The Australian Historic Shipwreck Protection Project

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Abstract

Australian wooden shipwrecks represent significant submerged heritage sites with huge potential to inform on historic connections, technological innovation and early colonial behavioural systems. Their archaeological potential is unfortunately often under severe threat from natural and human impacts. The Australian Historic Shipwreck Protection Project has recently been granted a large Australian Research Council (ARC) Linkage grant to investigate the excavation, reburial and in-situ preservation of wrecks and their associated artefacts, which are at risk. This project will focus on *Clarence* (1850), a historically significant colonial wooden trading vessel, and brings together the disciplines of behavioural archaeology, maritime archaeology, conservation sciences and maritime object conservation. The vessel lies in Port Phillip Bay in Victoria only a few hours from Melbourne by boat and by land. The overarching theoretical focus will be on shipwreck site formation models as well as the potential of wooden historic wrecks and assemblages to elucidate early colonial history and shipbuilding.

One of the main aims of the project is to try and develop a protocol for the rapid excavation, detailed recording and subsequent *in-situ* preservation of significant shipwrecks and their associated artefacts, at risk. This work will foster the development of a consistent national methodology for shipwreck and artefact storage and preservation underwater and assist in developing a strategy for the *in-situ* preservation of endangered historic shipwrecks. This work will also be critical to the future development of national, and possibly international, policy and technical guidelines for site managers of historic wrecks.

The project will run for a period of three years. During the field work components the investigators from the University of Western Australia (UWA), the Australian National University (ANU), Monash University and the Western Australian Museum (WAM) with support from research associates and practitioners from the ten partner organisations will operate from a jack-up barge located over the site including purpose built laboratories where they will excavate circa 25-50% of the *Clarence* site, conduct imaging (x-ray and optical) of recovered artefacts, conserve at-risk materials (where required) and rebury structural elements and associated artefacts using a combination of *in-situ* preservation techniques and initiate a long-term monitoring programme for the site. Excavation methodology will be overseen by Mark Staniforth, Peter Harvey (Heritage Victoria) and Peter Veth; conservation and *in-situ* preservation protocols, analyses and pre- and post-reburial monitoring by Ian MacLeod and Vicki Richards; imaging co-ordinated by Dudley Creigh (and colleagues) and Andrew Viduka; geoarchaeology and Geographical Information systems (GIS) by Tony Barham and Masters of Archaeological Science candidates.

Introduction

Australia is a maritime nation and much of its early history is represented by the cultural heritage of its maritime zone – most notably shipwrecks. More than 7,500 shipwrecks are known to lie within Australian waters which have unrivalled archaeological potential to provide information on social and economic history, cross-cultural exchanges and the early role of Australia within the Asia-Pacific region (Staniforth and Nash 2006). This maritime cultural heritage is under threat due to development work programs and the ravages of climate change and extreme weather events that lead to scouring and sudden exposure of buried elements. The management of underwater cultural heritage has demonstrably not kept pace with accelerating offshore exploration for gas and oil reserves,

pipeline construction and port-related facilities. Never has there been a greater need for a unified approach as to how to best manage and mitigate this irreplaceable record (Evans, *et al.* 2009).

The Australian Historic Shipwreck Protection Project has recently been granted a large ARC Linkage grant to investigate the excavation, reburial and *in-situ* preservation of wrecks and their associated artefacts, which are considered to be at risk. This project brings together the disciplines of behavioural archaeology, maritime archaeology, conservation sciences and maritime object conservation. One of the main aims of the project is to develop a protocol for the rapid recovery (excavation), detailed recording and subsequent reburial, as well as the *in-situ* preservation of significant shipwrecks and their associated artefacts. This work will foster the development of a consistent national, and contribute to the international, methodology for shipwreck and artefact storage and preservation underwater (Bergstrand 2002; Björdal & Nilsson 2008; Curci 2006; Gregory 1998). Furthermore it will assist in developing strategies for the *in-situ* preservation of endangered historic shipwrecks.

This work will be critical to the future development of national, and possibly international, policy and technical guidelines for site managers of historic wrecks. It is clearly in the national interest that a cost-effective management and mitigation strategy for historic shipwrecks impacted by natural or human actions is developed as a national priority. This project will develop a model for state and federal government collaborative research and policy development and offers an ideal pathway for developing a national collaborative approach to the sustainable management of maritime cultural heritage.

Background to the project

The idea of a national collaborative research project arose, in part, from the 2008 review of the Commonwealth Historic Shipwrecks Program (HSP). The report suggested that the federal nature of Australian politics has meant that after 16 years the HSP had not developed nationally standardised processes and procedures and no official national collaborative project had ever been successfully initiated. Maritime archaeology projects in Australia certainly have been collaborative in their nature but this has been largely based on personal relationships between people and usually not between organisations. Three examples of collaborative projects that were largely based on personal commitments to collaboration were the excavation and research conducted on HMS *Pandora, Sydney Cove* and HMS *Sirius* (Nash 2007; Henderson and Stanbury 1988). And yet, despite increased impacts and loss of shipwreck site integrity in marine precincts, there has been no large-scale maritime archaeological excavation in Australia for more than a decade – since HMS *Pandora* – which was heavily subsidized by the philanthropic sector.

There are three main reasons for a previous lack of national collaborative projects:

- the lack of proposed projects relevant to all organisations;

- the extreme difficulty in persuading States and Territories with limited budgets to participate in projects where the majority of benefits are indirect and short term; and
- the difficulty in coordinating and developing such a proposal.

In addition, there has been no significant increase in funding from the Commonwealth government for 20 years and under the current economic climate it is unlikely that an increase will occur in the near future. As a result there is a clear need to identify other funding options to meet organisational and research needs. Most jurisdictions in Australia have either remained at funding and staffing levels or decreased with operational money becoming scarcer in successive financial years. Furthermore, there is an ageing population of senior maritime archaeologists with a wave of newer maritime archaeologists coming into the field. Some of these younger professionals have not been involved in major excavation projects and lack the technical experience of their later career counterparts and the opportunity to develop these skills. The profile of historic shipwrecks as a national program has not greatly expanded over the years and our challenge is to engage a new generation of Australians to generate respect for our maritime heritage and an understanding of why it should be protected and conserved for the future. There is a need for national policy and standardised operational guidelines for site management to meet current needs in the workplace for cultural resource managers.

To address some of these issues, this project brings together, for the first time, 10 partner organisations in Australia representing government heritage agencies, museums and the peak avocational body – the Australasian Institute for Maritime Archaeology (AIMA). It will focus on a particular site at risk, the *Clarence* shipwreck. This project will have three main components focusing on:

- developing a world-class, and best-practice, protocol for the rapid recovery, recording and reburial of artefacts from historic shipwrecks;
- *in situ* preservation of historic shipwrecks at risk from natural and human impacts; and
- adding to the knowledge base of Australian colonial wooden ship-building.

Australian wooden shipbuilding

Australian wooden shipwrecks represent significant submerged heritage sites with considerable potential to inform on historic connections, technological innovation and early colonial behavioural systems. Their archaeological potential is, unfortunately, often under severe threat from natural and human impacts. This project will focus on *Clarence* (1850), a historically significant colonial wooden trading vessel, which lies in Port Phillip Bay in Victoria only a few hours from Melbourne by boat and by land. The project will build on the significant work carried out on *Clarence* during the 1980s by Staniforth, Harvey and others and contextualise this within the national knowledge base that has developed at the national level over the last 25 years.

In 1995 the Commonwealth Department of Environment and Heritage (DEH) commissioned the Historic Shipwrecks National Research Plan (HSNRP), which identified Australian shipbuilding as a research theme of national importance (Edmonds, *et al.* 1995). *Clarence* (Victorian Heritage register S127) is considered ideal for this focused reburial study for a number of reasons. This early colonial built vessel has already been extensively monitored and test excavated (Harvey 1989; Coroneos 1991). *Clarence* was one of the first Australian built vessels to be extensively surveyed (in the 1980s) and remains one of the best documented shipwrecks in Australia, which will allow comparison of data from the site over more than a 25 year time period (Figure 1). While protected by the *Victorian Heritage Act 1995*, it is subject to continuing anchor damage and is considered at risk. *Clarence* is very accessible as it lies in 5m of water at a location close to the major population centre of Melbourne, which will also help to make the work economically viable. The shallow depth allows for unlimited bottom time for the diving teams, which will help to maximise the productivity of the field work components and finally, it is also amenable to reburial.

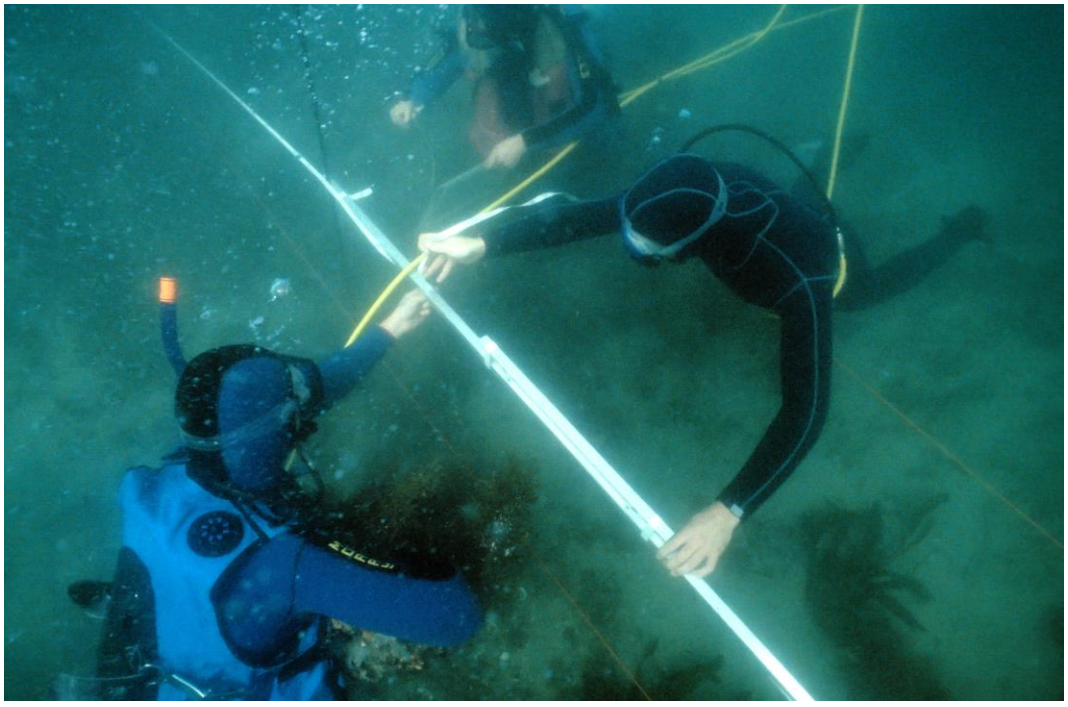

Figure 1. Recording on the *Clarence* wreck site in 1986 (photo courtesy of Heritage Victoria)

Clarence is representative of the majority of Australian-built vessels, which were small coastal traders that were often unregistered and therefore largely unrecorded. 2,786 Australian built vessels are recorded as having been wrecked on the Australian coastline. The available databases indicate that only 271 vessels have been located to date (approximately 10% of the total number wrecked) and that only 14 Australian-built vessels have been properly surveyed and/or excavated with the results published. This project will build on the long-

standing interest of Australian maritime archaeologists in the origins and development of colonial shipbuilding (Coroneos 1991; Harvey 1989; Nash 2004 2007; O'Reilly 1999; Staniforth 1984). While research into pre-1900 colonial shipbuilding has been conducted for more than 20 years, the colonial shipbuilding industry overall, is relatively poorly understood. This is argued to be a consequence of research being largely conducted on a case-by-case site basis within different jurisdictions and lacking any comparative component.

Rapid recovery, recording and reburial

What the proposed rapid recovery, recording and reburial protocol relies on are understandings of archaeological site formation models – generally for all sites – and specifically for wooden vessels in maritime contexts. While different aspects of maritime site formation models have been developed and profiled over several decades (Godfrey, *et al.* 2005; Richards, *et al.* 2009; Ward, *et al.* 1999) their longitudinal evaluation via excavation, reburial and monitoring (including coring and minimally intrusive sampling after reburial) has yet to be properly trialed in Australian waters. It is now accepted that sites pass through many stages of deterioration towards eventual quasi-equilibrium – and that these processes are structural/physical, chemical and biological in nature. What is less well understood is the cyclical nature and reversibility of these taphonomic processes in contexts where the sedimentary budget may vary widely due to natural systems (such as episodic scouring) and cultural impacts such as dredging or changes in the morphology of shorelines and the construction of port facilities and the like. The detailed mapping of seabed contours, recording of three dimensional (3D) relationships of artefacts and ship's structure, x-ray and optical imaging and the analysis of the physico-chemistry, geochemistry and microbiology of the site by the team during the recovery and reburial phase in Year 1 and subsequent monitoring phases in Years 2 and 3 will represent the first multi-decadal longitudinal monitoring at this important site – for which there are benchmark studies arising from the 1980s excavation programs. This current work will represent the beginning of long-term phyico-chemical and microbiological environmental studies of the site.

The reburial methodology will subject all excavated artefacts and objects to a sophisticated, forensic documentation prior to their reburial. Rapid documentation includes two dimensional (2D) to 3D imaging of all retrieved artefacts in a special purpose built chamber with rotating stage as well as laser imaging and morphometric and geochemical recording conducted on the working barge-platform. This approach maximises information gain, while minimising deterioration. Documentation such as stereo optical recording of all objects will be entered rapidly into a GIS database allowing unprecedented sophistication in how information is handled. This has not been previously achieved in maritime archaeology. Documentation will include non-invasive analytical methodologies such as X-ray imaging of smaller objects and possible imaging of larger elements at the Australian Synchrotron and portable x-ray fluorescence (XRF) spectroscopy, where applicable.

At the *Clarence* site some of the assumptions of these varied site formation models will be examined via detailed visualisations of the sea bed (staff from University of New South Wales and Port Melbourne); GIS-enhanced logging of wreck structures, fittings and objects (Mark Staniforth, Peter Harvey, Andrew Viduka and others); and laser and synchrotron 3D images of smaller artefacts and larger elements (Dudley Creagh, David Hallam and colleagues). Sacrificial samples will be placed on-site for continued future analysis and environmental changes in the reburial mound will be monitored over time by measuring the pH, redox potential, dissolved oxygen content and sulphate/sulphide, concentrations (see Godfrey, *et al.* this volume for details) in the sediment with micro-electrodes and other wet chemical techniques (Vicki Richards and Ian MacLeod). Sediment core samples will be collected both on and off site to: a) describe bedloads across the site; b) model sedimentary trends: c) establish control on facies development: d) assess any environmental changes that occur once the site is reburied; and e) assess the consolidation of the sediments. Terrestrial signatures may occur in the form of pollen, dust, insect remains and similar fossils, as well as non-living traces, such as sediments and dung (Tony Barham and Masters candidates). On prehistoric and historic vessels these properties can be highly informative about voyaging tracks, ports of call and previous cargos. In short, the efficacy of reburial as opposed to excavation and conservation – as a viable intervention needs to be tested. This will be judged on the actual conservation outcomes obtained through time, research insights afforded against opportunity and cost, the robustness of the protocol used to decide whether materials are conserved or reburied and the research ethics associated with excavation, recovery and conservation versus rapid recovery, recording and reburial.

In situ preservation

The coming into force of the UNESCO 2001 *Convention on the Protection of Underwater Cultural Heritage* (UNESCO 2001) and the ICOMOS *Charter for the Protection and Management of the Archaeological Heritage* (ICOMOS 1996) have focused attention on *in situ* preservation as the preferred method for the long-term preservation of underwater cultural heritage (Broadwater and Nutley 2009; Carducci 2006; Manders 2006; Oxley 1996; Panter 2006; Staniforth 2006). Thus these conventions set a political framework for the *in situ* protection of submerged cultural heritage. A properly planned reburial should eventually provide a storage option for archaeological material in a similar or improved environment to that which was responsible for its preservation in the first place. Reburial is a technique that should involve minimal continuing maintenance costs and also allow access to the reburied materials if necessary in the future. Martijn Manders (*et al.* 2008), and Staniforth and Debra Shefi (2010) have provided overviews of some of the methods of *in situ* preservation that have been applied to submerged sites over the years.

Reburial of an archaeological site and/or artefactual material may be an appropriate means of stabilising and decreasing the overall deterioration rate of our underwater cultural resource by limiting dissolved oxygen, nutrients, chemicals and so forth and minimising water movement which will, in turn, decrease physical, chemical and biological degradation of the site and associated artefacts. Unfortunately in the recent past, when sites or artefacts were reburied there was often little, if any, subsequent monitoring to determine the effectiveness of the technique (Gregory 1998). It is imperative that there be a holistic approach to the study of the environment, pre- and post-burial to gain a full understanding of the changes occurring in the local reburial environment and the associated deterioration of archaeological material (Caple 1994; Hogan, *et al.* 2002). This, in turn, will allow the accurate assessment of the success or failure of the adopted remediation strategy on the long-term preservation of the site (Nyström Godfrey, *et al.* 2009; Richards, *et al.* 2009).

In order for any *in situ* preservation strategy for an underwater cultural heritage site to be successful the following points must be addressed in the management plan:

- Ascertain the extent of the site;
- Assessment of the pre-disturbed local burial environment and the major factors affecting the long-term stability of the site;
- Assessment of the most significant physical, chemical and biological deterioration processes occurring on the site;
- Identification of the major material types present on the site and their extents of deterioration;
- Implementation of an appropriate *in situ* preservation strategy or combinations thereof, to mitigate continued deterioration and stabilize the site long-term;
- Implementation of a long-term monitoring program to evaluate the efficacy of the implemented *in situ* preservation strategy;
- Provision of alternative plans and procedures if the implemented *in situ* preservation strategies are unsuccessful; and
- Conservation of recovered artefacts.

Australia, in general has been involved with *in situ* preservation and site stabilisation work for more than twenty-five years. A few of the more notable projects include the *William Salthouse* (Hosty 1988; Harvey 1996; Moran 1997; Staniforth 2006) and *Cerberus* wrecks in Victoria (Figure 2) and the ex-slaver *James Matthews* in Western Australia (Godfrey, *et al.* 2005; Richards, *et al.* 2009; Winton and Richards 2005; MacLeod 2010; MacLeod and Steyne 2011).

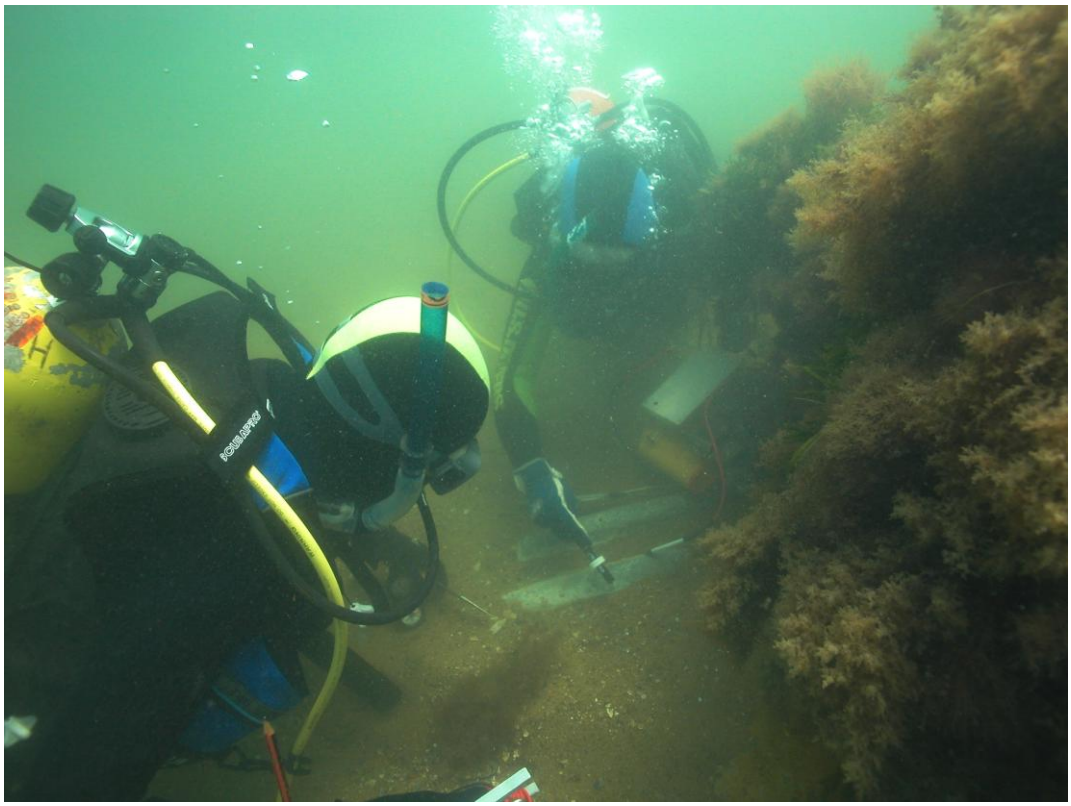

Figure 2. Divers measuring corrosion potentials on anodes treating gun barrels *in-situ* from HMVS *Cerberus* in 2009 (photo courtesy of Heritage Victoria S117).

Conclusion

Excavation and reburial is likely to become an increasingly important technique in the preservation of archaeological materials and underwater cultural heritage sites despite the current uncertainties surrounding such methods. Current and future reburial projects must continue and provide information that will ultimately lead to a better understanding of the associated benefits and disadvantages of this *in-situ* preservation technique. To this end the proposed *in-situ* preservation and reburial study on the *Clarence* (1850) will significantly contribute to this knowledge base and will make an interesting comparison with past and present reburial projects.

This project will be critical to the future development of Australian national, policy and technical guidelines for site managers of historic wrecks as well as at an international level. It is clearly in the national interest that a cost effective management and mitigation strategy for historic shipwrecks impacted by natural or human actions is developed as a national priority. This project will develop a model for state and federal government collaborative research and policy development. This project offers an ideal pathway for developing a national collaborative approach to the sustainable management of maritime cultural heritage.

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