Wrecks and Relics

Looking after maritime archaeological finds in the Robe region

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Abbreviations

ANMM Australian National Maritime Museum

AUCHD Australian Underwater Cultural Heritage Database

DCCEEW Commonwealth Department of Climate Change, Energy, the Environment and Water

DEW South Australian Department for Environment and Water

ICOMOS International Council on Monuments and Sites

SAILS South Australian Immigrant and Labourer Shipwrecks

SARHS South Australian Register of Historic Shipwrecks

SWF Silentworld Foundation

UNCLOS United Nations Convention on the Law of the Sea

UNESCO United Nations Educational, Scientific and Cultural Organization

Cover image View of Robe obelisk.
Irini Malliaros, Silentworld Foundation

MU
SEA
UM

SILENTWORLD FOUNDATION

National Trust

Cultural Heritage Agency
Ministry of Education, Culture and Science

Kingdom of the Netherlands

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Contents

1 Introduction

Robe is located at the southern end of Guichen Bay, South Australia. The bay is a large body of water with a predominantly sandy seabed that provided excellent anchorage for ships during the 19th century. However, the bay's vast, open entrance faces west and provides little protection from the full fury of the Southern Ocean during periods of inclement weather. Historically, this latter attribute resulted in the loss of several vessels, including three ships that wrecked while, or after, transporting Chinese immigrants to Robe in 1857. One of these shipwrecks, a Dutch *fregat* called *Koning Willem de Tweede*, is the focus of the study from which this booklet is being produced; however, its contents can also be applied more broadly to underwater cultural material found within Guichen Bay and its surrounds.

Dutch maritime links to Australia

When people associate Dutch shipwrecks with Australia, most think of 17th- and 18th-century vessels – such as *Batavia* and *Zeewijk* – that were lost on the coast of what is now Western Australia while transiting between the Netherlands and the former Dutch East Indies (modern-day Indonesia). The association is warranted, given that wrecked Dutch vessels from Australia's pre-colonial period have been the subject of extensive historical and archaeological inquiry. Nevertheless, by the 1850s the Dutch were again traversing Australian waters, this time aboard merchant ships carrying goods and passengers directly to and from the continent. Most of these voyages were between Sydney and Amsterdam by way of Batavia (modern-day Jakarta). During the 19th century, several Dutch ships were lost among the labyrinth of shoals and coral outcrops that make up the Great Barrier Reef and Australian Coral Sea Territory. Discovery and investigation of these wreck sites constitute a new avenue of historical and archaeological inquiry with which to examine Dutch maritime links to Australia.

Another intriguing but little-known maritime link between Australia and the Netherlands in the 1850s is the role of Dutch ships in transporting Chinese immigrants to the Victorian gold fields. The discovery of gold in Victoria in 1851 prompted hundreds of thousands of people from around the world to flock to the colony and seek their fortune. Among them were tens of thousands of Chinese, the majority of whom were men from the densely populated region surrounding the trading cities of Guangzhou, Hong Kong and Macau. The rapid influx of Chinese migrants to Victoria aroused anxiety within the colony's European population, with the result that the government passed the *Chinese Immigration Act* in June 1855 to limit the number of Chinese immigrants a vessel could carry. The Act also required ships' masters to pay a £10 poll tax for each Chinese passenger brought to Victorian ports. Ultimately, the legislation failed to curb Chinese migration to the gold fields, as ships began landing passengers at Robe, the nearest non-Victorian port. From there, an estimated 17,000 Chinese walked more than 400 kilometres to reach the diggings in places such as Ballarat, Bendigo and Daylesford. Most ships that delivered Chinese immigrants to Robe were British or American, but the Dutch also played a significant role. In 1857 alone, five Dutch vessels arrived at Robe with a combined consignment of about 2,000 Chinese passengers. One, *Koning Willem de Tweede*, would never leave Guichen Bay.

Koning Willem de Tweede

Koning Willem de Tweede was launched at the shipyard of Fop Smit in Kinderdijk, Netherlands, on 8 December 1840. Originally named *Erfprinses van Oranje* (*Crown Princess of Orange*), it was 140 feet (42.7 metres) long, had a beam of 39 feet (11.9 metres), a draft of 13 feet (4.0 metres) and a carrying capacity of 800 tons. It first appears in *Bureau Veritas* in 1842 and was commanded by LCE van der Brugh. *Koning Willem de Tweede* was initially owned by the firm BJ Suermondt of Rotterdam, but by 1842 ownership had transferred to Pieter Varkevisser, and the vessel was registered in The Hague. In 1849 its registration changed to the Port of Rotterdam. Little is currently known about *Koning Willem de Tweede*'s sailing career. It was certified to travel 'all seas', but scant historical evidence of its overseas journeys has so far been found.

The vessel departed on its final voyage in early June 1857, bound from Hong Kong for South Australia with over 400 Chinese migrants. It arrived at Robe on 15 June 1857, and its passengers were safely discharged the following day before commencing their arduous overland passage to the gold fields. Due to inclement weather, *Koning Willem de Tweede* remained sequestered in Guichen Bay and was still at anchor when it was struck by a severe southwesterly gale on 30 June. Initially the anchors dragged, but as the storm and seas intensified, the windlass was reportedly torn from the weather deck. This prompted the captain, Hindrik Remmelt Giezen, to order the vessel's crew to set sail to intentionally run it aground in shallows off Long Beach, a crescent-shaped sandy expanse that forms the bay's eastern boundary. Despite grounding on sand bottom close to shore, the storm's severity caused the hull to quickly break up and led to the loss of 16 of its crew of 25 when one of the ship's boats overturned in the surf. Giezen survived, but only through sheer luck, as he was unable to board the doomed boat and was later dragged to safety through the surf by a rope that he attached to a small barrel and floated to bystanders on shore. He reportedly sold the wreck for £225 to Robe carpenter Jacob Chambers a short time later. It is unclear whether Giezen remained in Australia, but a lawsuit brought against him in the 1860s suggests the *fregat*'s final voyage may have been unsanctioned and conducted without the shipowner's knowledge.

Koning Willem de Tweede at Batavia, 1849. Watercolour by Jacob Spin. Courtesy Rotterdam Maritime Museum (P1850)

Several artefacts currently in public and private collections within Robe and its surrounds are believed to be associated with *Koning Willem de Tweede*. These include an iron cannon displayed at Flagstaff Hill on the town's foreshore, a copper-alloy bell and several wooden doors reportedly salvaged from the wreck in 1857 and currently still in use in one of the town's oldest extant hotels, the Caledonian Inn. As part of an earlier phase of this project, all were documented extensively with digital photography, and the resulting images used to generate 3D models. Several unprovenanced shipwreck artefacts in the possession of the National Trust of South Australia (Robe Branch) were also examined, with the goal of identifying the vessel(s) from which they originated. Analysis of these and other community artefacts is ongoing.

Dr James Hunter (ANMM) photographs a copper-alloy bell believed to be associated with *Koning Willem de Tweede*. Image Heather Berry, Silentworld Foundation

Archaeological conservation and Robe's underwater cultural heritage

From a community conservation standpoint, Robe presents unique opportunities. The town prides itself on being in touch with its history, which is evidenced when walking through the rows of historic houses and wandering through the Robe Gaol and past the obelisk. Robe has been moulded from the ships that visited Guichen Bay, and literally built from those that wrecked there. Following a successful inmate escape, the gaol's walls, built from soft sandstone, were reinforced in 1863 with boilerplate reportedly salvaged from the wreck of *Admella*. Constant contact between significant shipwrecked items and the town's development creates a dynamic setting for the conservation of artefacts.

The best way for artefacts to be conserved and to survive generations is for them to be used and seen, rather than locked out of sight. Robe has excelled in this regard. The Caledonian Inn possesses extraordinarily well-preserved wooden doors that are believed to be salvaged from shipwrecks, as do several private residences. Through their conservation, the wrecks' stories are kept foremost in people's minds. Artefacts in the Customs House Museum are well cared for and evoke stories of the town's previous inhabitants. Assessment of artefacts held in the town's public and private collections enables a better understanding of their degree of preservation. This in turn allows development of specific community conservation advice and strategies. What follows is a brief *precis* of maritime archaeology and relevant cultural heritage legislation, followed by a more comprehensive discussion of artefact material types and conservation treatments that may be administered for their ongoing care.

Dr James Hunter (ANMM) documents another historic shipwreck site in South Australian waters – the barque *South Australian*, lost near Victor Harbor in 1837. Image Irini Malliaros, SAILS

2 Maritime archaeology

Archaeology has been defined as the study or examination of the past through its material remains (buildings, personal effects, cultural landscapes, etc). The discipline uses recognised methods or techniques of investigation that may include:

- methodical survey
- recording
- conservation
- interpretation
- management
- and, in some special circumstances, excavation of archaeological sites.

Archaeological investigation is usually based upon a theoretical framework and used to answer specific research questions about the past (Hosty 1995).

Archaeology frequently provides information that is not present in written records or has been overlooked by record keepers or deemed inconsequential or inappropriate. Used in conjunction with historical sources, archaeology may confirm, expand upon or contest documentary evidence. Archaeological investigation is therefore a means both of testing the validity of facts derived from historical documents, and of generating new ideas and information about the past.

Like many other disciplines, over time archaeology has been divided by time, practice, methodology, and in some cases ideological, political and religious beliefs, into a whole series of sub-disciplines. These include Middle Eastern, Feudal, Roman, Biblical, Pre-contact, Post-contact and historical archaeologies. One of the most recent sub-disciplines of archaeology to emerge is that of maritime archaeology. It has its roots in early-20th-century investigations that employed professional divers to 'excavate' (or, when viewed through a modern lens, salvage) underwater archaeological sites under the loose supervision of non-diving classical archaeologists.

This random, and what would now be considered very unscientific, method of excavation would likely have continued if not for the invention of self-contained underwater breathing apparatus (scuba) in the early 1950s. Hundreds of people were suddenly given access to the underwater world and the cultural material it contained. Before scuba, this material had – with the exception of the occasional discovery by a sponge or pearl diver, or commercial salvage venture – remained unseen and untouched.

The development of scuba equipment saw a dramatic increase in interest in, and salvage of, historic shipwrecks. In many countries this work was conducted with an eye for profit rather than knowledge. The laws of salvage and commercial gain – rather than archaeological principles – dictated that excavation take place quickly, with little regard for archaeological context or even material conservation of recovered artefacts.

Thankfully, some national governments, archaeologists and recreational divers realised underwater cultural heritage sites could be managed responsibly through protective legislation and educational initiatives. Further, they argued that excavation should be conducted carefully and scientifically, and recovered material conserved, curated and kept together as a single collection. Doing so, they reasoned, would not only preserve underwater heritage resources – such as shipwrecks, submerged landscapes and inundated prehistoric sites – for the enjoyment of all, but could also add significantly to our knowledge of the past.

In 1966, Dr George Bass published his landmark volume *Archaeology under water*. By this time the discipline had started to develop science-based methods and techniques that differentiated maritime archaeologists from commercial salvage divers and treasure hunters. Through the pioneering work of Bass, Keith Muckleroy, Margaret Rule and Australia's own Jeremy Green, maritime archaeology is now defined as:

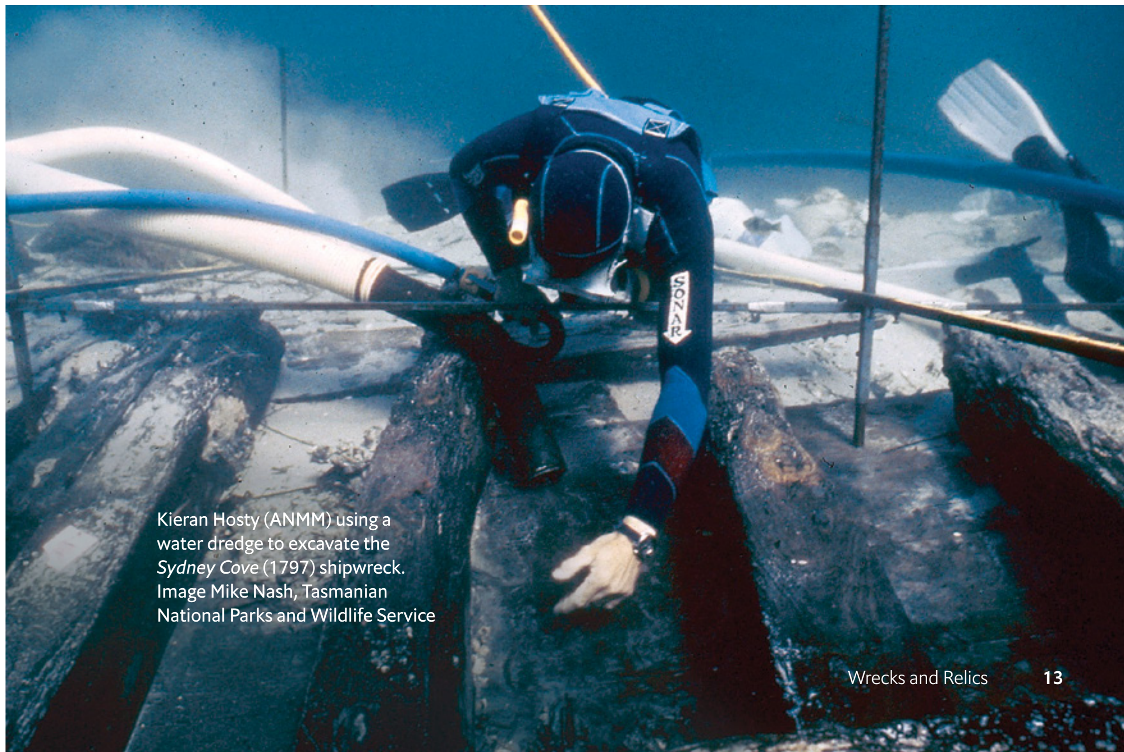
... the scientific study of the maritime past through the surviving material culture of all aspects of seafaring – ships, boats, equipment, cargoes, catches, passengers, cargo, crew and personal effects (Muckelroy 1978).

It also comprises the archaeological examination of all traces of human existence with a cultural, historical or archaeological character that have been partially or totally under water (periodically or continuously) for at least 50 years.

These traces can include:

- sites, structures, buildings, artefacts and human remains, together with their archaeological and natural contexts
- vessels, aircraft, other vehicles or parts thereof, their cargo or other contents, together with their archaeological and natural contexts
- objects and sites of a pre-contact nature, such as submerged occupation sites, fish traps and stone quarries
- marine-related sites such as shipwreck survivor or shipwreck salvage sites, ports, harbours and shipbuilding facilities.

The discipline of maritime archaeology is largely perceived in terms of accepted methods of archaeological site assessment, scientific excavation, recording, management and interpretation of underwater cultural heritage. Direct results of maritime archaeology can include site interpretation and conservation management plans, media interviews, exhibitions, public education programs and publications (in both hard-copy and digital formats).



Kieran Hosty (ANMM) using a water dredge to excavate the *Sydney Cove* (1797) shipwreck. Image Mike Nash, Tasmanian National Parks and Wildlife Service

Shore-based interpretive signage for the *South Australian* shipwreck site near the community of Encounter Bay. Image James Hunter, SAILS

3 Shipwrecks, artefacts and the law

Historic shipwrecks in South Australian state waters are protected by the South Australian *Historic Shipwrecks Act 1981* and the *Historic Shipwrecks Regulations 2017* (DEW 2023). State waters include:

- the waters of Gulf St Vincent and Spencer Gulf
- proclaimed historic bays (Anxious Bay, Encounter Bay, Lacepede Bay and Rivoli Bay)
- inland rivers and lakes
- everywhere else above the high tide mark.

Historic shipwrecks, aircraft and artefacts in Commonwealth or Australian waters (all other waters adjacent to state waters) are protected under the *Underwater Cultural Heritage Act 2018* (DEW 2023).

These pieces of legislation have similar protection provisions and require that anyone who discovers, possesses or transfers custody of a historic shipwreck and/or relic must notify South Australia's Department for Environment and Water (DEW) or the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) (DEW 2023).

All shipwrecks and associated relics (artefacts) that came to be lost in these waters at least 75 years ago are automatically protected by the above legislation. Similar protection is given to submerged aircraft in Commonwealth waters. Historic shipwrecks, aircraft and relics/artefacts are registered on the South Australian Register of Historic Shipwrecks (SARHS). The contents of SARHS can be accessed via the Australian Underwater Cultural Heritage Database (AUCHD). Please see Section 13.6 for access details.

3.1 Discovering a historic shipwreck, aircraft or relic/artefact

If you discover the location of a historic shipwreck, aircraft or historic relic/artefact you must notify South Australia's Department for Environment and Water (DEW 2023). Please see Section 13.6 for contact details.

3.2 Possessing a historic shipwreck, aircraft or relic/artefact

It is illegal to disturb or remove items from historic shipwrecks without a permit. Nevertheless, dealers and collectors can legally purchase or sell protected objects, and relics or artefacts can also be held by private collectors under a strict process of regulatory custody and transfer (DEW 2023). If you have possession, custody or control of a historic shipwreck, aircraft or associated relic/artefact, you must notify South Australia's Department for Environment and Water (DEW). Please see Section 13.6 for contact details.

3.3 Transferring a historic shipwreck, aircraft or relic/artefact

If you have possession, custody or control of a historic shipwreck, aircraft, and/or relic/artefact and wish to transfer the article to another entity, then you must notify DEW and give details of the entity to which it is to be transferred (DEW 2023). Please see Section 13.6 for contact details.

3.4 Moving a historic shipwreck, aircraft or relic/artefact interstate

If you retain custody of a historic shipwreck, aircraft and/or relic from state waters but are moving interstate, you must notify South Australia's Department for Environment and Water. Please see Section 13.6 for contact details.

If you retain custody of a historic shipwreck, aircraft and/or relic from Commonwealth waters but are moving interstate, you must notify the Commonwealth Department of Climate Change, Energy, the Environment and Water. Please see Section 13.6 for contact details.

3.5 Shipwrecks or underwater cultural heritage – what's the difference?

Legislative protection of a historic shipwreck, aircraft wreck or artefact is based on whether it is located in Commonwealth or state waters. State waters include the waters of Gulf St Vincent and Spencer Gulf, Anxious Bay, Encounter Bay, Lacepede Bay and Rivoli Bay, inland rivers and lakes, and everywhere else above the high-water mark (DEW 2023).

In state waters, only historic shipwrecks and associated relics (artefacts) that were lost in state waters at least 75 years ago, are protected by the *Historic Shipwrecks Act 1981* and the *Historic Shipwrecks Regulations 2017* (DEW 2023). However, in Commonwealth waters the *Underwater Cultural Heritage Act 2018* protects not only historic shipwrecks and relics (artefacts) lost in these waters for at least 75 years, but also submerged aircraft or any other cultural heritage items that are declared under that particular Act. It is unlawful to damage, destroy, interfere with or remove a historic shipwreck (and, in Commonwealth waters, aircraft or relic/artefact) without a permit (DEW 2023). Please see Section 13.6 for additional information.

3.6 Exporting a historic shipwreck, aircraft or relic/artefact out of Australia

It is illegal to export historic relics, including coins, out of Australia without an appropriate permit. Prohibition against exporting historic relics is listed under Section 35 of the UCH Act and requires a permit granted under Section 23 of the same Act. You should contact South Australia's Department for Environment and Water to lodge a permit application for possession or export of protected underwater cultural heritage. Please see Section 13.6 for contact details.

Maritime archaeological conservator Heather Berry (SWF) conducts a conservation assessment of an iron capstan on the grounds of Robe's Customs House Museum. Image James Hunter, ANMM

4 Material conservation

People – particularly those who are looking after their personal or their community's heritage – are central to conservation of our collective heritage (Scott 2018: 22).

4.1 Agents of deterioration

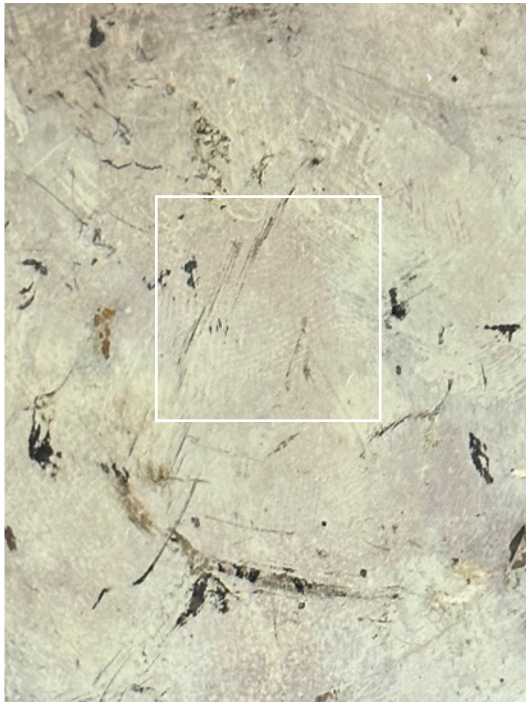
When considering objects and their preservation, it is necessary to first consider the agents by which they may come to harm. By understanding the ten 'agents of deterioration', as they have been termed by the Canadian Conservation Institute, one can begin to understand how to care for an artefact collection. These agents are:

- Physical forces
  - For example: incorrect handling causing mechanical damage to an object. This may result in either the total loss of an object, or loss of parts. It may also result in weakening of the structural integrity of an object (Marcon 2018).
- Fire
  - The loss of objects, or their associated information, due to a fire event. Even if not directly affected by a fire, artefacts may suffer long-term damage due to heat stress or may be affected by smoke staining (Stewart 2018).
- Theft and vandalism
  - This act of deterioration involves removal of all or part of a display by thieves, or the intentional damage of an artefact by vandals (Heritage Collections Council 2000: 9).
- Water
  - Water may cause damage via a flood event. Flooding may cause direct damage to collections and artefacts through water damage. However, it can also cause long-term issues with mould and damp, even if objects themselves are unaffected by direct water damage (Tremain 2018).

- Pests
  - Pests can range from mice and larger mammals to silverfish, clothes moths and other insects, to fungal and microbial bodies (Strang and Kigawa 2022).
  - Pests can cause total destruction of an object or disfigure it to an extent that is incapable of being interpreted (Rivers and Umney 2003: 296). In some cases, an artefact affected by fungus or mould may become hazardous to human health.
- Pollutants – these can be divided into three categories:
  - Airborne pollutants can range from traffic-generated air pollution to dust particles. They can cause discolouration of artefacts, encourage corrosion processes, or, in the case of dust particles, attract pests (Tétreault 2021).
  - Pollutants transferred by contact can include hand creams, natural oils and sweat transferred through handling an object. Contact pollutants may also include staining and can be transferred from display and storage materials such as adhesives and PVC plasticiser (Tétreault 2021).
  - Intrinsic pollutants come from within the artefact itself. These pollutants can include components of a composite object that affect other components. For example, leather can generate corrosion products on copper within a composite object. Iron gall ink, which may cause deterioration of paper and parchment, is another example of an intrinsic pollutant (Tétreault 2021).
- Light (ultraviolet and infrared)
  - Excess exposure to high light levels, especially ultraviolet light, can cause deterioration in paper, paintings, textiles and other organic objects (Keene 2002: 20).
- Incorrect relative humidity
  - Fluctuations in relative humidity in both storage and display can begin and accelerate deterioration processes in almost all artefact types (Michalski 2021).
- Incorrect temperature
  - Too high or too low temperature can cause damage to different types of objects, but collections are most at risk when temperatures consistently fluctuate. This can cause contraction and expansion of artefacts, which can lead to weakening and deterioration of their fabric (Michalski 2018).
- Dissociation
  - This is loss of information associated with an object, which in turn causes loss of its context and value. It can range from simple loss of an object's identifying label to loss of institutional knowledge when a long-term caretaker (such as a curator) or collector leaves a collecting institution (Waller and Cato 2019).

Left Example of an insect trap in a private museum. This example is ready for replacement, as it is full. Image Irini Malliaros, Silentworld Foundation

Right Within the area indicated, oils on a hand have created a small area of corrosion in the pattern of a fingerprint on this metallic object. Image Heather Berry, Silentworld Foundation



4.2 Conservation of maritime archaeological artefacts

Artefacts that have been recovered from a marine environment often require more care and treatment than may be assumed upon first inspection. If artefacts are buried within a seawater context, they can appear to be stable and unaffected by years under water. However, almost all artefact types are at risk of severe deterioration if allowed to dry in an uncontrolled manner and without treatment. The presence of chlorides and other dissolved salts in seawater inevitably leads to their uptake into artefacts. If salts are not removed by desalination, they will damage almost all material types upon drying. Iron artefacts may spall and crumble to pieces, bronze may succumb to bronze disease, and glass and ceramics that have not been desalinated may delaminate and lose all detail. Timber, if allowed to dry in an uncontrolled manner, will warp and disfigure, sometimes assuming a totally different shape from its original appearance when found.

This booklet seeks to safeguard Australian cultural heritage by providing conservation advice suitable to the budgets and expertise of private caregivers and small community-run museums. Its contents are specifically directed toward maritime collections. **What follows is advice for the storage and protection of artefacts, as interventive conservation treatments should only be carried out by a trained conservator**. Resources for contacting professional conservators are provided in Section 14.

Please note that by law, persons are not to recover any artefacts from any submerged or land-based archaeological sites without a permit. To do so is an offence under state and, in some cases, Commonwealth legislation and the penalties can be severe.

5 Handling artefacts

Artefacts are at their most vulnerable when being handled and transported; therefore, it is imperative that a visual assessment and a handling and movement plan be made before handling or transporting objects.

5.1 Planning handling and movement

- Assess the need for handling or transporting the object. Objects, especially those that are fragile, should be handled and moved as little as possible. If the object must be handled or moved, continue to the following steps.
- Examine the object for areas of weakness. In ceramics and metals, weaknesses may appear as small or large cracks; in textiles as areas of fraying; and in wooden artefacts as flaking surfaces or cracks.
- Plan the route used to move the object and ensure it is clear of any hazards.

5.2 Handling and moving

- Wear nitrile or latex gloves when handling any material types, but especially metals, ceramics or glass. If this is not possible, ensure hands are cleaned with soap and free of oils. Cotton gloves may not be appropriate, as they may not offer enough grip or sensitivity during the moving process.
- Based on an assessment of the object's condition, it may be most appropriate to lift and move it on a firm surface such as a board, or in a box with padding to prevent uneven handling and damage.

Further resources, including an illustrated guide, can be found in the Canadian Conservation Institute's online preventive conservation guide: see canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/handling-heritage-objects.html

A child's leather boot on display in the Robe Customs House Museum. Image Heather Berry, Silentworld Foundation

6 Preventive conservation and storage

Preventive conservation is one of the most important aspects of conservation, as its purpose is to minimise deterioration of artefacts while they are on display or in storage. Preventive conservation is often passive, and once changes have been made to ensure a safe environment for materials, upkeep of this environment should be relatively simple. Creation of a preventive conservation plan ensures that steps appropriate to a collection have been applied within individual time, space and budgetary limitations. This in turn ensures the safety of artefacts and limits the effects of agents of deterioration (detailed in Section 4.1).

6.1 Best practice display and storage environmental controls

For a diverse collection with multiple material types, ideal storage and display controls are:

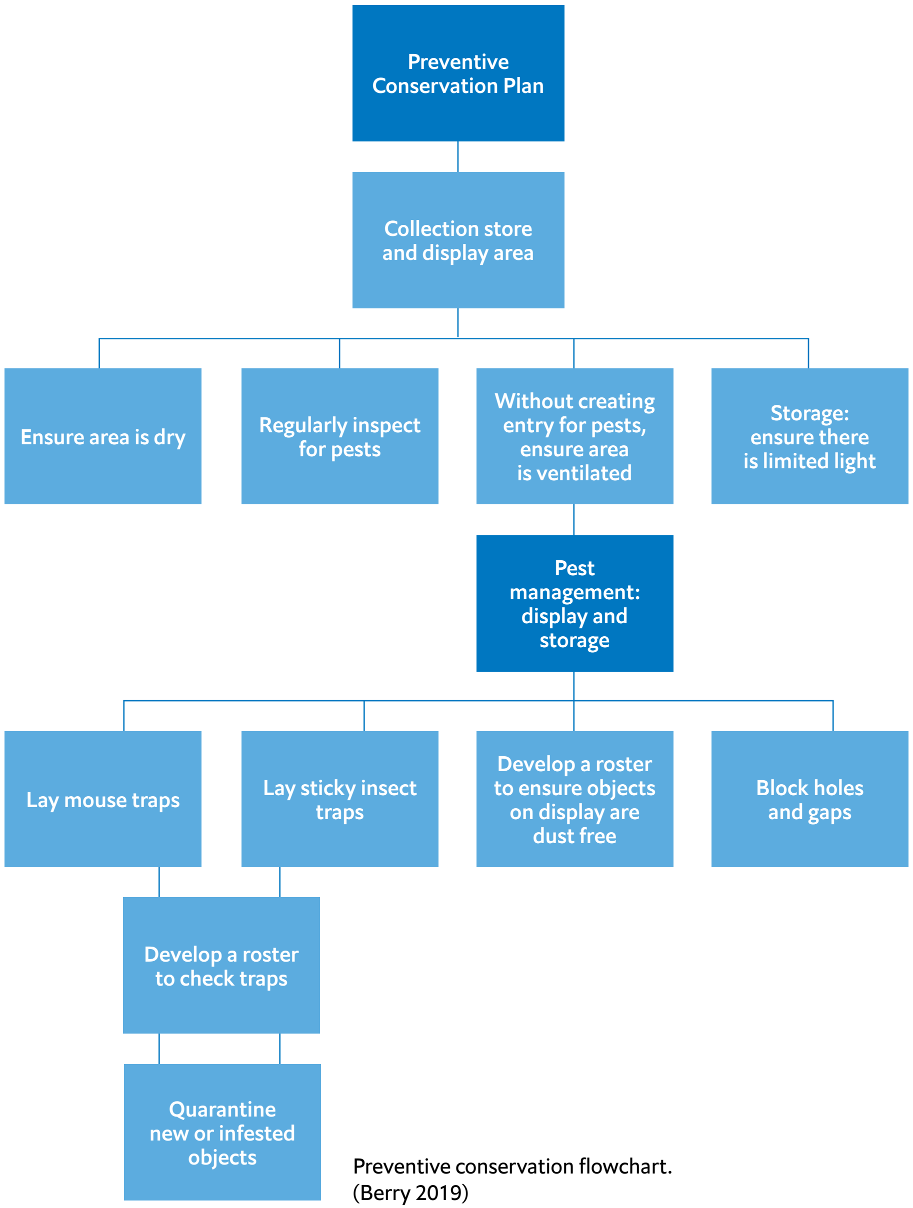
- 20°C, with minimal fluctuations
- 50–60% relative humidity, with minimal fluctuations.

Individual material types (such as metals) may be preferentially stored or displayed at lower relative humidity levels, but the above parameters ensure that, for a diverse collection, relative humidity is low enough that mould and corrosion are inhibited without causing cracking and shrinkage due to low relative humidity. Guidelines relative to specific materials can be found in later sections of this booklet.

These guidelines are based on the best possible environmental scenario and may not be achievable for all collections. If this is the case, the most important point to note is that collections be stored in an environment where both relative humidity and temperature are as stable as possible.

6.2 Preventive conservation flowchart

The following flowchart outlines an achievable preventive conservation plan for most museums or home settings and can be adapted as necessary to suit budgets or available space. The gold standard of conservation is to acknowledge an artefact as intrinsically valuable, and to attempt to preserve it using one's best efforts. Any of the following steps that can be practically achieved will lead to an increased lifespan for any artefact.



Preventive conservation flowchart. (Berry 2019)

6.2.1 Ensure area is dry

To prevent collections from incurring water damage, the artefact custodian should ensure storage and display areas are not at risk of flooding or leaks that could expose the collection to water (Heritage Collections Council 1998a: 31).

6.2.2 Without creating entry for pests, ensure area is ventilated

Proper ventilation is important to prevent mould and infestation but should not come at the risk of introducing pests into the collections area (Heritage Collections Council 1998a: 3).

6.2.3 Storage: ensure there is limited light

Although it may be necessary to limit light in some display areas depending upon the sensitivity of displayed objects, recommendations related to light exposure are beyond the scope of this flowchart. However, they may be found in the Further Reading list later in this booklet. To ensure longevity of all items in a collection, objects should be stored in the dark. Ultraviolet light is particularly damaging to collections, so while artificial light should be kept to a minimum, ultraviolet light should be blocked by any means possible (Heritage Collections Council 1998b: 1).

6.2.4 Regular inspections for pests

Objects on display and in collection areas should be regularly inspected for evidence of silverfish, rodents or other damaging pest populations (Heritage Collections Council 1998b: 45).

6.2.5 Pest management: display and storage

This section is designed specifically to discuss pest management steps within display and storage areas.

6.2.6 Sticky insect traps

Sticky traps designed to trap insects are ideal for a small museum or the home. They are inexpensive and provide vital information to artefact custodians about whether insects are in their display and storage areas, what kinds of insects are present and in what number (History SA 2011: 9). This is vital for determining whether an infestation is present before the collection is damaged. Resources for acquiring these traps are provided in Section 13.1 'General Collections Care'.

6.2.7 Mouse traps

As with the installation of sticky insect traps, the use of mouse traps is vital to determine the presence and quantity of rodents in and around storage and display areas. Monitoring for the presence of rodents can inform future preservation and collection management strategies, including searches to locate sources of entry for rodents, and re-evaluating rules around human food consumption and the collection (Heritage Collections Council 1998b: 51).

6.2.8 Block holes/gaps

To prevent current and future rodent and other pest infestations, it is best practice to ensure gaps and holes that could admit pests are blocked (Heritage Collections Council 1998b: 51).

Example of a pest in a private museum. Image Irini Malliaros, Silentworld Foundation

6.2.9 Develop a roster to check traps

Installation of traps in display and storage areas will ensure that some of the existing insect and rodent populations are caught. However, it is critical that these traps are regularly monitored so that information about the kinds and quantities of pests in a collection can be interpreted and acted upon (History SA 2011: 9). Insect traps should be checked monthly, provided there is no suspicion of active infestation, and rodent traps should be checked daily, as a dead rodent allowed to remain in place may attract further pests and increase or create a pest problem.

6.2.10 Develop a roster to ensure objects on display are dust free

A roster should be developed to dictate how often display and storage areas are cleaned. Cleaning prevents build-up of dust, which can cause insect infestations. The cleaning schedule can be determined based on observations of volunteers/caretakers or the collection custodian(s) and should target parts of the house, museum or storage area(s) where dust develops. It may also assist with identifying sources of dust (eg, visitor traffic), and determining how often volunteers can be present to assist with cleaning tasks.

6.2.11 Quarantine new/infested objects

Quarantine procedures are often used to prevent a new object or artefact from potentially causing infestation of an existing collection. This may include placing new objects into a separate room for several weeks and regularly monitoring them for signs of mould and pest infestation. However, many small museums may not have the facilities to create a separate quarantine area. If this is not possible, it is important to remain vigilant and monitor new objects for potential issues.

If an object is suspected of being infested, it should be placed into a sealed polyethylene bag so that any pests or mould spores present are unable to affect the rest of the collection (Collections Trust 2017). A conservator may be contacted to discuss the best way to manage the affected object by assessing the nature of the infestation and materials that make up the object.

Heather Berry (SWF) applies tannic acid to iron fasteners recovered from a shipwreck site. Image Irini Malliaros, Silentworld Foundation

7 Ferrous objects care

Ferrous, or iron-based, artefacts are common to shipwreck, agricultural and rural heritage collections. Caring for these artefacts is relatively simple, but treatment steps should be carefully followed as iron objects are prone to rapid deterioration. If an object is found within – or is known to be from – a marine context, the single most important step is removal of salts or chlorides, commonly known as desalination. If supplied with the correct equipment, chloride removal may be attempted by artefact custodians, but it can be a lengthy and, at times, intensive process (see 'Desalination of iron artefacts', Section 7.2 for more information). Desalination can also be undertaken by a conservator (see Section 14).

7.1 Iron corrosion

High humidity levels are a major contributor to corrosion in any metal. 'Preventive conservation during storage and display' (Section 7.4) below describes how to maintain correct humidity to prevent further corrosion of iron objects. Iron corrosion often appears as a reddish-brown powdery coating on an artefact but can also appear as flaking layers or areas of pitting on the surface of the artefact. If continued deterioration and active corrosion (flaky or powdery red product) of an iron object are suspected, consultation with a professional conservator is recommended.

Coca Cola and other household remedies for removal of corrosion products should be avoided, as they may cause abrasion and other mechanical damage to artefacts. This in turn may remove surface details.

7.2 Desalination of iron artefacts

Iron artefacts recovered either directly from the ocean, or from landscapes surrounding the ocean, are at increased risk of corrosion due to the presence of chlorides in both environments, which migrate into the artefacts' iron fabric (North 1987: 207). Before iron artefacts can be dried, they must first undergo desalination. As mentioned above, desalination can be a lengthy process, and so must not be carried out unless steps are taken to ensure its completion. **Dried iron artefacts are not to be rehydrated. If you suspect ongoing corrosion due to incomplete desalination of a now-dry artefact, contact a conservator.**

For the following section: If in doubt, contact a conservator (see Section 14) rather than undertaking the following treatment yourself.

Materials required

- acetone (available at hardware stores)
- demineralised/deionised water (available at hardware stores)
- lidded container
- paintbrush
- Personal Protective Equipment (PPE): nitrile or latex gloves
- chloride/salinity meter. This can be purchased for less than $100 from Amazon. Entering the search terms 'salinity meter amazon' in a web browser will yield results. Salinity meters are often available through aquarium shops as well. Salinity meters should measure sodium chloride (NaCl) and measurement units should be in parts per million (ppm). The salinity meter may need to be replaced yearly, as calibration can drift. Check the meter's instructions for further information.

Treatment steps

- Keep the iron artefact in a container of water from the site where it was found. If it was found at the beach, keep it in seawater collected from that beach.
- Take and record chloride readings of your tap water to establish a baseline.
- Transfer the iron artefact to a covered container of tap water. Ensure that evaporation is kept to a minimum, and that no part of the artefact's iron fabric is exposed above water.
- Take chloride readings daily. At first the readings may be displayed in parts per thousand (ppt) instead of parts per million (ppm), until the chloride levels drop.
- Once chloride readings have stabilised, change the tap water. This may take a couple of days.
- Repeat the above process until chloride readings remain stable at 50ppm over a week's duration (North 1987: 214).

- If tap water in your area has a chloride reading above 50ppm:
  - Once the water in which the artefact is being treated has reached a chloride concentration equivalent to that of plain tap water, switch to demineralised/deionised water (available from hardware stores and supermarkets).
  - Continue to use demineralised/deionised water in each water change until the chloride level stabilises at 50ppm.
  - Once the solution stabilises at 50ppm for a week's duration, you may begin the dewatering process.
  - Remove the iron artefact from the water and place on a glass or ceramic surface. DO NOT place it on a plastic surface, as the next step will cause plastic to melt.
  - Put on PPE, in this case nitrile or latex gloves.
  - Using a paintbrush, paint the entire surface of the artefact with acetone, ensuring full coverage within nooks and crannies (Heritage Collection Council 1998c: 94).
  - Allow the acetone to evaporate. Once the smell of acetone dissipates, you may place the artefact on display or in storage. For optimal storage conditions, see Section 7.4 below.

7.3 Treatment of iron corrosion

If an iron object has corrosion product that appears disfiguring or distracting, and it is in line with the collection's aesthetics to create an 'as new' appearance for it, the following steps may be taken (these steps are for iron objects only):

Materials required

- microfibre cloth
- brush (can be an old toothbrush, or a nail brush)
- cotton swabs
- tannic acid (available from brewing websites as a powder)
- deionised/demineralised water (available from supermarkets or hardware stores)
- PPE: nitrile or latex gloves.

Treatment steps

- Clean the artefact using a microfibre cloth or plastic brush (NB do not use a brass brush) to remove flaking active corrosion from the artefact. This may be a natural end point; if the aim is for the artefact to maintain some natural patina, it is perfectly appropriate to remove excess corrosion and store it in a low relative humidity environment.
- However, if an 'as new' appearance is desired, the initial cleaning regimen should be complimented by the following steps:
  - Tannic acid/rust converter – 10% weight/volume (w/v) tannic acid in deionised water (eg 10g to 90ml of deionised water to make 100ml solution) may be applied in several thin coats using cotton swabs and paintbrushes. This will convert the corrosion products to iron tannate, creating a more stable outer layer. Application of tannic acid will create a black coating, and so reduce the 'old' look of an artefact (image right).
  - For more treatment methods, see *reCollections: Caring for Cultural Material*, Volume 2, page 95 (See Section 13.2).

7.4 Preventive conservation during storage and display

Iron artefacts, or artefacts that may contain iron components, should be stored at low relative humidity. This may be achieved using simple silica gel packets, which can be reused by oven drying once they have become saturated. Iron objects should be stored in food grade, airtight plastic boxes, with packets of silica gel to ensure low relative humidity. This will greatly reduce the rate of an object's corrosion and deterioration.

Where possible, iron and other metallic artefacts should not be stored in close proximity to oak or other wooden objects or furniture, as off-gassing of acetic acid (produced by these wooden objects) can cause corrosion and deterioration. 'Natural' cleaning products should also be avoided, as these often include vinegar, which also leads to acetic acid production and corrosion of metallic products.

7.5 Preventive conservation during handling

When handling any metals, gloves should be worn to ensure oils and sweat are not transferred to the object. If this is not practical, ensure hands are freshly washed with soap and are clean before handling objects.

7.6 Concretions

Iron concretions are mixtures of iron corrosion product, organics from a marine environment, and sediment that form around iron artefacts in maritime contexts. A concretion may consist solely of an iron artefact, or it may have enveloped other material types in the vicinity, binding several objects together. Concretion conservation and treatment are complex, and beyond the scope of this document, so if stabilisation or removal is a goal, contact a conservator (see Section 14).

Heather Berry (SWF) undertaking tannic acid treatment of an iron fastening from a shipwreck. This image shows how the iron will look after and during the process. Image Irini Malliaros, Silentworld Foundation

Copper artefacts – including a variety of fasteners and a sheathing fragment – recovered from a 19th-century shipwreck site. Image Heather Berry, SAILS

8 Copper and copper alloy objects care

Copper alloys most commonly appear in archaeological contexts in the form of bronze, which is copper alloyed with tin. The other common copper alloy is brass, which is copper alloyed with zinc. Both alloys are commonly found on shipwreck sites, along with pure copper.

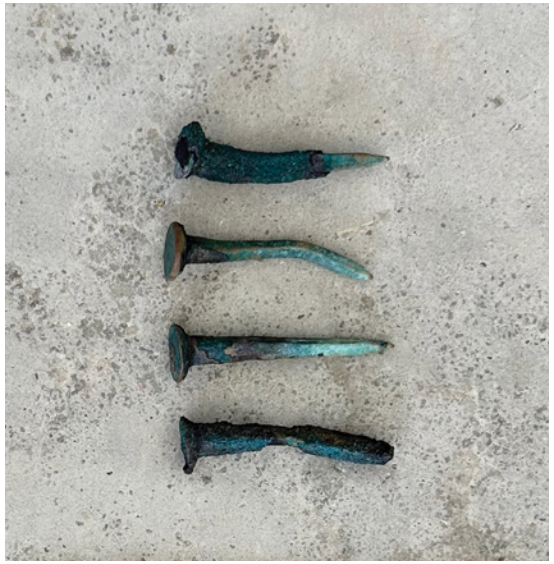
8.1 Copper corrosion

Copper and its alloys often develop a green or blue corrosion layer commonly termed 'patina'. In many cases, patina is a passive corrosion layer that may protect underlying metal from the surrounding environment and prevent further deterioration of an artefact (Scott 2002: 11). It can also add value to an artefact, as it indicates age. In most cases, patina that is removed from copper or copper alloy artefacts will reform; consequently, it should be left in place and not removed.

As with iron objects, chlorides and the presence of seawater add another layer of complexity to the storage and conservation of copper and copper alloy objects. If it is suspected that a copper or copper alloy artefact has been submerged in a marine environment, and was unlikely to have been desalinated, a conservator should be contacted to discuss desalination options (see Section 14). The advice provided above in Section 7.2 for desalination of iron objects is also applicable to copper and copper alloy objects.

If the corrosion product is a crumbly blue-green colour and can be brushed away to reveal a pitted surface underneath, this indicates active deterioration rather than patina, and a conservator should be consulted. If this is not possible, ensure the artefact is stored in low relative humidity conditions. Further information regarding storage of artefacts at low relative humidity is detailed in Section 7.4.

For treatment methods for copper artefacts, see *reCollections*, Volume 2, page 92: https://aiccm.org.au/conservation/collection-care/



Left A selection of pure copper tacks that feature a mix of adhering patina and concretion.

Below A pure copper keel bolt recovered from a shipwreck site, showing adhering patina. The cuts in the bolt shaft are the result of modern metal composition sampling.

Images James Hunter, SAILS

8.2 Preventive conservation during storage and display

The conditions under which copper objects should be stored are largely similar to those of iron artefacts (see Section 7.4). In addition, extra care should be taken when cleaning or caring for copper artefacts; acidic cleaning solutions should not be used on brass objects as they may cause corrosion of zinc from the metal matrix, leading to discolouration.

8.3 Preventive conservation during handling

Greasy spots on copper objects can be removed with ethanol after spot testing in an inconspicuous area. It is important that copper alloy artefacts are kept clean of fingerprints and other greasy spots as this can cause localised corrosion, as seen in Section 4.1 'Agents of Deterioration'.

An array of 19th-century ceramic fragments collected by members of the public from a beach near Robe. All are believed to have originated from an unidentified shipwreck site just offshore. Image James Hunter, ANMM

9 Ceramic objects care

Ceramics often survive well on shipwreck sites, and if they are protected from physical damage such as being washed against rocks or being abraded by sand, surface details often survive.

9.1 Ceramic deterioration

Ceramic artefacts on shipwreck sites are not often found intact, as they frequently suffer mechanical damage and are broken during the wrecking event and/or subsequent site formation. Physical damage of this kind may not be repairable, as broken edges may be degraded during intervening years between the wrecking event and discovery and may not fit back together.

The larger issue facing ceramics recovered from shipwreck sites is the presence of chlorides (salts) within their surviving fabric. If a ceramic artefact is removed from a marine environment and allowed to dry out, salt crystals form and can cause crazing and spalling of decorative glaze layers. In extreme circumstances, this process can cause delamination and collapse of the artefact.

The information provided in Section 7.2 regarding desalination of iron objects is also applicable to desalination of ceramics – but only if they are still wet or damp.

If it is suspected a ceramic artefact has not been desalinated and exhibits issues with chloride formation (the chloride crystals appear as sparkly specks on the surface of the ceramic), contact a conservator (see Section 14). If the ceramic artefact is already completely dried, no attempts should be made to rehydrate and desalinate it, as re-exposure to water can cause osmotic shock and further damage (Pearson 1987: 257).

9.2 Staining/breakage

If a ceramic artefact has iron or organic staining that is considered disfiguring and there is a desire to remove it, contact a conservator. Products such as household bleach should not be used to remove stains. If a ceramic artefact has been broken and there is a desire to restore it to its original form, contact a conservator (see Section 14).

9.3 Preventive conservation during storage and display

Ceramics are among the more stable objects featured in collections; they are less sensitive to light levels than other objects, and although temperature and relative humidity should be maintained at a relatively stable level, small fluctuations are unlikely to cause major damage. The exceptions to this rule are ceramic artefacts that have been contaminated with chlorides, as is likely the case with examples recovered from shipwrecks. If it is suspected that a ceramic object has been impregnated with chlorides, maintain as stable relative humidity as possible, and contact a conservator for further assistance.

Relative humidity can be controlled within a display case or plastic box by adding a small sachet of silica gel beads and monitored with a paper humidity indicator strip.

A decorated 19th-century ceramic sherd on a submerged shipwreck site. Note abrasion and removal of part of the external glaze by environmental forces, such as sand scour. Image Irini Malliaros, SAILS

Glass bottle base and body on a submerged shipwreck site, showing iridescence of its glass matrix. Image Irini Malliaros, SAILS

10 Glass objects care

Glass artefacts in a seawater environment behave similarly to ceramic artefacts. The main source of damage to submerged glass is largely physical, as the artefact breaks up either during the wrecking event, or in subsequent years due to waves, tide, current and other environmental factors.

10.1 Glass deterioration

Once removed from the underwater environment, glass can deteriorate rapidly – sometimes within hours. Deterioration may take several forms: delamination or 'peeling' of glass layers; the appearance of iridescence, either in patches or widespread across the artefact; or, conversely, dulling of the surface. These symptoms may be due to the deterioration of glass while submerged in the underwater environment or could indicate active deterioration due to crystallisation of dissolved salts (Davison 2006: 183).

If glass has not been properly desalinated, fluctuations in relative humidity can cause repeated solubilisation and crystallisation of dissolved salts within the artefact once it has been recovered and exposed to air. Over time this can cause damage and disfiguration to an artefact, or even total destruction. If it appears that a glass artefact has not received desalination treatment, attempts should be made to keep relative humidity as stable as possible to prevent deterioration, and consultation should be sought with a conservator (see Section 14).

10.2 Preventive conservation during storage and display

Glass artefacts should be kept under stable relative humidity and temperature conditions to prevent continued damage. Those in storage should be tightly packed with non-acidic paper or other stable packing materials in order to prevent mechanical damage and be placed on display in areas with minimal vibration. Bubble wrap should be avoided as a packing material as it can cause round imprints on the surface of objects. Glass should also be securely supported. Glass artefacts that display delamination or iridescence should be handled as little as possible to limit further damage.

Structural timbers on a 19th-century shipwreck site.
Note the tube-shaped calcified casts of the shipworm
Teredo sp. Image Irini Malliaros, SAILS

11 Timber objects care

Timber is a common material type associated with shipwreck sites. Hull components and other artefacts made from wood may become dislodged due to the wrecking event and/or subsequent environmental factors and float ashore. Timber, and any organic material recovered from shipwreck sites or marine environments, is arguably the most susceptible of any cultural material to degradation and change, both during its recovery process and in subsequent storage and display conditions.

11.1 Timber deterioration

Timber in a maritime environment is susceptible to decay by multiple mechanisms. The cellular structure of timber comprises cellulose and lignin, with lignin acting as a skeleton and cellulose padding out the cell. Cellulose often decays first, allowing for greater influx of water into wood cells. When a timber artefact is allowed to dry out, the sudden removal of water from the cellular structure causes collapse and shrinkage.

Timber in the marine environment is also often subject to marine organism predation, mainly that of *Teredo* sp. (shipworm), which bores holes in the timber. This can result in loss of structural integrity or of information for interpretation/analysis of an artefact or, in the worst cases, loss of the entire wooden artefact.

The other primary threat to wooden artefacts mirrors that faced by ceramics, glass and, to a lesser extent, metals: physical forces. Depending on a shipwreck site's specific attributes and environmental conditions, timber artefacts may be damaged or destroyed by physical contact with natural geological structures or other more robust shipwreck artefacts and structural elements.

11.2 Preventive conservation during storage and display

This section addresses timber artefacts recovered from marine environments that are currently held in a collection in a dried condition. The advice below is also applicable to wooden objects generally. Wooden artefacts are susceptible to high levels of light, and so should be stored or displayed out of direct sunlight. When not on display, they should be stored in opaque boxes.

Wood is particularly susceptible to changes in relative humidity and temperature, so timber artefacts should be stored under as high a degree of temperature control as possible. Fluctuations in temperature can cause cracking and mechanical damage as the wood expands and contracts. Fluctuations in relative humidity can rehydrate the timber and encourage growth of mould spores. In case of mould, the following steps can be taken:

Materials required

- nitrile or latex gloves
- N95 face mask
- soft brush – paintbrush, soft toothbrush, soft nail brush
- soft cloth
- vacuum cleaner with HEPA filter
- tulle or tightly woven netting.

Silentworld Foundation conservator Heather Berry cleans mould spots on a wooden artefact. Image Paul Hundley, Silentworld Foundation

Treatment of mould on dry wooden artefacts

- Quarantine the affected item by removing it from the rest of the collection, while maintaining limited fluctuations in temperature and relative humidity.
- Monitor the rest of the collection closely for mould.
- If the artefact is free from pigments, varnish or any surface coatings:
  - Use PPE – nitrile or latex gloves and N95 face mask.
  - If the surface of the timber is friable (splintering, crumbly), skip the following step.
  - Brush mould from surface using a soft brush (toothbrush, soft nail brush, coarse paintbrush).
  - In many cases this will not remove staining from the wood's surface. If staining cannot be removed, but is of significant concern, consult with a professional conservator.
- If the artefact has a varnish coating:
  - Use PPE – nitrile or latex gloves and N95 face mask.
  - Using a vacuum cleaner with a HEPA filter and a small nozzle attachment, hold the nozzle slightly above the mould infestation, and use a small paintbrush or similar implement to dislodge mould spores. The vacuum cleaner will remove the mould spores as they are dislodged with the paintbrush.
- If the artefact has a pigmented surface:
  - Follow the steps applicable to varnish coatings above, if the surface is not friable (crumbly, flaky, prone to dislodgement).
  - If the surface is friable:
    - Use PPE – nitrile or latex gloves and N95 face mask.
    - As outlined above, use a vacuum cleaner with a HEPA filter and a small nozzle attachment. In this case, cover the nozzle with a finely netted cloth such as tulle, and affix it in place using elastic bands.
    - Hold the nozzle slightly above the mould infestation and use a small paintbrush or similar implement to dislodge mould spores. Take care to impact friable pigment as little as possible, or try to brush in the same direction, preventing flakes from lifting further.
    - The vacuum cleaner will remove mould spores as they are dislodged with the paintbrush.
    - Any pigments that have been dislodged during this process can be collected from the tulle netting and stored in a sealable bag with the artefact. They may be useful for future analysis and prevent unnecessary loss of parts of the object.

11.3 Timber conservation

It is of utmost importance to keep a timber artefact wet if it is removed from a submerged marine environment or found in a tideline environment while still wet. The artefact should be stored completely submerged in a closed container and filled with water from the same environment in which it was found (whether seawater, lake water or river water). It should be stored away from light sources, ideally in an opaque box. At this stage, a conservator should be consulted, as wooden artefacts from marine environments require specialised chemicals and treatment regimens (see Section 14).

12 Conservation in situ

Since 1982, the United Nations Convention on the Law of the Sea (UNCLOS) has stated that all signatories to the convention – including Australia – need to protect underwater cultural heritage under the term 'archaeological and historical objects'. However, despite the UNCLOS statement, a growing number of underwater cultural heritage sites, such as RMS *Titanic*, were directly threatened by commercial salvage operations from the 1980s onwards.

Spurred by that threat, the International Council on Monuments and Sites (ICOMOS) developed an International Committee on Underwater Cultural Heritage in 1987 to advise the United Nations Educational, Scientific and Cultural Organization (UNESCO) on the ethics and problems of managing underwater cultural heritage sites (Henderson 1990: 21). The main objectives of the committee were to promote international co-operation in the identification, protection, conservation and management of underwater cultural heritage sites, and to advise ICOMOS on the development and implementation of programs in this field (Henderson 1990: 21). Of major interest to the international committee were the establishment of standards for training and the qualifications of practitioners; the development and promotion of effective strategies for conservation, management and presentation of the world's underwater heritage; and for the formulation at the United Nations of a worldwide convention that would protect underwater cultural heritage.

Advised by the ICOMOS committee, UNESCO commenced drafting a new convention in 1993 for the protection of underwater cultural heritage. The draft convention was subsequently adopted at the UNESCO General Conference in 2001.

Preparing sand bags to cover the excavated hull of the *Sydney Cove* (1797) shipwreck. Image Mike Nash, Tasmanian National Parks and Wildlife Service

Sandbags (white/grey) placed around the wooden bilge pump (wrapped in blue plastic) on the wreck of the *Sydney Cove* (1797) to protect it from storm damage and wood-eating *Teredo* worms. Image Mike Nash, Tasmanian National Parks and Wildlife Service

The main principles of the 2001 *Convention on the Protection of the Underwater Cultural Heritage* are:

- all states that are party to the convention pledge to preserve underwater cultural heritage for the benefit of humanity
- underwater cultural heritage will be protected from being commercially exploited for trade or speculation
- preservation in situ (the current location of the cultural heritage item on the seabed) of underwater cultural heritage is the first and preferred option to be considered in any activity directed at a site
- recovery of cultural heritage items may be authorised for the purpose of making a significant contribution to the protection, enhancement or knowledge of underwater cultural heritage. The consideration given to in-situ preservation as the first option stresses the importance of the historical context of the cultural object and its scientific significance. It also recognises that such heritage is, under normal circumstances, well preserved under water (owing to low deterioration rates and lack of oxygen) and therefore not necessarily in danger.

As of January 2024, the convention has been ratified by 72 countries. The Netherlands, United States, Great Britain and Australia have not ratified the convention to date, although Australia has agreed to abide by its principles, including those that promote in-situ conservation as the first and preferred option for all underwater cultural heritage sites (including historic shipwrecks) in Australian waters.

13 Further reading and additional information

13.1 General collections care

The Western Australian Museum's collections care manual <https://manual.museum.wa.gov.au/>. This guide includes advice on handling, labelling, storage and basic cleaning of objects.

Basic Requirements of Preventive Conservation, Stefan Michalski 2018. Canadian Conservation Institute <https://www.canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/basic-requirements-preventive-conservation.html>.

Handling Heritage Objects, Janet Mason 2018, Canadian Conservation Institute <https://www.canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/handling-heritage-objects.html>.

Insect Control Products, Archival Survival web store <https://archivalsurvival.com.au/pages/insect-control-products>. This website sells conservation-grade materials for preventive conservation in the home or museum.

13.2 Metals conservation

Caring for metal objects, Robert L Barclay, Carole Dignard, Lydnsie Selwyn, Canadian Conservation Institute <https://www.canada.ca/en/conservation-institute/services/preventive-conservation/guidelines-collections/metal-objects.html>.

reCollections: Caring for Collections Across Australia – Caring for Cultural Material Vol 2, Heritage Collections Council 1998, <https://www.aiccm.org.au/conservation/collection-care>. Metals treatment can be viewed on pp 81–112.

Caring for Silver and Copper Alloy Objects, National Park Service 1999, Conserve O Gram 10/2 <https://www.nps.gov/museum/publications/conserveogram/10-02.pdf>.

Cleaning and Care of Historic Metal Objects, Wiltshire and Swindon History Centre Blog 2019 <https://wshc.org.uk/blog/item/cleaning-and-care-of-historic-metal-objects.html>.

13.3 Timber conservation

Wood, Collections Care Manual, SR Garcia, IM Godfrey and S Lussier, Western Australian Museum <https://manual.museum.wa.gov.au/book/export/html/121>.

Mould Prevention and Collection Recovery: Guidelines for Heritage Collections Technical Bulletin 26, S Guild and M MacDonald, Canadian Conservation Institute <https://www.canada.ca/en/conservation-institute/services/conservation-preservation-publications/technical-bulletins/mould-prevention-collection-recovery.html#a3cd>.

reCollections: Caring for Collections Across Australia – Caring for Cultural Material Vol 2, Heritage Collections Council 1998 <https://www.aiccm.org.au/conservation/collection-care>. Timber treatment can be viewed on pp 49–58.

13.4 Textiles and organic objects

reCollections: Caring for Collections Across Australia – Caring for Cultural Material Vol 2, Heritage Collections Council 1998 <https://www.aiccm.org.au/conservation/collection-care>. Treatment of textiles/organics can be viewed on pp 1–28.

Preventive Conservation Recommendations for Organic Objects, National Park Service 1993, Conserve O Gram 1/3 <https://www.nps.gov/museum/publications/conserveogram/01-03.pdf)>.

13.5 Works on paper

reCollections: Caring for Collections Across Australia – Caring for Cultural Material Vol 1, Heritage Collections Council 1998 <https://www.aiccm.org.au/conservation/collection-care>. See pp 1–30.

13.6 Shipwreck legislation

The South Australian Register of Historic Shipwrecks (SARHS) can be accessed through the Australian Underwater Cultural Heritage Database at <https://www.dcceew.gov.au/parks-heritage/heritage/underwater-heritage/auchd>.

Additional information on the South Australian *Historic Shipwreck Act 1981* and the Commonwealth *Underwater Cultural Heritage Act 2018* can be accessed at <https://www.environment.sa.gov.au/topics/heritage/maritime-heritage/managing-maritime-heritage/legislation> or by contacting Department of Environment and Water (DEW), Heritage Branch, 81–95 Waymouth Street, Adelaide, SA 5000, P: 08 8124 4933. To report the discovery of a historic shipwreck in South Australia, or the possession of an artefact or relic from South Australia, see <https://www.environment.sa.gov.au/topics/heritage/maritime-heritage> or contact Department of Environment and Water, Maritime Heritage Section, 81–95 Waymouth Street, Adelaide, SA 5000, P: 08 8124 4933. DEW is the delegated authority for the Commonwealth Department of Climate Change, Energy, the Environment and Water's Underwater Cultural Heritage Program, and therefore handles all matters pertaining to historic shipwrecks, aircraft, relics (artefacts) or other underwater cultural heritage in the internal, coastal and offshore waters of South Australia.

14 Useful contacts

Australian Institute for Conservation of Cultural Material (AICCM)
PO Box 239
Moonah, TAS 7009
W: www.aiccm.org.au
E: secretariat@aiccm.org.au

Australian National Maritime Museum (ANMM)
58 Pirrama Road
Pyrmont, NSW 2009
P: 02 9298 3777
W: www.sea.museum
E: info@sea.museum

Commonwealth Department of Climate Change, Energy, the Environment and Water
Underwater Cultural Heritage Program
GPO Box 3090
Canberra, ACT 2601
P: 02 6213 6308
W: www.dcceew.gov.au
E: UnderwaterHeritage@environment.gov.au

South Australia Department for Environment and Water (DEW) Maritime Heritage
81–95 Waymouth Street
Adelaide, SA 5000
P: 08 8124 4933
W: www.environment.sa.gov.au/topics/heritage/maritime-heritage
E: DEWHeritage@sa.gov.au

Silentworld Foundation (SWF)
PO Box 982
St Ives, NSW 2075
W: www.silentworldfoundation.org.au
E: https://silentworldfoundation.org.au/contact/

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Heritage Collections Council 1998b, *reCollections: Caring for Collections Across Australia – Damage and Decay* <https://www.aiccm.org.au/conservation/collection-care>.

Heritage Collections Council 1998c, *reCollections: Caring for Collections Across Australia – Caring for Cultural Material 2* <https://aiccm.org.au/wp-content/uploads/2020/01/2_caring_for_cultural_material_2.pdf>.

Heritage Collections Council 2000, *Be Prepared: Guidelines for Small Museums for Writing a Disaster Preparedness Plan*, Heritage Collections Council, Canberra.

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17 Maritime heritage glossary

Analysis The process in which a find or artefact and its associated archaeological context are assessed, identified, classified, dated and interpreted.

Archaeology Knowledge of human life through the study of human antiquities, especially of the prehistoric period (no written sources) and usually by excavation. Underwater and maritime archaeology also frequently includes the historic period (written sources).

Archaeological context The physical setting, location and cultural association of artefacts and features within an archaeological site.

Artefact/artifact Any object made or modified by humans. Artefact assemblages from underwater sites can, and often do, include not only items expected in land excavations, but also items often not preserved on land, such as organic material including wood, foodstuffs, leather, paper and fabric. Shipwreck sites also contain artefacts associated with seafaring, including remnants of the ship itself, its fittings, equipment and rigging, ordnance, cargo and the personal possessions of passengers and crew.

Australian National Maritime Museum (ANMM) A Sydney-based Commonwealth of Australia statutory authority established by the *Australian National Maritime Museum Act* 1990 and responsible to the federal Minister for Communication, Urban Infrastructure, Cities and the Arts. Since its establishment in 1991, the museum has been a world leader in the preservation, promotion and sharing of Australia’s maritime heritage. The Maritime Archaeology Program (MAP) at the museum was established in 1993.

Coak/sheave A wooden or metal circular disc with a grooved outer edge that makes up part of a pulley-block. Blocks consist of an outer wooden or metal shell, the inner coak or sheave, a pin to secure and centre the coak to the shell, and a metal bushing or bearing located in the centre of the coak to prevent wear between it and the pin. Blocks vary in size and number of coaks/sheaves. In the 18th century it was not unusual for a vessel to use as many as 1,000 blocks in the running rigging.

Concretion Stone-like encrusted clump/conglomerate that partially or completely encases an artefact and is usually produced from the reaction of iron with seawater.

Conservation The scientific process of preserving cultural heritage. In the case of artefacts recovered from underwater cultural sites, conservation usually involves waterlogged material, often with high chloride concentrations.

Conservator Person qualified and experienced in the treatment and preservation of cultural material – in this case, cultural material recovered from underwater cultural sites.

Context An artefact’s place of origin and its association with other artefacts and structures. The careful investigation of multiple objects in situ provides far more valuable contextual information than just a single artefact. An object without context tends to lose its meaning and interpretive potential. Context and provenance are sometimes used interchangeably, but strictly speaking, context refers to the artefact’s original position while provenance refers to its history, ownership and location after discovery or recovery.

Copper-fastened Describing a vessel with fastenings made of copper.

Cordage Ropes and lines that make up the running and standing rigging of a ship.

Corrosion Except for some noble metals, most metals corrode in seawater. Corroded metals pose a significant conservation problem and can be very difficult to treat. Sometimes iron disappears completely and only leaves a cavity inside a concretion. This in turn can be filled with epoxy or plaster to make an accurate cast of the artefact.

Curator Person qualified and experienced in the storage, interpretation and exhibition of cultural material – in this case, cultural material from underwater cultural heritage sites.

Deadeye A round wooden disc pierced with two, three or four holes, which serves a similar purpose to a wooden block or sheave in the standing rigging of a sailing vessel. The holes accommodate the cordage and allow it to be tensioned or slackened when required.

Draft/draught The distance between the waterline of a vessel and its keel; the minimum depth of water in which a vessel will float. Also used to describe a drawing or plan of a ship.

Drift bolt A cylindrical bolt, headed at one end, that is slightly larger in diameter than the hole into which it is driven.

Dump bolt A short metal bolt driven into a structural timber such as a floor, futtock, keel or keelson to hold planking in place prior to the placement of through-fastenings that pass completely from the plank's exterior face, through the structural timber and out the other side.

Excavation The process of uncovering all or part of an archaeological site by removing soil or sediment and recording the context, location, type, size and amount of cultural material, including structural elements, such as a vessel's hull, prior to its removal. Excavation is a destructive process that will radically change or destroy the archaeological record, so it should only be undertaken by qualified and experienced archaeologists with specific research questions.

Frame A transverse timber, or line of assembled timbers, that provides the body shape of a vessel and to which the planking and ceiling are attached. Frames are sometimes called timbers or, erroneously, 'ribs'. From the 18th century onwards, frames consisted of floors, futtocks and top timbers. Square frames are those set perpendicular to the keel, while cant frames in the bow and stern were set obliquely to the keel. Frames running parallel to the keel and stem were sometimes called knuckle timbers but are more accurately known as hawse pieces and knightheads. Knightheads are frames adjacent to the apron or stemson that extended above the deck to form bitts and support the bowsprit. A vessel's aftermost frames were known as fashion pieces and formed the shape of the stern.

Futtock A structural timber that in association with other futtocks and the 'floors' makes up the 'frame' or 'ribs' of a wooden vessel. Futtocks are numbered depending upon their position relative to the floor, with the closest futtock to the floor or the closest futtock to the keel called first futtock, the second closest the second futtock, and so on.

Gudgeon A metal socket or bracket attached to the stern post of a wooden vessel upon which the pintle (hinge) of a ship's rudder fits.

Hull The shell (inner and outer planking) and framework (floors and futtocks) of a ship.

Hull fastenings Metal nails, spikes and bolts used to secure the structural timbers of a boat together. Wooden fastenings are usually called **treenails/trunnels** or dowels.

Keel The bottom-most longitudinal structural element of a vessel around which the hull of the ship is constructed. The keel runs along the centreline of the vessel from stem (bow) to stern and is usually the first part of the ship constructed. The floors (lowest parts of the frame of the ship) run across the keel and are supported by the keel and secured to the keelson above.

Keelson A reinforcing longitudinal structural element that runs along the centreline of the vessel from bow to stern that sits on top of the 'floors' and 'keel'. On occasion, large square timbers were placed at the floor head line or near the bilge, usually above the bilge keels. These were called **bilge keelsons** or, in some British documents, **sister keelsons**. Secondary keelsons did not necessarily run the full length of the hull, terminating at the ends of the hold, the last square frames, or some other appropriate location.

Knee/knee timber An angular piece of timber used to reinforce the junction of two surfaces of different planes; usually made from the crotch of a tree where two large branches intersected, or where a branch or root joined the trunk.

Mapping An underwater site can be mapped in various ways. To position a limited number of spots, fixed datum points may be used for reference. To create a very detailed map, a large grid (eg of aluminium frames) may be placed over the area.

Maritime archaeologist Person qualified and experienced in the discipline of maritime archaeology. As with all specialist archaeological areas, training in archaeological techniques alone does not suffice. Tertiary qualifications at a postgraduate level need to be combined with suitable qualifications and experience in working under water.

Maritime archaeology The archaeological study of humans and their interactions with the sea; this can include sites that are not under water but that are related to maritime activities, such as shipwreck survivor camps, lighthouses, port facilities and shore-based marine extractive industries such as sealing, whaling and fishing.

Material culture Objects (or artefacts) made, altered or used by humans.

Nautical archaeology The archaeological study of ships and shipbuilding. As with maritime archaeology, it can include sites that are not under water but that are related to ships and shipbuilding, including ship burials, shipwreck remains in the terrestrial environment or shipbuilding yards.

Photogrammetric 3D reconstruction (P3DR) A relatively new algorithmic process in which highly detailed and visually accurate digital 3D models or digital reproductions of real work objects, such as artefacts or entire shipwrecks, can be generated from multiple digital still images that are processed through a powerful computer using a photographic software program such as AgiSoft.

Pintle A vertical pin at the forward edge of a stern-hung rudder that fits into a gudgeon on the sternpost to form a hinge. On most vessels they were welded or cast to a bracket whose arms were fastened to the sides of the rudder.

Planking (hull) Relatively thin longitudinal structural timbers which, in carvel hull construction, are laid edge to edge and fastened to a timber floor or futtock (frame or rib), providing a smooth outer surface. The planks are neither attached to nor slotted into each other and are sealed with a caulking sealant between the planks to keep the water out.

Port/port side/larboard The left side of a vessel when facing forward towards the bow.

Provenance The chronology of the ownership, custody or location of a historical object or archaeological artefact.

Provenience The precise place of origin or earliest known history of an object or artefact.

Rove A small metal washer, used in clinker-built hulls, over which nail or rivet ends are flattened to lock the fastening. The term was also applied to washers used in bolting scarfs, floor timbers, etc.

Sheathing A thin covering of metal or wood, to protect hulls from marine life or fouling, or to stabilise and protect surface material applied for that purpose. Sheathing was most commonly used in the form of copper, lead, zinc or alloy sheets, or thin wooden planks known as 'furring' or 'deals'.

Ship Strictly speaking, a three-masted vessel with square rigged sails on all three masts; however, the term is generally used to describe most medium or large ocean-going vessels.

Shipworm/*Teredo navalis* A marine mollusc that eats wood. It only resides in salt water.

Silentworld Foundation (SWF) An Australian-based not-for-profit organisation founded by John Mullen AO and Jacqui Mullen in 1997 with a focus on supporting and promoting Australasian maritime archaeology, history, culture and heritage. SWF currently employs two archaeologists and a material conservator, curates a research museum and manages several archaeological and conservation projects within Australia and overseas.

Site survey The process of measuring and recording site features, spatial arrangements, distributions, and relationships between cultural materials on an underwater archaeological site.

Starboard The right side of a vessel when facing forward.

Stem A near-vertical structural timber attached to the keel of the ship at the forwardmost part of the vessel. Colloquially called the 'bow'.

Stern The rear part of a ship, technically defined as the area up and over the sternpost.

Strake Strictly, the overlapping outer hull planks of a clinker-built vessel, but the term is also used to describe a particular line or run of planking.

Timbers In general context, all wooden hull members; specifically, those members that form the frames of a hull.

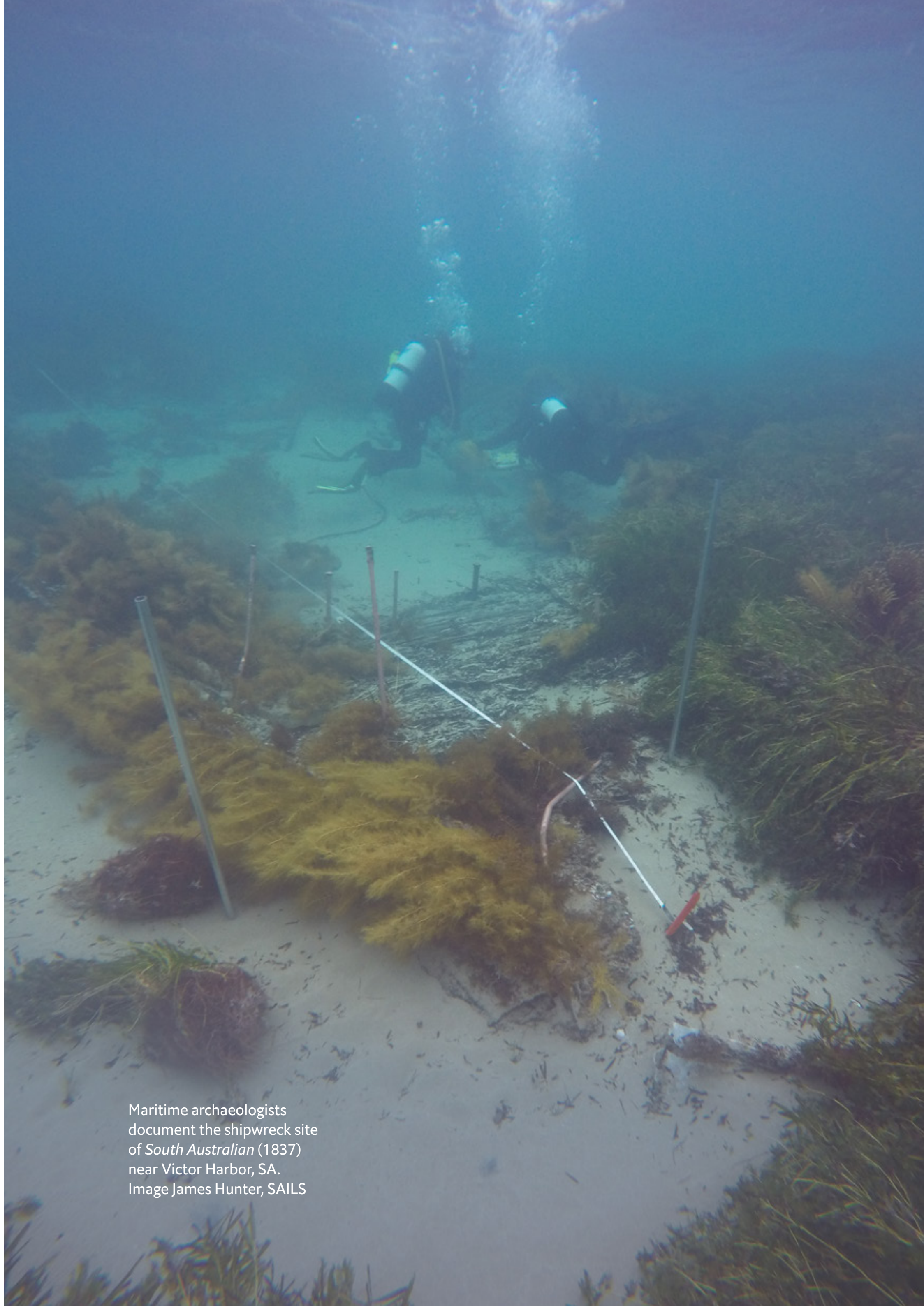
Ton The unit of measurement used to specify the size of a ship. In the 18th century, tons used in shipping were units of volume (100 cubic feet), not weight.

Tonnage A measurement of the internal volume of a vessel. The basic units of measurement are the Registered Ton, equivalent to 100 cubic feet, and the Measurement Ton, equivalent to 40 cubic feet. The calculation of tonnage is complicated by many technical factors and the definitions changed several times in the 18th and 19th centuries.

Treenail/trunnel A long round wooden pin or nail used to fix planks of a ship to its floors and futtocks. Treenails could also be also used to secure floors and futtocks to each other.

Underwater archaeology The systematic study of past human life, behaviours, activities and cultures using the physical (or material) remains (including sites, structures and artefacts) as well as other evidence found in the underwater (or submerged) environment. Such evidence may exist beneath fresh (or inland) waters, beneath salt (or marine) waters, in the tidal zones or underneath reclaimed areas of land.

Underwater cultural heritage Includes the direct and indirect physical evidence of the human past that survives under water.



Maritime archaeologists document the shipwreck site of *South Australian* (1837) near Victor Harbor, SA. Image James Hunter, SAILS