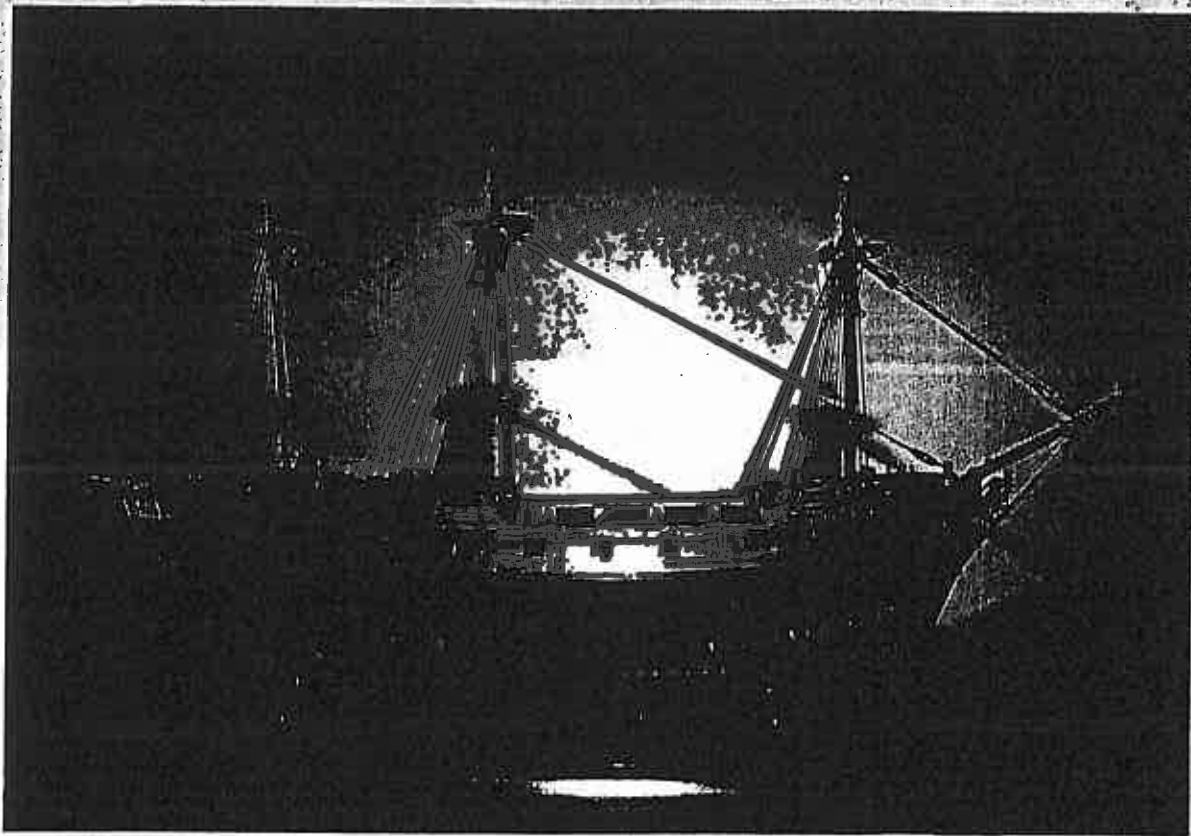
ble through the opening in their cell and struggle to the surface for air. Four mutineers drowned together with 31 of the ship's company.

The survivors camped on a small nearby island for 19 days. They were not the first to run aground on the treacherous reefs that protect the coastline of north Queensland. In 1770 the *Endeavour*, under the command of Captain Cook, had run aground on a coral reef some 250 miles further south. But Cook, after throwing six of his cannon overboard, had floated the ship and sailed to the mainland for repairs. The *Pandora*, however, was irretrievably lost in 17 fathoms. The survivors, including the unpopular Captain Edwards, set out for Batavia which they reached safely. Arriving back in England in June 1792, six of the ten surviving mutineers were sentenced to death. Meanwhile, Bligh, with two more ships, had already left England for Tahiti in another attempt to gather breadfruit plants. This time he was successful, but ironically the breadfruit was shunned by the slaves in Jamaica.

The wreck of the *Pandora* was discovered in November 1977 by divers from two private vessels. They were searching in the vicinity of Pandora Entrance, aided by an R.A.A.F. (Royal Australian Air Force) Neptune aircraft carrying a magnetometer. The find caused the Australian government immediately to proclaim the Historic Shipwrecks Act of 1976 to apply to waters off the Queensland coast. Previously, the act had applied only to Western Australia and the Australian Territories. Other Australian states were quick to follow the lead provided by Western Australia and Queensland. Now the act, one of the most advanced of its kind in the world, gives legal protection to archaeological sites in the waters of all the Australian mainland states.

Rewards are given to the finders of historic shipwrecks. This system encourages divers to report new finds and leave sites intact for archaeological excavation. The effectiveness of the legislation depends on whether divers view the reward payments as generous or parsimonious. In these times of government austerity, divers and maritime archaeologists join forces to lobby for adequate rewards. The finders of the *Pandora* were given a reward of \$10,000 Australian. The finders of an American China trader wrecked off the Western Australian coast were given a reward of \$17,500. Since that reward was paid, the site has been identified as the Boston ship *Rapid*, lost in 1811, and the Australian government is being lobbied for an increased reward on the basis of further archaeological materials found on the site.

In 1979 the Department of Home Affairs arranged for an expedition, directed by Graeme Henderson, to establish whether the site off the Queensland coast was indeed the *Pandora*, to assess the wreck's significance as an archaeological site, and to look at the feasibility of future excavation of material for research and display. The wreck was found on a level bed of coarse coral sand and extends 40 meters in a 150°-330° magnetic orientation. The ordered distribution of material on the seabed indicates that the ship did not break up as a result of turbulence. It simply settled into the seabed. Marine worms reduced the upper wood construction of the vessel, allowing heavy durable objects to sink vertically into the sand below. Given the conditions on the site—deep water, no turbulence on the



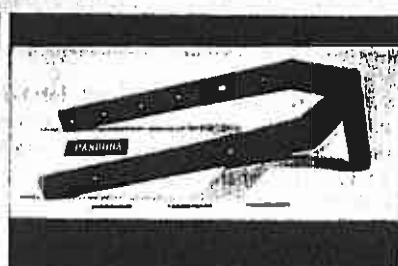
**HMS Crocodile, shown here in a model, was built in 1781 from the same plans used for the Pandora. The two vessels had the same dimensions and overall appearance. Even such detail fittings as rudder pintles would have been identical.**



**A detail of the Pandora's rudder pintle shows the name "Forbes" and a broad arrow. Length, 25 centimeters.**



**The number "24" punched into the pintle indicates a 24-gun ship.**



**The entire rudder pintle after treatment for bronze disease. Length, 77 centimeters.**

seabed, and level deep sand around and over the wreckage—it can be expected that a very substantial portion of the wooden structure lies buried in the sand. Exposed upper sections of chain plates which fasten the shrouds to the side of a ship give some indication of the level above which the timber has been destroyed.

Swimming from end to end of the wreck site, the major items exposed included a large anchor with one arm erect; a single small area of copper sheathing standing proud of the bottom, which may indicate that the toredo worm reached the vessel's

waterline only at this section because the entire hull below the waterline may be expected to have been clad originally in copper sheathing; copper tubing, likely to have been part of the ship's pumps; a group of iron cannon; the capstan; the ship's iron stove; several large "Ali Baba" oil jars; more anchors; and bronze rudder fittings. Lead deck scupper pipes, chain plates and a variety of other ironwork were intermingled with this material. The copper and bronze fittings were in good condition and the large ceramic jars appeared to be intact. Iron objects such as cannon and anchors had retained their shape

well and were only lightly encrusted.

Once the wreck site had been examined the most pressing question was that of positive identification. It could not be assumed simply because this wreck was in the correct position (judging by the accounts of the survivors) that it was necessarily the *Pandora*. The real test of identity had to be an overall correlation between what was known of the ship and what had been observed on or raised from the wreck so far.

The *Bounty* was a very small ship—in fact, much of the trouble on board seems to have been due to the fact that she was so small. And Lieutenant Bligh's lonely eminence as captain was made even more vulnerable because he had no other commissioned officers to support him, only young and inexperienced master's mates. Almost any vessel in the Royal Navy today would be bigger and better crewed than that small ex-merchantman. The whole situation obviously called for a senior officer with plenty of support from other officers. In other words, a full captain was needed, with a reasonably sized vessel to support his dignity and authority.

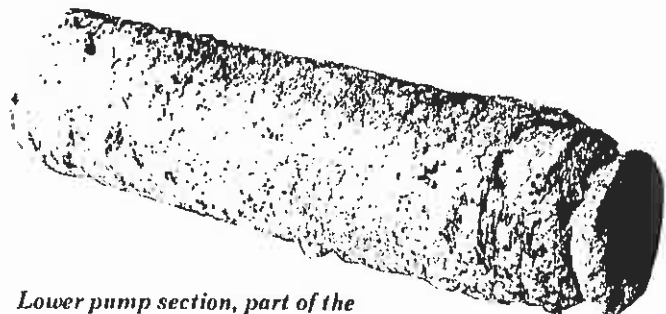
Ships in the Royal Navy at that time were divided into those which were the captain's commands and those which were not. Any ship commanded by a full captain was rated into one of six rates—divided originally by the pay rates of the captain—and soon afterward by size and gunpower. A first rate was a three-decker line of battleship of 100 guns or more, the biggest ship of the day. The sixth and smallest rate was for ships of between 28 and 20 guns. It was one of these—the 24-gun *Pandora*—which was chosen to sail for the Pacific. Other similar ships had been used for Pacific exploration work before, such as the 24-gun *Dolphin* a generation earlier. Captain Cook had shown that in many ways merchantmen were a better answer, with his *Endeavour* and *Resolution*. George Vancouver was following in this tradition with his *Discovery* at just this time, and the *Bounty* was an attempt to do the same thing as cheaply as possible. In order to create a command for Captain Arthur Phillip, who led the First Fleet of convict ships out to Botany Bay to form the first Australian settlement, an ex-mercantile transport, the *Berwick*, was re-classed as a sixth rate and renamed *Sirius*—a largely paper transaction to make her suitable for a Captain R.N. It is somewhat surprising that the same was not done for Captain Edwards, who was appointed to command the mission to track down the *Bounty* mutineers. Perhaps it was felt that a proper warship was required and so the *Pandora* was chosen.

She was one of a class of ten 24-gun ships built during the American War of Independence. *Pandora* was almost certainly ordered as being the most suitable type of vessel to deal with the problem of colonial disorder in North America, before the troubles there sparked an international maritime conflict for which other and larger types of warship were more suitable. This class, the Porcupine class, consisted of elegant, small three-masted ships, 34.82 meters long on the gundeck and 9.75 meters broad, with a depth in hold of 3.12 meters. The original

design by Sir John Williams, Senior Surveyor of the Royal Navy, was drawn up in 1776, and allowed for an armament of 22 nine-pounder cannon on the upper deck and two six-pounders on the quarterdeck. Although the ships also had a small forecastle, a short raised forward deck, this carried no guns. The officially allocated complement was 160 officers and men. *Pandora* herself was probably ordered to be built on the 11th of February in 1778. Her construction was contracted to the Deptford yard of Adams and Barnard, a partnership of two well-known ship-builders who had their own yards at Buckler's Hard in the New Forest and in East Anglia, respectively. This partnership helps to explain the legend still promulgated at that famous yard that the *Pandora* was built at Buckler's Hard. She was launched on May 17, 1779, went to Portsmouth to fit out, and then sailed off to play an active part in the war. After the end of the American war, she was laid up in the River Medway until selected for the Pacific mission.

The *Pandora* had the appearance of a small frigate, although it would be incorrect to call her one since the smallest frigates were 28-gun ships. She originated from a much older line than the true frigates, the first of which were not built until the middle of the eighteenth century. Sixth rates of *Pandora's* type had served in some numbers with the Royal Navy from the late seventeenth century. They were useful general purpose ships used for convoy escort, commerce raiding and general detached duty, particularly on Colonial Stations. A fine example of the versatility of the type is the *Rose*, whose depredations off the New England coast in the early months of the American Revolution caused the first demands for the creation of an American navy. By this time the larger frigate, which was really as cheap to build and man but more effective in war, was pushing the smaller sixth rate into the background. Even so, the type continued to be built in reduced numbers for some time.

The *Pandora* was refitted at Chatham Dockyard during the early autumn of 1790 for her Pacific voyage. The refit, besides preparing her to go to sea again after slow deterioration during her time in "ordinary" (the term used at the time for ships laid up in reserve), also involved the construction of extra storerooms in the hold for the voyage. One of these was intended for olive oil jars and other such odd-shaped items. Another alteration concerned the armament. During the latter years of the American war the short range but powerful carronade had proved its value—and four 18-pounder carro-



Lower pump section, part of the *Pandora's* equipment. Length, 73 centimeters.

nades replaced the two original long guns on the quarterdeck while 20 six-pounder cannon replaced the original nine-pounders on the upper deck. In October 1790 the structural work was completed and *Pandora* dropped downriver to the moorings at Black Stakes at the junction of the Thames and Medway to complete storing. Odd items such as tents, extra cordage, and a fine selection of all sorts and sizes of fishhooks and fishing lines suitable for sharks down to the smallest fish were rushed on board before *Pandora* sailed for the Pacific via Portsmouth.

**T**he discoverers of the shipwreck had raised a small number of items from the site. These artifacts provided a wealth of information about the state of preservation and the identity of the wreck. The salvaged items included two bronze rudder pintles—pins which hinge the rudder to the stern of the ship. One of the pintles was sent for treatment to the Western Australian Museum's Department of Materials Conservation, which deals principally with waterlogged materials. The fitting was covered with a dense layer of coralline material which supported outgrowths of coral, oysters and mollusks. Parts of the coral were stained green because of the interaction of the corrosion products from the bronze with the calcareous skeletons of the marine organisms.

There were several compelling reasons why the coral and other adventitious material should be removed. It is commonly found that when marine bronzes are displayed in warm humid environments, such as the temperatures found in Queensland, they undergo a rapid form of decomposition known as bronze disease. Instead of corrosion (patination) leading to a chemically stable and aesthetically pleasing layer of oxidized material over the metal, such as what is found on ancient Chinese bronzes, the metal continues to corrode. If left unchecked the objects will ultimately disintegrate. The pintle exhibited mounds of a blue-green copper mineral paratacamite breaking through the organic coralline layer. This copper mineral is a good indicator of bronze disease, so it was obvious that treatment to arrest degradation was essential. A second, and in this case more immediately important, reason for removing marine concretions is that useful information sometimes can be found on the surface of the metal object itself.

To stabilize bronzes that are undergoing such accelerated corrosion one must either maintain an inert atmosphere of nitrogen or argon gas, provide a relative humidity of less than 32 percent, or wash the object in a suitable solution to remove the aggressive chloride ions. The pintle was washed for two solid months in a plastic tub filled with 70 gallons of deionized water containing a mixture of bicarbonate of soda and washing soda. The brain coral, oysters and mollusks were removed manually using a flat hammer before the pintle was placed in another tub, this time containing citric acid and thiourea. After a few days, the concretion had either dissolved or softened so that it could be removed with a stiff nylon bristle brush. This preliminary treatment revealed two broad arrow marks and the name "Forbes" in raised lettering. Most of the pintle's

surface was covered with a dense gray-black thin layer of copper sulphide chalcocite with traces of diginite. The sulphides were mechanically removed, revealing further markings—a series of small dots punched into the pintle arm to form the number 24, and two larger dots punched into the lower edge of the pintle.

Samples of the concretion and corrosion products were taken for analysis before any chemical treatments to insure that important information regarding the site history would not be lost. From the varied nature of the copper minerals, it seems likely that after the ship foundered the pintle rested in water which had a good oxygen supply. This supported the growth of the normally protective but biologically toxic red-brown cuprous oxide. Then the site changed: The pintle fell into deeper water and was covered by sediment. In the absence of air some types of bacteria gain their oxygen from sulphate ions in the sea water, producing sulphide ions as a by-product. These ions react with the corroding metal to form insoluble minerals such as cuprous oxide. The site conditions around the pintle apparently changed back to aerobic because the black sulphide was next colonized by Bryozoa. These minute organisms secrete an exoskeleton, which looks like a flattened honeycomb and requires aero-

*An "Ali Baba" oil jar, part of the recovered cargo of the Pandora. Height, 77 centimeters.*



bic conditions to survive. The site conditions did not undergo any further drastic change before the pintle was raised, resulting in secondary colonization by serpulid worms and corals. The combination of these alternate site conditions appears to have been remarkably protective, since the bronze pintle suffered little corrosion after 186 years in the sea.

The markings on the 64-pound pintle, which seems to have been carried on the vessel as a spare, provide clear evidence that the wreck is the *Pandora*. First, the broad arrow marks show that the pintle was made for the British government. The number 24 punched into the pintle corresponds with the number of guns carried on the *Pandora*. Finally, the name "Forbes," appearing in raised letters, undoubtedly refers to William Forbes, who in 1779 was supplying a large proportion of the copper items used at the Deptford shipbuilding yard. And the *Pandora* was built at Deptford in 1779. The two larger punched dots possibly denote the second pintle position on the rudder. The British Navy's 1782 standard 24-gun building contract required that such vessels have five pintles on the rudder. This same contract gave the pintle diameter as 6.03 centimeters, identical to the cleaned pintle.

The *Pandora* wreck has considerable historical and archaeological significance. The mutiny on the *Bounty* and its remarkable train of events is regarded by many as one of the greatest sea stories of all time. Yet the broad significance of the *Bounty* episode should be measured in terms of the European penetration of the South Pacific—what the historian Alan Moorhead has termed "the fatal impact." That penetration commenced with the arrival of James Cook in the *Endeavour*, was accelerated by Fletcher Christian and his band of mutineers, and was completed when the economic exploitation of the region reached its peak in the nineteenth century.

For archaeologists, *Pandora* has a special impact since it may prove to be one of the best preserved shipwreck sites in Australian waters. In assessing the archaeological significance of the *Pandora*, the site can conveniently be divided into two aspects: the hull and equipment belonging to the ship, and the cargo and crew's possessions. The distribution and condition of material exposed on the seabed indicates that the vessel was subjected to little disturbance after settling on the bottom. Assuming that the hull is also in an excellent state of preservation, what is its potential for the study of eighteenth-century shipbuilding? Already during the eighteenth century the use of plans had become more widespread. The English Navy Board required construction drawings from 1716 on, and these became increasingly comprehensive as the century progressed. The plans used to build the *Pandora* survive in the Admiralty collection at the National Maritime Museum, where detailed specifications and fine contemporary models of similar ships can be found. As far as the archaeological remains of these vessels are concerned, the importance of the physical evidence lies in studying the finer details of ship construction, and in ascertaining if all of the naval specifications were followed, or if they were modified in the course of the vessel's life. The well-

documented *Pandora* provides a good opportunity for such research.

Britain has an eighteenth-century warship—HMS *Victory*. But the scale is not comparable to *Pandora*. The USS *Constitution*, a frigate built in 1797 and restored in the United States, is also considerably larger. The raised hull of the *Pandora* would provide the means for detailed comparison with these larger warships and an avenue to study the smaller ships with which Britain ruled the sea. She represents the ordinary working warship of the Royal Navy well—not an outstanding design, but a useful vessel built in numbers and used for all sorts of second line tasks, differing only in size, strength and number of decks from the larger vessels which fought in the line of battle. Even the condition of the wreck favors the survival of both the cargo (in this case the breadfruit plants and the many stores intended for the *Bounty* and her crew), and the hastily abandoned crew's possessions. Deeper levels within the wreck may well yield the wooden containers of the breadfruit. With careful excavation, study could go beyond the technological features of the vessel to social aspects of the crew's accommodations and their activities. The results are bound to shed new light on the life of a seaman on a British naval/scientific expedition of the eighteenth century. Now that the position of the *Pandora* is known, the staff at the Queensland State Museum is currently preparing plans for the first stage of the excavation of the *Pandora*.

**FOR FURTHER READING on the *Bounty* mutiny and its aftermath:** George Hamilton, *Voyage around the world conducted by H.M. frigate Pandora* (Berwick, 1793); Henry Maude, "The voyage of Pandora's tender," *Mariners Mirror* 50 (1964): 217-36; Alan Moorhead, *The Fatal Impact: The Invasion of the South Pacific 1767-1840* (London 1966).

**On shipwrecks in Australian waters:** Charles Bateson, *Australian Shipwrecks Volume 1 1622-1850* (Reed, Sydney 1972) covers shipwrecks in all Australian states but is not comprehensive; Graeme Henderson, *Unfinished Voyages: Western Australian Shipwrecks 1622-1850* (University of Western Australia Press, 1980).

**On eighteenth-century warships:** Frank Howard, *Sailing Ships of War 1400-1860* (Conway, Greenwich 1979), provides a good general coverage; C. Nepean Longridge, *The Anatomy of Nelson's Ship* (Argus, Hertfordshire, England 1977), details the *Victory*.

**On the use of ship plans in maritime archaeology:** David Lyon, "Documentary sources for the archaeological diver: ships' plans at the National Maritime Museum," *The International Journal of Nautical Archaeology* 3:3 (1974): 3-19.

**On marine conservation:** Ian MacLeod, "Bronze Disease, an electrochemical explanation," *Institute for the Conservation of Cultural Materials Bulletin* 8 (1981): 16-26; and "The formation of marine concretions in copper and its alloys," *The International Journal of Nautical Archaeology* 11:4 (1982).

