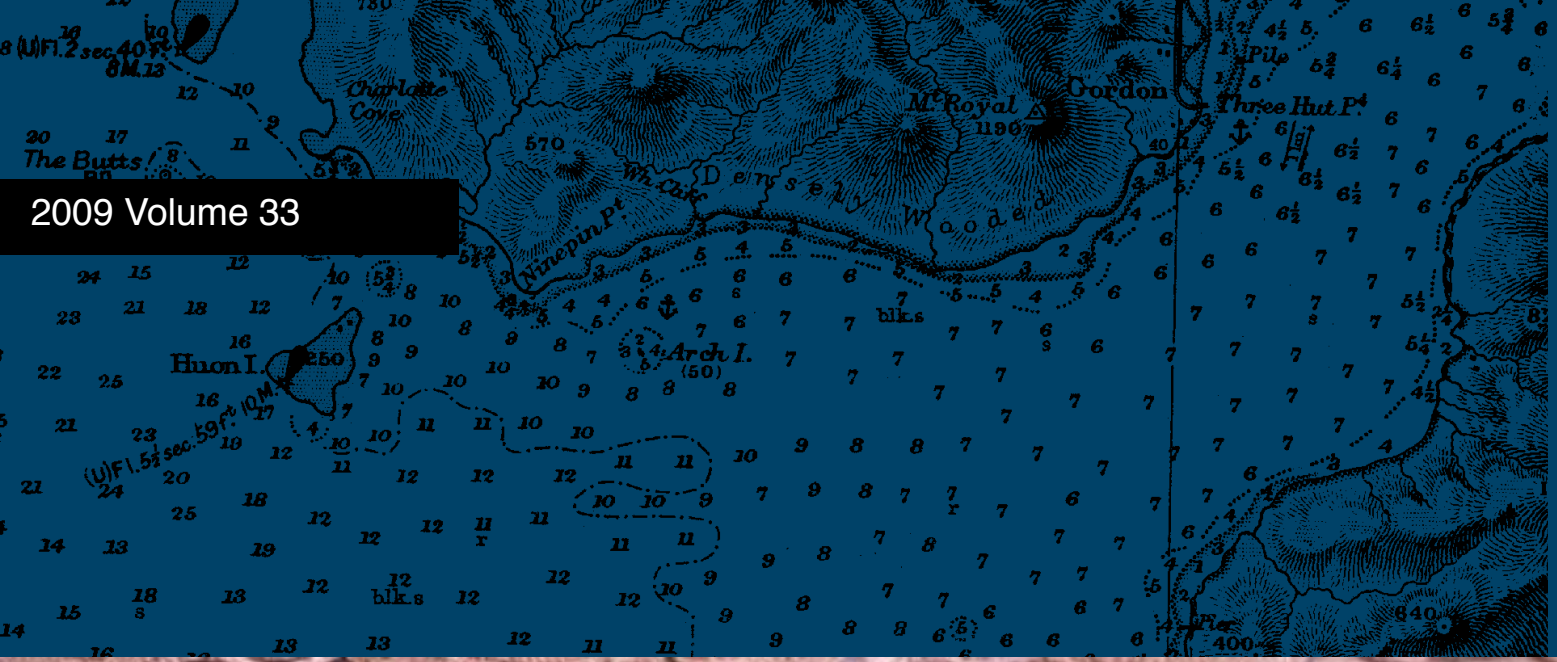


2009 Volume 33



THE BULLETIN
OF THE AUSTRALASIAN INSTITUTE FOR
MARITIME ARCHAEOLOGY



Editors: Jeremy Green and Myra Stanbury

Produced by the Australian National Centre of Excellence for Maritime Archaeology and the Department of Maritime Archaeology, Western Australian Museum

Published by The Australasian Institute for Maritime Archaeology Inc.

c/o WA Museum, Cliff Street, FREMANTLE, WA 6160. Ph: +61 (0) 8 9431 8488; Fax: +61 (0) 8 9431 8489.

President: Ross Anderson, WA Museum, Cliff Street, FREMANTLE, WA 6160. Ph: 08 9431 8442; Fax: 08 9431 8489; E-mail: ross.anderson@museum.wa.gov.au.

Secretary: Cassandra Philippou, Maritime Heritage Unit, Heritage Victoria, Level 4, 55 Collins Street, MELBOURNE, VIC 3000. Ph: 03 8644 8941; Fax: 03 8644 8941; E-mail: Cassandra.Philippou@dpcd.vic.gov.au

Treasurer: Jun Kimura, Dept. of Archaeology, School of Humanities, Flinders University, GPO Box 2100, ADELAIDE, SA 5001. Ph: 08 8201 2863; Fax: 08 8201 2784; E-mail: jun.kimura@flinders.edu.au.

Senior Vice President: Cosmos Coroneos, Cosmos Archaeology Pty Ltd., 122c Percival Road, STANMORE, NSW 2048. Ph/Fax: 02 9568 5800; E-mail: cosmosc@ozemail.com.au

Vice President: David Nutley, Department of Environment and Heritage, GPO Box 1047, ADELAIDE, SA 5001. Ph: 08 8124 4944; Fax: 08 8124 4980; E-mail: nutley.david@saugov.sa.gov.au

Vice President: Andrew Viduka, Maritime Heritage, Heritage Division, Dept. of Environment, Water, Heritage and the Arts, PO Box 747, CANBERRA, ACT 2601. Ph: 02 6274 2116. E-mail: andrew.viduka@environment.gov.au

STATE COUNCILLORS:

NEW SOUTH WALES:

Tim Smith, Heritage Branch, NSW Department of Planning, Locked Bag 5020, PARRAMATTA, NSW 2124. Ph: 02 9873 8575; Fax: 02 9873 8599; E-mail: tim.smith@planning.nsw.gov.au

Phillip Bowman, 540 Jerusalem Road, STEWARTS RIVER, NSW 2443. Ph: 02 6556 9664; Mobile: 0408 11 33 13; E-mail: p.nbowman@bigpond.com

NORTHERN TERRITORY:

David Steinberg, Heritage Branch, Northern Territory Government, PO Box 496, PALMERSTON, NT 0831. Ph: 08 8924 4141; E-mail: david.steinberg@nt.gov.au

QUEENSLAND:

Vivienne Moran, Maritime Museum of Townsville, 42-68 Palmer Street, TOWNSVILLE, QLD 4810. Ph: 07 4721 5251; Fax: 07 4721 5759; E-mail: tmhs@bigpond.com.au

Bill Jeffery, Dept. of Archaeology, James Cook University, TOWNSVILLE, QLD 4810. Ph: 07 4781 5858; E-mail: billjeffery@gmail.com

SOUTH AUSTRALIA:

Terry Drew, Society for Underwater Historical Research, 38 Baker Street, SOMERTON PARK, SA 5044. Ph/Fax: 08 8295 1877; E-mail: tdrew@bigpond.net.au

Peter Bell, PO Box 3044, Rundle Mall, ADELAIDE, SA 5000. Ph/Fax: 08 8373 1900; E-mail: pbell@adelaide.on.net

Jennifer McKinnon, Dept. of Archaeology, Flinders University, GPO Box 2100, ADELAIDE, SA 5001. Ph: 08 8201 5875; Fax: 08 8201 2784; E-mail: jennifer.mckinnon@flinders.edu.au

Jason Raupp, 20 Albany Rd, PORT NOARLUNGA SOUTH, SA 5167. Ph: 08 8386 3056; E-mail: jraupp@hotmail.com

Adrian Brown, 9 Duffield Street, GAWLER EAST, SA 5118. E-mail: adrian.brown@ozemail.com.au

TASMANIA:

Mike Nash, Department of Tourism, Parks, Heritage and the Arts, PO Box 1751, HOBART, TAS 7001. Ph: 03 6233 2387; Fax: 03 6224 0884. E-mail: mike.nash@parks.tas.gov.au

Peta Knott, Maritime Museum of Tasmania, PO Box 1118, HOBART, TAS 7001. Mobile: 0407 232 987; E-mail: petaknott@archaeologist.com

VICTORIA:

Peter Harvey, Maritime Heritage Unit, Heritage Victoria, Level 4, 55 Collins Street, MELBOURNE, VIC 3000. Ph: 03 8644 8918; Fax: 03 8644 8951; E-Mail: peter.harvey@dpcd.vic.gov.au

Brad Duncan, Aboriginal Affairs Victoria, Dept of Planning and Community Development, GPO 2392, MELBOURNE, VIC 3001. Ph: 03 9208 3265; E-mail: brad.duncan@graduates.jcu.edu.au

Hanna Steyne, Maritime Heritage Unit, Heritage Victoria, Dept of Planning and Community Development, GPO 2392, MELBOURNE, VIC 3001. Ph: 03 8644 8949; E-mail: hanna.steyne@dpcd.vic.gov.au

WESTERN AUSTRALIA:

Vicki Richards, WA Museum, 47 Cliff Street, FREMANTLE, WA 6160. Ph: 08 9431 8472; Fax: 08 9431 8489; E-mail: vicki.richards@museum.wa.gov.au

Corioli Souter, WA Museum, 47 Cliff Street, FREMANTLE, WA 6160. Ph: 08 9431 8439; Fax: 08 9431 8489; E-mail: corioli.souter@museum.wa.gov.au

Wendy van Duivenvoorde, WA Museum, 47 Cliff Street, FREMANTLE, WA 6160. Ph: 08 9431 8435; Fax: 08 9431 8489; E-mail: wendy.vanduivenvoorde@museum.wa.gov.au

NEW ZEALAND:

Andy Dodd, PO Box 19188, Courtenay Place, WELLINGTON 6149, New Zealand. E-mail: andyj.dodd@gmail.com

COMMONWEALTH:

Kieran Hosty, Australian National Maritime Museum, GPO Box 5131, SYDNEY, NSW 2001. Ph: 02 9298 3710; Fax: 02 9298 3780. E-mail: khosty@anmm.gov.au

AIMA/NAS:

Corioli Souter, WA Museum, 47 Cliff Street, FREMANTLE, WA 6160. Ph: 08 9431 8439; Fax: 08 9431 8489; E-mail: corioli.souter@museum.wa.gov.au

ANNUAL SUBSCRIPTION

Ordinary Member	A\$45	Institutional Member	A\$85
Student Member	A\$35	Associate Member	A\$25
Life Member	A\$500		

ACKNOWLEDGEMENTS

The Australasian Institute for Maritime Archaeology gratefully acknowledges the financial support of the Australian Federal Government through the Historic Shipwrecks Program.

NOTE: All articles in this volume have been peer reviewed by an editorial committee or independent referees.

Printed by PK Print

AIMA web site <<http://aima.iinet.net.au>>



Australian Government

Department of the Environment, Water, Heritage and the Arts

The archaeology of military mismanagement: an example from New Zealand's colonial torpedo boat defences, 1884–1900

James W. Hunter, III

PhD Candidate, Maritime Archaeology Program, Flinders University, GPO Box 2100, ADELAIDE, South Australia SA 5001
Email: james.hunter@flinders.edu.au

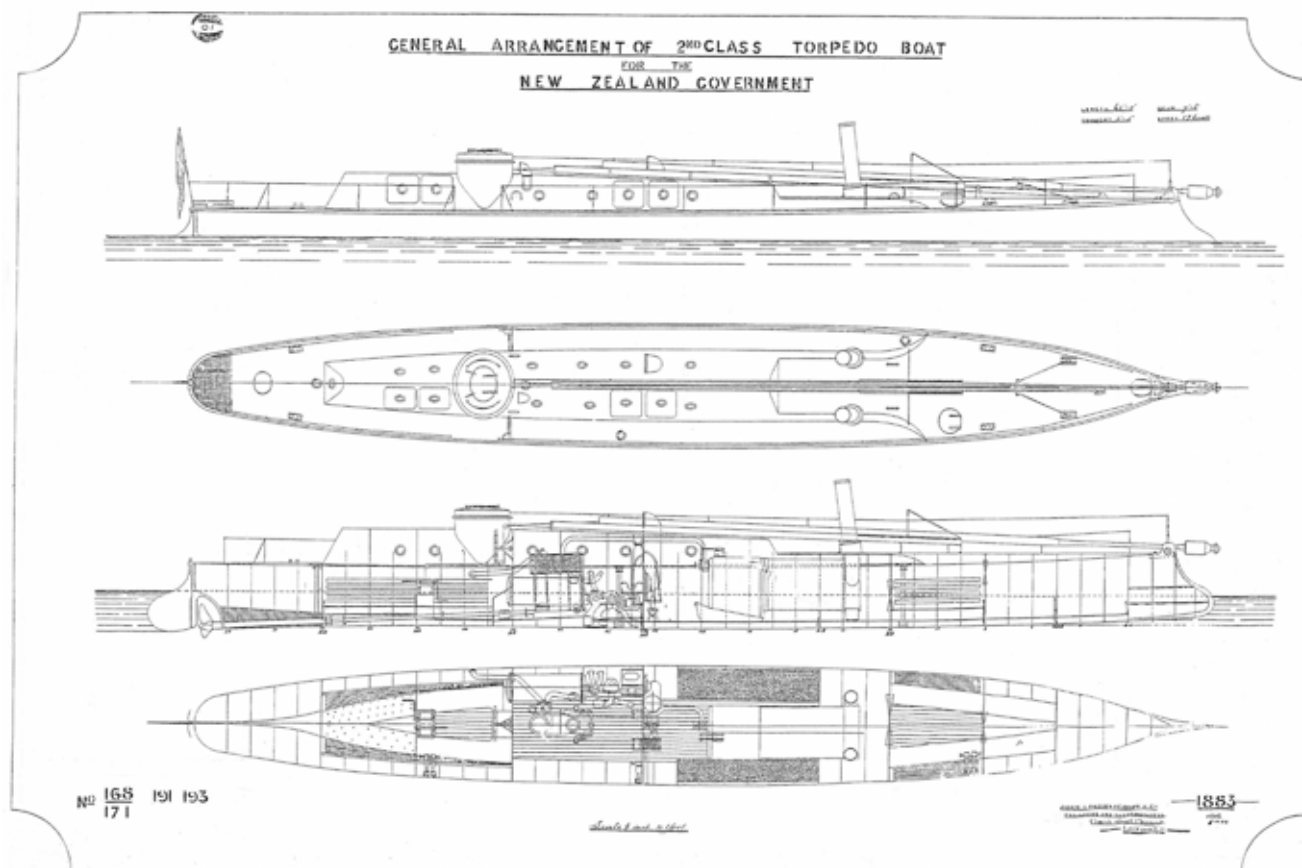


Figure 1. General arrangement of 2nd Class Torpedo Boat for the New Zealand Government (Vessel Nos. 168-171, 191 and 193) (Image courtesy Thornycroft Torpedo Boat Museum, Lyttelton, New Zealand).

Introduction

In 1882, New Zealand's colonial government purchased four torpedo boats (Fig. 1) from J.I. Thornycroft & Co., a British firm that specialized in the manufacture of such craft and boasted an impressive clientele—including the national navies of Great Britain, France, Italy and Russia, among others. These small, manoeuvrable, steam-powered vessels had their origins in the American Civil War (1861–1865) and were specifically designed to attack large warships within the confines of harbours and inland waterways. They utilised a bow-mounted 'spar torpedo' which, quite unlike the guided, self-propelled weapons of today, was essentially a canister containing several kilograms of black powder affixed via a long pole or 'spar' to the bow of the torpedo boat. During an attack, the spar would be extended forward of the bow as the torpedo boat crew attempted to ram the explosive charge at its forward extremity against the hull of an enemy vessel (Gray 1975: 79–80). Torpedo boats were an integral component of the New Zealand Government's efforts to develop coastal defences for the colony's most

important ports, and part of a larger Australasian response to regional threats and other defence-related concerns. Foremost among these were perceived Russian military designs on British territories in the South Pacific, the withdrawal of Imperial British troops from Australia in 1870, and subsequent rumours of potentially aggressive foreign naval deployments to the region (Nicholls 1988).

One of these craft, designated No. 168 by Thornycroft's manufacturing yard, was deployed to the town of Lyttelton (near Christchurch) in 1884, where it remained for the duration of its service career (Fig. 2). The boat was decommissioned in 1896 and eventually sold out of service to a Lyttelton steam launch operator, who salvaged it for its engines, boilers, machinery and military hardware before discarding the hulk at nearby Purau Bay. Nearly 100 years later, the vessel's remnants were recovered, conserved and exhibited as the centrepiece of a torpedo boat-themed museum established on the property of the former station where it was once assigned.

Several archival records exist that detail the acquisition, deployment, service career, and eventual disposal of

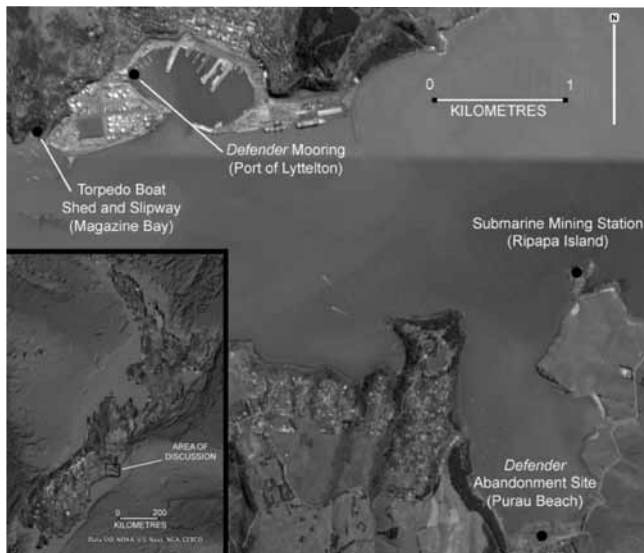


Figure 2. Aerial photograph of Lyttelton Harbour, showing the locations of facilities and other points of interest associated with the service career of the torpedo boat *Defender* (Base image courtesy Google Earth).

this vessel. Similarly, primary and secondary historical sources address some design and construction features of the land-based facilities associated with submarine mining and torpedo boat defence in Lyttelton Harbour. These accounts, when combined with data gleaned from archaeological investigation of torpedo boat No. 168 and its associated shed and slipway, demonstrate that Lyttelton's torpedo boat defences were negatively affected by numerous and significant episodes of indecision, mismanagement, incompetence and neglect.

New Zealand's 'Russian Scare'

Great Britain's refusal to deploy Imperial troops to assist New Zealand's colonial forces in the suppression of indigenous resistance during the Maori Land Wars of the 1870s underscored British reluctance to assume responsibility for the defence of its antipodean possessions. With the cessation of hostilities these internal threats diminished; however, Russian and French expansion in the Pacific Ocean in the wake of the Crimean War (1854–1856), combined with heightened tensions between Great Britain and the United States during the American Civil War forced many New Zealanders to consider the vulnerability of their country to hypothetical attack by a foreign aggressor. Phobia turned to panic in February 1873 following publication of an article in Auckland's *Daily Southern Cross* announcing seizure of the city's monetary wealth and the ransoming of several prominent citizens during a 'hostile visit' by the fictitious Russian ironclad warship 'Kaskowiski' (*Daily Southern Cross*, 17 February 1873). In fact, the story was a hoax perpetrated by the newspaper's editor David Luckie, but its intent—to bring the colony's relative defencelessness to the fore of its citizenry's consciousness—was incredibly effective (Cooke 2000: 36).

New Zealand's military planners recognised that the colony's biggest threat would come in the form of

seaborne raids on principal ports by small naval units comprised of a handful of warships. Although few potential enemy vessels had visited New Zealand by the time of the 'Kaskowiski' incident, the colony's defensive vulnerability had been amply illustrated by several unannounced visits to Australian waters by Russian naval vessels (Cooke 2000: 36–38; Nicholls 1988: 38, 60–61, 94). These included the 1861 voyage of the cruiser *Haydamack* through the Tasman Sea, unannounced arrival of the frigate *Svetlana* at Sydney in 1862, appearance of the screw corvette *Boyarin* at Hobart and Adelaide in 1871, and subsequent visits to Sydney and Melbourne by other Russian warships.

The flagship of the Russian Pacific Fleet, *Bogatyr*, called on the New South Wales and Victorian capitals in 1863. In 1881 the warships *Afrika*, *Vyestnik* and *Platsun* paid yet another visit to these cities, as well as Hobart and Glenelg (near Adelaide). Perhaps not surprisingly, Melbourne newspaper the *Age* ran a series of articles shortly after the departure of *Afrika*, *Vyestnik* and *Platon* that questioned the Russians' motives and roundly criticised local defences. Foremost among the hoaxes these stories generated was a report that the Russian Admiral had transmitted details of Melbourne's defensive capabilities and weaknesses to his superiors back home via telegraph (Fitzhardinge 1966).

New Zealand's fear of Russian invasion finally translated into action in 1880, when government officials invited Lt Col Peter Scratchley of the British Royal Engineers to assess the colony's coastal defences and submit a report of his findings. Scratchley suggested each of New Zealand's four primary port cities (Auckland, Wellington, Dunedin and Lyttelton—the latter serving as the main entrepôt to the city of Christchurch) be protected by a three-tiered defensive system comprising shore-based artillery, submarine mines and torpedo boats. He emphasized the adaptability of spar torpedoes to most types of vessels, and believed them best suited to the defence of the colony's harbours; consequently, the New Zealand Government was urged to purchase no less than three torpedo boats for each port (Cooke 2000: 129; Moffat 1996: 4–5).

Within six weeks of the release of Scratchley's report on 1 March 1880, New Zealand's official representative in London, Agent General Sir Francis Dillon Bell, requested information about torpedo boat designs from the British Admiralty. However, two more years would pass before Bell received instructions to actually purchase vessels on the government's behalf (Cooke 2000: 129; Moffat 1996: 5). Ultimately, a total of four 2nd-class craft were ordered—at an individual cost of £3 150—from Chiswick (London)-based J.I. Thornycroft & Co. Bell informed the Colonial Secretary that the boats were not based on the most innovative and up-to-date designs then available, and questioned whether the purchase was a wise one, but also stated his confidence in the government's ability to make an informed decision (National Archives of New Zealand [NANZ]: AD 1, 1887/1855, 4/9/1882). By 21 September 1883 all four torpedo boats had been completed, launched and tested; however, delivery would be delayed by problems with the spar torpedo delivery system, which had apparently never undergone a 'live' test (Moffat 1996: 7–9).



Figure 3. The New Zealand torpedo boats *Defender* and *Taiaroa* at Port Chalmers, 1884 (Image courtesy John Dickie Collection, Alexander Turnbull Library, Wellington, New Zealand).

Lyttelton's torpedo boat defences

Lyttelton's torpedo boat, No. 168, was loaded aboard the steamer *Lyttelton* with its sister vessel No. 169 (intended for the defence of Port Chalmers near Dunedin) in October 1883 (NANZ: AD 6, 7/2/1884). However, it was not until February of the following year that *Lyttelton* departed on its three-month passage from London to Port Chalmers, where it arrived on 9 May. Surprisingly, the arrival of the colony's newest element of coastal defence does not appear to have elicited much excitement among the public—nor within the government responsible for its purchase, deployment and use (Moffat 1996: 11–12). Both torpedo boats were placed on the torpedo station mole at nearby Deborah Bay shortly after their arrival at Port Chalmers (Fig. 3), and remained there until the arrival of New Zealand's two other torpedo craft (Nos. 170 and 171) in August 1884. Four more months would pass before No. 168 was finally transferred to its duty station at Lyttelton. Official correspondence does not reveal the reason for the delay, although it was almost certainly associated with a lack of both facilities (such as a boat shed and slipway) and a trained crew for the boat when it arrived in New Zealand (Moffat 1996: 13). No. 168—rechristened *Defender*—arrived in Lyttelton Harbour on the evening of 24 December 1884, in tow of the Colonial Government Steam Ship *Stella* (*The [Lyttelton] Press*, 26 December 1884).

At the time of *Defender's* arrival in Lyttelton, specific facilities for its deployment and upkeep did not yet exist. A submarine mining depot was included in the 1885 construction plans for Fort Jervois on Ripapa Island (near the mouth of Lyttelton Harbour), but the depot's buildings were used instead to house the convict labour responsible for constructing the fort. As originally conceived, the depot comprised a Whitehead Torpedo shed, mine store, cable tank, workshop, and primer test pit (Cooke 2000: 113; Moffat 1996: 19). Curiously, a torpedo boat shed and slipway were not included among the planned structures.

In 1885, *Defender* was finally outfitted with its necessary support facilities; not at Ripapa Island as one might expect, but instead 4.2 km to the north-west in a small embayment known alternately as Magazine Bay and Baker's Bay (see Fig. 2). Not that a direct association between the torpedo boat and submarine mining depot was necessary: nearly a decade later, in 1893, the buildings at Ripapa Island were still not being used for their original purpose (Cooke, 2000: 113). The shed was a wooden-framed structure with corrugated iron cladding that measured 70 ft [21.3 m] in length, 13 ft [4 m] wide, and was 12 ft [3.7 m] high. The slipway comprised iron rails placed atop wooden piles (Fig. 4), and featured a wheeled iron cradle to transport the boat from the shed to the water for launching (Watson, 2004: 6).

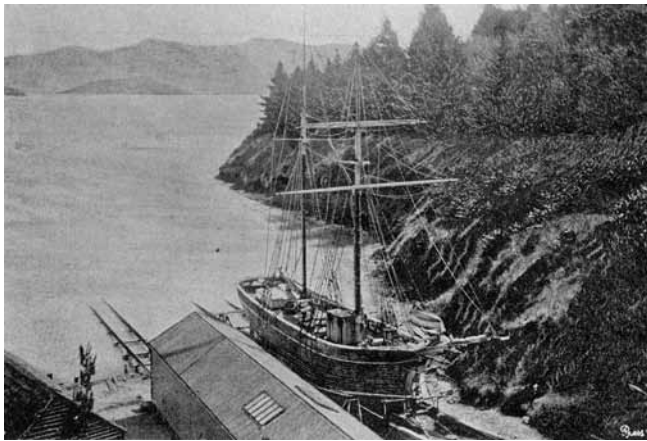


Figure 4. Print from the *The [Lyttelton] Weekly Press*, 27 January 1897, showing the torpedo boat shed and slipway at Magazine Bay (Image courtesy Aotearoa New Zealand Centre, Christchurch City Libraries, Christchurch, New Zealand).

Only five individuals were responsible for operating *Defender*, as well as maintaining the boat and its associated shed and slipway. All were members of the Torpedo Corps, an organization of professional soldiers formed in 1886 to oversee maintenance and operation of all New Zealand-based submarine mining installations and materiel, as well as train volunteer recruits (Moffat 1996: 18). As time went on, the vast majority of men appointed to the Torpedo Corps shifted from experienced sailors and soldiers to individuals engaged in a variety of civilian trades. By 1892, the Corps comprised butchers, blacksmiths, boiler fitters and painters, among others (Appendices to the Journals of the House of Representatives [AJHR]: H-47, 1891).

Unfortunately, the use of non-military personnel may have had a detrimental effect on the upkeep of the boat. A pamphlet produced for the New Zealand Government by J.I. Thornycroft & Co. outlined procedures necessary to properly maintain the colony's torpedo craft. These included monthly inspections of the interior and exterior hull, to be followed by cleaning and painting of any exposed areas to prevent corrosion of the boat's 1/16-inch galvanised steel hull plates. In the event the hull's zinc plating was removed through sudden or gradual wear, zinc blocks intended as sacrificial anodes were to be placed within the hull below the waterline (NANZ: AD 1, 1884/1855). Despite these directives, reports surfaced as early as 1886 that the individual responsible for *Defender's* upkeep, Robert Brown, had failed in his duties. Brown was a civilian contracted by the Army Department in Lyttelton to serve as the boat's engineer and chief maintenance officer, but was later discharged for leaving the boat 'much rusted and nearly spoiled... [and needing] to be taken to pieces and cleaned' (NANZ: AD 1, 1886/1046, 4/5/1886).

The boat's less-than-satisfactory condition was also noted by a reporter from the *Lyttelton Times* (*LT*), aboard *Defender* to report on an official inspection of the vessel's performance by Rear Admiral R.A.E. Scott, honorary Commodore of the Naval Artillery Volunteers:

The boat went anything but well; in fact her performance was enough to make any marine engineer weep tears of gall. Her engines were so rusty that 12 knots was all that could be got out of her, and nothing worked smoothly. The priming was constant, and when the water was blown off it was the colour of brick-dust (*LT* 30 March 1886).

The *Times* reporter also took issue with the boat's shed and slipway, stating these facilities were located in an 'exposed and out-of-the-way position', and that the inclination of the slip was 'so steep it imperiled [sic] the vessel's launch in anything less than calm seas' (*LT* 30 March 1886). In fact, the original slipway constructed at Magazine Bay was too short to effectively launch *Defender*—even at high tide—and had to be extended by another 90 ft [27.4 m] (Cooke, 2000: 113). Ultimately, even this measure proved ineffective, and the boat spent the majority of the remainder of its service career moored in Lyttelton Harbour (Fig. 5) near the port's dry-dock facilities (Cooke 2000: 113). For reasons that remain unclear, the slipway was not built to the length originally specified in a construction plan drafted for the torpedo boat installation in May 1885 (Fig. 6). Had these plans been followed, it seems likely tidal fluctuations at Magazine Bay would have had negligible impact on *Defender's* launch and operation.

In a continuation of the vessel's woes, *Defender* was involved in a collision with a wharf in the port of Lyttelton one year later. The accident, which appeared to be the result of miscommunication between the boat's commander and newly appointed chief engineer, resulted in damage to the vessel's stern-post, stern hull plates, woodwork, and propeller shaft, as well as the complete loss of the propeller. During the subsequent Court of Inquiry, it was revealed by four of *Defender's* crewmen that the chief engineer, Alexander Milne, was hard of hearing. Further, Milne admitted under questioning that he was nearsighted, could not read a newspaper, and had very limited vision in unlit areas (NANZ: AD 1, 1887/2572, 9/9/1887).

Milne's testimony also hints that the vessel's poor maintenance record may have contributed to the collision. Although *Defender's* commander, Petty Officer Charles Gray, reportedly signalled via telegraph for the engine room to put the engine 'full steam ahead', Milne stated the engine room's telegraph indicator was 'flying about and not resting at any point but vibrating' (NANZ: AD 1, 1887/2572, 9/9/1887). In what could easily be considered a shocking miscarriage of justice, the Court of Inquiry overlooked Milne's disabilities and instead placed full blame for the incident on Gray, who was reduced in rank and ordered to relinquish command of the torpedo boat. *Defender* fared somewhat better, and by the end of September 1887 had been repaired and restored to its pre-accident condition (NANZ: AD 1, 1887/1572, 29/9/1887).

***Defender*: Decline, discard and resurrection**

By the mid-1890s, New Zealand's fleet of torpedo boats was no longer viewed by government officials as a necessary

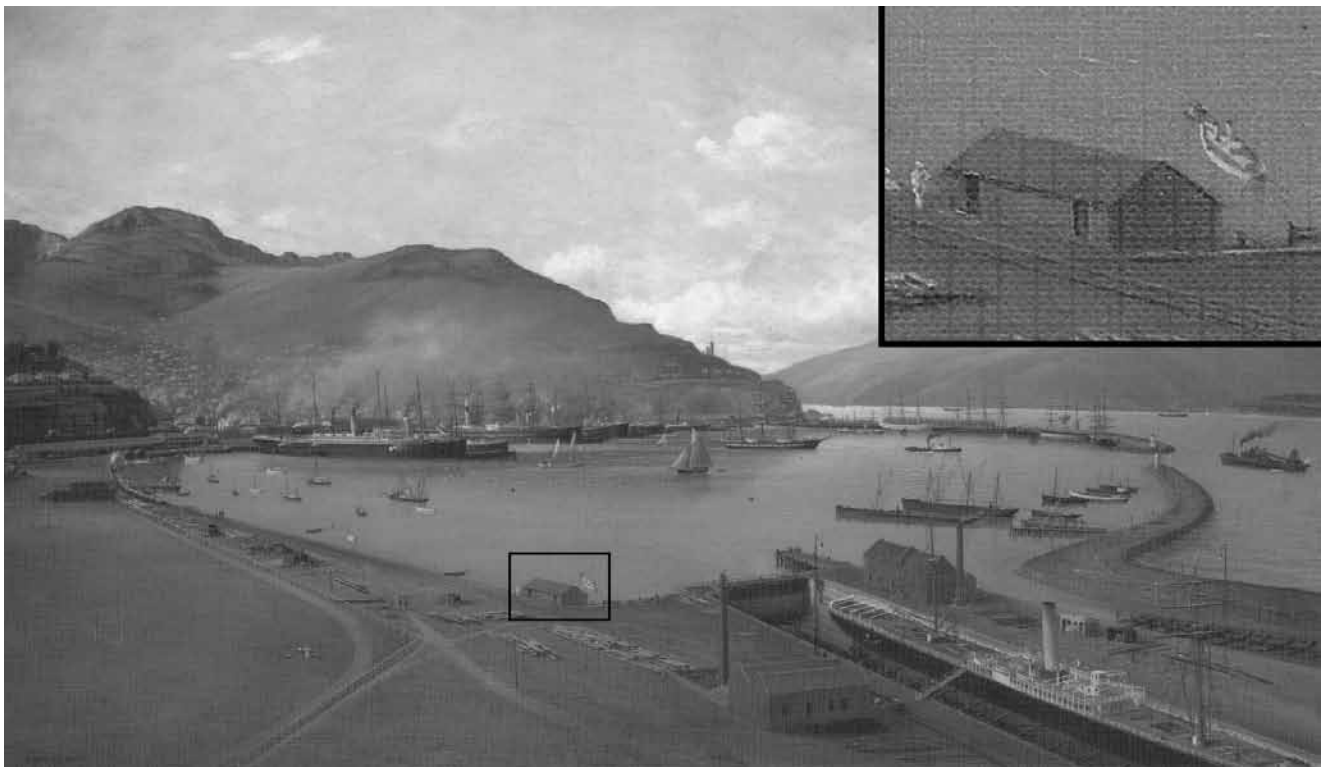


Figure 5. Painting *Lyttelton Harbour, 1900* by John Gibb showing the torpedo boat *Defender* (inset) moored near the port's dry dock facilities.

element of harbour defence. This was due in no small part to the relative obsolescence of spar torpedoes, as well as advances in range and accuracy for shore-based gun batteries and ship-mounted machine guns. Another critical factor appears to have been the expense(s) associated with maintaining the boats and their associated facilities. In March 1896, the Hon. R.J. Seddon, Minister of Defence, was asked to decide whether the torpedo boat fleet was to remain active or be laid up. The Minister chose the latter option, as did the Commandant of New Zealand Forces, Colonel John Francis Fox, when solicited for an opinion by the Undersecretary of Defence Sir Arthur Percy Douglas (NANZ: AD 1, 1903/2596). Until the first decade of the 1900s, the boats continued to be used for miscellaneous tasks (such as tenders for their respective submarine mining depots), but were all but phased out of the active defensive role for which they had been purchased (Moffat 1996: 29).

Defender's service career with New Zealand's colonial forces appears to have ended in 1899, when Army Department records discontinue all mention of it. Similarly, no official correspondence relating to the boat's disposal is known to exist, although local histories state it was purchased around 1900 by Mark Thomas, a Lyttelton steam launch operator (Bundy, 2008, pers. comm., 13 November; Moffat 1996: 35; Ogilvie, 1970: 75). Thomas salvaged most of *Defender's* machinery—including the engine, boiler and propeller—before discarding the hull at Purau Beach on the southern shore of Lyttelton Harbour (Fig. 7). Tidal scour around the hulk undercut an adjacent road to such an extent that the Mt Herbert

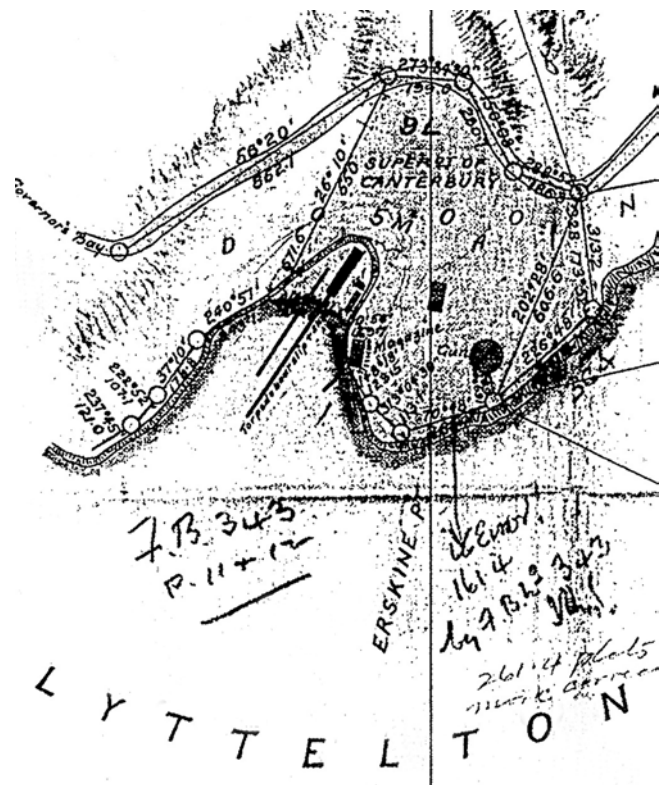


Figure 6. Section of map entitled, *Land Taken for Construction of Defence Works at Lyttelton, Provincial District of Canterbury* (11 May 1885), showing intended footprint for Magazine Bay torpedo boat shed and slipway. As originally conceived, the slipway would have extended far beyond the bay's extreme low water mark (Image courtesy Thornycroft Torpedo Boat Museum, Lyttelton, New Zealand).



Figure 7. Painting *Purau Beach* by Jesse Hollobon, showing the discarded bow and stern sections of *Defender* c. 1930 (Image courtesy David Bundy).

County Council used heavy machinery in an attempt to move it further away from the water, with the result that it broke amidships into two sections (Ogilvie 1970: 75). *Defender's* remnants were a distinct landmark at Purau for several years afterwards, and were photographed on at least two occasions during the 1940s and 1950s (Figs 8 & 9) before the County Council ultimately bulldozed them into two shallow pits in the late 1950s (D. Bundy, 2008, pers. comm., 13 November).

In 1996, Project Port Lyttelton, a community based non-profit heritage group, commenced efforts to restore Lyttelton's historic powder magazine at Magazine Bay. Because of the magazine's close proximity to the site of the former torpedo boat shed and slipway, Project Port Lyttelton suggested it might serve as a future venue for a torpedo boat-themed museum display and requested that committee member David Bundy mount a search for *Defender's* remains at Purau Beach. Utilising 19th-century archival sources, mid 20th-century aerial photography, oral histories acquired from older-generation Purau residents, and the assistance of New Zealand Army mine detecting specialists and local volunteers, Bundy located the boat's discard site in 1998. *Defender's* largest extant hull components were scattered over a 30 x 10 m area, with several smaller sections emerging from multiple shallow holes on its periphery (Fig. 10). The bow formed the most

complete, articulated section; by contrast, the stern had been broken, twisted and crushed to fit into an 80-cm deep depression (D. Bundy, 2008, pers. comm., 13 November; Thornycroft Torpedo Boat Museum [TTBM], 2003: 5).

Although the site was not excavated archaeologically—a factor influenced by reportedly poor overall contextual integrity and its exemption from New Zealand's existing historic preservation laws—Project Port Lyttelton took particular care to thoroughly document its recovery. Hull components and associated artefacts were systematically identified, catalogued and conserved. Ultimately, the bow and stern sections were reconstructed from conserved hull material and placed on display within the historic magazine as part of a larger exhibit and data archive collectively known as the Thornycroft Torpedo Boat Museum (TTBM) (D. Bundy, 2008, pers. comm., 13 November; TTBM 2003: 5–6).

Archaeological investigations

New Zealand-based consulting archaeologist Katharine Watson performed two investigations of Lyttelton's former torpedo boat shed and slipway in 2001 and 2002 (Watson 2004: 7). The purpose of these investigations was to locate and identify the footprint of the boat shed to assist staff of the TTBM in their efforts to interpret the site. The first phase of the project, conducted in



Figure 8. Photograph showing the remnants of *Defender* at Purau Beach, 1941 (photographer unknown) (Image courtesy W.C. Lee Collection, Alexander Turnbull Library, Wellington, New Zealand).



Figure 9. Photograph of 10-year-old Clive Goodenough sitting on the conning tower of *Defender's* discarded hull, c. 1950 (Image courtesy Thornycroft Torpedo Boat Museum, Lyttelton, New Zealand).

November 2001, involved excavation of a 1 m² test pit within the hypothesized location of the shed's foundation, followed by a theodolite survey of the entire site. A second investigation, in May 2002, utilised a small mechanical excavator to expose a larger area of an asphalt feature discovered the previous year (Watson 2004: 7–8).

The initial excavation revealed a layer of asphalt at a depth of 1.03 m below ground surface, as well as overlying layers of soil and sand capped with a 75 cm deep layer of fill that resulted from gravity-generated movement of sediment off hillsides surrounding the site. The asphalt layer was thought to form the original foundation of the torpedo boat shed; a proposed origin for the sand layer was either consecutive 'high tide and storm incidents dumping sand in the area' or intentional infill following the shed's demolition (Watson 2004: 8). The 2002 investigation expanded the area of excavation and confirmed the identity of the asphalt layer as the shed's foundation. Additionally, archaeologists identified the full extent of the foundation's width, and revealed specific structural elements, including both wooden rail bearers and iron rail bolts at the junction where the shed connected with the slipway (Watson 2004: 8–9).

The author conducted a non-invasive archaeological survey of the slipway's extant pile remnants in November 2008 as a component of his doctoral research. In a fortunate turn of events, this visit coincided with an extreme low tide event in Lyttelton Harbour, which permitted a thorough walkover inspection of the Magazine Bay foreshore, including areas that are submerged under normal tidal conditions. The furthest extant piles were located 28.5 m from the seaward end of the asphalt foundation, which was partially exposed due to shoreline erosion. All visible piles were square-hewn timbers—the best preserved of which measured 15 by 14 cm [6 x 5 ½ in]—and both pile lines were spaced apart an average of 2 m [6 ½ ft]. The latter dimension corresponds well to *Defender's* maximum breadth (7 ft 6 in or 2.3 m), and helped confirm the identity of the slipway as that associated with the torpedo boat shed.

The extreme low tide event of 13 November 2008 also revealed a significant design flaw in the slipway—specifically, that its overall length was inadequate to successfully launch *Defender* during periods of excessive low water. The last extant pile at the seaward end of the slipway fell short of the day's low tide mark by a distance of approximately 20 m (Fig. 11). In fact, the slipway may have been too short to launch the boat during a *regular* low water event, as the last extant pile is located slightly shoreward of a scour zone comprising exposed shell and rocks (Fig. 12). According to TTBM staff, this zone denotes the 'normal' low tide line (D. Bundy 2008, pers. comm., 13 November; J. Cleaver 2008, pers. comm., 12 November).

Elements of *Defender's* bow and stern sections on display at the TTBM were recorded during the author's November 2008 visit to Lyttelton, with particular emphasis placed on discerning physical evidence of the boat's mismanagement. This would include obvious signs of damage and/or repair, including unorthodox modifications to the vessel's hull. Similarly, clues were sought that might suggest acute wear or complete degradation of *Defender's* hull fabric prior to its disposal at Purau Bay.

Inspection of *Defender's* restored bow and stern sections revealed two features that appear indicative of hull repair and/or modification. The first comprises a prominent line of rivet holes located along the starboard side of the vessel's stern just above the waterline (Fig. 13). No corresponding line of rivets or rivet holes is present at the same location along *Defender's* port side, nor does the starboard rivet line appear in contemporary hull plans of the 2nd-class torpedo boats produced by J.I. Thornycroft & Co. for the New Zealand Government (see Fig. 1). The possibility exists that this anomalous rivet line is associated with a repair to—or replacement of—the vessel's stern hull plating, and may be a direct result of its documented collision with a wharf at the port of Lyttelton in 1887.

The second feature of interest is a dark, hardened resinous substance present in the bilge at *Defender's* extreme forward and aft ends. In terms of appearance,



Figure 10. Remnants of *Defender's* midships and bow sections being excavated by New Zealand Army personnel, 1999 (Image courtesy David Bundy).

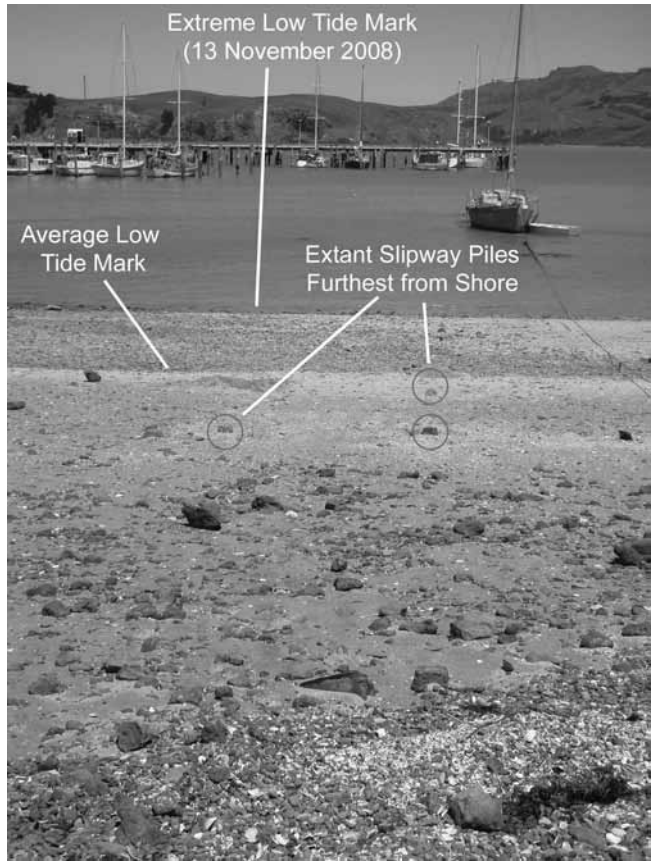


Figure 12. Shoreline of Magazine Bay during an extreme low tide event on 13 November 2008, showing the location(s) of extant slipway piles furthest from shore relative to average and extreme low tide levels.

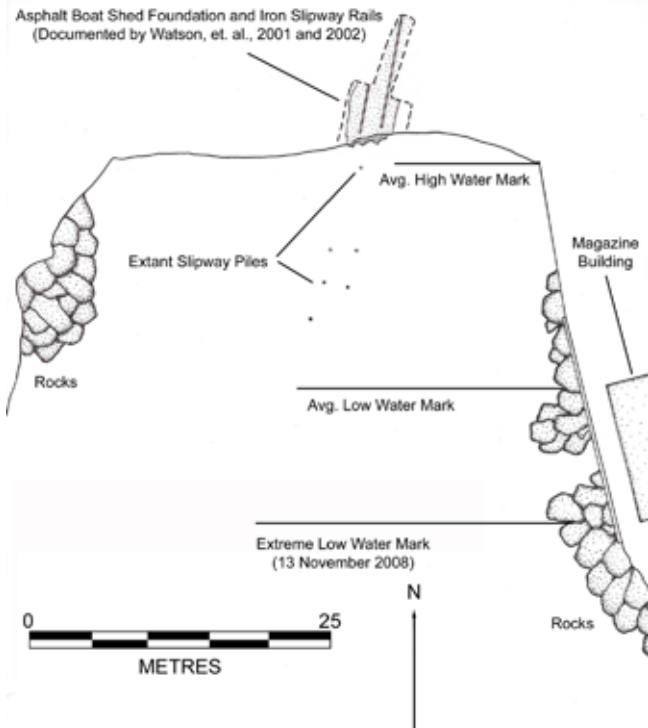


Figure 11. Site plan of Magazine Bay torpedo boat shed and slipway remnants, as observed in May 2002 and November 2008, respectively (Illustration by the author; base map adapted from Watson, 2004: 7).

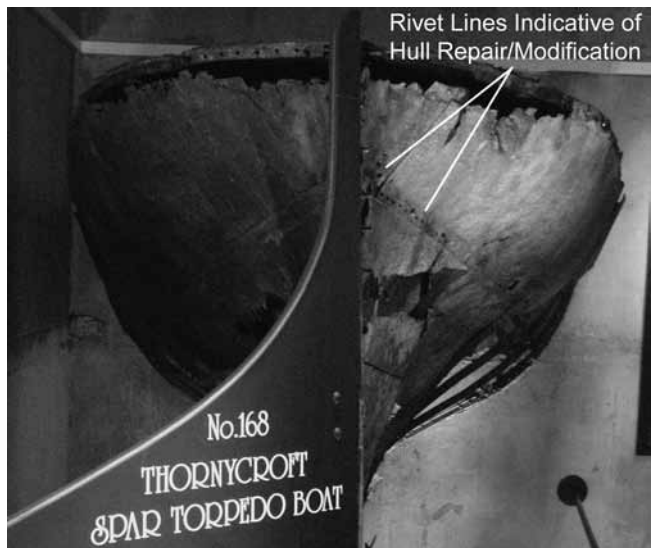


Figure 13. Stern-on view of exhibited stern section of *Defender*, showing the location of rivets suggestive of hull repair and/or modification (Photograph by the author).



Figure 14. Starboard view of *Defender's* exterior stern bilge; highlighted areas show unidentified resinous substance that emerged from the hull during a warm weather event and later re-solidified. The vessel's screw aperture is at far left of image (Photograph by the author).

it resembles solidified tar or pitch; however, the material also exhibits a relatively low melting point, as evidenced by the formation of 'stalactites' where it emanated from breaches in the hull during periods of hot weather and subsequently re-solidified (Fig. 14). Bundy (2008, pers. comm., 13 November) first noted this phenomenon during an unusually warm weather event that followed the TTBM's grand opening in 2002. Under normal circumstances, the historic magazine where *Defender's* remnants are exhibited and stored is usually dark and cool, features low relative humidity, and consequently is not equipped with an HVAC (Heating, Ventilation and Air-Conditioning) system. During the warm weather event, the temperature inside the magazine increased substantially, with the result that the resinous substance softened and began to leach from breaches in the hull fabric. The substance is not specifically referred to in the construction contract for New Zealand's torpedo boats, which suggests it may have been placed in *Defender's* bilge later—perhaps as a measure to prevent leaks where the hull had been damaged and/or fallen into disrepair (NANZ, AD 1, 1884/1855).

Conclusion

Archival sources have revealed that Lyttelton's torpedo boat defences suffered from poor planning, mismanagement and neglect for the majority of the station's operational period. Uninformed action—or failure to act—on the part of certain individuals and organisations negatively affected several of the defensive system's critical elements. However, those responsible were not limited to the civilian contractors who constructed the boat and its facilities, or the volunteer servicemen who attended to their day-to-day operation and upkeep. Indeed, the highest echelons of New Zealand's colonial

government, as well as their Imperial overseers in Great Britain, bore a significant share of the blame, especially for problems related to planning, purchase, funding and execution of Lyttelton's torpedo boat programme.

Similarly, archaeological investigation of surviving elements of *Defender*, as well as extant features associated with its associated shed and slipway facilities, has provided tangible evidence of design flaws and other missteps in the establishment and operation of Lyttelton's torpedo boat defences. Measures to repair damage to *Defender*, including installation of one or more additional hull plates in the stern and the incorporation of a tar-like substance in the bilge of the extreme forward and aft compartments, appear to be a response to incompetence and/or neglect on the part of the boat's caretakers and operators. Shortcomings in the design and construction of *Defender's* associated facilities included a slipway that was too short to effectively launch the vessel during low tide, and a boat shed that may very well have been partially submerged during storms or other events that generated periods of extreme high water.

Nicholls (1988: 175–77) has commented that the colonial defence forces of Australasia, when viewed in hindsight, appear 'little more than ineffectual, ill-conceived and expensive knee jerk reactions to illusory threats'. While this may be overstating the case just a bit—and Nicholls is quick to argue against his own supposition—archival evidence has offered little doubt that Australasia's colonies were burdened with obsolete and deficient weaponry and facilities, as well as a standard of training that was modest at the best of times. The information revealed by archaeological investigation of Lyttelton's torpedo boat defences has provided a tangible reminder of these shortcomings—consequences that stemmed from the hasty creation of a quasi-independent naval force with limited funding, resources, training and support.

Acknowledgements

The author wishes to thank David Bundy, John Cleaver, volunteer staff of the Thornycroft Torpedo Boat Museum, and the Bundy family for their overwhelming hospitality, generosity and assistance during this research project. Similarly, Mary O'Keeffe and her family were outstanding hosts during my stay in Wellington and are to be commended for offering wonderful accommodation with incredible views of that fine city. Many thanks also to Katharine Watson for kindly allowing me to cite results of her excavations at the former Lyttelton torpedo boat shed site, and adapt elements of the resulting site plan to my own map. The staff of the Alexander Turnbull Library in Wellington was extremely helpful and provided access to a variety of archival material, including photographs of *Defender* in Port Chalmers and documents pertaining to its service career in Lyttelton. Last, but certainly not least, this project benefited tremendously from AIMA, which kindly provided funding for the author to travel to New Zealand to instruct AIMA/NAS Part 1 and 2 training courses in the cities of Dunedin, Wellington and Auckland

(and sneak in a bit of research when not engaged with teaching responsibilities). I would particularly like to thank AIMA members Ross Anderson, Jun Kimura, Corioli Souter, David Nutley, Mark Staniforth, Peter Ross, Matt Carter, Andy Dodd and Emily Jateff for their collective and individual assistance, guidance and enthusiasm.

References

- Appendices to the Journals of the House of Representatives, *Returns of appointments to Torpedo Corps since 24 January 1891*, H-47 1891.
- Cooke, P., 2000, *Defending New Zealand: ramparts on the sea, 1840s-1950s (Part 1)*. Defence of New Zealand Study Group, Wellington.
- [Auckland] *Daily Southern Cross*, 17 February 1873, Facsimile on file, Thornycroft Torpedo Boat Museum, Lyttelton, New Zealand.
- Fitzhardinge, V., 1966, Russian naval visitors to Australia, 1862-88. *Journal of the Royal Australian Historical Society*, 52.2.
- Gray, E., 1975, *The devil's device: The story of Robert Whitehead, inventor of the torpedo*. Seely, Service and Co. Ltd., London.
- Lyttelton Times*, 30 March 1886, Facsimile on file, Thornycroft Torpedo Boat Museum, Lyttelton, New Zealand.
- Moffat, I., 1996, *Most formidable weapons: a history of New Zealand's Thornycroft spar torpedo boats*. Wellington Maritime Museum, Wellington.
- National Archives of New Zealand, Wellington. *Agent General to Colonial Secretary, 4 September 1882*, Army Department [AD] 1, Inwards Correspondence (1880-1907), 1887/1855.
- *Commandant of New Zealand Forces to Undersecretary of Defence, 8 May 1896*, AD 1, Inwards Correspondence (1880-1907), 1903/2596.
- *Hearing on accident in Lyttelton, 9 September 1887*, AD 1, Inwards Correspondence (1880-1907), 1887/2572.
- *Instructions for care of Thornycroft torpedo boats*, AD 1, Inwards Correspondence (1880-1907), 1884/1855.
- *Invoice of expenses, Thornycroft & Co. to New Zealand government*, AD1, Inwards Correspondence (1880-1907), 1884/1855.
- *Marine Inspector to Secretary of Marine, 29 September 1887*, AD 1, Inwards Correspondence (1880-1907), 1887/1572.
- *Memo to Undersecretary for Defence, 4 May 1886*, AD 1, Inwards Correspondence (1880-1907), 1886/1046.
- *Re: laying up torpedo boats as such*, AD 1, Inwards Correspondence (1880-1907), 1903/2596.
- *Undersecretary for Defence to Agent General, 7 February 1884*, AD 6, Outwards Correspondence, Letterbooks (1880-1904).
- Nicholls, B., 1988, *The colonial volunteers: the defence forces of the Australian colonies, 1836-1901*. Allen & Unwin, Sydney.
- Ogilvie, E., 1970, *Purau*. The Caxton Press, Christchurch.
- The [Lyttelton] Press, 1884-1904* [microfilm], Christchurch City Libraries, Christchurch, New Zealand.
- Thornycroft Torpedo Boat Museum, 2003, *Thornycroft Torpedo Boat Museum, Magazine Bay*. Informational brochure produced by the Thornycroft Torpedo Boat Museum, Lyttelton, New Zealand.
- Watson, K., 2004, *The torpedo boat shed at Magazine Bay, Lyttelton: an archaeological investigation*. Unpublished report produced for the Torpedo Boat Museum, Lyttelton, New Zealand.

Raising the War: Japanese salvage divers and allied shipwrecks in post-war Darwin

David Steinberg

Heritage Branch, Northern Territory Government, Level 1, 9–11 Cavenagh Street, DARWIN, Northern Territory NT 0800

Email: david.steinberg@nt.gov.au

Name	Type	Built	Dead	Salvage History Rights
<i>British Motorist</i>	British commercial tanker — 6891 tons	1924	2	Merrit had salvage rights by 1949. Sold to Tropical Traders in 1953.
<i>Mauna Loa</i>	US merchant cargo ship — 5436 tons	1919	5	Sold to Atkinson in 1947 by Disposal Commission.
<i>Meigs</i>	US merchant cargo ship (USAT designation — 12568 tons)	1921	2	Sold to Atkinson in 1947 by Disposal Commission.
<i>Neptuna</i>	Australian passenger liner — 5952 tons	1924	45	Merrit had salvage rights by 1949. Sold to Tropical Traders in 1953.
<i>Zealandia</i>	Australian passenger liner — 6683 tons	1910	3	Sold 1949 by Commonwealth to Oceanic Salvage (Masse and Atkinson).
<i>Kelat</i>	Naval coal hulk	1881	Nil	Owned by RAN.
<i>Maive</i>	Naval lugger — 14 tons	Unknown	Nil	Owned by RAN (completely salvaged).
<i>Peary</i>	US Clemson Class Destroyer — 1190 tons	1919	92	Sold 1949 by Commonwealth to Oceanic Salvage (Masse and Atkinson (not found until 1956).

Table 1. The war wrecks of Darwin Harbour partly salvaged by Fujita (mostly derived from National Archives of Australia [NAA] CRSF1,1955/1381: 158). Five were merchant ships in the service of the allies and three were naval vessels.

Introduction

The first Japanese air raid on Darwin Harbour on 19 February 1942 was a major event in Australian wartime history. This demoralising attack of a port within Australia resulted in over 200 dead and the sinking of many ships and planes. It heralded the beginning of Japanese attacks on Australia's homeland that included the infamous attacks on Broome and Sydney Harbour. The ships that were sunk in Darwin Harbour were partly salvaged for scrap metal seventeen years later, ironically by a Japanese salvage company. Leaving behind the ship floors the rest was shipped back to Japan to be absorbed into that nation's post-war industrial boom.

The sentiment behind the salvage for Mr Fujita, owner of the Fujita Salvage Company, had as much to do with making amends for the war, as it was to turn a profit. He committed to their salvage in part as a form of unofficial reparation. Today the remains of these wrecks are seen as significant monuments. They were salvaged in 1959 because of their association with the war, not in spite of it. This paper accounts for the limited salvage that occurred before the Fujita Salvage Company and then focuses on its work. This research is a valuable resource for those attempting to understand the site formation processes that these significant wrecks have undergone. It also tells a story of how the salvage of war wrecks, which still contained the remains of the deceased, was sanctioned

in part because of the opinion that historic battlefields should be cleared rather than preserved.

The Japanese air raid

Over the course of the war there would be 64 air raids on the Northern Territory, with none causing the same level of devastation as the first. The 19 February 1942 raid was aimed at Darwin's ships and wharves, and also its aircrafts (Powell 1992: 76). Powell puts the attack force at 36 zero fighters, 71 dive bombers and 81 level bombers. Lockwood reflects on the damage to shipping, informing us that: 'Within 23 minutes of the start of the raid 22 ships had either been damaged, sunk, or were sinking. More than 38,000 tons went to the bottom' (Lockwood 2005: 51). Lockwood also gives a harrowing picture of the emotional trauma suffered by survivors; men who 20 years later remained haunted by the smell of fuel, which conjured memories of burning ships and charred bodies. This human trauma, the enormity of these experiences, make an interesting counterpoint to the mindset of the local government in 1959, which conceived the wrecks as simply shipping hazards.

The wartime shipwrecks of Darwin Harbour

Schiffer explains that natural and cultural disasters, like earthquakes and wars, can lead to 'distinctive debris deposits' (1991: 65). The wartime shipwrecks of Darwin

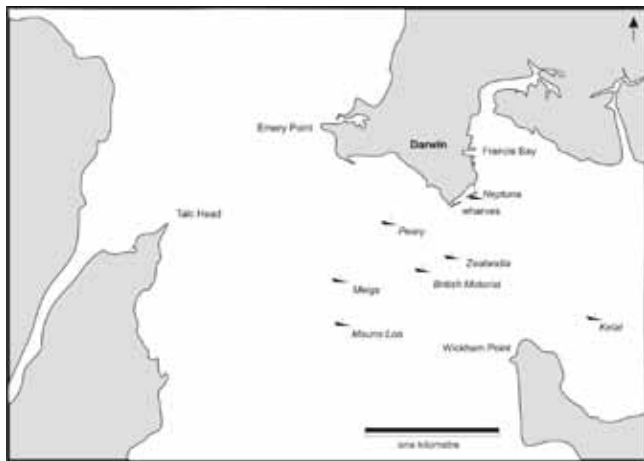


Figure 1. The location of wrecks partly salvaged by the Fujita Salvage Company. The map shows only the middle of Darwin Harbour.

Harbour is such a deposit; a group of wrecks formed from a single and dramatic cultural event. Table 1 shows the wrecks salvaged by the Fujita Salvage Company, all of which had been sunk in the Japanese attack on 19 February 1942. However, the table should not be taken as a complete inventory of maritime losses associated with that event. It does not include aircraft wrecks. It does not include vessels that were successfully re-floated, such as *Portmar*. Nor does it include *Florence D* and *Don Isidro*, which were attacked by the same force on the same day, but were sunk outside the harbour. Finally, it does not include those ships that were not complete losses, but suffered considerable damage with loss of life, for example the hospital ship *Manunda*.

The salvage history summarised in Table 1 illustrates that others owned these wrecks before Fujita gained salvage rights. This pre-Fujita history is complex with wrecks changing ownership more than once and persons having multiple interests and trading under different company names. The significant point is that as early as 1947 the government was handing these wrecks over to commercial salvors. Figure 1 shows the location of the wrecks partly salvaged by the Fujita Salvage Company.

Salvage prior to the Fujita salvage company

Prior to work done by Fujita, which began in 1959, salvage work had been conducted on Darwin Harbour's World War II (WWII) wrecks by both government and commercial operators. Figure 2 shows the chronology of salvage prior to Fujita.

The Commonwealth Salvage Board was formed in March 1942. The Board's first task was to deal with the wartime shipwrecks of Darwin Harbour and its surrounding waters. It sent a salvage team in July 1942 who re-floated *Portmar*, repaired the hull, and towed it back to Brisbane using the *St Giles* (National Archives of Australia [NAA] MT204/3: 187). They attempted to re-float the *Don Isidro* at Bathurst Island but failed, taking anchors and chain instead (NAA MT204/3: 187). We also learn that Captain Williams, who managed the re-

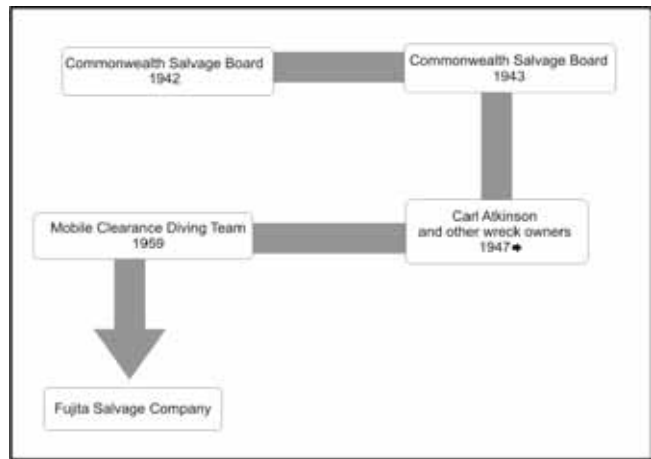


Figure 2. The chronology of salvage leading up to the Fujita Salvage Company.

floating of *Portmar*, had an interest in salvaging the *I-124* Japanese submarine located outside Darwin Harbour, although its salvage was never actually attempted (NAA MT204/3: 649).

Officially it was only the Salvage Board who conducted salvage in 1942; however, documents show that the navy based in Darwin, who had likely assisted the Board, took a great deal of gear for themselves. The navy took anchors, cable and shackles from *Mauna Loa*, *Zealandia*, *British Motorist*, *Meigs* and *Don Isidro* (NAA MP456/4 1943: 118 [a]). They also took a lathe, drilling machine, grinders and two motors with fans and a circular gun shield, from the *Don Isidro* (NAA MP456/4 1943:118 [a]).

The Commonwealth Salvage Board returned to Darwin in 1943 with the intention of re-floating *Kelat*, *Meigs* and *Mauna Loa* (NAA MT204/3: 611). The Board failed on all three counts. Numerous attempts to build a cofferdam around *Kelat* to facilitate salvage failed, with the work culminating in dropping a 3-ton concrete block on site (NAA MP456/4 1943: 371, NAA MP456/4 1943: 370). They recovered a wooden derrick from *Meigs* for the local Commodore, which he hoped to use as a wharf derrick, and also an anchor for their own vessel (NAA MP456/4 1943/371, NAA MP456/4 1943: 370).

The most interesting aspect of the 1943 salvage attempt is the report on *Mauna Loa* shipwreck (NAA MP456/4 1943: 118 [b]). The report contains a detailed description of the wreck, including a description of the damage sustained in the attack. It also includes a basic sketch of the wreck suggesting where the cofferdam and buoys should be placed to facilitate the sunken ship's repair and re-floating. The report recommends that the buoys should be similar to those used on the anti-submarine net that lay across Darwin Harbour.

Turning from government salvage to commercial salvage, before the eventual arrival of the Fujita Salvage Company it was Carl Atkinson who had done the majority of commercial salvage on these wrecks. Table 1 shows he purchased *Mauna Loa* and *Meigs* directly from the government, and he held interest in other wrecks as co-owner of Oceanic Salvage. Atkinson removed specific



Figure 3. Carl Atkinson with the wheel and telegraph he salvaged from *Peary* (Tom Lewis Collection).

items rather than salvaging structure as scrap. Local accounts tell that he removed motor vehicles, arms and other items from *Meigs* and *Mauna Loa* (Lewis 1992: 53). He removed a variety of items from *Peary* including a large gun, which is now a monument on Darwin's esplanade. Atkinson would later sell his rights over *Meigs*, *Mauna Loa*, *Zealandia* and finally *Peary* (*Northern Territory News* [NTN] 8/5/1959). The Commonwealth Government initially challenged Atkinson's rights over *Peary* but eventually retracted legal action fearing the delay would prevent Fujita from removing the wreck at all.

The Mobile Clearance Diving Team, attached to the Royal Navy, inspected *Peary* in 1959 to report on the possible remains of human bodies (NAA F425/C137 Part 1: 91). They penetrated numerous interior compartments and recovered human remains from the Wardroom Passage and Yeoman's Office. A ship's safe was raised and torpedo tubes were found to be loaded. The torpedos were later raised so as not to endanger future salvors (NAA F425 C137 Part II: 69).

War refuse as a shipping hazard

The salvage conducted by the government, Atkinson and other owners of the wrecks, all prior to Fujita, amounted to the removal of specific items, but not the removal of ship structure. The one exception was the re-floating of *Portmarin* in July 1942. As late as 1959 the large wrecks listed in Table 1 remained relatively intact and were either visible

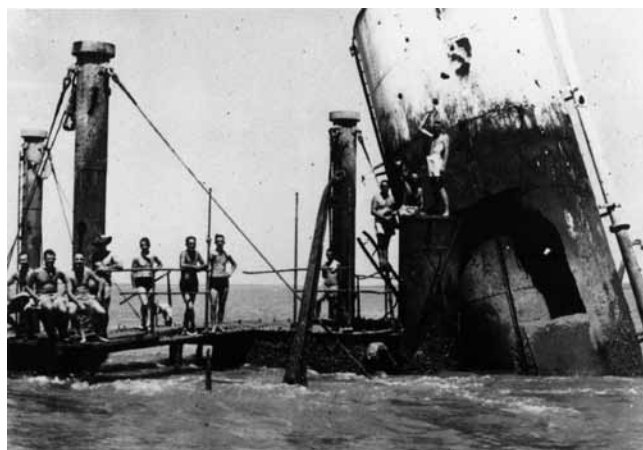


Figure 4. Wreck of the *Meigs* remained a landmark and shipping hazard for decades (Jim Mitchell Collection, NT Library).

above the water's surface or sat just beneath it. *Neptuna* was moored against the wharf when it was sunk, and still remained a major obstacle to wharf operations.

Although these wrecks became considerable shipping hazards from the moment they were wrecked, they were not salvaged to any great extent for sixteen years. The reasons for this began with the Commonwealth being unable to re-float the ships within the time that they remained viable vessels. As they degraded further the opportunity to utilise them as re-floated ships diminished. In later years the government perceived the cost as prohibitive. There was such wide reluctance from government agencies to accept responsibility and fund the work that a senior public servant claimed it was the worse case of buck-passing he had ever seen (NAA CRSF1 1946/409 12/02/1947). Furthermore those that held commercial salvage rights were either unwilling or had no real capacity to conduct the work.

The issue came to a head in the mid-1950s with captains of visiting ships reporting collisions or near misses with the wrecks (NAA CRS 1946/409 19/03/1948). There were also plans to expand the wharf and increase shipping to meet a projected increase in exports and, therefore, the wrecks were seen as an obstacle to harbour development (NTN 26/06/1959, NAA CRSF1 1946/409 13/10/1948). The position of the government is summed up with a 1956 quotation from the Administrator of the Northern Territory. He said:

I agree with Captain Spurgeon that for two reasons it would be a good thing to see the last of these wrecks in this harbour; one being that they are daily evidence of Japanese marksmanship in war and secondly, if they are within the anchorage, even if they break up into harmless pieces, they could still be a nuisance which we could well do without (NAA CRS F1 1956 04/05/1956).

Underlining the government argument about the need to make the wharf area more viable was a sense of embarrassment. As the Administrator acknowledged the wrecks certainly continued to symbolise a military



Figure 5. Fujita salvage team on Darwin Harbour October 1959 (Lois and Geoff Helyar Collection, NT Library).



Figure 6. Re-floated stern section of the *British Motorist*, July 1960 (Lois and Geoff Helyar Collection, NT Library).

defeat. But there was also embarrassment in managing a harbour that appeared derelict. The continuing presence of these old shipping hazards gave the impression that shipping and trade in the Northern Territory was of so little consequence, that it was not warranted to invest the resources to clear its major harbour.

The Fujita Salvage Company and the conditions of the agreement

It is unclear whether Mr Fujita first made an offer to salvage the wrecks, thus instigating a tender process, or whether he merely responded to a call for tenders. What is clear is that he provided the only viable offer. The Fujita Salvage Company was also referred to as the Nanyo Boeki Kaisha, a name with a considerable pre-war history in the Pacific. The local Darwin agent for the company was Burns Philp & Company Ltd (NAA F425 C137 Part 1 29/06/1959).

There was no doubt in the minds of the Australian authorities that the Fujita Salvage Company was capable of the job, having successfully salvaged wrecks in Japan, Palau and Manila (NTN28/07/1959). An early condition of the agreement, as of July 1959, was that the wrecks were to be 'removed in their entirety' with 'no foul ground' left (NAA F425 C137 Part 1: 128). This clarification is an important key to understanding that the original aim of the work was not just to remove shipping hazards but also clear the sea bottom. This condition would be later changed resulting in salvage needing only to satisfy the Administrator, a change that would allow Fujita to avoid dredging the hulls and removing material below the mud line (NTN 17/06/1960). It is this compromise in 1960 that gives us our Darwin Harbour wartime shipwreck resource today.

In the context of cultural site formation studies the beginning of the Fujita phase of salvage can be viewed as a shift in material reuse from *lateral cycling*, in which new users made use of objects without those objects being physically modified, to *recycling*, which involves returning material to a manufacturing process (Schiffer 1991: 29). The chain, anchors, shackles and derricks removed by the

navy are examples of lateral cycling. The breaking down of each ship into scrap, fundamentally a raw material, is recycling. The distinction is not semantic. It symbolises a major shift in how much investment was required.

Operations

The Fujita Salvage Company team began to arrive on varying vessels between the 19 and 21 July 1959 (NAA F425 C137 Part 1:163). There were 120 personnel and the vessels consisted of the mother ship *Seizan Maru*, the crane barge *Kichiringo*, the oxygen plant ship *Nachi Maru* and the small tug *Kori Maru* (NAA F425 C137 Part 1: 34, NAA F425 C137 Part 1: 163).

The original plan was to raise *British Motorist* and use it as a floating work platform towing it over each wreck in succession (NAA F425 C137 Part 1: 163). However, the team reverted to their second plan that was to re-float this ship, but use the old wharf spur and the wreck of *Neptuna* as a work platform. The upturned hull of *Neptuna* lay beside the spur.

The *British Motorist* was the first wreck to be worked and, unlike the others, this was to have a second life. The ship was cut in two parts leaving behind the deadweight of the engine section. The forward and stern sections were pumped of mud and floated, the bulkheads creating sufficient cavities for buoyancy. These parts were towed into the shallows, winched together, welded together and then this converted hulk was towed back into deeper water. Figure 6 shows the raised stern section.

The *British Motorist* was converted to accommodate two new consecutive roles; first as a stationary hulk serving as lodgings and base for the salvage team, and then as a barge, as it was eventually filled with scrap metal and towed back to Japan. Although this remains unconfirmed, once it reached Japan it was likely scrapped along with its cargo. The *British Motorist* is an interesting case of vessel modification. There was a *technological reduction*, with the loss of a propulsion system, and also a contraction of the vessel's dimensions (Richard 2002: 294–95). The contraction of the hull, by removing the midships, likely



Figure 7. Scrap from the wreck of *Zealandia* being lowered onto the wreck of the *Neptuna* August 1959 (Lois and Geoff Helyar Collection, NT Library).



Figure 8. Scrap sheets stacked on the wreck of *Neptuna* (Fay Cheater Collection NT Library).

made re-floating easier and supported its new roles as a hulk and barge by reducing deadweight. Although this modification of *British Motorist* is not well documented in written records it is well documented in historic images and thereby provides an informative case study of modification and reuse.

The NT Administrator's report for 1959–1960 provided a status report on the work, stating that by 30 June 1960 *British Motorist* and *Kelat* had been 'completely removed' and *Zealandia*, *Meigs*, *Mauna Loa*, *Neptuna* and *Peary* had been partly removed (Northern Territory Archive Service [NTAS]: Administrator Report 1959–1960). In direct conflict with this status report are the results of recent site inspections by the Heritage Branch that show that the ship's floor of the *Kelat* remains *in situ*, and there is substantial wreckage associated with the *British Motorist*.

The wrecks may have been broken down through a combination of explosives and use of a thermal oxygen lance. The use of explosives is accounted for in the records (NAA F425 C137 Part II: 33, NAA F425 C137 Part 1: 163; NTN16/06/1959). In terms of the lance the fleet included the oxygen manufacturing plant ship *Nachi Maru*, which explains the source of oxygen for the cutting of scrap on the surface using acetylene torches. It may also have fuelled an oxygen lance underwater. Recent investigations of *Meigs*, *Mauna Loa* and *Zealandia* shipwrecks show that the edges of remaining hull appear to have been cut away, rather than torn away as would occur in an explosion (R. Weisse 2009, pers. comm., 18 June). Similarly the hull of *British Motorist*, shown in Figure 6, appears to have been cut away rather than blown apart. In the case of the lance the Fujita divers would cut through the hull and large sections would be raised with the floating crane.

Once raised to the surface the scrap was transported to the spur jetty and the upturned hull of *Neptuna*. Here it was cut up into uniform sized sheets using acetylene torches, and grouped in bundles of 25 tons (NTAS TS655). The original mother ship was loaded with scrap and sent to Japan midway through the program. At the end of the project *Neptuna* was cut up and all remaining scrap

was loaded onto the re-floated *British Motorist* which was towed to Japan.

The NT Administrator's report for 1960–1961 summarises the achievements of the Fujita Salvage Company detailing it 'removed most of the wreckage which was a hazard to navigation in the port' (NTAS Administrator Report 1960–1961). Total scrap obtained during the operation was 12 240 tons. The salvage achievements consisted of the raising of *British Motorist*, the partial salvage of *Meigs*, *Mauna Loa*, *Zealandia*, *Kelat*, *Peary*, *Neptuna* and the complete salvage of RAN lugger *Maive*. They also salvaged a jetty, train rolling stock and various scrap around the harbour (NAA F425 C137 Part II: 93, NTN23/02/1960). They also used their floating crane to lay two mooring buoys for the harbour-master (NTAS NT Administrator Report 1960–61). Mr Fujita concluded that it was the most difficult and unproductive salvage program he had conducted, due mostly to tidal conditions and poor visibility (NTN06/11/1959). Furthermore his most experienced diver, Sanzo Hayashi, was killed underwater. On the night he died 55 of the Japanese workers kept an overnight vigil at the town morgue, a custom to protect the spirit of the recently deceased (NTN 27/10/1959).

Salvors and the Darwin community

Documents provided to the immigration authorities detail the names, sex, ages, job descriptions and places of birth of Fujita's boat and salvage crews (NAA E51/0, 1959/1130). There were 120 personnel varying in age from 16 to 65 years. The conditions of entry into Australia were the same as those for Japanese pearlmen. These were to have played no prominent role in the war against the allies; to have not undertaken any activities that may have caused unfavourable reaction; and to have not take part in any operations against Northern Australia (NAA F425 C137 Part 1:36). The major concern was from the unions, who feared this would begin a pattern of local workers losing jobs to cheaper foreign labour, therefore the salaries of Fujita's workers was negotiated with the North Australian Worker's Union, and was comparable to the salaries of



Figure 9. Brass crucifixes made from salvaged scrap, Darwin United Church 2008 (Photo: David Steinberg).

Australian workers *NTN* 26/02/1960).

The original plan was for workers to be based at a shore camp at Frances Bay, close to the heart of Darwin (NAA CRSF1 1955/1381:105). The salvors may have been housed for a time there as historic images show makeshift huts built from salvaged scrap from the wrecks (NT Library PH0049/0049). It certainly was Fujita's original intention that his salvage workers be housed on the shore, providing the opportunity to recuperate from difficult work conditions (NAA CRS F1 1955/1381:93). However, once it was prepared they lived aboard *British Motorist* and were only permitted one-day shore leave a month. Living conditions aboard the raised wreck were described as horrible (NTAS TS655).

The shift of the salvage workers from shore accommodation to the *British Motorist* was likely done at the insistence of the government. It may have come from a desire to clarify to everybody that the workers were in Darwin both temporarily and on a very restricted basis. When the company was awarded a small additional contract to remove scrap from Dudley Point it was a condition that the crew not be permitted to sleep ashore (NAA F425 C137 Part II: 97).

We learn from media and oral history accounts that there was very little animosity between the Darwin community and the salvors. Japanese workers were already a familiar sight in Darwin again with the return of the Japanese pearling fleet years earlier, 56 Japanese pearlmen being based in Darwin in the 1957–58 financial year (NTAS NT Administrator report 1957/1958). There was also a genuine respect for the skill of the salvors, the extremely difficult dive conditions and the fact that the work was for Darwin's benefit, namely cleaning up their port for industry (NTAS TS655; *NTN* 26/06/1959 & 6/11/1959). This local acceptance was in line with national sentiment. By 1959 Japan and Australia were strong trading partners, also sharing significant common ground with their strong opposition to communism (Meaney 1999: 111).

A final explanation for there being no animosity from locals is that the local residents of Darwin in 1959 were not

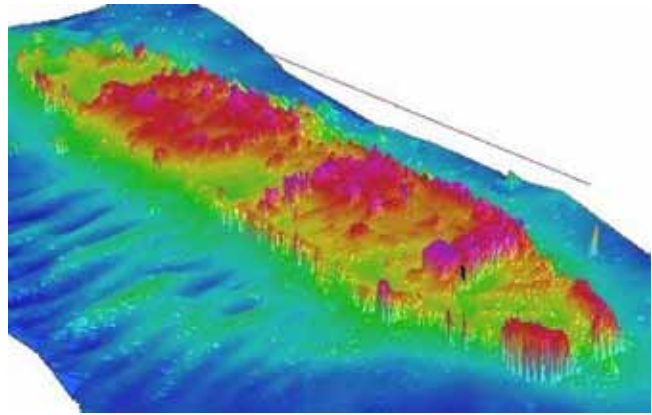


Figure 10. Multi-beam image of *Meigs*. Note the degree of relief off the seabed (Courtesy Tek Ventures Diving Services).

the same people who experienced the bombing of Darwin in 1942. Prior to the bombing, most civilians had been evacuated, meaning it was the servicemen and merchant seamen, rather than the civilians, who experienced the bombing. Thus the civilians that constituted the Darwin community of 1959 had little or no first-hand experience of those raids. However, the bombing story was not ignored as an issue during the salvage company's stay. As a gesture of peace the divers had over 50 crucifixes made from brass scrap. Fashioned in Japan they were donated to the local United Church. The church building was constructed at around the same time, and was dedicated to those that had died as a consequence of the war.

The US Destroyer *Peary*: wreck salvage as war reparation

The salvage of *Peary*, a US Clemson Class Destroyer, was the most sensitive case of all the salvaged wrecks. The *Peary* was an American State Vessel that went down fighting with 80 American servicemen dying aboard. Despite many attempts to locate the wreck, it was only discovered in May 1956, well after negotiations with Fujita had started. The local authorities were keen to have it salvaged due to its proximity to the wharf, and they believed that the Fujita Salvage Company presented the only viable option. Fujita's position was that *Peary* was relatively small and in deeper water than the others and so not a profitable venture.

The US Government's original position on the possible salvage of *Peary* was that it should be left undisturbed (*NTN* 27/05/1960). This position was reiterated to the Australian Government years before the wreck was located, with the US Government arguing that '[the *Peary*] remain undisturbed as a place of rest for the heroic men who went down with her' (NAA CRS F1 1955:112).

By 1959 the local government was making pleas for the wreck to be removed, and went so far as to argue against the very notion of a wreck being a monument to those that died aboard. It was argued that if divers did not find human remains in the wreck then it could not be conceived as a 'tomb', and a more fitting monument to the American loss would be a memorial on the foreshore. The wreck, it was

argued, was 'invisible', being underwater, and so made a poor monument (NAA F425 C137 Part 1: 13). Even after the Mobile Clearance Dive inspection confirmed the presence of human remains, the local authorities continued to insist on the wreck's immediate salvage (NAA F425 C137 Part 1:96).

Although reiterating its preference for the wreck to be left as it was, the US Government finally relented and agreed to salvage, with the condition that human remains and confidential material such as cipher documents and safes be returned (NAA F425 C137 Part 1:117). It also confirmed that it considered *Peary* 'abandoned', thereby relinquishing any possible claim of ownership (NAA F425 C137 Part II: 40). Interestingly the Japanese Government was also reluctant to provide any support for salvage until the Australian and US Governments had confirmed their support. The Australian Government bought *Peary* from Atkinson and gave it to Fujita.

The most interesting position of all was that of Fujita himself. While Fujita described *Peary* as not being a profitable commercial venture he was anxious for personal reasons to make up for 'war damage' caused by his country. He was therefore willing to salvage the wreck at no charge as a gesture of goodwill (NAA F425 C137 Part II: 41). He communicated this sentiment on other occasions (NTN 26/05/1960). Fujita's reasoning was complex as he refused to pay for the wreck, nor charge for its salvage, but was reconciled with turning a profit from the scrap. Fujita's reasoning for agreeing to work *Peary*, namely because his country was responsible for its sinking, makes the act of salvage a form of unofficial war reparation.

Salvage history and archaeological investigation

The official government accounts of the salvage certainly give the impression that the salvage resulted in the near removal of all wreckage from the seabed, but an inspection of these wrecks today shows that this was not the case. The multi-beam survey of *Meigs* shows that considerable structure above the seabed remains. This resonates with Richards' observation that: 'The belief that the salvage and dismantling of vessels at the end of their functional life constitutes their total destruction is just one common misconception in maritime archaeology and history' (2001: 330).

When they sank the *Meigs* and *Mauna Loa* were loaded with military supplies intended for the armed forces in Timor. The salvage of these two wrecks in 1959–60 amounted to the removal of the superstructure, and perhaps also the boilers and engine. In exposing the lower cargo hold the salvage has exposed various cargo items including trucks, motorbikes and rail carts. This material evidence demonstrates that even though these wrecks had undergone considerable salvage, archaeologists can still address research questions about the working life of these ships, in particular their role in the war.

The salvage history of these wrecks is also an essential background to any maritime archaeological investigation of the bombing of Darwin Harbour. Figure 7 shows wreckage from *Zealandia* being lowered onto *Neptuna*, which was used as a salvage work platform. It is therefore feasible that wreckage now found at the *Neptuna* is from other

wrecks, and was re-deposited during the scrap break-up process. In the same way it is also possible that material raised from salvaged ships was consequently dropped in transit. An archaeologist investigating isolated finds in Darwin Harbour must appreciate the possibility that what they are investigating was not deposited during the bombing event, but by subsequent salvage.

Another direction in archaeological investigation is a more in-depth study of the Fujita salvage program itself. The archaeological study of maritime salvage can provide significant insight into both maritime related behaviours and broader social and cultural processes (Gibbs 2003; Richards 2002; Steinberg 2008). One such direction in research would be the identification of archaeological signatures of salvage on the *Peary*. This research has shown that Fujita's salvage of the *Peary* was never going to be a profitable venture but was conducted as a gesture of reparation. Archaeological signatures may show that the site was salvaged in greater haste because of this, or conversely, with greater care.

The extensive salvage of these wrecks raises a deeper question about how important a wreck's physical integrity is to those who perceive it as a monument. One of the men who served aboard *Peary* and survived its sinking died in 2008. His family carried out his final wish, scattering his ashes over the wreck on the anniversary of the attack. Given that the extensive salvage of *Peary* is common knowledge it is probable that this gentleman knew of it, but this did not stop him from still identifying the wreck as the resting place of his shipmates, and as a monument to their sacrifice. Another case in point is *British Motorist* which was raised with only the engine section left behind. Though little physical material remains it is heritage listed under the Northern Territory's *Heritage Conservation Act*, acknowledged for its monumental significance.

Conclusion

The WWII shipwrecks of Darwin Harbour are a group of sites created by a single major cultural disaster, the bombing of Darwin by the Japanese on 19 February 1942. Only seventeen years after the attack a Japanese company came to salvage the wrecks. The sentiment behind Fujita's salvage was as much to do with making amends for the attack, as it was to turn a profit. It was in fact Fujita's sense of national responsibility that drove him to complete the task. This self-imposed sense of obligation culminated in the salvage of the US naval ship *Peary*.

Salvaged only to the point whereby they were no longer considered shipping hazards, a significant degree of these wrecks and their cargo remain *in situ*. This resonates with Richards' observation that the salvage of wrecks does not necessarily result in their total destruction. Rather, what remains can be a significant part of the archaeological record. Given the scope of this salvage any archaeological research on these wrecks must appreciate that salvage was a leading factor in site formation. The impact of this salvage extends beyond the wrecks themselves, and may explain the origin of isolated features deposited across Darwin Harbour.

Acknowledgments

Thanks to Rick Weisse, from Tek Ventures Diving Services, for sharing his knowledge in matters related to commercial diving, particularly the use of cutting equipment. Thanks to David Urbinder who conducted research on my behalf at the National Archives in Melbourne. Once again thanks to Anna Davis for proofreading and ongoing support.

References

- Gibbs, M., 2003, The archaeology of crisis: shipwreck survivor camps. *Australasian Historical Archaeology* 37.1: 128–145.
- Lewis, T., 1992, *Wrecks in Darwin waters*. Turton and Armstrong, Sydney.
- Lockwood, D., 2005, *Australia under attack: The bombing of Darwin 1942*. New Holland Press, Frenchs Forest, NSW.
- Meaney, N., 1999, *Towards a new vision: Australia and Japan through 100 years*. Kangaroo Press, East Roseville.
- National Archives of Australia. Series: MT204/3, online page 187, 'Brief Record of vessels which have received assistance from the Commonwealth Salvage Board', 14 December 1942, Melbourne NAA Office.
- Series: MT204/3, online page 649, 'Salvage Board, re 'Portmar' Memorandum from Snowden Neave and Demsiner for Chairman and Chief Salvage Officer', 09/04/1943, Melbourne NAA Office.
- Series: MT204/3, online digital page 611, letter from Norman J. Makin, 16/03/1943. Melbourne NAA Office
- Series MP456/4, Item 1943/118 (a), report from Royal Australian Navy to Naval Board 'Articles salvaged at Darwin', Melbourne NAA Office.
- Series MP456/4, Item 1943/118 (b), letter to OCBDS Darwin 'Proposed salvage of the Mauna Loa, 19/07/1942, Melbourne NAA Office.
- Series MP456/4, Item 1943/371, letter from Captain Fant to Captain Williams 7/3/1943, Melbourne NAA Office.
- Series MP456/4, Item 1943/370, report from Captain Fant 18/04/1943, Melbourne NAA Office.
- Series E51/0, Item 1959/1130, 'Quarantine ships Japanese salvage operations' Melbourne NAA Office.
- Series F425/C137, Part 1, original file document number 91, confidential report from A.S. Cuthbert, Mobile Clearance team dated 5 May 1959, Darwin NAA Office.
- Series F425/C137, Part 1, original file document number 96, letter from J.C. Archer, dispatch date 23/05/1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, letter from Burns, Philip and Company, 29/06/1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, original file document number 128, letter from J.C. Archer Administrator, dispatched 09/07/1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, original file document number 15, letter from R. Marsh Acting Administrator, circa January 1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, original file document number 13, letter from Acting Harbourmaster, 29/01/1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, original file document number 163, letter from Acting Administrator Marsh, undated, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, original file document number 34, Memo from Hayes 09/02/1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part 1, original file document number 36, Memo from Police headquarters 02/03/1959, Darwin NAA Office, microfiche.
- Series F425 C137 Part 1, original file document number 117, Record of conversation with Mrs Johnson, Second Secretary US Embassy, 24/06/1959, Darwin NAA Office, microfiche.
- Series F425/C137, Part II, original file document number 33, letter from R. Marsh, Assistant Administrator 20/09/1960 Darwin NAA Office, microfiche.
- Series F425/C137, Part II, original file document number 69, letter from W.H. Hilder Port Superintendent, 08/08/1960, Darwin NAA Office, microfiche.
- Series F425/C137, Part II, original file document number 97, letter from R. Marsh Representative of the Administrator to Burns, Phillip and Company, Darwin NAA Office, microfiche.
- Series F425/C137, Part II, original file document number 93, letter from W.H. Hilder Port Superintendent, 27/06/1960, Darwin NAA Office, microfiche.
- Series F425/C137, Part II, original file document number 40, letter from R.J. Withnall, Crown Law Officer, 24/06/1960, Darwin NAA Office, microfiche.
- Series F425/C137, Part II, original file document number 41, letter from R.J. Withnall, Crown Law Officer, 24/06/1960, Darwin NAA Office, microfiche.
- Series CRSF1, 1946/409, letter from A Driver, Administrator, 12/02/1947, Darwin NAA Office, microfiche.
- Series CRSF1, 1946/409, letter from Marine Superintendent, 19/03/1948, Darwin NAA Office, microfiche.
- Series CRSF1, 1946/409, draft memo to Dept. of Interior, 13/10/1948. Darwin NAA Office, microfiche.
- Series CRSF1, 1955/1381, original file document number 158, letter from harbourmaster office 6/1/1958 Darwin NAA Office, microfiche.
- Series CRSF1, 1955/1381, original file document number 93, letter from Nanyo Boeki Kaisha to Australian Embassy, 10/09/1956.
- Series CRSF1, 1956, original file document number 30, letter from FJS Wise, Administrator, 04/05/1956, Darwin NAA Office, microfiche.
- Series CRSF1, 1955/1381, original file document number 105, letter from Administrator 10/10/1956 Darwin NAA Office, microfiche.
- Series CRSF1, 1955, original file document number 112, letter from Secretary, Dept of External Affairs, December 1956 Darwin NAA Office microfiche.
- Northern Territory News*, Northern Territory Library, microfilm. Northern Territory Archive Service, Oral History TS655, Patrick McDonald.
- Northern Territory Archive Service, Administrator Reports.
- Powell, A., 1992, *The shadow's edge: Australia's northern war*. Melbourne University Press, Melbourne.
- Richards, N., 2002, *Deep structures: an examination of deliberate watercraft abandonment in Australia*. Thesis (PhD), Flinders University of Australia.
- Schiffer, M., 1991, *Formation Processes in the Archaeological Record*, University of New Mexico Press.
- Steinberg, D., 2008, *Shipwreck salvage in the Northern Territory: the wreck of the Brisbane as a case study in site salvage and material culture reuse*. Special Publication Australian National Centre of Excellence for Maritime Archaeology No. 12. Australasian Institute for Maritime Archaeology, Special Publication No. 14.

Site formation process (wing inversion) at Catalina flying boat wreck sites lying in Roebuck Bay, Broome, WA

Silvano Jung

Anthropology, Faculty of Law, Business and Arts, Charles Darwin University, DARWIN Northern Territory NT 0909

Email: silvano.jung@gmail.com

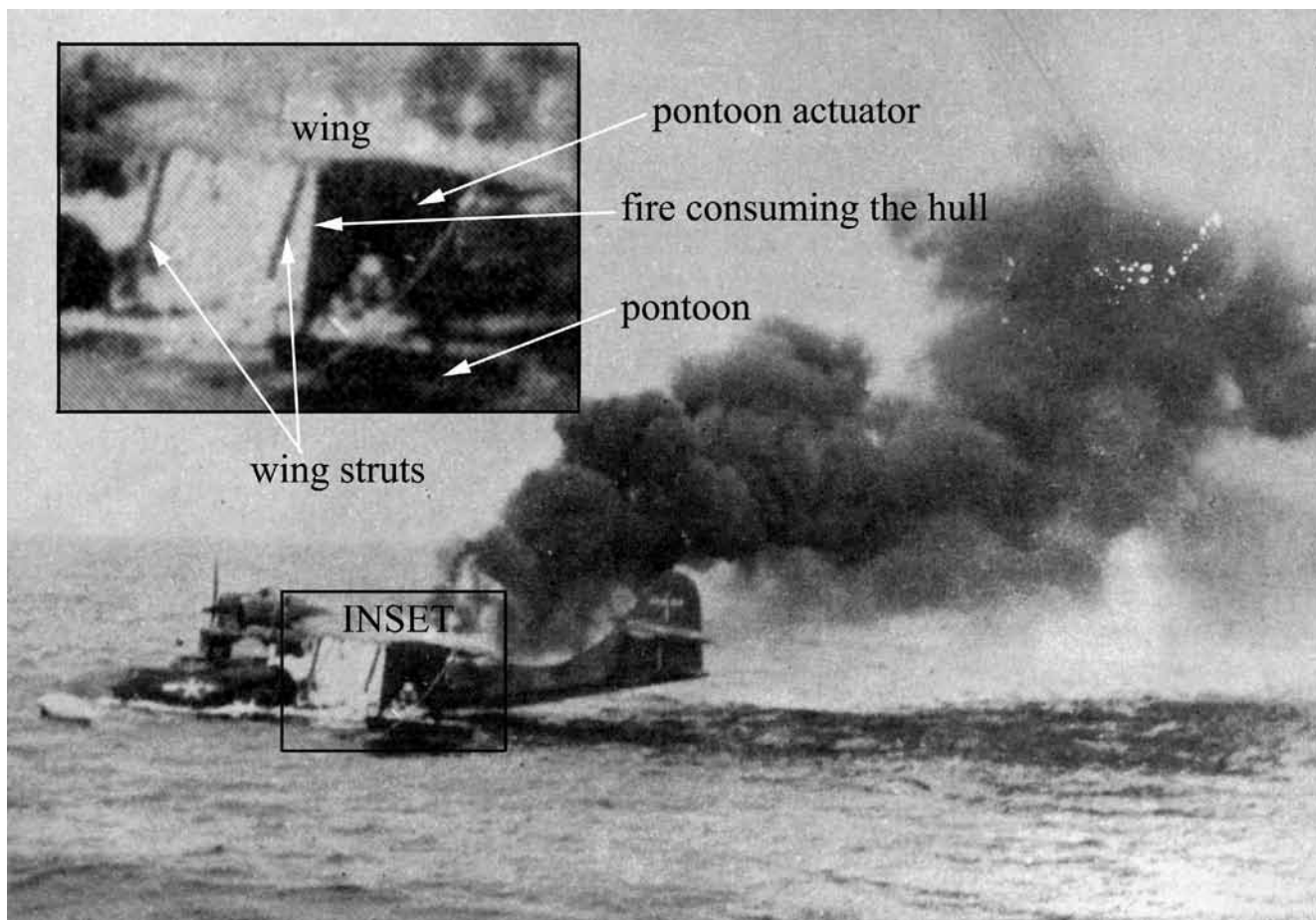


Figure 1. 'After rescuing her crew off the coast of Japan, an American submarine sets this crippled PBY afire with her guns. Sub crews scan the sea for downed fliers as they go about their job of destroying Jap [sic] shipping' (Hyman 1945: 253). Note: this view would have been similar to what Japanese pilots saw at Broome.

Introduction

I believe most of them [the flying boat wrecks] that were... [dredged] up, blown up and taken further out and exploded. So they've been disturbed a lot already (Bibby 2001).

The ten World War II (WWII) flying boat wreck sites lying in Broome's Roebuck Bay reported in Jung (2007a) are argued in this paper to be *in situ*, and their layouts indicate how they sank. Wreck site layouts reveal a signature pattern, or regularity in aircraft elements. A depositional site formation phenomenon relating specifically to Catalina flying boats referred to as 'Wing Inversion', is defined in this paper. A burning Catalina, therefore, produces a distinctive pattern in the distribution of its archaeological material (Fig. 1). A hypothetical break-up sequence, based on archaeological data, is suggested for the Broome wreck sites, but is also applicable to all Catalina flying boats that have sunk as a result of fire. Post depositional impacts, such

as salvage, on the wrecks are discussed, but it is argued that the wrecks are a continuous site type; the surviving archaeological material in Roebuck Bay represents a remarkably *in situ* battlefield assemblage.

Given their relatively intact nature, it is believed the wreck sites in Broome have changed little in the intervening years, providing a snapshot of their loss event. Significant amounts of fabric, therefore, do survive at those sites, which makes them a valuable archaeological resource of the time when Australia faced surprise attacks by the Japanese during WWII. The Broome wrecks are poignant tangible reminders of their successful sweep.

Site formation process—primary and secondary salvage

Primary salvage is largely that undertaken during the recovery processes by owners or other agents with a pecuniary interest in a vessel's loss. Others were salvaged because they formed a shipping hazard; there were many

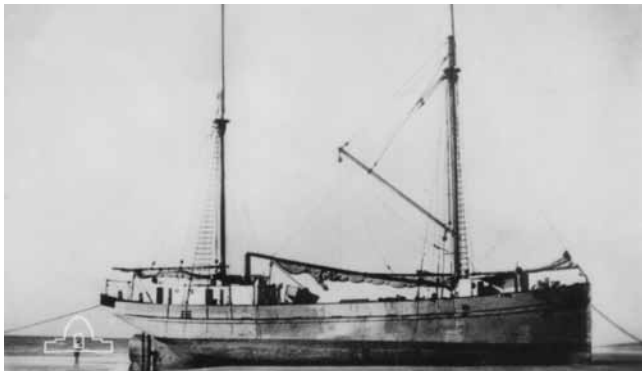


Figure 2. 'Wallal Beach, WA. Starboard side view of the auxiliary schooner *King Bay* beached. The photograph was taken prior to her being requisitioned by the RAN in 1940–07 for service as an examination vessel at Fremantle' (Id. No. 300905 Naval Historical Collection, Australian War Memorial).

reasons. Secondary salvage is that which is carried out 'by individuals or groups other than those directly involved at the time [of loss]...and it generally occurs after an abandoned site is relocated and then salvaged by people without a "primary" interest in the site' (McCarthy 2000: 59). These categories have been supplemented with the terms 'opportunistic salvage' and 'systematic salvage' to take into account that:

...a purely temporal distinction fails to allow for continuing access to a wreck, whereas primary/secondary places emphasis on legality and does not encapsulate the range of possible access to both the wreck proper and the wreck products off-site (Gibbs 2006: 14).

The Broome flying boat wreck sites fall into the secondary salvage or systematic salvage category as well as re-entering a systemic context whereby they have become the focus of attention to pilgrims (i.e. the active participants of the air raid) and tourists (Schiffer 1977: 15–16; McCarthy 1983). Human visitation, however, has had a devastating impact on wreck site fabric, much worse than *in situ* degradation (Edney 2006). The information loss from wreck sites that occurs when people take artefacts without recording the context of finds, is clearly demonstrated in Jung (2004). The very reason why people have been able to find artefactual material remaining in the flying boat hulls must be because the wreck sites were not subjected to primary salvage.

Continuous and discontinuous sites

Post depositional site formation processes at the wreck sites are described in local folklore as having severely impacted on the fabric and location of the wreck sites today. The oral history of the Broome wreck sites, however, is 'subject to the abstraction that characterises historiography, and they bring their own values and interests in their accounting of time past' (Deetz 1988: 17). For instance, although the Royal Australian Navy (RAN) is believed to have cleared Roebuck Bay of its flying boat wrecks shortly after their loss

in 1942, archaeological data suggests that the supposed extent of the salvage work is inconsistent with the oral history. All of the wreck sites discussed in this paper are defined, therefore, as a continuous site type, based upon Muckelroy's concepts of continuous and discontinuous sites (Muckelroy 1977; 1978: 182–214). Continuous sites are succinctly paraphrased as:

...relatively localized in their remains of the hull and any cargo or...fittings, as opposed to discontinuous sites [whose] elements...are widely scattered, with no single specific locus of the wreck site (Anuskiewicz 1998: 228).

A wreck site locus, or continuous site type, is defined in this paper as the fuselage with the keel surviving as far as the stern-post (see Jung 2007a: 35, fig. 3). Furthermore, wings and engines will be no more than 20 m from the fuselage. Aircraft wreck sites, like shipwreck sites, often have opened-up and partially disintegrated fuselages, and artefactual material scattered over a large area. Frequently, very little of the airframe remains intact after a crash. This also depends on the environment, depth, and so on, as well as depositional and post depositional human impacts. In the case of ship hulls, maritime archaeology's 'principle concern is with establishing the hull's original form, since it has often not only partially disappeared, but also fragmented and distorted, accommodating itself to the contours of the sea-floor' (Muckelroy 1978: 183). In this instance, the salvage would have resulted in the formation of discontinuous sites in Broome, rather than what is evident in the archaeological record today. In aviation archaeology, for example, the Catalina crash site in the Territory of the Cocos (Keeling) Islands is a discontinuous site, since very little remains of its fore-body and after-body and that the mainplane and debris area lie a considerable distance from where the fuselage was believed to have been located (Jung 2006).

Secondary salvage—HMAS *King Bay* in Broome

The auxiliary schooner HMAS *King Bay* (237 tons) was originally built as a lighter at Fremantle Western Australia, but following the declaration of war with Germany the vessel was taken over by the RAN as an examination ship in July 1940 (Lenton & Colledge 1968: 298; Nesdale 1993: 112; Dickson 1998; P. Martin 2004, pers. comm., 8 April). On 2 September 1939 the Examination Service was established at all Australian ports, whereby the examination ships, manned by Australian Naval Reservists, were to stop vessels about to enter port, identify them and to search for contraband (Gill 1985: 64). The *King Bay* was later transferred to the Australian Army in February 1944. The ship's operations in Broome during 1942, however, are virtually a complete mystery (Fig. 2). No ship's logs are known to have survived for that period, nor are there accounts from personal diaries:

Unfortunately it is often the case that there are few, if any, operational records on the smaller craft that were requisitioned for war service, and those that do exist tend to be sparse and incomplete.



Figure 3. Chief Petty Officer Claude Choules RAN in 1936 (Photo: courtesy Daphne Choules-Edinger via Kevin Kenneally).



Figure 4. Able Seaman Keith Herber, crewmember on *King Bay* during the Broome salvage operation (Photo: courtesy Keith Herber).

We have very little information on the activities undertaken by HMAS *King Bay* and as far as is known, the only log books that exist for her are held by the Australian War Memorial, and relate to her later war service with the Australian Army (B. Mitchell 2004, pers. comm., 3 June).

The only reference for the *King Bay* having been in Broome at all is from a website listing RAN ships. *King Bay* is referred to as 'an examination vessel at Fremantle, a tender to a shore establishment and helped clear the harbour at Broome of wrecks after Japanese air-attack' (Wilkins 2007a). In a 2003 interview Claude Choules, who lead the demolition team, claims the ship was in Broome and equipped with a team of four divers to salvage the flying boat wrecks and probably some of the sunken moorings.

Choules and Herber accounts

Following the fortuitous meeting between Dr Michael McCarthy (Department of Maritime Archaeology, Western Australian Museum [WAM]) and Daphne Edinger (Choules' daughter), an interview was organised with former Chief Petty Officer Claude Choules RAN (Fig. 3). Corioli Souter from the Western Australian Museum (WAM) was provided with a list of questions, relating to the ship's stay in Broome and the salvage work they did. This interview is presented in Appendix 1. To summarise

the findings, the results provided many useful insights into the extent and nature of the salvage operation that took place, but there are gaps and inconsistencies between what was said to have occurred and what is found in Roebuck Bay today.

The *King Bay* was allegedly in Broome for approximately four months from November 1942 until February 1943. During this time it also spent a week in Port Hedland rescuing two grounded vessels there. The salvage team did not travel on the ship to Broome, but were flown in from Fremantle. Divers in standard dress, it is said, were diving every day. Their task was to clear an area for a proposed flying boat base by removing wrecks and replacing sunken moorings. Divers placed explosives underneath the flying boat hulls to destroy the wrecks. Once the structure at each wreck site was reduced to manageable sized sections, probably by multiple explosions, those sections were hauled aboard *King Bay* and dumped into deeper water. Choules was adamant that the salvaged sections were dumped in the 100-fathom (182 m) line in Roebuck Bay. Souter pointed out that the only water near Broome approaching that depth was adjacent to Entrance Point close to the new jetty, known as 'Roebuck Deep' (AUS 50, 1973), a short distance from the wreck sites. The secondary discard of the salvaged sections from the flying boats may very well then be in Roebuck Deep. The WAM side scan sonar survey in 2001 did not cover



Figure 5. Salvage of an Empire flying boat. Location unknown, date unknown (Series number: A705/1. Control symbol: 9/25/13, NAA). Note: heavy lift capacity crane in use in Rose Bay or Batavia, also Australian registration for aircraft in foreground.

that area. Significantly, Choules did not remember how many wreck sites or which particular aircraft were salvaged.

One other eyewitness account of *King Bay*'s operations in Broome collaborates parts of Choules' recollections. This account is from Able Seaman Keith Maxwell Herber (87 years in 2008), who was on board the ship at this time (Fig. 4). He remembers seeing suitcases with khaki clothes and human bones in the salvaged wrecks. Significantly, he mentions that at least two wrecks were salvaged and that this work was done in late 1943, not late 1942:

You will note that I was first drafted to the K.B. on 10.7.43 when it was engaged in examination duties. It ceased these duties about 21.10.43. The crew was removed and myself and another A.B. were assigned to the ship to attend to moorings and cleaning duties as required.

On 15.11.43 the crew to go to Broome were assembled on board and 2 or 3 days later we sailed.

The times of working on the wrecks were dictated by the tides. I don't remember the scope of the work but I feel there was more than one [salvaged].

The explosives were placed at low tide and when the incoming tide covered the wreck[s] they were exploded.

The ship's company, if memory is correct, consisted of:

Captain	W/O	(his name may have been Gunn)
Exec Officer	W/O	?
Diving Officer	W/O	?
C.P.O.	Claude	Choules
E.R.A.	Harry	Sykes

Cook Sid Bull

1 Leading Seaman

3 (?) divers A/B

The name of one of the A/B's was [Lionel?] Gardiner.

Approx. 8 or 9 A/Bs (K. Herber 2008, pers. comm., 22 October).

Herber's recollection of two wrecks being salvaged may explain the debris field with the Dornier X-20 artefacts (see Jung 2008: 257, 260). Perhaps the wrecks closest to the jetty were salvaged i.e. Target 2 and Target 29? It should be noted that only Type One wreck (sites exposed at spring low tide) were blown up. No Type Two wrecks (deep water—always submerged) were salvaged, but Herber (2008 pers. comm., 19 December) did not rule out the possibilities that the deep-water wrecks were searched for and probably inspected.

While the accounts of Choules and Herber do indicate secondary salvage in Broome, its specific nature i.e. which and how many aircraft were salvaged, is not clear (see Appendix). Furthermore, it is most unlikely diving was conducted 'everyday', mentioned in Choules' account, since the environmental factors that limit diving today must surely have impacted in 1942/43. Given that *King Bay*'s time in Broome was during the wet season, traditionally the lay-up season for pearling luggers, diving would also have been hampered by monsoonal squalls producing rough seas, strong currents and underwater turbidity. It is posited here that *King Bay* would not have had suitable diving conditions (i.e. neap tides) to physically move all 15 wrecks, especially the large Empire flying boats, at the time *King Bay* was recorded to have been in Broome (Fig. 5). The archaeological data indicates that all the flying boats investigated in this study are *in situ* and that therefore *King Bay* only moved significant sections from one wreck site, Target 2 or SC1 (Jung 2007a: 43). The reason is that the wreck sites exhibit patterning in the layout and distribution of aircraft elements that is consistent with a flying boat sinking at moorings as a result of fire. The break-up sequences to describe these processes are discussed in the following section.

Inferred site formation process—'wing inversion'

Our cat was a sinking hulk with smoke pouring out of her. She was slowly keeling over at a crazy angle (Juta n.d.).

Fire easily consumes an aluminium airframe. Accelerated by fuel, it results in a catastrophic failure of the mainplane. In the Catalina-type flying boat, fuel tanks are located in the centre section of the mainplane, between the engines and above the engineer's station. What appears to have happened in the Broome examples is that the ruptured fuel tanks leaked burning fuel down the wing and into the blister compartment, causing the empennage to eventually break away (see Fig. 1). The structural integrity of the wings fails, causing them to collapse around the



Figure 6. A United States Army Air Force (AO-10) Catalina, which suffered pontoon damage after a heaving landing in Tampa Bay, Florida. It is actually Serial # 44-34067 not 43-4067, which was a B-25J that crashed in Switzerland on 7 February 1945. This Catalina was later salvaged—it did not sink' (Ragnarsson 2006; Johnson 2003). Note: the Catalina almost capsizing to starboard due to the submerged starboard wing tip and pontoon. Both pontoons have been damaged.

fuselage (Jung 2001: 166). This often results in what is referred to as 'wing inversion', where the port wing settles upside-down on the starboard side of the fuselage (upside down) and vice versa for the starboard wing.

McCarthy (2004: 83) points out that aviation archaeology is akin to aircraft crash investigations, whereby crash site investigators have been 'waiting for the archaeological world to catch up and to realise what important information can be had and what innovative methods are being used in this field!' One method of interpreting an airframe at time of loss due to fire at sea, is to investigate a phenomenon known as 'wing clapping':

Assume now that the wings are the first to break off while undergoing the same dive-pullout scenario. The wings will break off upward, and the fuselage and tail may continue like an arrow shaft. Often the wings, as they break off upwards and back, impact with portions of horizontal and vertical tail parts. Such impact evidence is indicative of the wings breaking before the tail.

When both wings break simultaneously, it is not unusual to see that they impact each other as they depart the airplane. This phenomenon is known as clapping or wing clap. This is indicative that they broke simultaneously while under high positive g loading. This result is usually from pilot input or uncommanded flight control input (McCormick & Papadakis 2003: 172).

The above generally refers to an aircraft in flight, but the term wing inversion is used in this paper to take into account the descent through the water column. This pattern has been observed elsewhere at other Catalina wreck sites that caught fire (Jung 2005). This is a general law, since other forces act upon an airframe during the descent to the bottom. Sometimes both wings can settle on the same side, albeit upside down. This phenomenon is produced when a flying boat capsizes once one of its wings has broken away or has taken on water (Fig. 6). The now water-filled fuselage can also drag the still attached wing over in a 90° arch (Fig. 7). While at this angle, this wing too will most likely detach.



Figure 7. 'NZ4046 — the final moments before sinking' (Harrison, *et al.* 1997: 231). Note: although this Catalina did not burn, it is capsizing given that the starboard wing, seen here, is dragged down by the fuselage and port wing.

A flying boat's hull 'has a negative metacentre height and, therefore, when at rest on the water the boat is, laterally, unstable' (Gouge 1935: 695; Gould 2000: 77). Loss of a float, therefore, will result in the hull capsizing. It would not have been necessary to target fuel tanks or engines, as the destruction of a sailplane section would equally have caused the machine's loss. The extent of wing inversion is also attributable to at least two other factors: depth of water and the amount of damage done to the mainplane before it sinks. The reader is referred to Jung (2007a) for wreck nomenclature. Wing inversion clearly occurred at Site 23, but to a lesser extent at Sites 10, 11 and 13. This is because these machines, it is argued, sank in a similar manner, due to the type of damage they sustained. Two types of damage are believed to have occurred, known as the 'centre of mass', resulting in classic wing inversion, and the other, 'engine-wing' damage. These are explained below.

The theory of 'Centre-of-mass damage'

General aircraft fighter principles for destroying multi-engine aircraft dictate that pilots either aim for what is known as a 'centre-of-mass' or 'engine-wing' attack. Conceivably, the attacks on the two Empire flying boats at Broome may have utilised both techniques, since it is recorded that A18-10 (in particular) had its starboard wing severed by cannon fire. Subsequent passes then targeted the flying boat's centre-of-mass, hence the fuel tanks behind the cockpit exploded, throwing Sgt Ireland out of the hatch on the flight deck. In the centre-of-mass attack, the best position to attack was apparently from ahead so as to avoid the side machineguns of a bomber. The fighter would, therefore, be attacking the greatest area, or centre of mass:

Nothing prevents a fighter attacking a bomber in a pursuit curve from targeting the cockpit—except the bomber's defensive fire. In a head-on attack, aiming for the cockpit is easier than trying for an engine because you are putting the gunsight on the center of mass, and if you have wing guns that converge a certain distance ahead, when you open fire your rounds will converge toward the center of mass (cockpit) from the outer wings and then back again as you close the distance and scoot on by. If you are piloting a fighter with centerline guns, targeting the center of mass still makes sense because it is a bigger target, and rounds that strike the front of the fuselage will pass through until they hit something. Since, in a head-on, closing at about 750 fps [feet per second], you're only going to be in firing range for less than two seconds, targeting center of mass is the only hope you have of getting hits. It's not an ideal way to attack a bomber, but is the safest from the point of view of reducing the risk of defensive fire. The pursuit curve is the best way, giving you plenty of time to pour rounds into the engine-wing-fuel tank-crew compartment area. But it can also be the riskiest if the bomber is well defended.

If the head-on was the most effective way to shoot down a bomber, GAF [German Air Force] night fighters would have been trying to use it against Bomber Command planes. Instead, they developed equipment and tactics to attack from an undefended position. And they didn't bother to target the cockpit at all. They went for the engine-wing-fuel tank area' (Anon. 1998).

Fighter pilots attacking bombers head on aimed directly at the centre-of-mass—there was not much time to aim for anything else. While this example relates to flying battles, the same principles apply to stationary flying boats on the water. Figure 8 shows a typical attack on the centre of mass and the resultant break up of the airframe upon descent to the sea floor.

Given that the distance between Catalina engines is small compared to a Lancaster or B-17, such distinction between centre-of-mass and engine-wing attack might seem irrelevant. The Japanese pilots would have hit the fuel tanks or the centre of mass, even if they were just aiming for engines. The Catalina wreck sites, however, do show distinct patterns consistent with both centre-of-mass damage and engine-wing damage. Wing inversion is evident in both cases, but both wings on the same side of the fuselage are indicative of engine damage, rather than fuel tanks having exploded.

The theory of 'Engine/wing damage'

Engine/wing damage in the archaeological record is exhibited by a break in the mainplane, whereby fuel tanks remain relatively intact, but the wing breaks through an engine nacelle. This has occurred at several Type One sites in Broome. Figure 9 shows a typical wing attack by cannon fire, resulting in the loss of wing integrity.

If an engine nacelle/mount has been damaged after the flight engineer's compartment has disintegrated, both

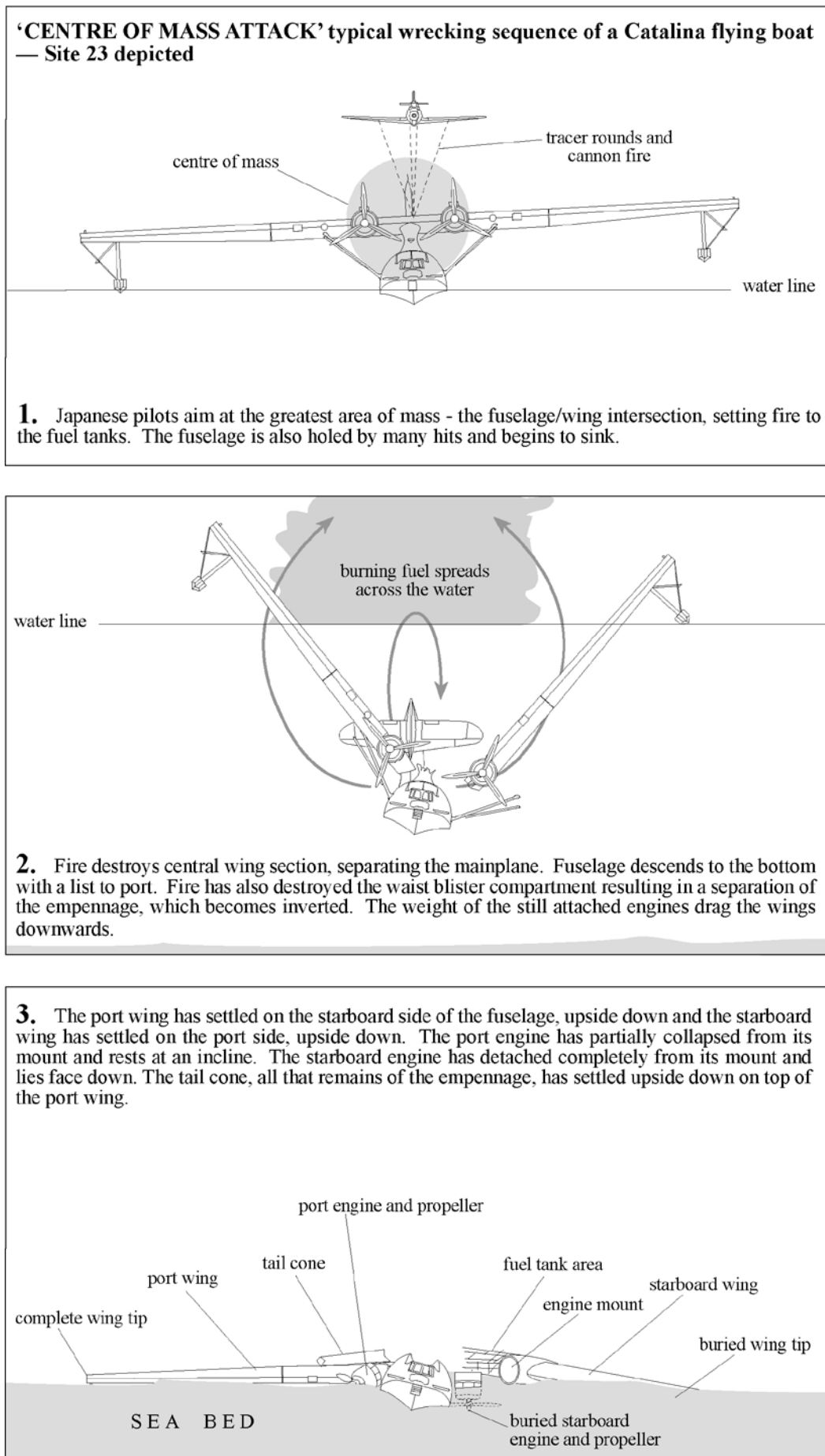


Figure 8. Hypothetical break-up sequence of a centre-of-mass attack (typical), resulting in wing reflection. Site 23 depicted.

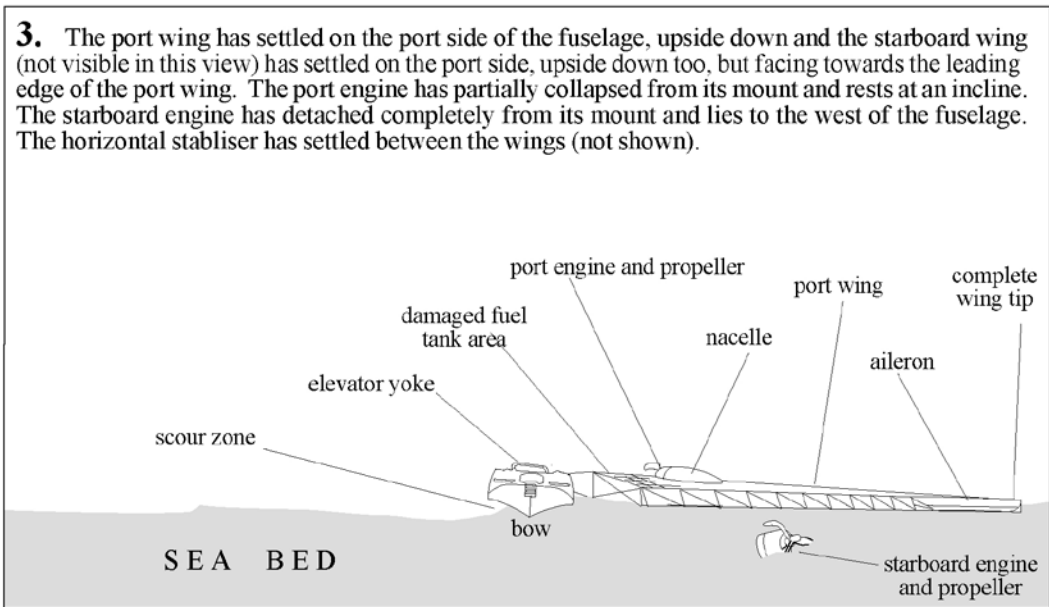
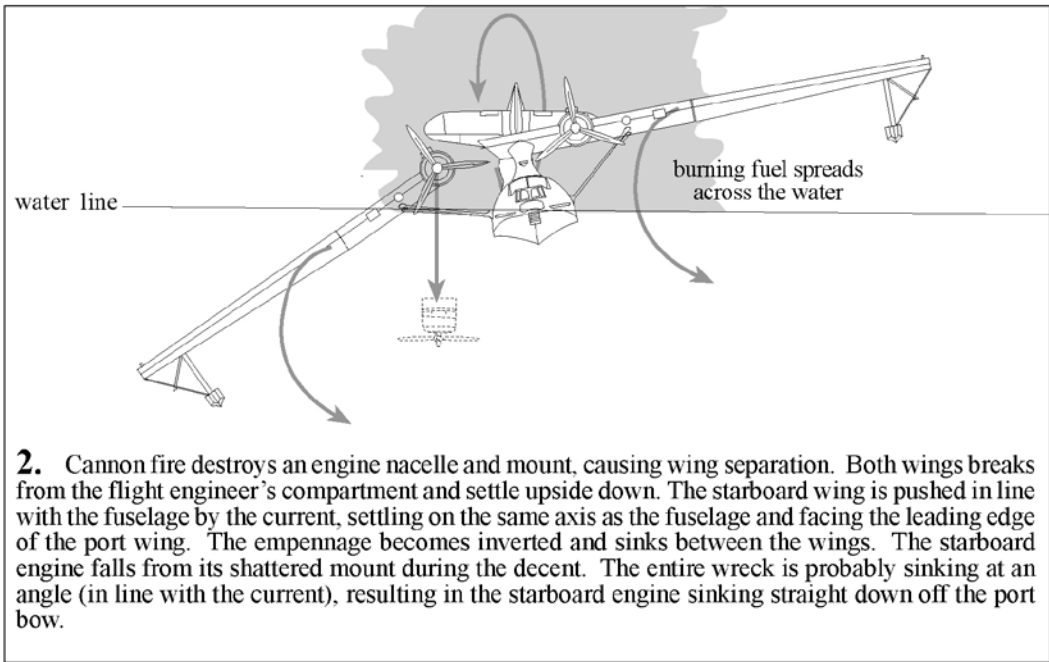
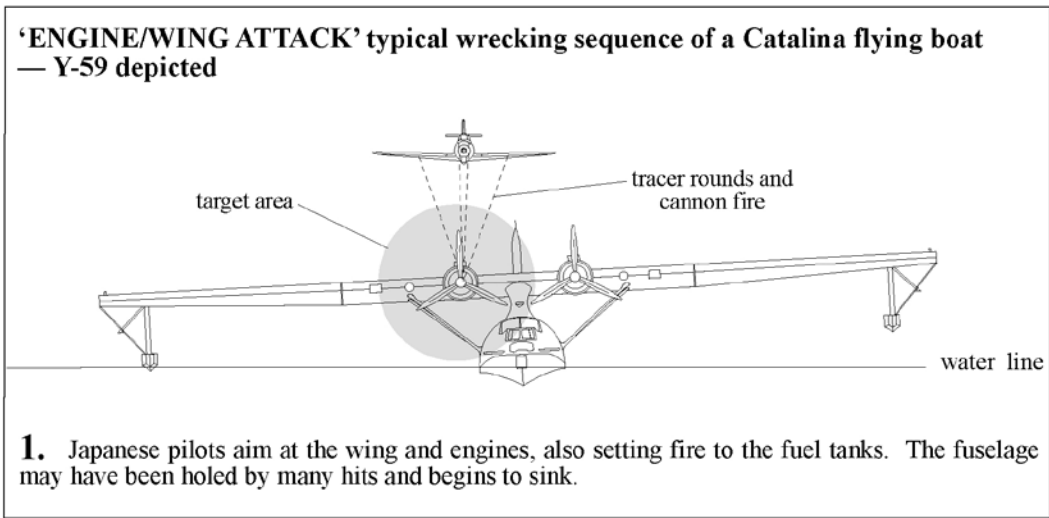


Figure 9. Hypothetical break-up sequence of an engine/wing attack (typical), resulting in wing separation at an engine mount, instead of through the fuel tanks. The loss of the Y-59 is depicted.

wings occur on one side of the fuselage. The detached wings being dragged down by the weight of the engines, leading edge first cause this. The wings become inverted at this stage, but before they hit the bottom, they are carried by the current and settle at an angle greater than 90° to the fuselage i.e. they are swept back. The leading edges of the wings fold back and face each other. The detached engine finished some distance from the wreck locus.

This pattern of damage appears to apply to Site 10, Site 11 (Y-59) and Site 13, which are both Type One sites. Site 24, a Type Two site, however, exhibits a similar pattern. Here fuel tanks show evidence of fire damage (i.e. absence of wing sheeting, showing only ribs), but the centre wing section was not destroyed completely before the flying boat sank. Site 10 and the Y-59 are almost identical in this respect and although the starboard wing is missing on Site 10, it is probably in the same position as on the Y-59 wreck site. The same is applicable for Site 13, which has a missing starboard sailplane section. Further inspections at both sites on the port side of the fuselage may locate the missing wings buried there.

Site 26 (FV-N) is known to have had its starboard sailplane section upside down on the starboard side of the fuselage according to historic photographic interpretation, but that part of the wing is not there today, or has become buried (see Jung 2007a: 40, figs 14 & 15). The flying boat's fuel tanks are relatively intact, which would suggest the machine suffered wing failure due to an engine being destroyed. Therefore, some sites exhibit both types of damage while others show only one. Engine-wing damage does not always result in wings settling on only one side of the fuselage. The two Dornier sites (X-1 and X-23) show centre-of-mass damage, and their wings initially collapsed straight down on top of their fuselages. The later settling of the two sailplane sections on the port side of the X-23 is most likely caused by storm/cyclone activity moving the wings off the fuselage. Despite the two types of damage, the significant aspect of all the wreck sites is that all aircraft elements are close together and not dispersed over a large area. The fuselages have intact keels, but their tops show evidence of the conflagration that caused their destruction.

Discussion and conclusions

...if you dig down deep in history you find, just as you do when you go under water, that there are well preserved things there and there's a whole pattern of the drama that happened with the sinking of an aircraft and the death of people (Bibby 2001).

An understanding of site formation processes that affected the Broome flying boats recorded to have been lost while at anchor, indicates that these are continuous site types. Aircraft elements are found in a locus of debris and structures, rather than being dispersed over a large area. Natural site formation processes have had a minimum impact on the wreck sites inspected. Cultural site formation processes appear more complex than originally thought, given the mass of unprovenanced material taken from

Roebuck Bay. Other Catalinas were lost (the RAAF's A24-70 and A24-76) and many moorings and channel marks were laid down, which skewed the side-scan sonar data (Green 2002). Although the two Australian Catalinas lost in Broome were probably not dumped in Roebuck Bay, but salvaged, moorings and channel markers were abandoned.

The secondary salvage of the Broome flying boat wrecks is demonstrated here to have occurred. The oral historical record of the salvage team, however, only partly explains this naval mystery (Choules-Edinger 2003). The extent of the RAN's salvage is predictably ambiguous; such activity is rarely recorded and it is only through interviews with the participants that some idea of what may have happened to wreck sites can be determined (Garrett *et al.* 2006: 81). Analysis of the archaeological data indicates the extant wreck sites have escaped the ravages of past salvage behaviour. Wreck sites were either destroyed in their entirety or left alone, probably because not all were found by the RAN in the time available during 1942–43, which would suggest that some may be in pristine condition.

Secondary salvage of the wreck sites commenced virtually on the day they were lost. This is well documented, for instance, guns were recorded by W/Commander W Nicklen to have been recovered probably from the Type One sites and the terrestrial wrecks at the aerodrome, so as to help defend Broome from further attacks:

All salvageable guns were removed. 22 were returned to Pearce for repair and about 6 are mounted at Broome and Port Hedland for aerodrome defence. I did not have the heart to despatch these 6 guns South, as they were all that they had at Broome and Hedland for their defence. A considerable number of magnetos and instruments have arrived in Perth, and are being sorted out. Other equipment salvaged from the flying boats was placed on luggers which left Broome recently (Nicklen 1942).

Other flying boats arriving shortly after the air raid, were also using the flying boat wreck sites for spare parts:

Two more Catalinas drifted into Broome from Tjilatjap on the morning of 7 March. One of these had been abandoned in Java as being unserviceable. Collecting bits and pieces from other wrecked aircraft, the Dutch pilot eventually got it serviceable. He came across from Tjilatjap with no radio and no anchor, but obtained an anchor from one of the wrecks at Broome which was exposed by the low tide (Bennett-Bremner 1944: 102).

Unfortunately salvage today continues at the wreck sites by tourists who seek to acquire new items for their collections and for many other reasons (see Griffiths 1996; Steinberg 2005). All of the wreck sites investigated in this paper showed some evidence of secondary salvage. For instance, none of them was found to have their main armaments (machine guns); some had neatly cut off sections from the exhaust collector rings off their engines—this could only have happened post deposition. Recently, a well-meaning site visitor recovered a pistol

and thought to hand in the object so that it could be preserved. Other anecdotal information suggests artefacts taken from the sites are sold at Broome's local Sunday market despite those wreck sites having been protected by heritage legislation in 2003 (M. McCarthy 2007, pers. comm., 19 June). Many of the wreck sites investigated in this paper, therefore, are not pristine, but to a certain extent, contaminated. However, diagnostic artefacts that suggest the wrecks are *in situ*, were found on many of them.

The wreck sites exhibit a pattern in the layout of aircraft elements that is consistent with that of a flying boat sinking at moorings or at anchor as a result of fire. Wings, particularly in the case of Catalinas, become inverted on the sea floor and occur relatively near the fuselage. Two other indicators that the flying boat wrecks in Broome are *in situ* are the direction the wrecks are facing and the attitude of the fuselages themselves, which is indicative of a synchronous wrecking event i.e. the 10–20 minutes it took for the Japanese to sink all of the flying boats.

Comparison of the site plans for each of the wreck sites with fuselages, wings and engines is shown in Jung (2007b: 27, fig. 2). All the fuselages point west-south-west or due south—none point north or east. It would appear from their orientations that the current and windage was acting upon the fuselages right until they hit the bottom, their anchors holding them in the direction of the current while they sank. The wrecks, hence, are weathercocked. Furthermore, all of the fuselages are upright. If these wreck sites are the product of secondary discard (i.e. produced by salvage and subsequent dumping in deeper water elsewhere), then it should be expected that fuselages would not be as complete. *King Bay* would not have had the capacity to lift a sediment-filled fuselage, which is why the wreck sites are said to have been blown to pieces, to facilitate them being brought on deck, or alongside and dumped elsewhere. If the extant wreck sites were dumped, their fuselages would likely be upside down and facing in any direction.

The wreck sites in Roebuck Bay exhibit two types of damage resulting from either exploding fuel tanks or engines and wings having been severed by cannon fire. Both types of damage result in wing inversion to some degree, and all aircraft elements remain close together on the seabed.

The results of this paper indicate no wreck sites lie to the west of the old jetty. The secondary salvage of the flying boat wrecks in Broome, it is believed, account for the destruction, removal and subsequent abandonment in deeper water of only one wreck site that is known to have been to the west of the jetty. There must be another four wreck sites near the known Type Two sites. This paper also indicates that in order to test some of the claims made in oral histories, a further survey is warranted in an area where flying boat wreckage was not previously expected to be discovered; Roebuck Deep.

Acknowledgements

My sincere thanks to the Choules family and to Keith Herber for filling in the gaps about what HMAS *King Bay* did in Broome. Thanks to Steve Allan (Office of Air Force History, Canberra) for providing a copy of the Nicklen report.

References

- Anon. 1998, Re: B-24 with B-17 nose URL: (<http://yarchive.net/mil/bomberguns.html>) Accessed 29 January 2007.
- Anuskiewicz, R. 1998, Technology, theory, and analysis: using remote sensing as a tool for middle-range theory building in maritime and nautical archaeology. In: L. Babits and H. van Tilburg 1998, *Maritime archaeology: a reader of substantive and theoretical contributions*. Plenum Press, New York: 223–231.
- Bennett-Bremner, E., 1944, *Front-line airline: the war story of Qantas Empire Airways Limited*. Angus and Robertson, Sydney.
- Bibby, P., 2001, Shipwreck Detectives, Prospero Productions Tape 116: Peter Bibby (Broome historian) oral history interview. Copy held at the Department of Maritime Archaeology, Western Australian Museum, Fremantle, Western Australia.
- Choules-Edinger, D. and Marsh, G., 2003, 'WA's Pearl Harbour: The Submerged Aircraft Wrecks Of Broome' URL: (<http://users.bigpond.net.au/sellwood/kimsoc/Past%20Talks%202003.htm>) Accessed 19 August 2004.
- Deetz, J., 1988, History and archaeological theory: Walter Taylor revisited. *American Antiquity*, 53.1: 13–22.
- Dickson, R., 1998, *They kept this state afloat: shipbuilders, boatbuilders and shipwrights of WA 1829–1929*. Hesperian Press, Western Australia.
- Edney, J., 2006, Impacts of recreational scuba diving on shipwrecks in Australia and the Pacific. *Micronesian Journal of the Humanities and Social Sciences* 5.1/2: 201–233.
- Garrett, B., Stein, E., Bigourdan, N. and Jeffery, B., 2006, The World War II landscape of Townsville, Queensland. *Bulletin of the Australasian Institute for Maritime Archaeology* 30:76–84.
- Gibbs, M., 2006, Cultural site formation processes in Maritime Archaeology: disaster response, salvage and Muckleroy 30 years on. *The International Journal of Nautical Archaeology* 35.1:4–19.
- Gill, G., 1985, *Royal Australian Navy 1939–1942*, (2nd edn). William Collins, Sydney, in association with the Australian War Memorial, Canberra.
- Gouge, A., 1935, Flying-boats and their possible developments. *Journal of the Royal Aeronautical Society* 39.296: 691–717.
- Gould, R., 2000, *Archaeology and the social history of ships*. Cambridge University Press, Cambridge, England.
- Green, J., 2002, The application of side scan sonar and magnetometer to the location of archaeological sites. *Bulletin of the Australasian Institute for Maritime Archaeology*, 26: 119–131.
- Griffiths, T., 1996, *Hunters and collectors: the antiquarian imagination in Australia*. Cambridge University Press, Cambridge.
- Harrison, P., Lockstone, B. and Anderson, A., 1997, *The golden age of New Zealand flying boats*. Random House Limited, New Zealand.
- Hyman, N. (ed.), 1945, *Eyes of war*. Telpic Sales Incorporated, New York, New York.
- Johnson, D., 2003, 'Some photo mysteries to solve...' URL: (<http://forum.keypublishing.co.uk/showthread.php?t=55685>) Accessed 18 February 2007.

- Jung, S., 2001, *Wings beneath the sea: the aviation archaeology of Catalina flying boats in Darwin Harbour, Northern Territory*. Thesis (Master of Arts), Northern Territory University, Darwin.
- Jung, S., 2004, *Artefacts from Broome's World War Two flying boat wreck sites: a survey of data collected 1979–2001*. *Bulletin of the Australasian Institute for Maritime Archaeology* 28: 63–80.
- Jung, S., 2005, *Archaeological investigations of the World War Two Catalina flying boat wreck sites in East Arm, Darwin Harbour: an appraisal of results*. In: P. Bourke, S. Brockwell, and C. Fredericksen, (eds.) *Darwin archaeology: Aboriginal, Asian and European heritage of Australia's top end*. Charles Darwin University Press, Darwin: 85–95.
- Jung, S., 2006, *A tragic birthday on an island paradise: archaeological site formation processes of a World War II Catalina flying boat wreck site in the Cocos (Keeling) Islands, Royal Air Force JX435*. *Bulletin of the Australasian Institute for Maritime Archaeology* 30: 110–126.
- Jung, S., 2007a, *Working backwards: Japanese air raid on Roebuck Bay, Broome 3 March 1942; flying boat wreck sites reconstructed from archaeological non-disturbance surveys*. *Bulletin of the Australasian Institute for Maritime Archaeology* 31: 32–44.
- Jung, S., 2007b, *A defabrication method for recording submerged aircraft: observations on sunken flying boat wrecks in Roebuck Bay, Broome, Western Australia*. *Bulletin of the Australasian Institute for Maritime Archaeology* 31: 26–31.
- Jung, S., 2008, *Australia's undersea aerial armada: the aviation archaeology of World War II flying boat wrecks lying in Roebuck Bay, Broome, Western Australia*. Thesis (Ph.D), Charles Darwin University, Darwin.
- Juta, H., n.d., *The Broome Drama*. *The living past*. Trans. Levend Verlenden. [Note: describes the landing and loss of Y67]. Mervyn Prime Collection Volume 1, Section 7: Dutch personnel correspondence and interviews. Copy held at the Department of Maritime Archaeology, Western Australian Museum, Fremantle, Western Australia.
- Lenton, H. and Colledge, J., 1968, *British & Dominion warships of World War II*. Doubleday & Co., Garden City.
- McCarthy, M., 1983, *Wrecks and recreation*. In: W. Jeffery and J. Amess, (eds.) *Proceedings of the Second Southern Hemisphere Conference on Maritime Archaeology*, South Australian Department of Environment and Planning and the Commonwealth Department of Home Affairs and Environment, Adelaide, SA: 381–389.
- McCarthy, M., 2000, *Iron and steamship archaeology: success and failure of the SS Xantho*. Kluwer Academic/Plenum Publishers, New York.
- McCarthy, M., 2004, *Historic aircraft wrecks as archaeological sites*. *Bulletin of the Australasian Institute for Maritime Archaeology* 28: 81–90.
- McCormick, B. and Papadakis, M., 2003, *Aircraft accident reconstruction and litigation* (3rd edn). Lawyers and Judges Publishing Company, Inc., Tucson.
- Muckelroy, K., 1977, *Historic wreck sites in Britain and their environments*. *The International Journal of Nautical Archaeology and Underwater Exploration* 6.1: 47–57.
- Muckelroy, K., 1978, *Maritime archaeology*. Cambridge University Press, Cambridge.
- National Archives of Australia. Series number: A705/1Control symbol: 9/25/13Title: QEA [Qantas Empire Airways] – Flying boats – commission [conversion?]. National Archives of Australia, Canberra, ACT.
- Nesdale, I., 1993, *Small ships at war: they joined the R.A.N.* Published by the author through Gillingham Printers Pty., Ltd., Underdale, South Australia.
- Nicklen, W., 1942, *Broome—Salvage operations following raid*, extracts from File 73/6/1111, RAAF HQ. RAAF Historical Records, Department of Defence, Canberra.
- Ragnarsson, R., 2006, *Re: [PBY] PBY water landing*. URL: (<http://groups.yahoo.com/group/PBY/message/23100>). Accessed 18 February 2007.
- Schiffer, M., 1977, *Toward a unified science of the cultural past*. In: S. South, (ed.) *Research strategies in historical archaeology*. Academic Press, New York: 13–40.
- Steinberg, D., 2005, *A ship for the taking: the wreck of the Brisbane as a case study in site salvage and material culture reuse*. Thesis (Master of Arts), Charles Darwin University, Darwin.
- Wilkins, L., 2007, *The Royal Australian Navy of World War II*. URL: (<http://users.chariot.net.au/~lensome/auxilliarries.htm>). Accessed 16 January 2007.

APPENDIX: Claude Choules interview 17 November 2003 by Corioli Souter (WAM) with questions posed by Silvano Jung

Q1: How many flying boats did you blow up?

A: Unknown.

Q2: How did you destroy the wreckages? Can you describe the method you employed in more detail, i.e. were charges placed under the hulls or inside?

A: After examining the position of the sites at low tide when you could see the outline of the wrecks, Choules directed a team of naval divers to dig a channel under the hulls and lay charges on the outside to blow the wrecks in half. The trick was to 'lift' the hulls which had settled into the sediment described as 'congealed mud'. Often a charge would split the hull but lift it free from the suction of the silt.

Q3: From my observations of the wreck exposed at low tide, only some flying boats were blown up. I gather that once a wreck site had been blown, that not all of the wreck was removed, e.g. hull extending below the chine remained on the sea floor. Is this a valid assumption?

A: No When they were blown they took away everything they could lift Although it is possible that part of the hull might be left, Choules made sure that the charges were placed underneath the base of the hull to 'bust them up' so that all the pieces could be removed All the charges were laid on the outside, none on the inside He was fairly adamant that he didn't leave any pieces of the aircraft behind that he worked on.

Q4: Considering that not all of the flying boats were blown up, what criteria guided you to select which wreck to blow-up? For example, were all of the wrecks in the way of the approaches to the old jetty blown-up?

A: They were only interested in clearing a space for the “Catalina Base” so the area where the aircraft moored was targeted. There were no channels as such, cleared to access the jetty.

Q5: One wreck site, a Dornier (the closest to the old jetty) may have been moved entirely. Were any wrecks dragged into deeper water?

A: No, not in his time. Too big to move in their entirety. Choules also cannot recall individual aircraft.

Q6: Anecdotal information suggests that the wreck of a Short Empire flying boat could be seen to the west of the old jetty, exposed at low tide. Was this machine in fact at that location? If so, what happened to the wreck?

A: No, he cannot remember any particular aircraft although he states that if a Sunderland had been in the way of the Catalina base he would have certainly “blown it up and carted it away”.

Q7: Can you remember how many Dornier flying boats you saw, exposed at spring low tide? I count two, but there is evidence to suggest that there was a third wreck site exposed during spring low tides.

A: No.

Q8: Did you blow-up just the drying sites or did divers blow up the deeper water wrecks too?

A: Choules states that he mainly concentrated on the deep-water sites. He is unclear whether he worked on the drying sites and if so, to what extent. (This makes sense as the drying sites could be better salvaged by hand at spring tides.)

Q9: Do you have any photographs of the salvage work? Any notes, or correspondence?

A: Choules made a number of notes at that time and has given them to his grandson, Andrew for collation. He can’t remember whether his notes refer to his work in Broome. Note: ‘Daphne has asked me to tell you, that on checking, her father’s ms life story does not include his WWII exploits’ (K. Kenneally 2004, pers. comm., 8 January).

Q10: Have you got any photographs of the crew of HMAS *King Bay* and of yourself during services (in the RAN)?

A: No. He and the dive team were flown into Broome for this particular job and after its completion the *King Bay* was turned over to the Army Water Transport Division.

Q11: I understand that once the flying boats were blown up that pieces were picked up, put on deck and then taken out to deeper water and dumped. Can you remember where you dumped the flying boat pieces? Were they dumped at just one location or where they scattered over a large area?

A: There was no one dumping area and Choules kept referring to the 100-fathom line. I showed him a chart of Broome and he pointed out the area around Entrance Point where the new jetty stands today. He did, however, state that they did not drag the wreckage around the corner to Gantheaume, but dragged it directly out from where they were working into the deeper water of Roebuck Bay.

Q12: How long was HMAS *King Bay* doing salvage work in Broome?

A: See question 14.

Q13: What were your orders regarding your visit to Broome?

A: To clear an ‘area’ for a Catalina base on Roebuck Bay. It was intended to remove the wreckage so that new moorings could be put down where the King Bay had worked.

Q14: What days/months/years were you in Broome with *King Bay*?

A: December 1942, January, February 1943. The *King Bay* was seconded for one week during this time to go to Port Hedland to salvage a tug, which had been blown “half a mile inland” by a cyclone. They also had to unload a British ship, which was carrying “non-explosive cargo and munitions” and had run aground.

They dived every day, working on the “sites in the shallow water when the tides were least and when the tides were at the greatest they worked in the deeper water”.

Q15: Did you or anyone else keep relics or any souvenirs from the flying boats?

A: No. They didn’t see any equipment and anything that may have been salvageable was destroyed in the explosions to break up the sites. Choules was not aware of any other military team involved in the breaking up of the wrecks although it was conceivable that servicemen may have recovered some material prior to his arrival. No locals recovered any material; the only civilian in Broome at the time had been the Lord Mayor. Broome “was virtually an army and air force base” during Choules’ period there.

Q16: Did you find any human remains in the wreck sites?

A: No. Choules states that “he would have known for sure if there had been”. Although he does say that as the wrecks were “so full of mud and sand they wouldn’t have seen them and they never emptied any of the aircraft”.

Other information. (Questions posed by Corioli Souter) Choules recalls that he heard an air raid siren every day he worked when the Japanese reconnaissance planes flew over. Despite Broome now being an army and naval base (this was very clear as all vessels working the Bay carried a white ensign), the Japanese showed no interest. They were looking for Noonkanbah. As a result nobody took any notice of the Japanese planes. The servicemen or their vessels were not armed so “they couldn’t shoot them down even if they were going to bomb us”.

Only one woman remained in Broome at that time. Choules cannot recall her name although she was the owner of the Continental Hotel. She was quoted as saying: “I was born here and if I must die, I’ll die here but you’re not going to shift me unless you put me a straight jacket”. Choules had a team of aircraft men working for him at the lighthouse at Cape Leveque “which was the nearest point to Japanese held territory...And they thought that the Japs [sic.] may come down and bomb the lighthouse”. Choules was directing the aircraft men “to punch holes in the rock with one inch steel poles to put gun emplacements around the lighthouse...they made the gun emplacements with explosives...demolition charges were dropped into the holes”.

I (Souter) asked about Aboriginal people in town at the time and Choules related a story of how one fellow had been recommended by the squadron leader to repair his watch: “He was a very skilled man. He took pieces of the aircraft that had been knocked out about [and using] the white metal made me a new wrist band for my watch”.

Additional questions for Claude Choules given to Souter on 14 September 2004. Note: no response was recorded.

Q1: Can you, on the chart, show where the flying boat alighting area, which you were clearing, would have been? (In relation to the old wharf).

Q2: What shape would the area have been: a rectangle, a circle?

Q3: Do you recognise any of the wrecks in the pictures?

Q4: Do you remember recovering any wrecks in their entirety? The Dornier X-20 may have been moved, with only a debris field left, hence the wing section at Site 29.

Q5: Can you remember any wrecks west of the old jetty (see ‘Babs’ projected line on chart).

Archaeology of an Australian steam tug: The SS *Dumaresq*

Michael MacLellan Tracey

Archaeologist, PO Box 4284, St Lucia South, BRISBANE, Queensland, QLD 4067, Australia

Email: mtracey@heritagearchaeology.com.au

Introduction

Inhabitants in Australia, an island continent, have depended on some form of watercraft for thousands of years. Upon European settlement traditional dug-out

archaeological narrative of one such vessel.

John Bach's classical *Maritime History of Australia* (1976) remains the definitive historical publication regarding the history of the Australian shipping industry. While

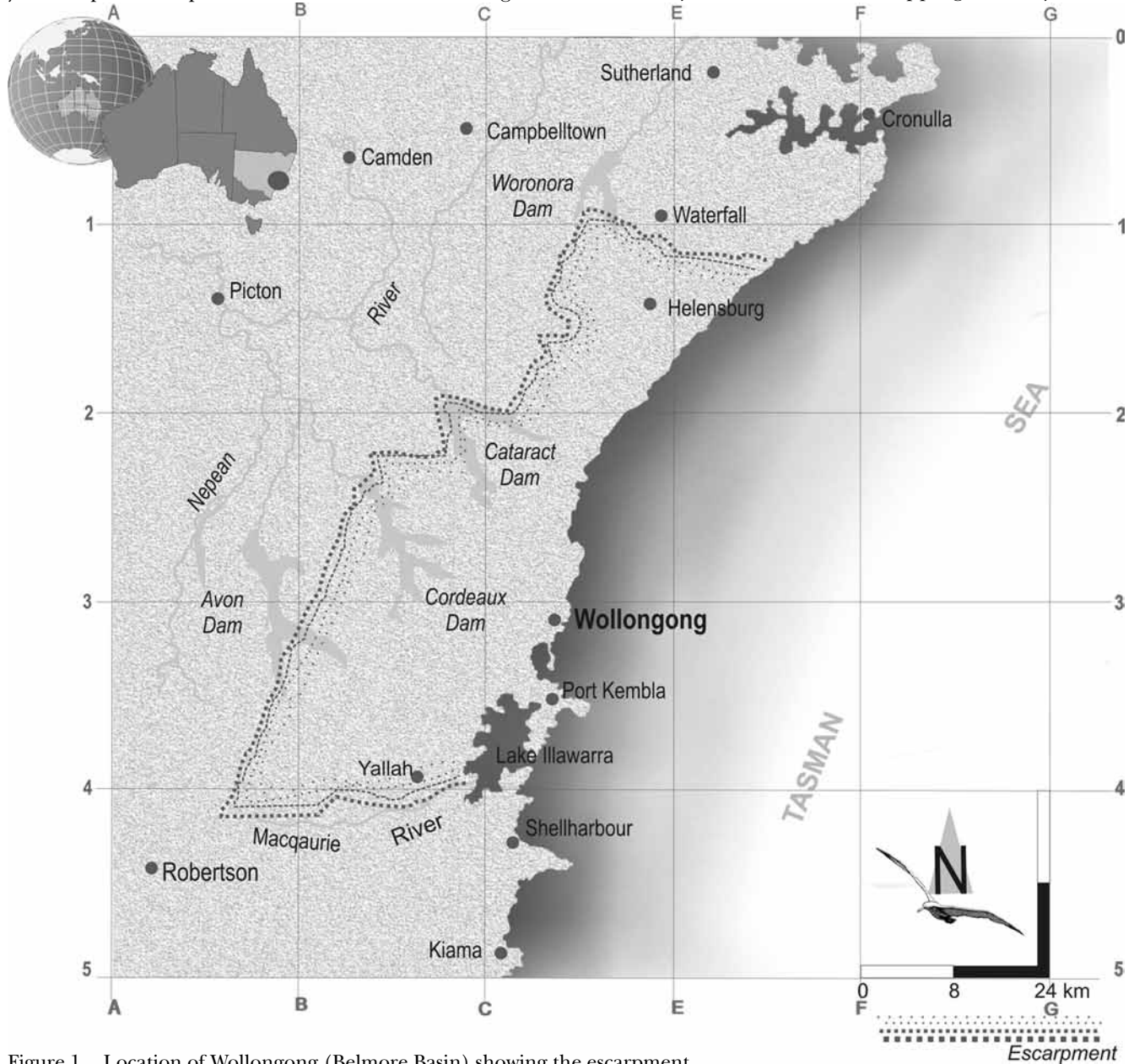


Figure 1. Location of Wollongong (Belmore Basin) showing the escarpment.

and bark canoes gave way to introduced shipbuilding technology. Although timber suitable for shipbuilding was available in the Colony of New South Wales its properties were poorly understood. Similarly, the timber industry depended upon men of decision, dedication and management, as well as workers and work boats to fulfil various entrepreneurial dreams. Work boats, such as steam-tugs were forgotten by history. This paper is an

archaeologists have explored isolated wrecks strewn along the Australian coastline, minimal investigation has been undertaken of shipbuilding processes, launching methods, operating procedures or of those who built, operated and maintained the vessels. Ships are constructed with defined purposes, for example, to travel, trade, exploit and to offend or defend. A vessel represents the intent and pride of its owner, the scientific and technological



Figure 2. Maritime activities at Belmore Basin in 2003.

excellence of its builder and seamanship skills of its Master. A seagoing vessel represented the best-applied technology of the day. However, it will be demonstrated certain decisions regarding the SS *Dumaresq* contradict this statement. Shipwright Alfred William Morrow Settree was a descendant of a pioneering family synonymous with wooden shipbuilding on the east coast of Australia, and in particular, New South Wales. The practice of shipbuilding, inherent skills and imported traditions was carried on for more than a century in successive generations of this family.

A dynasty of shipwrights of convict origin

The Settree family's patriarch in Australia, James Settree (1775–1827), a butcher, was convicted and sentenced to death at the Old Bailey, London, for stealing a heifer (*Old Bailey Proceedings* 19 February 1812). His sentence was commuted to transportation for life to the penal colony of New South Wales. James arrived on board the *Fortune* to Port Jackson in 1813 and was assigned to the Government Slaughter House where he continued his trade (State Records, New South Wales [SRNSW], 17 September 1817: 605). At this time the Colony was struggling to supply food and necessities for its increasing population. Convicts, particularly those from semi-skilled occupations were immediately put to work in their known professions. James Settree's experience as a butcher would no doubt have been utilised to full advantage by his overseers.

The standard of living, tastes of the settlers and the isolation of the colony created a strong demand for consumer and producer goods requiring non-rural occupational skills which the convict workers were able to provide (Nicholas & Shergold 1988: 8). The employment of a convict in their chosen profession or trade may have meant a slightly more stable and easier lifestyle; however, that by no means meant that the colonial government considered a convict anything but a commodity. John Macarthur, a leader in industry in the Colony, wrote:

If the Colony is to be continued a receptacle for Convicts and if it be required, that they shall be retained in proper subjection, that they shall be compelled to procure by their own labour their own subsistence... (Macarthur in Onslow 1914: 349).

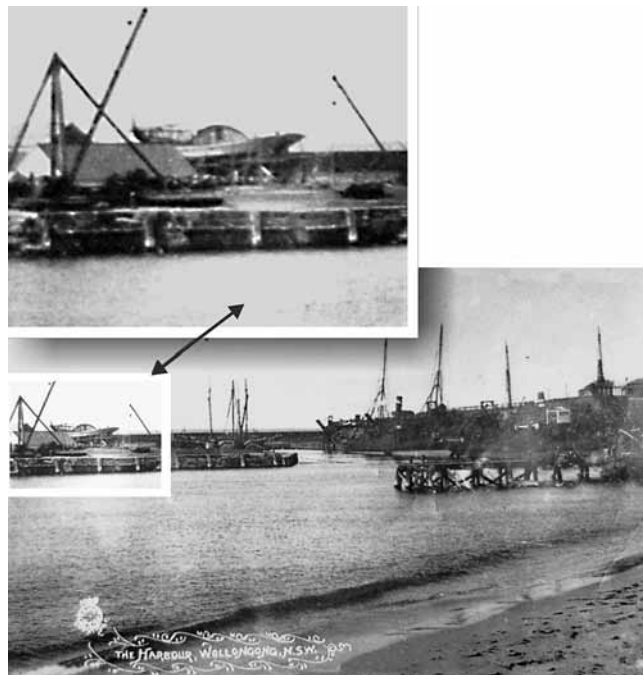


Figure 3. The postcard sent to the author's grandfather showing Belmore Basin, Wollongong, NSW (Courtesy J.R. Tracey).

Marines and free-settlers initially provided the nucleus of trades to the Colony of New South Wales. While the need for technical labour was evident many marines were experienced in various trades including mining and the secondary usage of mining products. However, Macquarie was well aware of the immediate disbursement of skilled convict labour to meet the demands of the settlers. King (1957: 21) comments on Macquarie's anxiousness for trained or experienced labour:

Macquarie was irritated by the fact that for those of the convicts who were mechanics and artisans he was plagued with requests from important settlers, but for no other class of prisoner did any demand exist and these remained the governor's responsibility.

Ann Morrow (1776–1852), James Settree's wife, was reunited with her husband following her arrival in the Colony in 1817 aboard *Lord Melville*. Their two sons James Robert Settree, aged four years, and Joseph Settree aged eleven years, had accompanied their mother on the voyage. The family prospered in the harsh conditions and their son Robert was born in 1817 followed in 1820, by their fourth son, Alfred William Morrow Settree. James Settree died in 1827. Ann Morrow Settree then married Frederik Wilhelm Reics, also a butcher by trade, at Scots Presbyterian Church, Sydney on 29 March 1830 (NSW Births Deaths and Marriages Index [New South Wales Births, Deaths, Marriages [NSW BDM] V1830139 73A/1830). James Robert Settree, James and Ann's eldest son, was, by this time, indentured to R. Williams of Castlereagh Street, Sydney as an apprentice shipwright. James' commencement of his apprenticeship began the Settree dynasty of shipbuilders.

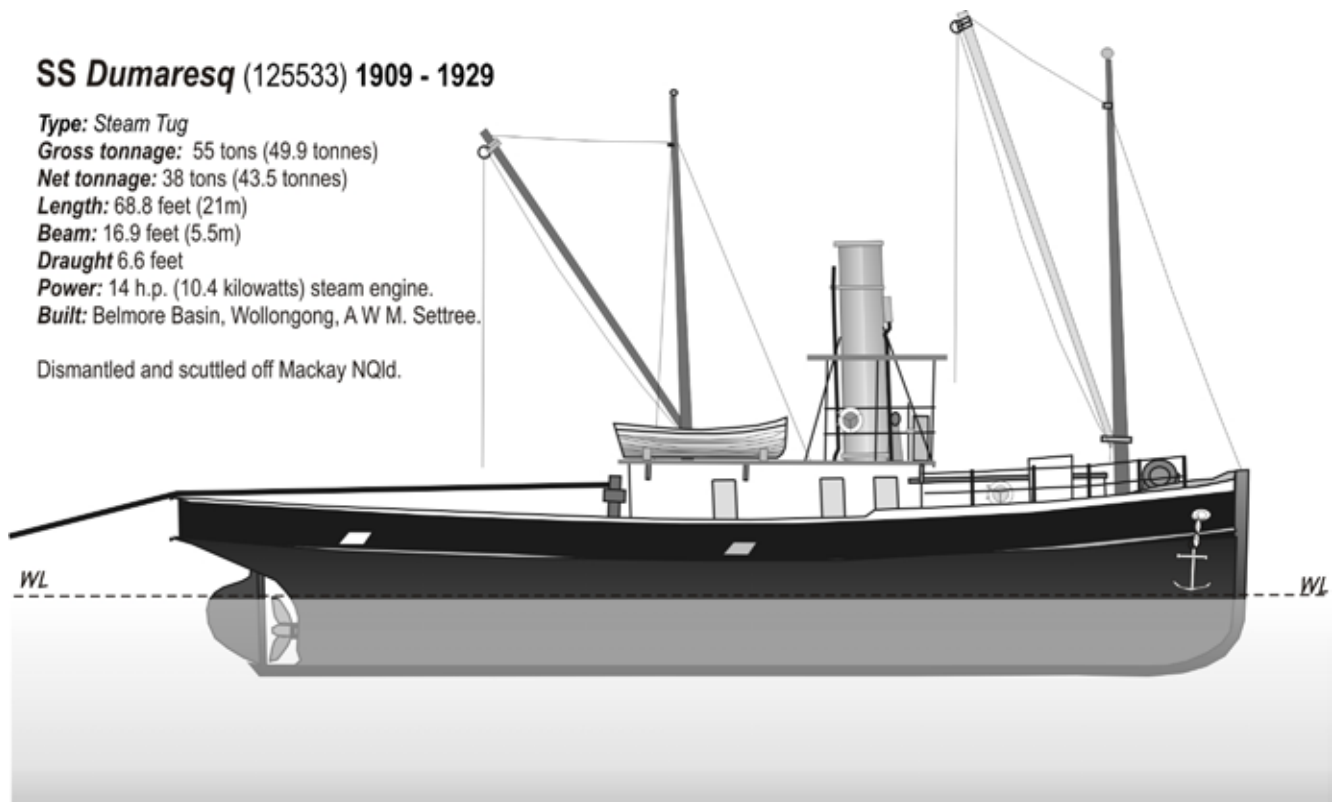


Figure 4. Drawing of SS *Dumaresq* compiled from photographs and registry descriptions.

The Settree's second son, Joseph, had gone to sea as a cabin boy, eventually qualified as a Ship's Mate and subsequently applied to Governor Darling for a land grant. After some contention with the regulations, and with the assistance of his mother who had gained considerable respect in the Colony, he was allocated his land grant of 60 acres at Goonoorra, *Settree Farm*, at the northern end of Brisbane Water (SRNSW, 1830–1832). His mother and stepfather also lived on the Woy Woy Bay property. However, in December 1840 while Joseph was serving aboard the whaler *Mary* the vessel encountered a cyclone near Lachlan Island off the New Guinea coast. The *Mary* was wrecked, Joseph Settree drowned, and the whaler *Jane* eventually found other survivors in 1842. When Joseph's death was confirmed, his landholding, *Settree Farm*, passed to his brother Alfred William Morrow Settree.

Alfred William Morrow Settree (1820–1906) was a highly experienced mariner. He was born in Sydney on 25 February 1820 while his parents, James and Ann Settree, were living at 32 Cumberland Street, The Rocks (Gulley, n.d.). At the age of twenty he was master of the cutter *Traveller's Bride* built in 1840 for William Ward. He also served on many other vessels, several of which were owned by his stepfather, F.W. Reics. Settree developed a close association with many local Aborigines and obtained an appointment to the Native Institution Committee hoping that he could be instrumental in conversion of the Aborigines to European customs. Settree persisted despite the earlier experiences of Samuel Marsden who had

...disengaged himself from the Native Institution, not to create difficulties, but because of his doubt that the Aborigines could be converted to the habits of the whites... (Ritchie 1970: 202).

A.W.M. Settree married Martha Sawyer in Sydney in 1844. Their first son, Alfred William Robert (A.W.R) Settree, was born in 1845, followed by three other children, Mary Amilia, Martha and a son who died in infancy. Following his wife's death, A.W.M. Settree married Maria Bateman in 1855 and moved from Sydney to Cockle Bay at Brisbane Water (NSW BDM, V1855253). A.W.M. Settree retained ownership of Joseph's original land grant *Settree Farm* until it was sold to Edward Fagan in 1882. Maria and A.W.M. Settree raised eleven children. In 1886, Settree purchased an acre of land from Benjamin Davis near the Davis Brothers shipyard where A.W.R. Settree was an apprentice shipwright. In 1869, early in his shipbuilding career, Alfred built the ketch *Day Dawn*. The hull of the ship was built from spotted gum (*Eucalyptus maculata*). In discussions with A.W. Settree in 1994, Settree stated that when building a hull, his father and grandfather 'almost always used spotted gum as it worked well'.

Following the completion of this vessel, young Alfred's business prospered given the reputation earned under the expertise of his father as Master and part owner. On 20 April 1871, Alfred married Mary Woodward of Kincumber, NSW, and by 1874 he had built and launched the brig *Endeavour* and the cutter *Sylph* in Davistown. These successful projects were followed in 1876 with completion of the brig *Edith Settree* named

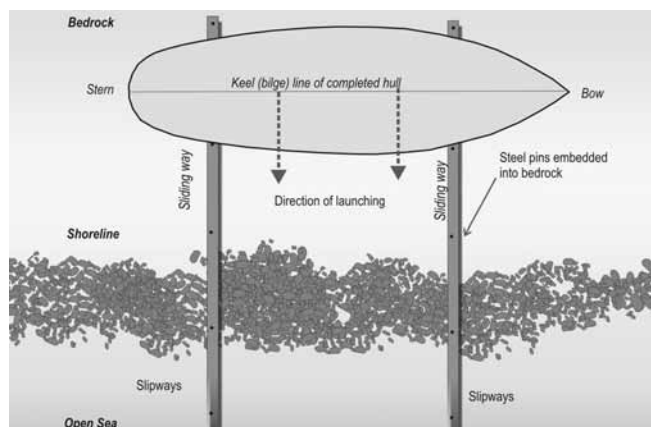


Figure 5. SS *Dumaresq* was bilge launched e.g. broadside to the sea.

after their daughter. Tragically, Edith Emma Settree, aged four years, died as a result of scarlet fever shortly after the vessel was launched (NSW BDM, 5263/1876). The ship was renamed *Edith Keep* and was lost at sea on a voyage from Port Jackson to the Richmond River in 1880.

Alfred William Morrow Settree II (1877–1957), the eldest son of Alfred William Robert Settree and Mary Woodward, was born in Davistown, NSW in 1877 (NSW BDM 9283/1977). The family moved to Balmain in 1886 and Alfred attended Fort Street High School. Following the tradition of Settree generations before him, A.W.M. Settree went to sea as a cabin boy about 1892 before departing to New Zealand to become an apprentice shipbuilder. There he began his with Lane and Brown, Shipbuilders and Sawmillers of Totara, Whangaroa, in 1896 (Kerr 1985: 138). Settree returned to New South Wales in 1900 and established a small shipyard at Tomakin, south of Batemans Bay. There he built the two-mastered wooden schooner *Three Cheers*, for his father, A.W.R. Settree. The quality of Settree's shipbuilding was recognised by George Skinner of Murwillumbah who commissioned him to build two wooden steamships, the *Mibben* in 1903 and the *Booyong* in 1904. These ships were specifically designed to carry passengers between Murwillumbah and Tweed Heads on the Queensland New South Wales border and provide a link for passengers travelling interstate by rail.

While in Murwillumbah, Settree met and married Henrietta, daughter of publican, William Collins and his wife Sarah Keppie. The couple relocated to New Zealand where Settree again worked for Lane and Brown building the 100-ton *Wanganui*. Their first child, Elsie Isobel, was born in New Zealand in 1905. The family returned to Camden Haven, NSW in 1907 where Settree established a small shipyard. John Oxley had observed the potential for shipbuilding around Camden Haven, and the exploitation of timber resources, on his expedition in 1818 (Oxley 1820: 146). In 1908, Settree built and launched SS *Our Elsie* for A. & E. Ellis sawmillers. *Our Elsie* was of wooden construction, 213 tons (216 t) powered by a 28 hp (20.9 kw) steam engine.

Close to the timber

Wooden shipbuilding on the coast of New South Wales was often a short-term industrial activity where the shipwright selected a specific area in which to construct a single vessel. In 1909, Alfred William (A.W.) Settree relocated to Wollongong and there he constructed the only large wooden ship built in that area, the steam tug *Dumaresq*. Short-term shipyards may have been a cultural practice imported to the Colony as Gustav Milne (2000: 8) comments on medieval British shipbuilding on the English south coast:

The boatyard included no major installations of any kind—no dry docks or slipways, just 60 timbers arranged in groups, laid out over an area that had once been the open foreshore, just above the high-tide mark... We had previously imagined docks and inlets and shipyards with facilities like those of Europe and America in the industrial age. The boatyard at Poole, where boats were simply laid out on the shore...

Settree established his shipyard as close as possible to a reliable supply of timber (Kerr 1985). Initially he considered that the spotted gum growing below the Wollongong escarpment could be used to construct the *Dumaresq*. However, the local timber proved unsuitable and supply was sourced further south along the coast at Bawley Point, Pebbly Beach and Durras sawmills (A. Settree, 1997, pers. comm.). The Bawley Point Sawmill had an established tramway with access to stands of spotted gum and turpentine (*Syncarpia glomulifera*) in the Termeil State Forest and Kioloa State Forest (Tracey 1997: 188–209).

Settree constructed and launched the *Dumaresq* in 1909. Ephemeral archaeological remains relating to the construction of the vessel were located by the author on the foreshore of Belmore Basin, an area that has historical links with the settlement and development of Wollongong (Tracey 2007: 174–183). A comprehensive collection of archival material supports the archaeological evidence. The contemporary photograph below illustrates the maritime industries that have been established in the Belmore Basin area. In the background is a container ship and trawlers are seen working at sea. At centre left, a replica of a square-rigged vessel is being repaired on the slipway as two recreational sailing craft leave harbour. The Coast Guard office is located centre right with a boat sales yard and repair shed to the rear. At the waterline is the convict constructed sandstone wall of Belmore Harbour. Between the Coast Guard office and the slipway is a small area of sand and part of the seawall. This is the location where the *Dumaresq* was constructed and launched.

The name 'Dumaresq' given to the vessel comes from the noted Dumaresq family from the New England Tableland district. John Saumarez Dumaresq had a distinguished career in the Royal Australian Navy and was the first Australian-born officer to command the Australian fleet (A. Settree, 1994, pers. comm.). In 1955 the author inherited a collection of photographs of ships from his father, John Tracey, including a postcard that had been sent to John Henry Tracey (author's grandfather). The

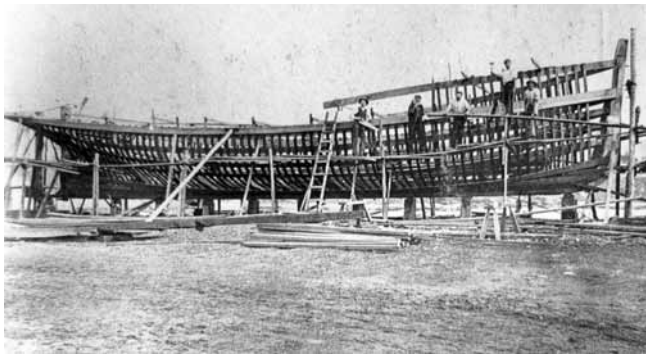


Figure 6. SS *Dumaresq*. Frames fitted to the keel. Shipwright A.W. Settree is the first person from the stern holding the saw (Courtesy J.R. Tracey).



Figure 7. SS *Dumaresq*. Spotted gum planking being attached to the frames (Courtesy: Alfred Settree, 1995).

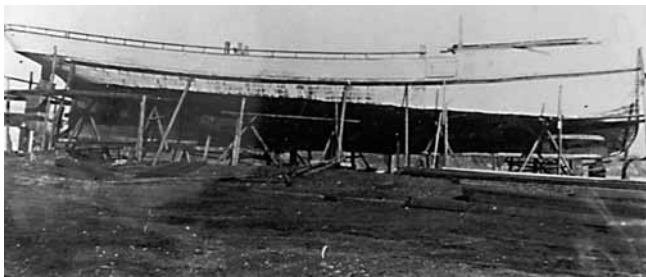


Figure 8. SS *Dumaresq*. The spotted gum planking, the kauri topsides and the decking in place. Note the rudder is fitted and no propeller shaft is visible (Courtesy Mavis Settree, 1998).



Figure 9. Completed hull of the *Dumaresq* prior to launching. Note the railway lines forming the slipway. The rails are unequal length and positioned at slightly different angles to turn the vessel to the right upon entering the water (Courtesy Mavis Settree, 1998).

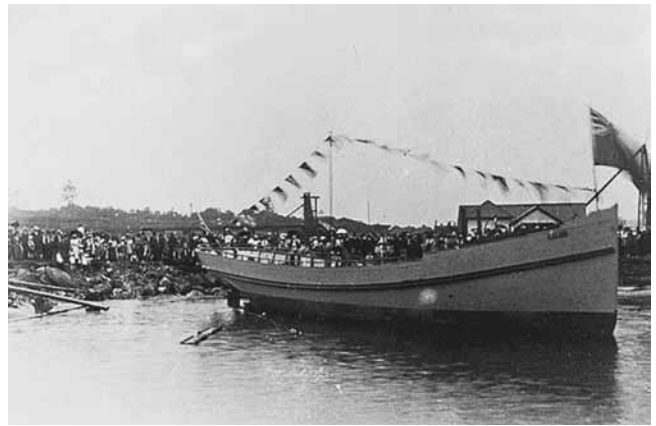


Figure 10. SS *Dumaresq* immediately after launching. The vessel has entered the water safely and turned to the right. Note the sliding way floating to the vessel's stern. The bow has snared the rope visible on the right hand side of the photograph (Courtesy J.R. Tracey).

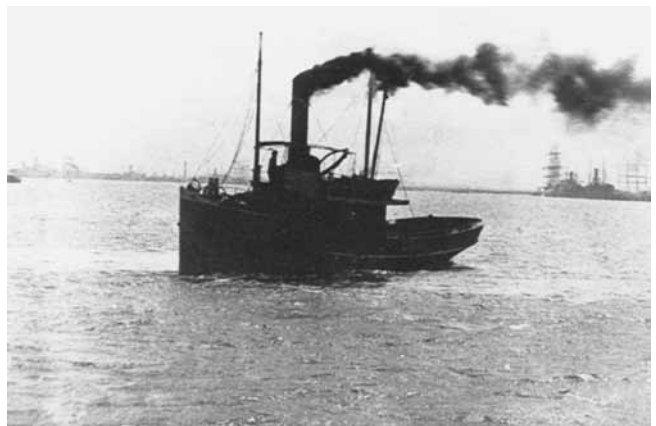


Figure 11. The only known photograph of the steam tug SS *Dumaresq* in service. Note the mast of the sailing ships in background (Courtesy J.R. Tracey).

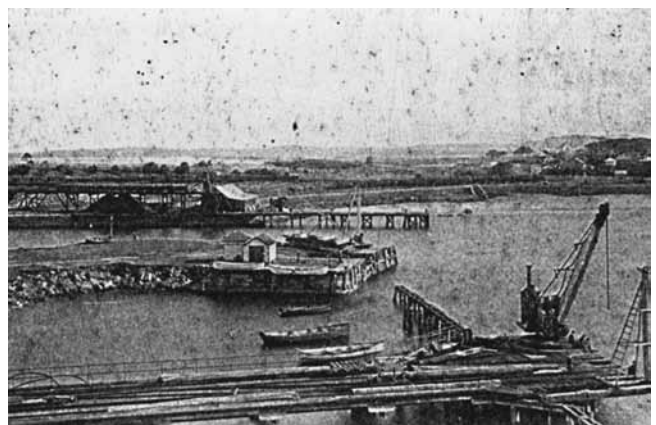


Figure 12. Wollongong Harbour, Tee jetty and crane c.1897. Note the bearers and pylons for the boardwalk. The hull of SS *Dumaresq* was towed through this opening (Courtesy Wollongong City Library 1998).

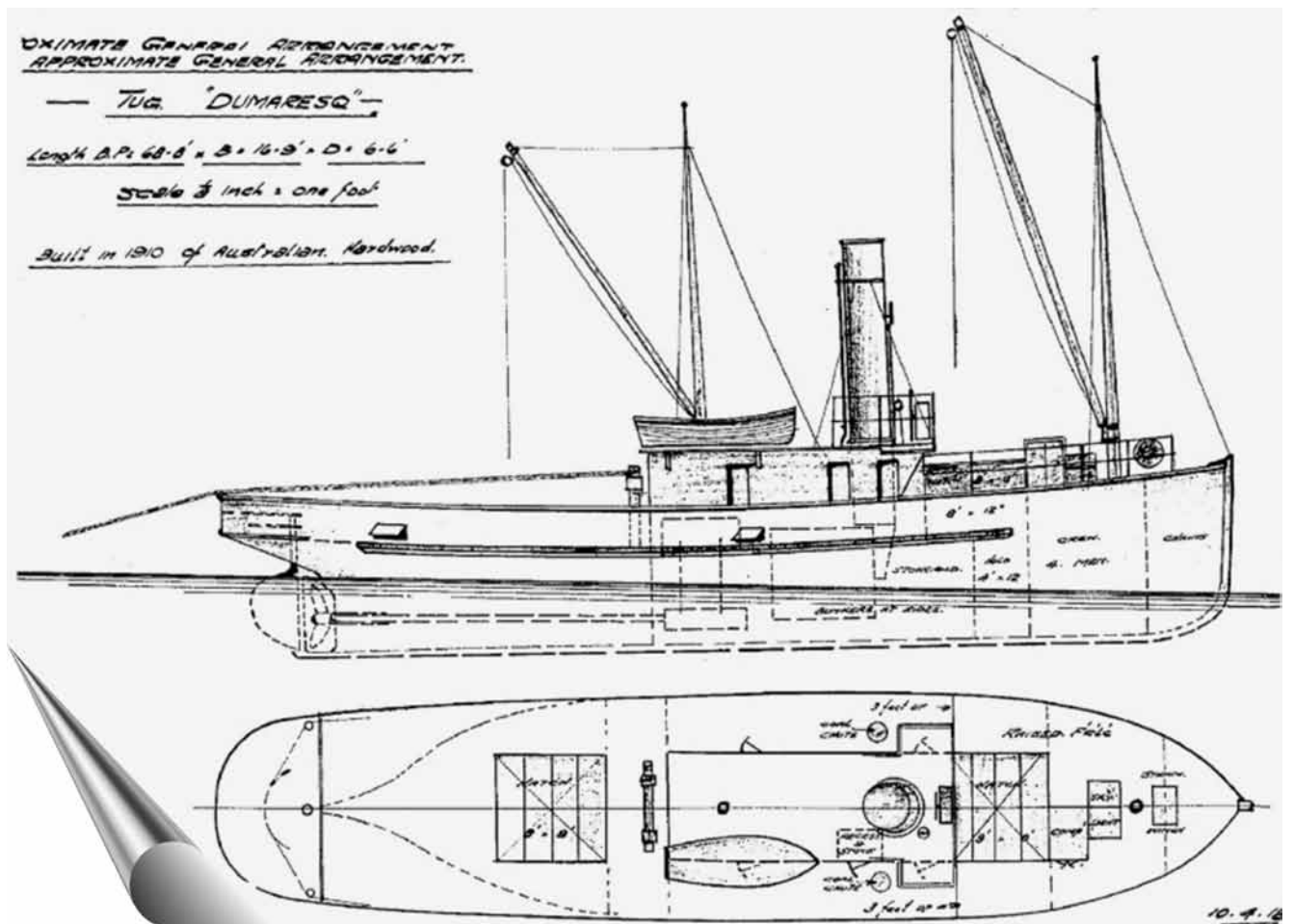


Figure 13. This plan of the SS *Dumaresq* shows the configuration at the time of the sale from Reid and Callen to the Adelaide Steamship Company c.1918 (Courtesy J.R. Tracey).

postcard is annotated ‘*The Harbour Wollongong*’ and to the left is a crest marked ‘1909’. This was the year the *Dumaresq* was launched. When a section of the postcard is magnified, the stern of a hull under construction is visible on the extreme left. Inquires to historians in Wollongong failed to establish that any vessel was constructed at Belmore Basin. Andrews (1983) commented in his publication *South Coast Steamers*:

The intriguing information on this photo tells that it is the launching of the first steamer constructed in Wollongong—but the name is not given!...I’d appreciate any other information.

The steam tug

A steam tug is a small, powerful vessel with high manoeuvrability used to haul barges, to assist to berth large ocean going ships and for towing disabled vessels. Tugs were constructed with resilient wooden hulls to prevent damage to both ship and tug during operations. Tugs were used in several ways e.g. towing ahead, towing alongside and shunting. These methods often caused contact and strain on the vessel leading to damage, including opening of the seams and flooding.

Shipbuilding methods changed rapidly in Australia and internationally in the early 1900s as sail eventually succumbed to steam, and wood to steel. It was during this transitional period that the *Dumaresq* was constructed. Experiments in propulsion technology brought major advances in Europe and Britain. In 1892 Rudolf Diesel patented his engine, and by 1900 diesel engines began to supplant steam power (Alper 1990). SS *Dumaresq* was constructed nine years after Diesel’s invention. It is assumed that the cost and availability of diesel engines in Australia prompted installation of a second-hand steam engine into the *Dumaresq* (Dundon 1997: 8–9; Page 1982: 202). This design decision and the rising cost of coal as a fuel, eventually led to the demise this ship.

The history of marine technology involves study of the constant changes through which economical and cultural techniques have evolved, and of the social, economical, and political ramifications those changes have produced (Rapp 1981: 1–8). Discarded tools, derelict machinery or parts thereof, building foundations, decaying hulks of sunken vessels, cargo handling facilities, slipways and earthworks remain in the archaeological record as testament to human induced technological change. Rapp (1981: 4) justifiably argues: ‘The outward sign of technology’,

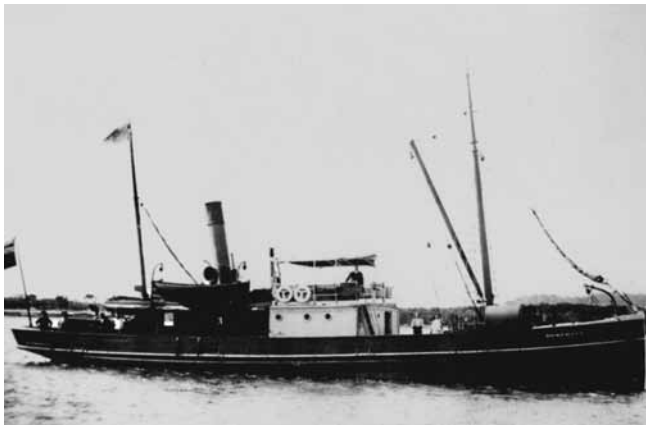


Figure 14. SS *Brinawarr* in service at Mackay, North Queensland (J.R. Tracey Collection).



Figure 15. Forgan Bridge over the Pioneer River. SS *Brinawarr* wreckage in centre of photograph (J.R. Tracey Collection).

instruments, machines, and other devices, stand out in sharp relief from objects of the inorganic and organic world.

To comprehend the development of applied technology it is necessary to consider a wide sphere of often very remote events that have influenced its evolution in a specific country or location. Shipbuilding is a complex process of invention according to the 'spirit of the times' (Rapp 1981: 7). These processes represent the culmination of the combined skills of the inventor, shipwright, engineer and labourer coupled with and according to the prevailing known sciences.

Sail and steam

The late 19th century witnessed the overlap of two great eras of maritime technology e.g. sail and steam (Johnson 1983; Cole 2006: 145). Most ports displayed a bevy of tall masts, crossed yardarms and the smokestacks and funnels of steamships including steam tugs. Sail and steam propulsion formed an alliance for a short time capitalising on the advantages of both designs. In 1812 Henry Bell designed the hybrid PS *Comet* and it became the first commercial paddle steamer to operate in European waters. Its hull was typical of a sailing ship and it was fitted amidships with twin steam-powered twin paddles port and

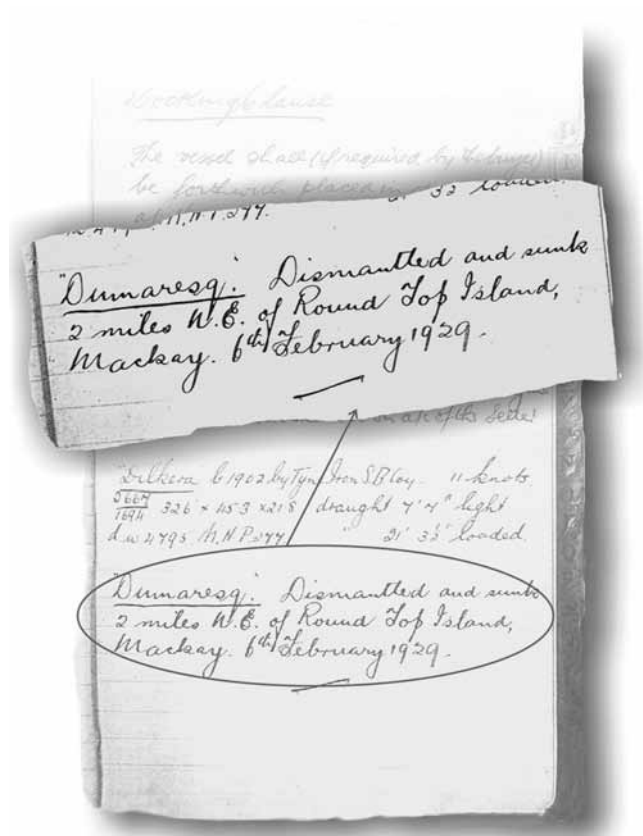


Figure 16. The last artefact of SS *Dumaresq*. A note in the logbook of the secretary of the Adelaide Steamship Company F.R Harris, 6 February 1929.

starboard. SS *Strathleven* carried the first consignment of chilled meat from Australia to England in 1888 using the advantage of both steam and sail (Burke 1979: 242; *The Times*, UK, 9 February 1888; Arthur 2006: 63–82). The marriage of the two technologies was evident in the timber trading vessels of the 1920s.

Sailing ships remained a common sight when the *Dumaresq* was sold by her original owner in 1911 and entered into service for Mark C. Reid and John Callen of Newcastle (Callen 1986; RANZ Shipping 1912–1913). Curiously enough, it was the steam tug that assisted sailing ships to endure into the 20th century. The highly manoeuvrable steam tug assisted the sailing ship to move in and out of slips, piers and docks of modernised harbours. The tug-assisted manoeuvres were executed without the need for sailing vessels having to take advantage of the wind or compensate for tidal currents. In the early 1900s shipbuilding trends tended towards oil-fired internal combustion engines. However, in 1910, the *Dumaresq* was fitted with a steam engine without the foresight of installing a diesel engine. Diesel technology had proven to be reliable, efficient and economical in Britain and Europe and was beginning to dominate in the United States of America.

Ships can be very elusive entities from an archaeological perspective. A ship by definition is mobile, which is its fundamental design purpose. The two indelible marks

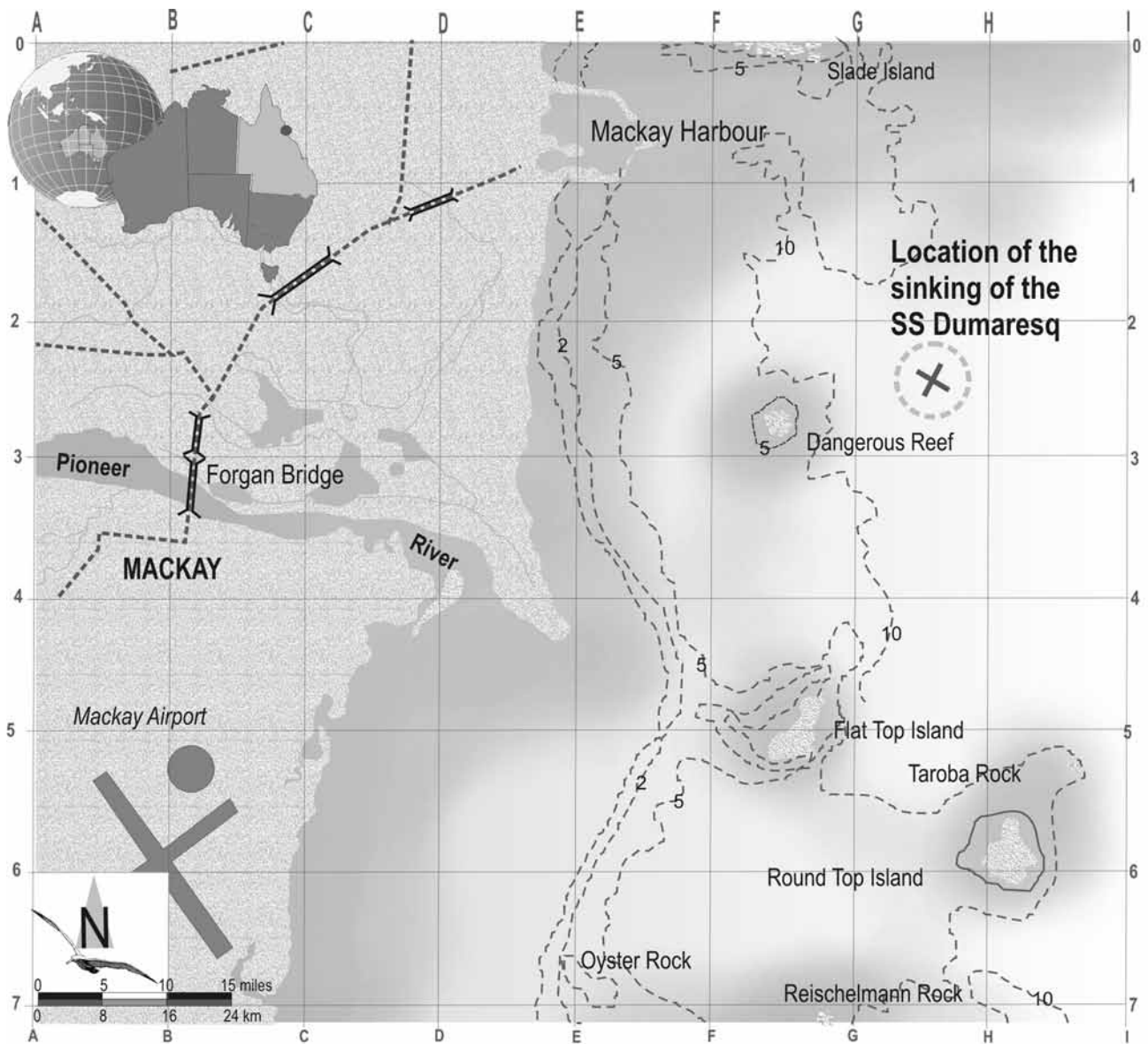


Figure 17. Map showing the location of the sinking of the SS *Dumaresq*.

it imparts to the land and seascape, are where it was constructed and launched, and for some vessels, where they come to rest. Some archaeologists may consider a slipway to be above the high water mark and hence belonging to the land-based archaeologists. Nayton's hypothesis that marine transport has a dynamic nature that influences land sites is a strong, acceptable argument (Nayton 1992: 17–24). It would be naïve to attempt to separate the shipyard, the slipway and indeed the forest and sawmill, from the life of a wooden ship. These landscapes, while subject to individual interpretation, may be the only extant remains to assist in the archaeological reconstruction of the vessel. Physical properties of the timber used in the construction of a vessel may assist interpretation of the reasons for its demise. In addition, this may also reveal why a ship was constructed in a particular area or the methods of construction. Arguably, *land-based* aspects pertaining to the vessel are part of the dynamics of maritime transport and are equally as

important as any wreck site. Another factor that may be added to the investigation of a particular vessel is the work practices of the shipwright.

The *Illawarra Mercury*, 31 December 1909, reports that: 'the SS *Dumaresq* bears the distinction of being the first to be constructed in Wollongong'. The comment 'of being the first to be constructed' must be questioned given John Cunningham's shipbuilding activities in the early 1830s (Royal Australian Historical Society [RAHS], Vol. 20, p. 298). However, from the time Cunningham worked on the foreshore at Five Islands, until the construction of the *Dumaresq* at Belmore Basin in 1909, no evidence of any other shipbuilding has been located. A search of the Lloyd's Registers and the Register of Australian and New Zealand Shipping also fails to identify any other further shipbuilding in that locality between the years of 1880 and 1920. The extensive photographic record kept of the construction the *Dumaresq* may indicate that the event was unique in Wollongong. Alternatively, it may have been

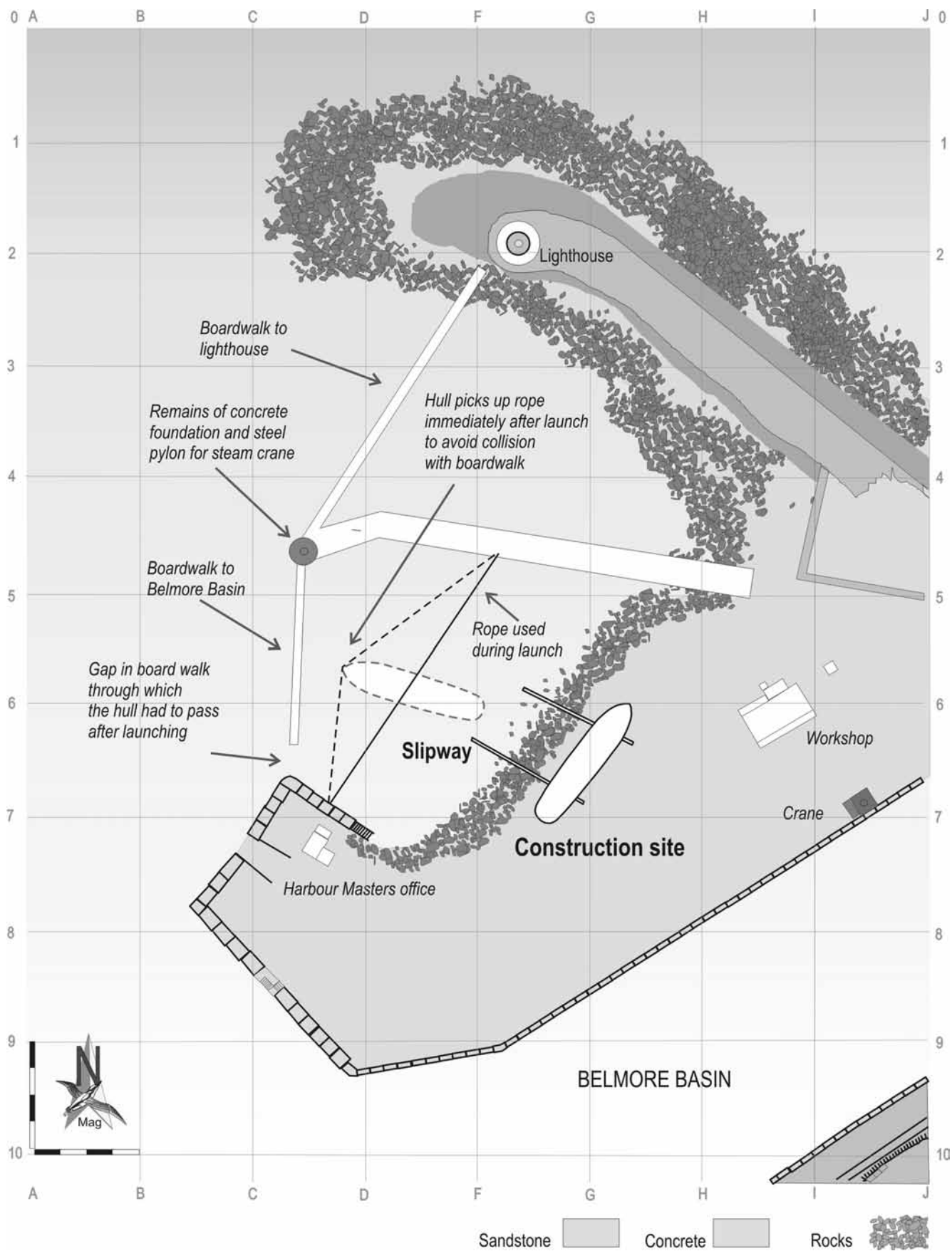


Figure 18. Site survey of the slipway and construction site of the SS *Dumaresq*, Belmore Basin, Wollongong NSW.



Figure 19. Belmore Harbour c.1930. SS *Dumaresq* was constructed in front of the shed and launched from the seawall (Courtesy Wollongong City Library 1998).



Figure 21. Steel rail lines from slipway twisted by the weight of the rock infill c.1999.



Figure 20. Steel rail lines c.1999. Slipway for SS *Dumaresq*, 1909.



Figure 22. Location of the seawall before the storm damage (white dotted line), 2004, (looking south-west).

for the *Dumaresq*'s construction. Captain Crossley of the Adelaide Steamship Company confirmed the use of kauri in a report that stated: 'the topsides were of kauri with the decks of 1¾ inch tongue and grooved kauri' (Noel Butlin Archives [NBA] N46/1029). If the gunwales and deck were made from kauri as reported, the species does not, and did not grow, in the Wollongong area. Kauri is readily available in New Zealand and this may well have been the source of the timber. Settree had become familiar with the properties of this timber and its suitability for maritime use during his apprenticeship in New Zealand. A. & E. Ellis through their sawmilling operations at Bawley Point, exported hardwoods to New Zealand and the kauri pine required could have been back-loaded cargo to New South Wales (Tracey 2007: 86). Further evidence to support that the importation of kauri from New Zealand was a common practice comes from the history of John Charles Smith of Goodlet and Smith. Smith's Sydney residence *Yester Grange*, designed by architect James Barnet Jnr, was constructed 'of the finest New Zealand kauri timber that Goodlet and Smith could obtain'.

SS *Dumaresq*'s engine

In 1908 John and Robert Horn acquired the salvage rights to the stricken Ketch *Kincumber*, 98 ft (30 m), 85-ton

(77 t) Reg. No. ON106198 and constructed by George Frost for the Manning River Limestone and Steamship Co. Ltd of Newcastle, NSW. On 22 October 1908, it sank with the loss of the captain and one crewmember. Nine of the crew survived the incident. According to the salvage rights granted, Horn Brothers removed the engine from the ketch *Kincumber* (Kerr 1985: 138). Dundon (1997) states: 'engine and boiler said to have been shipped to Wollongong and put into tug *Dumaresq* constructed in 1910'.

Transporting the engine to Wollongong is unlikely if A.W. Settree's relationship with Chapman and Co. Ltd is taken into consideration. SS *Our Elsie* in 1908 and SS *Douglas Mawson* in 1914 were fitted out in Sydney, and it would stand to reason that the hull of the *Dumaresq* was also fitted out at engineering facilities in Sydney. The engine was not fitted to the vessel before launching nor was this the practice of the shipwright (A. Settree, 1995, pers. comm.). Following their launchings, the hulls of the three ships, *Our Elsie*, *Dumaresq* and *Douglas Mawson*, rode high out of the water suggesting that the weight of their engines had not been added. This is evident in the photograph of the *Dumaresq* (Fig. 10). Also, the *Illawarra Mercury*, 12 December 1909, reported that after the launching of the *Dumaresq*:

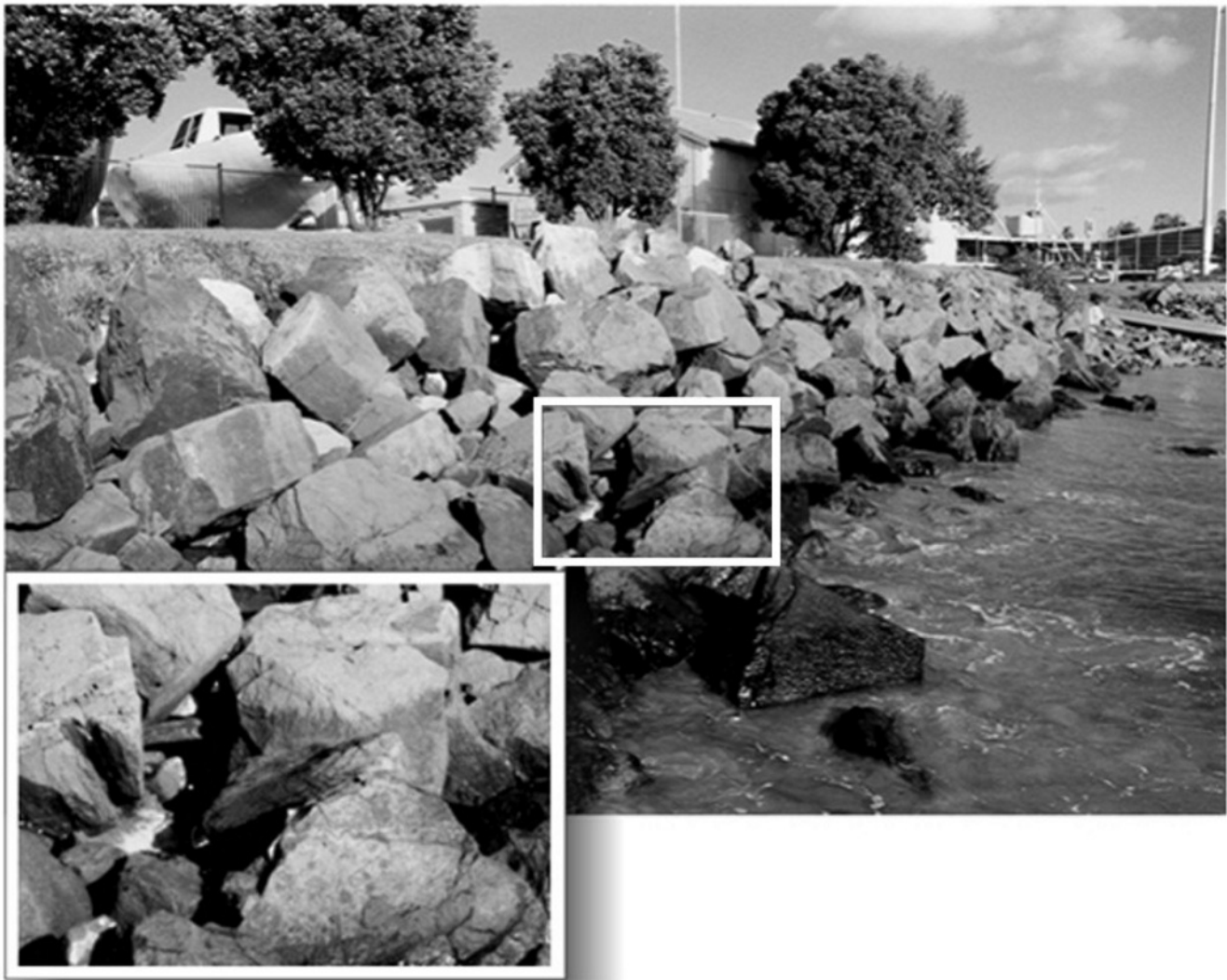


Figure 23. The rock wall rebuilt after a severe storm destroyed the seawall. The sections of rail line remain under the rocks (looking south-west).

Her owner and builder quickly boarded her and towed her round from the small cove at the tee jetty into Belmore Basin, from whence she will be towed to Sydney.

If the engine was 'shipped to Wollongong and put into tug *Dumaresq*' the vessel could have made her own way to Sydney to undergo marine survey and fitting out. This would have negated the expensive and dangerous towing of the completed, top-heavy hull in the open sea. The boiler and engines were tested in Sydney in February 1910 two months after launching (Register of Australian and New Zealand Shipping [RANZS], 1910–1911). There is no extant archaeological or archival evidence to support any engineering facility at Belmore Basin in 1909, particularly one that would facilitate the fitting of a boiler, large marine engine and propulsion equipment.

Bilge launching

SS Dumaresq was launched broadside into the sea. Bilge or broadside launching was considered hazardous and was a method that caused considerable concern for shipwrights,

owners and engineers. The launching of *SS Great Eastern* in 1857 was undertaken using the bilge method and prompted newspapers to comment about its designer, Isambard Brunel: 'he was worried sick by the uncertainty of the launch'. Immediately after releasing the winches to launch the *Great Eastern* she slid sideways from the 1 in 12 gradient of the slipway to become stuck in the mud. Vaughan also states on Brunel's behalf: 'there can be no doubt that the launch from an engineering point of view was a disaster' (Vaughan 1991: 261). Perhaps this historical launching was known to Settree and prompted his fears at using the method.

The completed hull, less its engines and superstructure, was much lighter than the finished vessel and, therefore, had a high centre of gravity. This would cause the vessel to settle high in the water with a tendency to make the hull top heavy. The probability of capsizing upon entering the water was greatly increased. There was further danger associated with the launching of the *Dumaresq*'s hull. The archaeological survey identified the remains of a steel pylon and



Figure 24. Area where artefacts associated with construction of the SS *Dumaresq* were located (looking north-east).

concrete pier in the small cove where the hull was launched. The steel pylon was the support for a steam crane installed in the harbour *c.*1882 to replace the old hand-driven crane. *The Illawarra Mercury* on 22 August 1882 reported:

The recently erected crane on the new jetty at the lighthouse was finally tested yesterday afternoon. The crane lifted and lowered upward of fifteen tons of iron rail quite readily, and swung them around most admirably. The whole machinery worked so smoothly that it made little more noise than an ordinary sawing machine.

The 16 hp (11.9 kw) crane called ‘the Conqueror’ was manufactured by Mort’s Dock and Engineering, Sydney, NSW and supplied to the Harbours and Rivers Department for £3 000 (Eardley 1968: 9). A boardwalk was constructed from shore to the crane allowing access for loading and unloading. In the 1860s the boardwalk was extended seawards to the lighthouse and then to the beach and the northern extremity of the Belmore Basin sandstone wall. Therefore, at the time of the launching of the *Dumaresq*’s hull, the boardwalks completely enclosed the area of the small cove where the hull was constructed.

The hull of the *Dumaresq* was constructed with the bow facing seaward. Upon release of the sliding way the hull slid down the rail line slipway and entered the water. The momentum produced during this process could have propelled the hull through the water until it collided with the boardwalk or the crane pylon. To prevent such a catastrophe, a rope, set from the sandstone wall to the boardwalk and from the shore to the crane’s foundation was used during launching. The rope is visible rising from the water and crossing the bow of the vessel in Figure 18. Upon launching, the rope would swing the bow of the vessel towards the beach. However, the shipwright deliberately swung the bow of the *Dumaresq* toward the sea during launching. This was achieved by making one rail of the slipway closest the bow shorter than the slipway rail nearest the stern. One section of rail line for the slipway was shorter and would have caused the bow of the vessel to enter the water first and assisting to right the hull quicker than a parallel broadside. It would also turn the bow away from the shore to seaward.

SS *Dumaresq* in service

The hull of the *Dumaresq* was towed to Sydney and the engines and superstructure fitted. The vessel was then delivered to the owners, Horn Brothers of Sydney. The ship saw service in Sydney Harbour as a general tug until 1911 when it was sold to Mark Christian Reid and John Henry Callen of Newcastle, NSW. Mark Reid was proprietor of the Melbourne Steamship Company, ship owners and coal merchants of Newcastle (Newcastle Chamber of Commerce [NCC], 1918). The Callen Brothers established their shipbuilding interests at Brisbane Water followed by their Newcastle enterprises in 1876. The Stockton shipyard north of Newcastle was under the management of Peter Callen, the senior brother in the firm. By 1888 operated two steam lighters, one seagoing steamer, two sailing vessels, three ferryboats, five pile-driving machines and employed 75 workers (Morrison 1888: 730). Callens established a considerable fleet and in addition to their shipping interests, operated a large timber yard, a steam sawmill at Stockton and a dockyard with slipways capable of accommodating ships up to 500 tons (453 t). SS *Dumaresq* joined the Callen’s fleet and saw service in Newcastle as a tug from 1911 to 1918.

The Callen brothers recognised that most tugs were underpowered and could be dangerous to the ships they served, stating:

Many a vessel cast off her tug while in a dangerous position near the Oyster Bank because the tug could not hold her (Callen 1986: 90).

Ship Surveyor Captain Crossley did not comment about the power of the *Dumaresq* when conducting sea trials prior to purchase. However, he noted that he found the vessel to ‘steam exceptionally well’ quoting an average speed of 10.5 knots untethered and 7 knots while towing (NBA N46/1024). The *Dumaresq* was primarily used for towing lighters and barges rather than seagoing tug operations. During sea trials Crossley used the *Dumaresq* to tow a barge of 105 ft in length, a beam of 24 ft and a draft of 6 ft. He stated that the vessel performed equally well ‘both alongside and ahead with towline, inside and outside the harbour’ (NBA N46/1027).

The *Town and Country Journal*, 17 November 1909, reported that the prolonged effects of a coal strike that had besieged Newcastle in 1909 eventually caused the lay off and cancellation of shipping contracts. Reid was anxious to sell the *Dumaresq* in this ongoing depressed economic situation. Crossley states:

I saw Mr. M. Reid, the vendor, and he advised me that as things were at present in Newcastle, there was absolutely nothing profitable for her to do and that he was anxious to sell the craft (NBA NA 46/1027; NBA N46/1024).

Modifications were made to the vessel during its service in Newcastle. The drawing shows a vertical upper topside on the stern while all photographs show a slanting upper topside. This may have been part of an extensive upgrading carried out on the vessel or was a misinterpretation by Crossley. It is considered that this

change of configuration represents modifications to the vessel after launching.

Unnamed tropical cyclone

On 21 January 1918 a tropical cyclone with a central pressure of 932.6 mb and subsequent tidal surge struck the city of Mackay in North Queensland at 2 am, causing the loss of eighteen lives and considerable property damage (Bath 1957: 46–59). The Bureau of Meteorology recorded the tidal surge produced by the 1918 cyclone as the ‘highest tidal surge ever to hit Mackay’. The resident lighthouse keeper on Flat Top Island, George Randall, unsuccessfully attempted to signal passing ships warning them of the destructive force of the cyclone. Randall established communication with SS *Wyreema* at 3.30 pm requesting the Master to wait offshore to relay a ‘message of utmost importance’ from the Harbour-Master to Brisbane. The Master agreed and the following message was relayed at 7 pm:

Cyclone, floods and tidal waves losses 14, bodies recovered, all wharves and sugar stores have collapsed. Relief, Quasha and Brinawarr sunk. Tay, Apa and Pelican ashore. Mackay is on military rations and only 10 days food on hand. No lighterage plant available...All buildings, Pilot Station and Signal Station unroofed and vacated by crew. All markers except lighthouse destroyed and no means of replacing same. Boat shed and all plant completely swept away (Bath 1957: 51).

Over £1 000 000 damage was caused to the Mackay district (Visher & Hodge 1925; Moore 1978: 12–13). The Harbour-Master’s message included notification of the sinking of SS *Brinawarr*, a wooden vessel constructed by J. Hawken, shipwright of Coolangatta, NSW for J. Hay of Sydney. She had a gross tonnage of 144 tons (103 t) and was powered by a steam compound engine engineered by Kincaid and Company, Glasgow, Scotland. She was capable of 8.9 knots and in 1893 the Adelaide Steamship Company acquired the vessel (NBA 46/856). *Brinawarr* served the sugar port of Mackay in various roles, carrying passengers, troops and as a tug for sugar lighters (Page 1982: 202). During the cyclone the Forgan Bridge over the Pioneer River collapsed onto the ship. The owners abandoned the sunken vessel and she was not salvaged. The wreck of the *Brinawarr* was disturbed by bridge construction works in 2009.

Although this cyclone impacted several thousand kilometres away from the SS *Dumaresq* the havoc wrecked upon the northern community played a major role in a decision that affected that steam tug’s remaining working life. The 1918 ‘*Annual Report of the Adelaide Steamship Company*’ notes that the steam tug SS *Dumaresq* was purchased from Mark C. Reid and John Cullen to replace the crippled SS *Brinawarr* (Page 1982: 202).

When the owners of the *Dumaresq* offered it for sale, the ship was inspected by the Marine Superintendent of the Adelaide Steamship Company, Captain Crossley. He described the vessel as made of Australian hardwood with kauri topside, kauri tongue and groove decking and the

hull coppered to the waterline. Crossley praised the ship in his recommendations stating:

Found the vessel to steam exceptionally well having harbour speed of 10/14 knots, 7 knots towing the above barge in the harbour, and about 5 knots against heavy S.E. seas.

The barge referred to was the *Neptune*, 105 ft in length, 24 ft in beam and a draft of 6 ft. He continued his praise of the vessel and in turn Shipwright Settree, with his comments: ‘I have never seen a handier tug. She could do anything with the barge...She is a very good sea boat’. Crossley recommended an offer of £1 500 be made for her purchase (NBA N46/1024).

The Adelaide Steam Company Limited purchased the *Dumaresq* for £1 600 (Bill of Sale, 17 April 1918). She serviced Mackay Harbour from 1919 to 1928 and carried a complement of seven, including the Captain, engineer, two deck hands, fireman, a cook and one boy (NBA N46/856; Hayter 1950).

The Adelaide Steamship Company had experienced heavy financial losses as a result of the cyclone and continued to recover from the loss of SS *Yongala* in 1911 (Hayter 1950). A prolonged strike by the Queensland Railways led to a strike by the Waterside Workers and losses were also suffered in WWI. Hayter states:

...the vigorous building programme of the early twenties stands out in sharp contrast to conditions during the period which followed not only in Australia but the whole world suffered the effect of an economic depression...signs of the decline in trade had appeared in 1926 (Hayter 1950).

The effects of protracted strikes caused the laying up of many ships and the rising costs of coal prompted the Company to modify their fleet. Coal imported from the Britain was cheaper than that purchased in Australia and several vessels were converted to the cheaper fuel alternative diesel engines. In 1926 the Adelaide Steam Ship Company placed an order with Mort’s Dock and Engineering for a steam tug, SS *Uta*, to tow sugar lighters in Queensland rivers (Page 1982: 225). The *Dumaresq* was not considered for conversion to diesel and the acquisition of a replacement vessel meant her working life was over. The possibility that the hull was not in as good a condition as Crossley had first claimed is possible.

In 1929 the *Dumaresq* was withdrawn from service. The following epilogue was published in the Adelaide Steamship Company’s *Annual Report*, 10 September 1929:

The tug “*Dumaresq*” having become obsolete and expensive to work has been dismantled and sunk off Mackay (NBA N46/856).

Construction and launching site of SS *Dumaresq*, Belmore Basin

Activities in the use of Belmore Basin as a harbour and shipyard have destroyed much of the archaeological evidence relating to its early use, including the construction and launching of the *Dumaresq*. However,

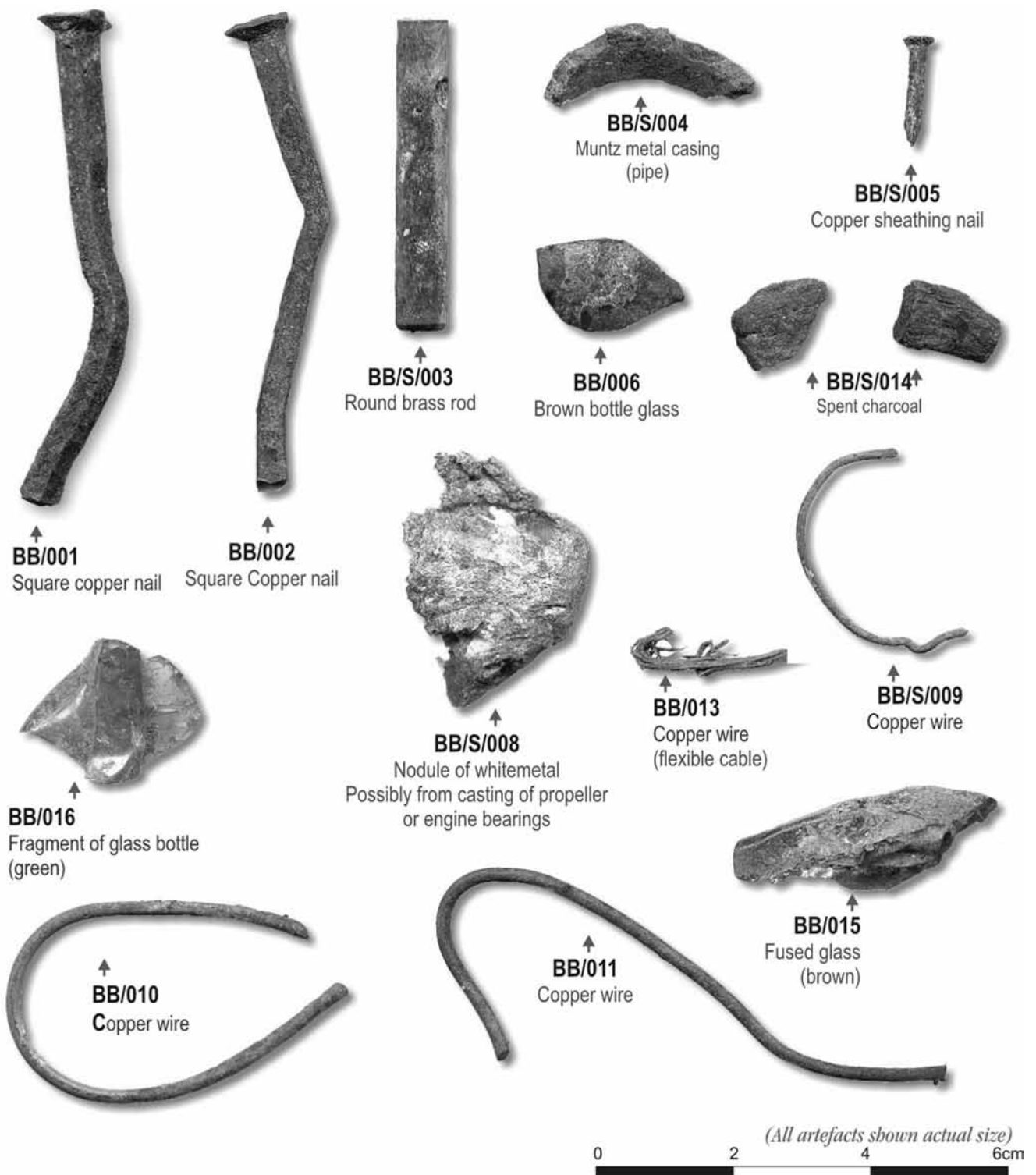


Figure 25. Surface artefacts salvaged from the SS *Dumaresq* construction site.

in 1998, two lengths of rail line used as the slipway for launching the vessel and other associated materials were located *in situ*. The steel had been severely twisted when boulders and infill were placed on top to form a seawall. The slipway is visible in historical photographs of the launching.

Site surveying was undertaken in 1998, 1999, 2004 and 2007. Results from these surveys were analysed along with archival materials and historical photographs. A drawing

was then compiled to represent the site at the time of the launching in 1909.

Archaeological excavation in the area immediately adjacent to the fence of the modern boatyard, may have led to clarification of the techniques used in the construction of the vessel. While excavation was desirable it would have caused considerable disturbance to the fragile vegetation on the foreshore. The area where excavation was considered was grassed and atop the rock wall where

surface and sub-surface soil was eroding. Some artefacts were evident in the eroded area. Tourists visiting the present slipway and persons fishing off the rocks, walk in this area. Damage to the site caused by human impact and continual erosion led to a decision to salvage the surface artefacts and to excavate part of the undisturbed area. The salvaging of the artefacts was the right decision. A severe storm struck the area intended for excavation and it was destroyed. A Coast Guard officer reported that the storm washed away the beach and most of the seawall overnight.

The artefacts collected from the surface are shown in Figure 12. No major diagnostic value can be attributed to the artefacts. All the artefacts had been burnt and three fragments of bottle glass BB/S/016, BB/S/006 and BB/S/015 have been fused by heat. The insulation has been burnt from the copper wire BB/S/011, BB/S/013, BB/S/009 and BB/S/013. Many early vessels were wired with DC (direct current) and thick braided, copper cables were necessary to prevent decrease of current and to avoid voltage drop. Smaller diameter, wound wire BB/S/013, is often used in radios or as an internal aerial. As the vessel was not fitted out at Belmore Basin this wire is most likely from a radio used on site during construction.

Artefact BB/S/008 is a nodule of white metal commonly used in filling or installing bearings for propeller shafts etc. The rudder and propeller were installed at the construction site and are visible in the photographs of the launching sequence. Copper nails were located BB/S/001 and BB/S/002. Shipwrights used this type of nail in affixing panelling or railings. The nails were usually driven through the timbers to be joined and then bent over at the back to provide a secure joint and eliminate movement. A third option was to drive the copper nail into the two boards, bend the tip of the nail and drive it back into the inside board. This type of joint was safer as the tip of the nail was not exposed.

After the launching of the *Dumaresq* A.W. Settree shifted his operations to Bawley Point to commence construction of SS *Douglas Mawson*, the only ship constructed at Bawley Point and the largest vessel Settree had constructed. Tropical cyclones played a significant role in the demise of both vessels (Tracey 2007).

Acknowledgments

The author acknowledges the assistance of Professor Peter Bellwood, ANU, Canberra; Captain (Rtd) Graeme Andrews, Sydney; Wollongong Historical Society, NSW; the late Alfred Settree, Huskisson, NSW; Mavis (Settree) Marsh, Wollongong, NSW; and Dr Jennifer Lambert Tracey.

References

- Alper, J., 1990, Rudolf Diesel's engine. *Chem Matters*, American Chemical Society, Columbia, Ohio.
- Andrews, G., 1983, *South coast steamers*. Marine History Publications, Geelong.
- Arthur, I., 2006, Shipboard refrigeration and the beginning of the frozen meat trade. *Journal of the Royal Australian Historical Society* 92: 63–82.
- Bath, T.A., 1957, The Mackay cyclone of 21 January 1918. *Australian Meteorological Magazine*, Commonwealth Government of Australia, 46–59.
- Burke, J., 1979, *Connections*. Book Club Associates and Macmillan London Ltd, London.
- Callen, T., 1986, *Bar dangerous: a maritime history of Newcastle*. Newcastle Region Maritime Museum Runciman Press and Varley, Newcastle.
- Cole, H., 2006, Explosion on board the steamer *Native*: The limits of early marine engineering in colonial New South Wales. *Journal of the Royal Australian Historical Society*, Sydney, 145.
- Dundon, G., 1997, *The Shipbuilders of Brisbane Water New South Wales*. Open Book Publishers, Adelaide.
- Eardley, G.H., 1968, *Transporting the black diamond. Book 1. Colliery Railways of the Illawarra District*, NSW Central Section, Traction Publications, Canberra: 9.
- Gulley, J., n.d., James Settree. Unpublished mss.
- Hayter, H.N., 1950, The Adelaide Steamship Company—A history. (Unpublished) NBA N46/1136.
- Johnson, P.F., 1983, *Steam and the sea*. Peabody Museum of Salem, Massachusetts.
- Kerr, G., 1985, *Craft and craftsman of Australian fishing 1870–1970, an illustrated oral history*. Mains'l Books, Geelong: 138.
- King, C.J., 1957, *An outline of closer settlement in New South Wales, part 1; The sequence of the land laws 1788–1956*. Division of Marketing and Agricultural Economics, Sydney: 21.
- Milne, G., 2000, Putting Britannia on the waves; Medieval shipbuilders give up their secrets. *Scientific American, Discovering Archaeology*, 8.
- Moore, A.H., 1978, *The Mackay Harbour story*. Mackay Harbour Board and Rigby Publishing, Adelaide: 12–13.
- Morrison, W.F., 1888, *Centennial history of New South Wales*. Aldine Publishing Company, Sydney: 730.
- Muirhead, J.P., 1858, *The life of James Watt with selections from his correspondence*. John Murray, Albemarle, London: 438.
- Nayton, G., 1992, The importance of the maritime perspectives to the understanding of Australian historical archaeological sites. *The Bulletin of the Australian Institute for Maritime Archaeology*, 16, 2: 17–24.
- Nicholas, S. and Shergold, P.R., 1988, *Unshackling the past; Convict workers; Reinterpreting Australia's past*. S. Nicholas, (ed.), Cambridge University Press: 8.
- Onslow, S.M., 1914, *Some early records of the Macarthurs of Camden*. Angus and Robertson Ltd, Sydney: 349.
- Oxley, J., 1820, *Journals of two expeditions into the interior of New South Wales: undertaken by order of the British Government in the Years 1817–18*. John Murray, London: 146.
- Page, M., 1982, *Fitted for the voyage; The Adelaide Steamship Company 1875–1975*. Rigby Limited, Adelaide.
- Ritchie, J., 1970, *Punishment and profit*. William Heinemann Australia Pty Ltd, Melbourne, 202.
- Tracey, M.A., 1994, When the timber cut out, archaeological aspects of timber extraction procedures and shipbuilding in the Murrumbidgee district, NSW. Honours dissertation (unpub.), Department of Archaeology and Anthropology, Australian National University, Canberra.
- Tracey, M.M., 1997, The SS *Douglas Mawson*—A launching and a shipwreck. *The Bulletin of the Australian Institute for Maritime Archaeology*, 21: 9–18.
- Tracey, M.M. and Lambert Tracey, J., 1999, The intrigue of the SS *Douglas Mawson*. *Australian Sea Heritage*, Sydney Maritime Museum, Sydney: 57.
- Tracey, M.M., 1997, Archaeological evidence for a horse-drawn tramway at Bawley Point NSW. *Australia's Ever Changing Forests III, Proceedings of the third national conference on Australian forest history*, J. Dargavel (ed.), Centre for

-
- Resource and Environmental Studies, Canberra: 188–209.
- Tracey, M.M., 2007, Wooden ships, iron men and stalwart ladies: The TSS *Douglas Mawson* Saga. Thesis (PhD), Department of Archaeology and Anthropology, Australian National University, Canberra.
- Vaughan, A., 1991, *Isambard Kingdom Brunel: Engineering knight errant*. John Murray, Albemarle, London: 261.
- Visher, S.S. and Hodge, D., 1925, *Australian hurricane and related storm surges*. Bureau of Meteorology, Melbourne.

The *Surprise*: Australia's first steamship

R.T. Sexton

22 Tyne Street, GILBERTON, South Australia SA 5081, Australia

Email: sacristan@sa.chariot.net.au

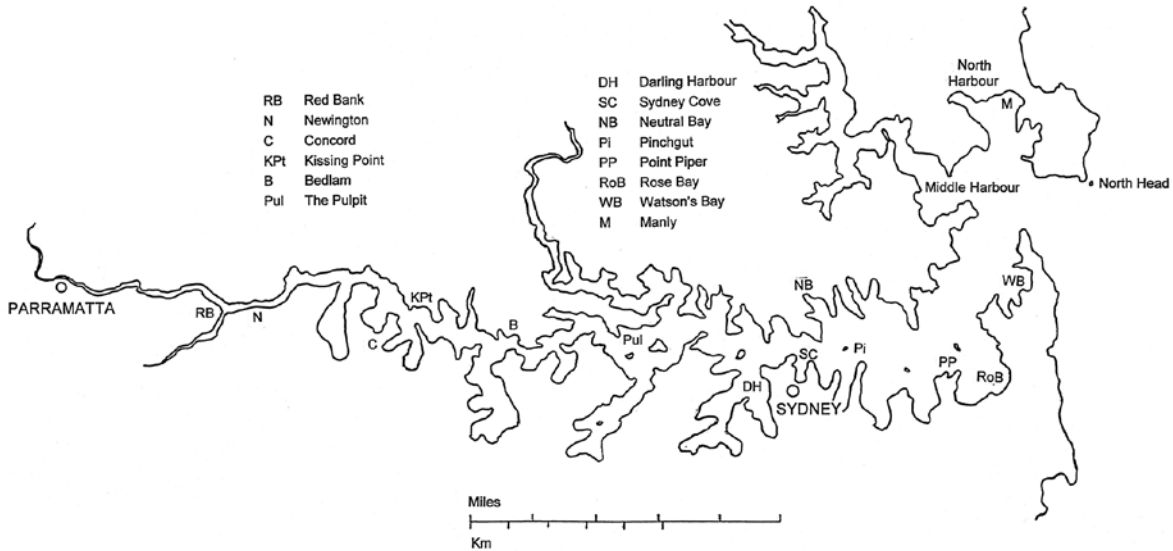


Figure 1. Map of Port Jackson, New South Wales, for whose waters the *Surprise* was built.

Introduction

The *Surprise* was the first steamship to be either built or to operate in Australia. As a result it received an unusual amount of attention in the contemporary press from which its interesting career can be traced in considerable detail. No pictorial record of the vessel seems to have survived; however, the wealth of information in a variety of sources provides a solid basis for a reconstruction of the ship's probable details. This extends to the machinery, perhaps the most remarkable thing about the *Surprise*. The vessel was fitted with lightweight plant developed by (Sir) Goldsworthy Gurney (1793–1875), one of the pioneers in the design of steam carriages. This included his patented water-tube boiler, the forerunner of those which with improved technology came to prominence towards the end of the century.

Building the *Surprise*

The *Surprise* was built for the firm of Smith Brothers of Macquarie Place, Sydney. Henry Gilbert Smith, the driving force in this enterprise, was born in Northamptonshire in 1802 and survived until 1886 (Pike 1967). He and one brother had arrived in 1827 by the ship *Lang* to seek their fortunes, but Charles soon returned to Britain (Anon. 1961: 119).

Henry himself made a business trip to England by the *Lang* in May 1829. The ship had called at Hobart to arrange for a cargo of wool and colonial produce while on its way to Sydney. However, this proved to be unavailable

upon return so it proceeded to Sydney a second time, bringing back the ship's surgeon, Alexander Thomson, and merchant 'George' Smith before completing its lading and now sailing directly for London (*Hobart Town Courier* [HTC], 21 Mar.; *Sydney Gazette* [SG], 7 Apr. & 7 May 1829). Smith had first left just three months after a description of 'Gurney's patent steam carriage' appeared in *The Australian*, Sydney [A] (20 Feb. 1829). This was opportune as he had the building of a steamer for the Parramatta trade in mind, and while in Britain he not only purchased the necessary machinery from Gurney but sought privileges from the Secretary for the Colonies in view of the expenses he would incur for a project that would be of general benefit to New South Wales (Smith 1830). Returning by the *Lang* in late October 1830, Henry was followed shortly by his brother Thomas (1795–1842) and an engineer to superintend the concern (A 26 Nov. 1830; Pike 1967). They came by the *Eliza*, whose cargo included the engine but no vessel in frame as is sometimes asserted (SG 30 Nov. 1830). The cargo for Smith Brothers in fact comprised '10 cases, 5 bundles containing a steam-engine, 4 iron pipes, and 1 case containing a lathe, 75 fire bricks, 11 cases hats, 4 sheets mill boards, 8 packages ironmongery, 1 case silks and cottons' (SG 30 Nov. 1830).

Various items about proposed steamers appeared in the press, but as the vessels were unnamed there is room for confusion. Three months after the final departure of the *Lang* in 1829 it was reported in Sydney that a gentleman visiting from the Derwent had ordered a steamboat from

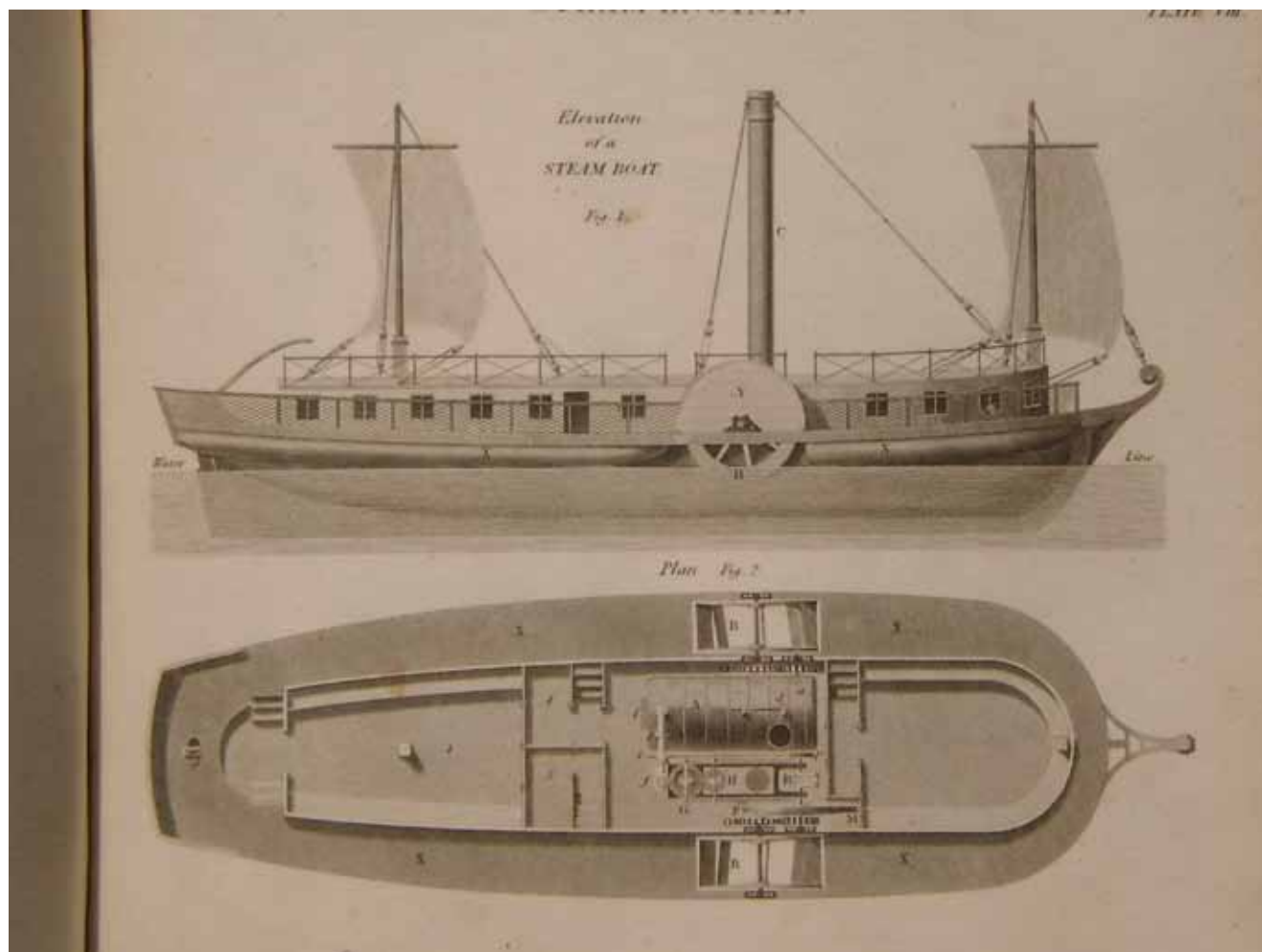


Figure 2. Plans of a small paddle steamer from Rees's *Cyclopædia* of 1820. In this example flue boiler and side-lever engine are installed side by side in the engine room, and the cabins are the full breadth of the hull and sunken about half their height into it. Wings and spsonons are both marked X in plan and side view respectively.

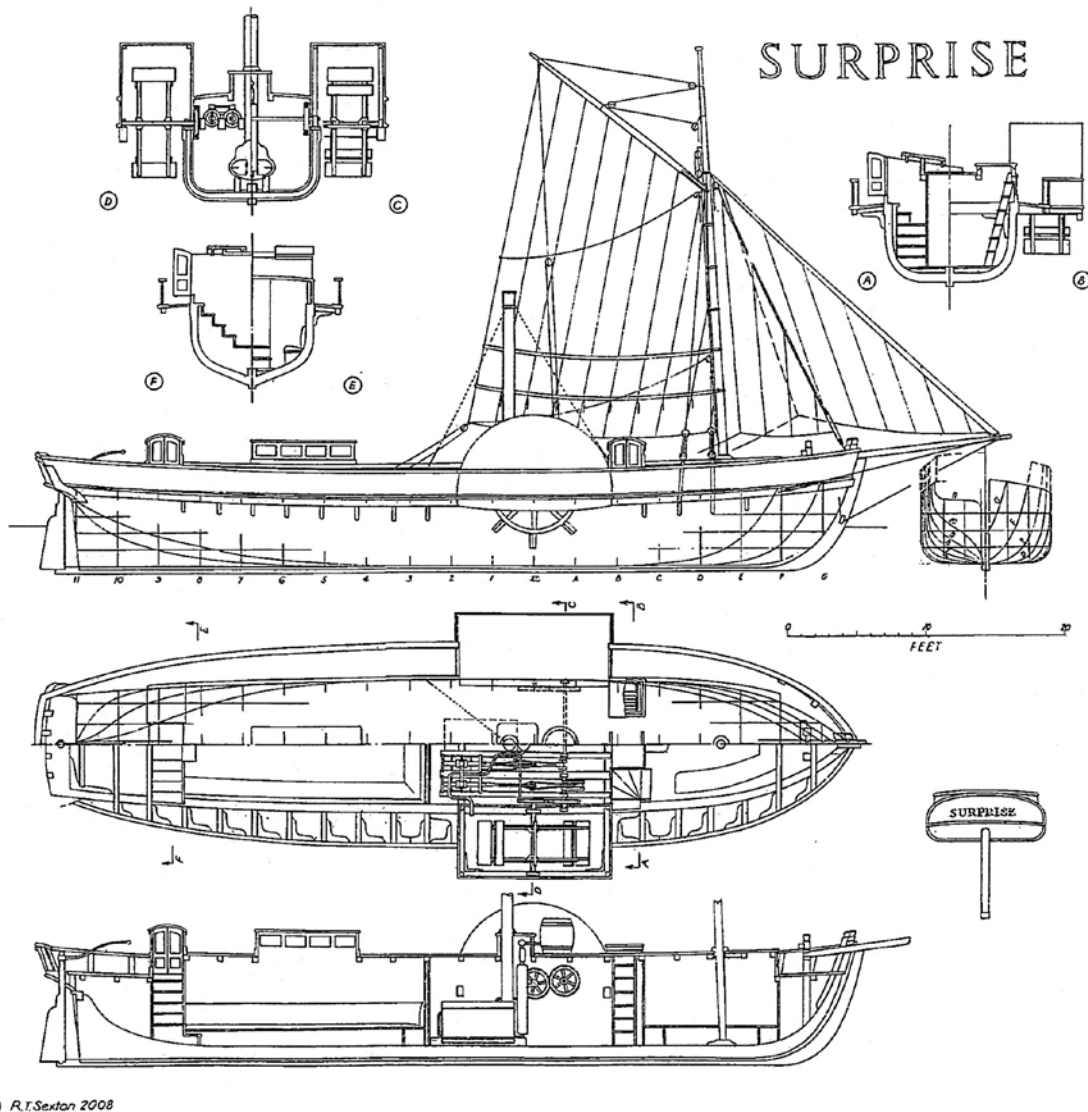
England (SG 15 Aug. 1829). This may have referred to Dr Thomson, and whether or not he continued in the *Lang* at that time, he certainly returned to Hobart from Britain in late 1831 bringing the frame of a steamer that was to become the *Governor Arthur* (*Colonial Times*, Hobart [CT], 7 Dec. 1831). First newspaper mention of Smith's steamboat appeared in the *Sydney Gazette* of 16 December 1830, noting that it was expected to start for Parramatta in six or seven weeks, leaving every morning from the Market Wharf and landing goods, passengers and parcels at Bedlam, Kissing Point, Concord, etc., and returning in the evening. About this time it was thought likely that a second steamboat would ply between Sydney and Parramatta, and that its draught of two feet would allow it to 'go over the flats at all times of the tide, and thus ensure a safe, certain, and commodious conveyance, infinitely superior to coach travelling, with greater speed, and no chance of meeting with bushrangers' (SG 25 Dec. 1830).

Henry Smith wrote back to his parents on 19 December to say that construction was under way, and that Collins—another passenger by the *Eliza*—was getting the engine in order. He hoped to have the vessel afloat in two months. In a further letter dated 12 February 1831 he said his time was fully taken up superintending construction, going

by boat the two miles to the builder's yard on the North Shore every morning at sunrise. He returned at 8.30 am but spent the afternoon there until sunset.

The *Surprise* was launched on the 11 am tide from Mr Millard's slip at Neutral Bay on 31 March 1831, Smith doing the honours with a bottle of champagne (SG 2 Apr. 1831). The hull was then towed to Sydney Cove by two boats and installation of the engine began on 3 April. With the machinery in place but the boat still open, tremendous rains late in the month resulted in work on the vessel being suspended, delaying its completion (Anon. 1961: 122; *Sydney Herald* [SH] 2 May 1831).

Even with construction still under way the coach proprietors had already begun to talk about 'invasion of rights' and 'blowing people to the moon in a whistle' (SG 12 Apr. 1831). However, worse was to come. The *Sophia Jane* was to arrive from London under sail on 14 May, and Mr Grose now had a third steamer, the *William the Fourth*, on the stocks at William's River for the Newcastle trade. This was launched on 14 November 1831 and fitted with a sixteen-horsepower marine engine built by Fawcett & Preston of Liverpool in 1826 and brought to Sydney from Mauritius three years later (SG 23 Apr. 1829 & 25 Dec. 1830). Another steamer to follow was the Australian



© R.T.Sexton 2008

Figure 3. Reconstructed plans of the *Surprise*.

Agricultural Company's *Caruah*, launched on 2 December 1831 at Port Stephens where the ship was to be employed on the Karuah River. The vessel was constructed under the surveillance of their Superintendent, Sir William Edward Parry, previously an arctic explorer and Hydrographer of the Navy, and its machinery was largely manufactured by 'a gentleman named Turnbull, from London' (*SH* 29 Aug. & 12 Dec. 1831). Yet another was the *Experiment*, also built by Marshall & Lowe at the William's River and intended for the Parramatta trade; however, this did not arrive in Sydney until September 1832 and its paddles were at first powered by horses working on a treadmill (*SG* 11 Sept. 1832).

Port Jackson

The first steam trial of the *Surprise* was held on 19 May 1831. Conditions were boisterous and with insufficient ballast to immerse the paddles sufficiently the vessel made only five knots (*SG* 21 May 1831). Following a second run around

the Cove and Pinchgut Island on the 24th, the first voyage to Parramatta was conducted on 1 June. This was a special trip under Captain Corbett prior to commencement of regular passages and fares were seven shillings, boarding at the Government Domain. Despite the high cost there were a good number of passengers (*SH* 30 May; *A* 3 June 1831). All went well until the steamer stuck fast on the mud at Red Point due to delay in adjusting the engine which resulted in it arriving at the shallowest part of the river two and a half hours after high water, although 'in the opinion of her steersman, King (the old Commodore of Parramatta passage-boats), she would have crossed them with ease had she been a half an hour sooner'. The vessel 'rested' until 10 pm before continuing on its voyage and mooring at the Commissariat Wharf. Next day the *Surprise* completed the round trip, its 30 or 40 passengers including Parramatta ladies and gentlemen who went for an outing as far as Mr Blaxland's property at Newington. The steamer had rolled considerably before starting but

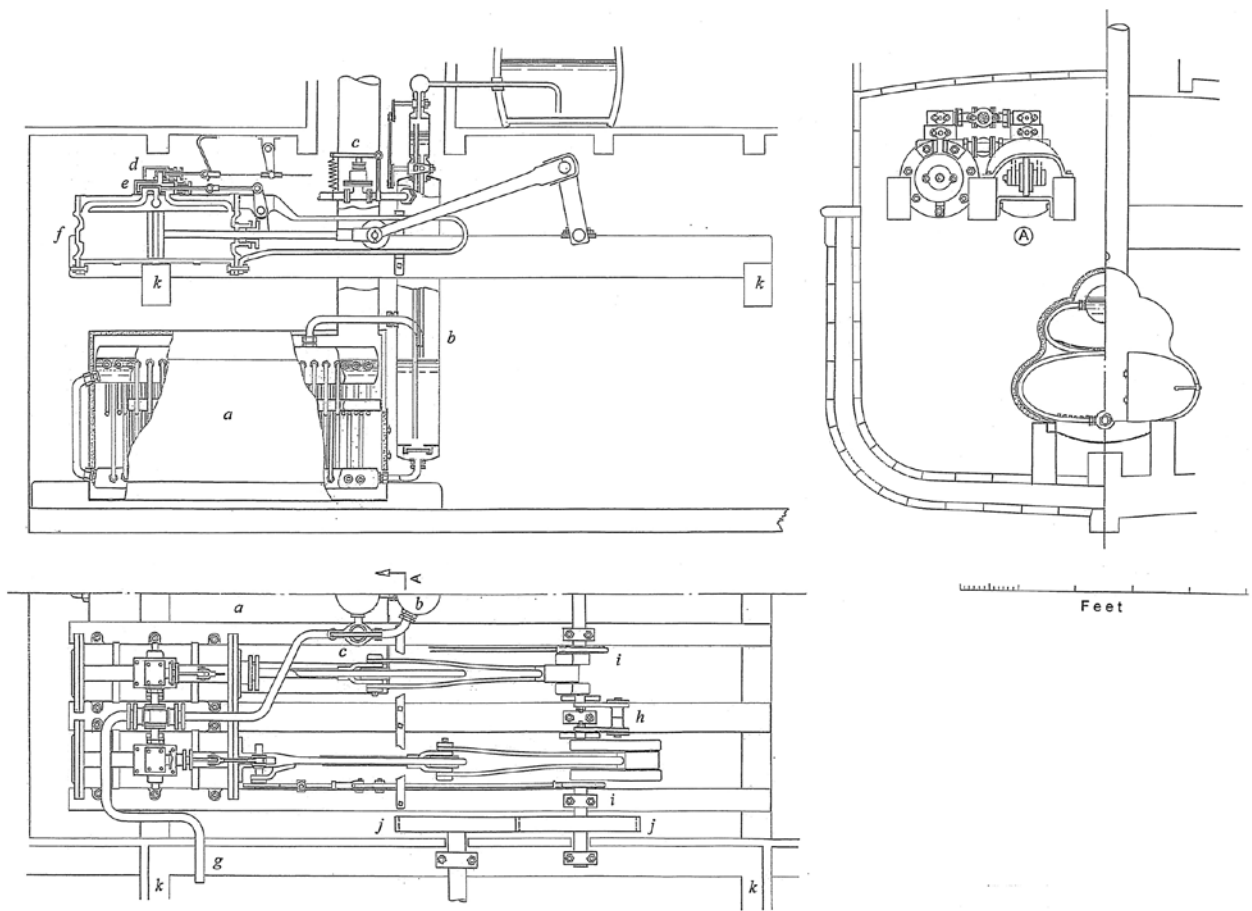


Figure 4. Drawings showing a reconstruction of the machinery installed in the *Surprise* based on Gurney's patents for a water-tube boiler (1825) and steam carriage (1827), and a surviving Gurney engine. Items shown include:

- (a) boiler
- (b) steam separator
- (c) safety valve in the steam pipe
- (d) cutoff valve
- (e) steam box
- (f) engine
- (g) exhaust pipe discharging into the paddle box
- (h) steam cutoff cam and trip lever
- (i) slide valve eccentric and drive-rod
- (j) spur wheels connecting the drive-shaft to separate paddle shafts each side
- (k) paddle beams

The cross section at A shows the straps stiffening the outer end of the connecting-rod guide bars.

was steadier when under way. This was again attributed to being too light, which could be easily overcome when the river channel was improved, or being rather top-heavy, which the proprietors decided to remedy forthwith by lowering the deck by 18 in (457 mm) (SG2 & 4 June 1831).

The *Sophia Jane* was refitted and during her first run under steam on 12 June towed the ship *Lady Harewood* out of the harbour. Thus although certainly the first coastal steamer, departing for Newcastle on the 19th, the *Sophia Jane* was the second not first steam vessel to operate in Australia. Such a claim, often repeated, goes back to the press report of the official 'first' voyages which involved a

short trip for the Governor followed by a longer excursion for the general public:

The first efficient exhibition of steam navigation, in the *fifth quarter* of the world, was beheld by the select few who ventured on board the *Sophia Jane*, on Friday, the 17th day of June, 1831. True, the *Surprise* had, as we fully reported in a recent number, performed a trip to Parramatta some days before; but that was altogether so diminutive a display of the tremendous power of steam, that it cannot for a moment be placed in competition with the magnificent enterprise of yesterday. It must also be granted that the *Sophia Jane*

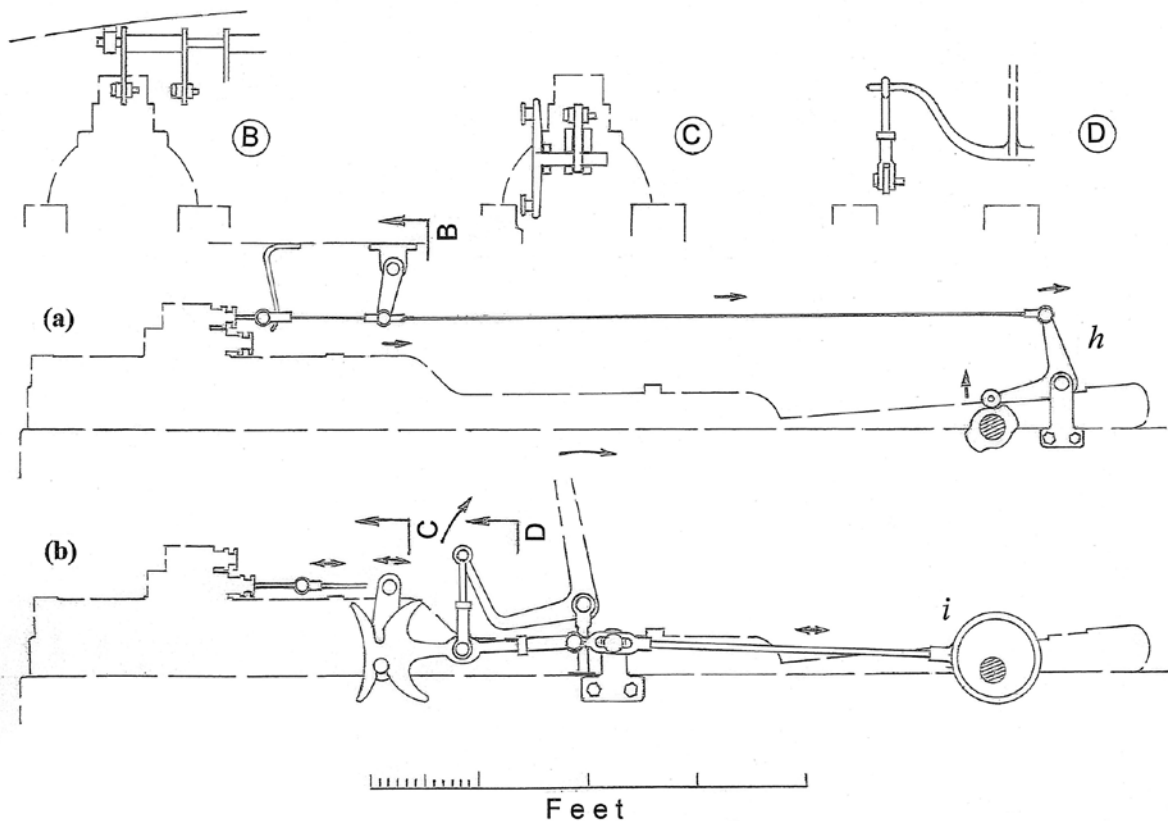


Figure 5. Details of the mechanisms to operate:

- (a) a valve to cut off the steam supply at mid-stroke and allow that already in the cylinder to work expansively. A cam on the drive-shaft lifted a lever to drag a spring-loaded D-valve across the outlet from steam pipe to steam box.
- (b) the slide valve working in the steam box and connecting steam supply and exhaust port to the appropriate end of the cylinder. Carmichael's reversing gear with its single eccentric for each cylinder was fitted (see page 59).

herself performed one trip before that which we designate her first (SG 18 June 1831).

With modifications complete, the *Surprise* made a trip to Kissing Point on 27 June, proceeding at seven knots, and next day commenced regular trips between the Lord Liverpool Wharf and Parramatta (SG 28 June 1831). The first departure was made at 8 am and the return was to commence at midday, but times were adjusted to suit the tides on successive days. Fares were three shillings and sixpence for first class and two shillings in steerage. It might be noted that about this time the Parramatta Royal Mail set off from Sydney at 8 am and 4 pm daily on the two-hour journey, the fares being five shillings inside the coach and three shillings outside (Directory 1832: 35).

There was a break in early July while the vessel was coppered, and in an effort to increase patronage there was an excursion to Manly Beach and North Harbour on the 10th. Although fares were five shillings and no 'refreshments' were allowed to be served, the *Surprise* was full of passengers (SG 9 July 1831). Then in the course of

its regular run to and from Parramatta on the 13th the *Surprise* took a party of schoolboys for a picnic at Kissing Point, and there was another public excursion to Point Piper, Rose Bay, Watson's Bay and North Head on the 23rd. The recent improvements were shown to have overcome the problem with rolling and the ship now progressed at nine miles an hour. The next day was one of the two each fortnight when the tide would not allow the steamer to pass Red Bank, beyond which the river shoaled, and the passengers were forwarded thence by boat (A 6 May; SG 16, 23 & 26 July 1831).

Smith volunteered the services of the *Surprise* to tow the 368-ton ship *Duckenfield* to sea on 7 August, demonstrating that it was capable of performing such duties (SG 9 Aug. 1831). Shortly afterwards *Surprise* was put to an even greater test going upriver in the teeth of a tremendous westerly gale but managed to reach Parramatta in three hours, only an hour more than its usual average (SG 16 Aug. 1831). More sedate was a further excursion to Watson's Bay, Manly Beach and Middle Harbour on 21 August (SG 18 Aug. 1831).



Figure 6. Photographs of Gurney's engine for a drag sent to Scotland in 1831 and now preserved in the Glasgow Transport Museum:

- (Left) The engine, looking forward. All connections to the cutoff valves, located in the upper boxes, have been lost. The tie-rod working the far engine slide valve is damaged while the near one is complete. In the foreground the yoke and hangers are to be seen supporting the outer ends of the eccentric drive-rods.
- (Right) The engine looking back to the crank shaft, eccentrics and their drive-rods, and connecting-rods working on wheels running between the upper and lower legs of the guide bars. It will be seen that the outer main bearings have broken away from the foundation timbers, and the toothed wheel set in the central 'perch' is all that remains of the gear to operate the steam cutoff valve.

It was announced on 1 September that the *Surprise* would briefly cease operations while being painted prior to commencing two runs a day; however, it was mid-October before the next report appeared. Engineer Mr Pattison had more than halved the boiler pressure and a trial up as far as the Pulpit and around Pinchgut showed that the steamer's performance was equal to if not better than before. However, there was an even more important move on the administrative side, the offer to sell two-thirds of the shares in the vessel, together with the gentle threat that without sufficient public support the owners intended to send the steamer down to Van Diemen's Land, now Tasmania (SG 1 Sept. & 15 Oct. 1831). At a meeting of interested parties held at Cummings' Hotel on 26 October under the chairmanship of Henry Smith, a number of shares were taken up at £30 each, half payable in cash and the residue in approved bills at six months (SG 29 Oct. 1831). The regular runs under the auspices of the committee of management were resumed on 2 November, the *Surprise* setting off each day at 7.45 am for Red Bank and the passengers taken on thence by coach at no cost. For a short period the starting point was from Sydney near the Domain, then later from the Market Wharf in Darling Harbour. The return commenced at 3.15 pm (SG 1 & 26 Nov. 1831).

On the evening of 11 December the *Surprise* burst her boiler while on the run back to Sydney. As expected of its multiple-tube construction, no injury resulted, but the accident delayed completion of the voyage for several days. The report went on to lament that regrettably 'this vessel does not meet with great encouragement, particularly

as a trip by water is far preferable to a rocking ride on a colonial coach' (SG 15 Dec. 1831). In late December an earlier rumour that the 'Parramatta Steam Packet' was to proceed shortly to the Derwent to ply between Hobart and Kangaroo Point was confirmed, the proprietor having found that it 'does no answer at this place' and that navigation on the river was made almost impossible by the Red Bank shoal, lying in mid-channel within about two miles of Parramatta (SH 26 Dec. 1831).

Some modification was necessary for the voyage, which was made under sail, and the *Surprise* was for the first time enrolled at Customs (Customs House Register [CHR], Sydney, 38/1831). The nineteen part-owners of the 64 shares were Henry Gilbert Smith (44), William Dawes (2), William Wallace (1), Alexander Brodie Spark (1), Alexander Walker Scott (1), and John Terry Hughes (1), all merchants; Samuel Terry (1) and John Nicholson (1), both Gentlemen; Ambrose Foss (2), William Cummings (1), Robert Bourne (1), James Blanch (1), James Simmons (1), Frederick Peterson (1), Caleb Wilson (1), Thomas Barker (1) and Frederick Parbury (1), all dealers; Thomas Bodenham (1), auctioneer; and Edward Biddulph (1), master mariner. Of these, Nicholson was the Sydney Harbour Master and Biddulph commander of the *Sophia Jane*.

The *Surprise* sailed on 13 January 1832 under Joseph Moffitt with a cargo of stores and timber and arrived at Hobart on 1 February, making it the first steamship in Tasmanian waters (SH 16 & 23 Jan.; *Hobart Town Courier* [HTC] 4 Feb. 1832).

The Derwent

Upon the arrival of the barque *Auriga* at Hobart from London on 7 December 1831, one of the passengers was the charterer, the Aberdeen-born Dr Alexander Thomson (1800–1866). He had been previously surgeon of the *Lang*, but now intended to settle there and brought out a steam packet in frame (Gardiner 1967; *SG* 12 Jan. 1832). It was said to have come by the *Platina* but is not mentioned in the detailed cargo manifest (*CT* 14 Dec. 1831; *SH* 16 Jan. 1832). Thomson continued in the *Auriga* to Sydney and remained there between 10 and 31 January 1832, probably seeing the *Surprise* still in port since Henry Smith's intention on 6 January had been to proceed to Hobart in a few days in an effort to sell the vessel, which was to be sent ahead (Anon. 1961: 124). An indication that Thomson and Smith renewed acquaintance in Sydney is that while the *Surprise* arrived in Hobart on 1 February and the *Auriga* on the 10th, Thomson's purchase for a reputed £4000 was settled quickly thereafter and a notice dated 14 February advertised a trip to New Norfolk on the 18th (Parsons 1967: 26). It was proposed that two days after this excursion the steamer would commence making four regular runs a day from the King's Wharf to Kangaroo Point, lying directly across the River Derwent (*CT* 15 Feb. 1832). Smith set off back to Sydney by the *Arab* on 9 March (*CT* 14 Mar. 1832).

The *Surprise* is often said to have been the first steamer to visit New Norfolk, but there was a strong current and tempestuous weather on the day and the vessel had only green gum timber for fuel. The Black Snake inn at Granton, barely half way, was reached at a late hour so it was thought advisable to return downstream to Hobart (*CT* 22 Feb. 1832).

On 12 June the steamboat *Governor Arthur* was launched by Messrs Callaghan, but although the boiler was already in position, it was expected to be a month before the vessel would be ready for service on the run between Hobart and Kangaroo Point (*HTC* 15 June; *CT* 19 June 1832). No announcement of it running had appeared before Mr Thomson's unnamed steam vessel, at this time the *Surprise*, was despatched to Frederick Henry Bay on 24 August to take off the female emigrant passengers of the *Princess Royal*, stranded at Tiger Head (*HTC* 31 Aug. 1832; O'May n.d.: 61). Word was received in Hobart on the 30th that the free ladies had abandoned ship for the 'new' steamer and two government vessels. The 'novelty of the importation excited considerable interest, and at 3 o'clock when it was known that the steam-boat was approaching the battery, away went all the inquisitive gentlemen in their boats' (*CT* 4 Sept. 1832).

In late September Thomson 'applied a new cylinder to the steam engine of his new passage boat *Governor Arthur*' to increase its power, and a trial trip is said to have been made on 11 October, taking a party across from Hobart to Kangaroo Point in a time of twelve minutes (*HTC* 28 Sept. 1832; Portus 1904: 185). However, it was late November before his second steamboat, capable of towing large ships, was reported to be ready for work in a day or two with a new and very powerful engine (*CT* 20 Nov. 1832). Thus an

advertisement that ran for a month from mid-September informing the public that the new steam packet *Governor Arthur*, 'Moffat' master, was now regularly plying between Hobart Town and the new jetty at Kangaroo Point must have referred to the *Surprise*. Fares for a cabin passage were one shilling, steerage sixpence, and gigs, horses, and all kinds of produce were carried at the 'usual' rates (*HTC* 14 Sept. 1832). It was also remarked that Dr Thomson's steamboat was daily crowded with passengers, many no doubt encouraged to take a pleasure trip across the river through the commander having taken out a retail licence (*CT* 25 Sept. 1832). On the other hand, advertisements for the anonymous 'Kangaroo Point Ferry' in December may have applied to either or indeed both vessels. Fares were now sixpence on workdays and a shilling on Sundays for the six return trips a day, and a punt was available for cattle and a whaleboat for those unwilling to await the steamer (*HTC* 7 Dec. 1832).

The prospectus of the Derwent Steam Navigation Company, a joint-stock company with capital of £5000, was issued in February 1833, with applications for the £25 shares to be made to Thomson. At present there were two steamboats of 12 and 14 horsepower, a 20-ton punt, and two boats as well as other assets (*CT* 19 Feb. 1833). Thomson got around to registering the *Governor Arthur* in his own name in May 1833 before despatching it to Launceston to try the trade there, but it returned to Hobart via the George's River in October (CHR Hobart, 11/1833; *HTC* 25 Oct. 1833). A year later, a new more powerful engine was built for the *Governor Arthur* in Hobart by Captain Wilson, and with its completion in January 1835 it was reported that the vessel would shortly commence plying to New Norfolk (*HTC* 24 Oct. 1834, 30 Jan. 1835). Official records named the engine-builder as Mark Williams of Hobart, and noted that it was of 16 horsepower, with a 22-in diameter cylinder and stroke of 2 ft 6 in (559 & 762 mm) (The National Archives of England and Wales, Kew [NA], BT167/54). It was not until November 1835 that Thomson re-registered the *Surprise* before disposing of the steamship to merchant George Watson, who in turn sold it to another merchant, William Johnson (CHR, Hobart, 20 & 21/1835, 5/1836). Also acquiring the *Governor Arthur*, Johnson was in financial difficulties in mid-1836 and the two Kangaroo Point ferries were offered at auction (*HTC* 1 & 29 July 1836). The *Surprise* was sold to Stephen Adey, gentleman, and the *Governor Arthur* to Robert Kerr, a merchant. By February 1837, both vessels were owned by Henry Miller, a gentleman of Hobart (CHR, Hobart, 4 & 5/1837). During Miller's ownership details were first provided for a manuscript list of all British-registered steamships. This records that the engine was built by Gurney of London and was thus still the original, as was the boiler to judge from the comment in an auction notice only the previous year that it was 'so constructed as to consume only half the usual amount of fuel' (NA BT167/54; *HTC* 1 July 1836).

It was reported in March 1841, after the final departure of the *Governor Arthur* to Melbourne to engage in trade there, that the *Surprise* was laid up pending repairs (Fox 1964: 30–1). Mr P.H. M'Ardell advertised in May 1841 that

the vessel would resume the run to the wharf at Jones's 'Golden Fleece' at Kangaroo Point on the 14th after being almost entirely rebuilt and coppered, the boiler and engine now almost wholly new (*HTC* 14 May 1841). Only four days later the boiler exploded as the result of a large stone being placed on the lever of the safety valve. The stoker was killed, and at the inquest M'Ardell was identified as the proprietor (*HTC* 28 May 1841). It was November before a new flue boiler was installed and services were resumed (*HTC* 5 Nov. 1841).

The *Surprise* was re-registered by John Walker, gentleman, and millwrights Clark, Robertson and Easeby, with no mention of M'Ardell's involvement, on 14 January 1842 (CHR, Hobart, 4/1842). Shortly afterwards the *Surprise* was sold to Richard Jones the Younger, licensed victualler of Kangaroo Point, who re-registered her on 5 February and in April transferred the vessel by deed of mortgage to Richard Jones the Elder, a schoolmaster of Hobart (CHR, Hobart, 5/1842). Jones then left Kangaroo Point to embark on another line of business and in July tried to sell the *Surprise*, at present rented to a 'responsible person' for £3 a week (*HTC* 22 July 1842). After being laid up 'in consequence of the badness of the roads on either side of the Derwent', the 'Kangaroo Point steamer' resumed her runs from Hobart's New Wharf on 8 September (*HTC* 9 Sept. 1842).

Now time was running out for the *Surprise*. In February 1843 Jones advertised the sale of the flue boiler and engine, with or without the hull, and claimed they would answer admirably for use in a flour or other mill (*HTC* 10 Feb. 1843). He remained the last recorded owner, and when broken up her Custom House register was cancelled upon the authority of a letter dated 1845.

It is often said that after the boiler accident the *Surprise* was rebuilt as a schooner for George Watson under the name *Ann Jane*. The story seems to have originated with John Lucas of Hobart and was published in 1904, but in fact refers to Watson's schooner of this name built in 1848, long after the *Surprise* had passed from his ownership (Portus 1904: 33). Confusion may have arisen from the two vessels being the same length, but the *Surprise* was half the breadth of the *Ann Jane* so it is unlikely that salvaged materials, even if available, would have been of much use in its construction.

The *Surprise* described

Official records

The basic factual description of the *Surprise* comes from the Custom House Registers (Sydney 38/1831; Hobart 20/1835, 5 & 16/1836, 4/1837, 4 & 5/1842). The vessel had a length of 58 ft (17.68 m) from the fore part of the stem under the bowsprit to the aft side of the stern-post aloft, breadth of 9 ft 8 in (2.95 m) below the main wales, depth of hold 4 ft 9 in (1.45 m), and was 18²⁶/₉₄ tons admeasured afloat. The hull was carvel-built with one deck, a square stern, and had no galleries or figurehead. The vessel was always fitted with a standing bowsprit and generally carried one mast, but from 1835 to 1837 there was none.

At some time between February 1837 and January 1842, details of the *Surprise* were first provided for a list of all British steamships (NA BT167/54). These included the official dimensions, and the draught at the load waterline of 3 ft 4 in forward and 3 ft 6 in aft (1.01–1.07 m). The vessel was reported to have one high-pressure engine of ten horsepower made by Gurney of London. The cylinder was 10 in (254 mm) in diameter and the length of stroke 2 ft 4 in (710 mm), the engine making 35 strokes per minute at full speed. The paddle wheels were 8 ft (2.44 m) in diameter and made 35 revolutions per minute, resulting in a maximum speed of eight miles per hour and an average of seven (12.9 and 11.3 km/h). Four tons (4064 kg) of coal were carried 'in boxes' and the hourly consumption was 3 cwt (152 kg). Some details were subsequently amended while the *Surprise* was owned by Richard Jones: the rig from 'not' to 'sloop'; the maximum and average speeds to seven and six miles an hour; and the paddle wheel diameter increased to 10 ft and working at 32 revolutions per minute.

General description of the vessel

Early reports of the *Surprise* tended to be glowing. It was a 'beautiful model, appears well constructed for a clipper, and for light draught of water', and a 'fine little boat, well adapted to her projected purpose, nearly flat-bottomed, eighty feet [*sic*] in the keel, and twenty-five tons burthen' (A 1 Apr.; SG 2 April 1831). However, following the *Surprise*'s first passage to Parramatta, it was remarked that '[i]n consequence of her being too wall-sided or without bearings, she rolled considerably, and the engine did not work steadily' (*Sydney Monitor* [SM], 4 June 1831).

Expected characteristics were often speculative: 'the boat, although of 50 tons, when loaded, will only draw 2 feet water'; closer to completion the loaded draught was estimated to be three feet; and a reported burthen of 400 tons was hurriedly corrected to 30 or 35 tons (SG 16 Dec 1830; A 1 & 8 Apr., 20 May 1831).

Henry Smith said that the *Surprise* would 'carry 25 tons besides engine and passengers; a small half deck cabin will be made for the latter' (Anon. 1961: 120). It was also said there was to be 'superior accommodation for passengers, equal to the little English steamers', and that the 'state cabins will be tastefully and elegantly fitted up' (SM 11 May; A 8 Apr. 1831). It is hard to reconcile the grand statements that '[f]ifty passengers will be accommodated in her besides goods' and that 'being built entirely for the purpose of a passage-boat, her room is exclusively devoted to the accommodation of passengers' with the sour comment that now 'the novelty has worn off, she is not over and above crowded...owing to her total want of accommodation below deck' (SG 12 April; SG 14 May 1831; A 1 July 1831).

It was commented that the 'fastenings are copper, and her rudder peculiarly fitted so as to work in a groove, not with pintles standing out from the stern post' (A 1 Apr. 1831). After a short delay the hull was sheathed with copper (SM 9 July 1831).

For its first trial runs the 'little bark was neatly painted and gilded, and bore two flags, on one of which was inscribed her name', and 'she weighed anchor, with a long pendant and streamers flying' (SG 2 June; A 3 June 1831). It was not until an advertisement appeared for the sale of the vessel in 1842 that the anchor was again mentioned, together with a chain cable and an awning (HTC 22 July 1842).

The machinery described

It was variously reported that the 'engine is one of the latest patents, by Gurney', that it was 'a 10 horsepower high pressure steam engine', and that the 'engine is on a novel and greatly improved construction, having tube boilers' (SG 16 Dec. 1830; A 1 Apr.; SG 2 Apr. 1831). Further, it was stated that:

All possibility of those fatal accidents, which operated formerly to the prejudice of this species of navigation, is entirely removed, the boiler not being, as then, one open cylinder, but consisting of a tier of small tubes, all acting in unison upon the engine but so distinct from each other, that, in the event of one bursting (a circumstance, from its construction, by no means likely) it would merely serve to evaporate its own steam, without in the smallest degree affecting the others or the safety of the vessel (SG 12 Apr. 1831).

After less than four months operation, it was decided that the boiler pressure be diminished from 70 to 30 pounds per square inch (483–207 kPa) to reduce the amount of coal consumed and, successfully as it turned out, to make the *Surprise's* progress through the water 'more easy and rapid'. The work was undertaken by Mr Pattison, the Sydney engineer (SG 15 Oct. 1831). Alexander Lyle Pattison arrived in the colony in 1827 and had established his Phoenix foundry at Blackwattle Swamp by this time (Richards 1987: 107). Five weeks later there was a boiler accident, the only one recorded in the press until the catastrophic explosion in 1841, the result of interference with the safety valve (HTC 28 May 1841). The new flue boiler then installed was 'made of 7-16th inch plate, and will hold nearly 1 400 gallons of water, dimensions 13 feet by five' (HTC 10 Feb. 1843).

Reconstruction of the hull

No further information about Mr Millard, the builder, has been traced that might connect him to the Robert Millard residing at 29 Clarence Street in 1857 and described as a ship's carpenter, or the following year as a shipwright, nor is it known what prior knowledge he or Henry Smith had of steam vessels (*Cox and Co.'s Sydney Post Office Directory*, 1857).

The newspaper report of Gurney's steam carriage no doubt led Smith to contact this Cornish-born surgeon, who then resided in 7 Argyle Street, Hanover Square, London (Harris 1975: 14). Despite claims otherwise, there is no suggestion in the patent documents that Gurney's boiler and engine might be used for marine purposes; however, his friend the Reverend Rouse recorded that

on 9 May 1829 he 'returned with Gurney and went on board a steamboat, which was trying the effect and power of one of his engines. Cruised up and down the Canal—the agitation of the water after the boat was incredibly fine' (Carbonell 1931). Thus Smith may have been able to see this boat in operation and assess the suitability of the machinery for his proposed vessel, and indeed decide on its size and proportions in the light of first-hand observation. Nevertheless it is likely he had to investigate other steamers to be able to complete building and fitting-out.

While a variety of published accounts of the progress of steam navigation at the time exist, none can compare with the section on steam vessels in *A Treatise on Marine Architecture* by Peter Hedderwick, published in Edinburgh in 1830. It was illustrated by detailed drawings of the *Brilliant*, a seagoing vessel little larger than the 142-ton *Sophia Jane*, which measured 115 ft by 20 ft 1 in by 10 ft 3 in (35.1 x 6.12 x 3.12 m). One useful though simple technical drawing of a steamboat had already appeared in Rees's *Cyclopædia* of 1820, accompanying the article on 'Steam-Engines'. Surviving also is a lines drawing of the *Sons of Commerce*, a Gravesend packet built in 1817 by William Elias Evans, who in 1826 was to build both the *Sophia Jane*, with engines provided by Barnes & Miller, and the *Courier*, South Australia's first steamer (Fincham 1851: 339; CHR London, 604 & 740/1826; NABT167/54). The *Sons of Commerce* measured 85 by 14 ft, somewhat larger than the *Surprise* but of even less depth, 4 ft 4 in (1.32 m).

Hedderwick differentiated between river and seagoing steamers in discussing proportions, construction and power. The dimensions of the *Surprise*, 58 ft by 9 ft 8 in by 4 ft 9 in, accord precisely with his recommended six beams for length and very close to his half of beam for the depth at midships (Hedderwick 1830: 383). The average draught of 3 ft 5 in (1.04 m) however is somewhat more than his suggested quarter of breadth, say 2 ft 5 in, but suits the suggested immersion of the paddles to a third of the diameter of the wheel if its bearing was mounted on the gunwale (Hedderwick 1830: 385, 394).

The tonnage of any vessel was calculated by multiplying the length of keel by the beam and by half the beam (representing the depth), and dividing by 94. For a sailing ship, this length was measured along the rabbet of the keel from the aft side of the main stern-post to a point directly below the fore side of the stem under the bowsprit, with three-fifths of the beam then subtracted to allow for bow rake. Based on the above dimensions and assuming an upright stern-post the tonnage is $25^{90}/_{94}$, the 25 tons of some press reports. The official figure was $18^{26}/_{94}$ tons, the difference representing the length of the engine room—evidently 15 ft 5 in (4.70 m)—also subtracted under the current registration Act in obtaining the length of a steamer's keel (6 Geo. IV, c. 110).

There is little guidance as to the form of the hull other than it being 'nearly flat-bottomed', 'well constructed for a clipper', and 'wall-sided'. The midship section adopted for the *Surprise* was proportioned from Hedderwick's suggestions that the floor be three-quarters of the beam

and rise about half an inch for every foot of its length (Hedderwick 1830: 386). The *Sons of Commerce* was quite flat-floored, and while the rounded bilge and outline of the fore foot and upright stem lead to a hull that might be described as a 'clipper', Hedderwick considered the stem should be raked six to eight inches per foot above the water and this certainly yields better lines forward with a shallow hull (Hedderwick 1830: 385). The stern of the *Surprise* escapes comment beyond it being 'square'; however, there was probably a counter as in both the *Sons of Commerce* and Rees's steamer.

The *Surprise* was to be fitted with accommodation 'equal to the little English steamers', for which Smith originally proposed a 'small half deck cabin', but the usual arrangement was to have the first class cabin abaft the engine room and the smaller steerage cabin before it. The depth of the hold was manifestly inadequate to accommodate the cabins below deck. A trunk the full width of the narrow hull as in Rees's steamer therefore seems desirable, and if it was carried full height over both cabins and engine room, lowering the whole roof would have been effective in reducing top-heaviness. The depth at midships was then adjudged from the level of the residual decks forward and aft, or more likely here, to the top of paddle beams set flush with the gunwale.

Access around the hull would have been by means of 'wings', projecting decks which extended the full breadth of the paddle boxes in the case of Rees's steamer, or part way for the *Brilliant*, and were carried on knees or where possible lengthened deck beams. The presence of these wings is confirmed by the comment that the *Surprise's* 'singular broad beam, shallow hold, and flat bottom, have excited much speculation', since the beam of the actual hull was only half of what onlookers would have been used to in sailing coasters of the same length (*A* 15 Apr. 1831).

The wings of seagoing vessels were subject to wave damage, and 'sponsons'—bands of planking external to the hull and set at an angle—were fitted below them to deflect seas outwards. These were fitted to the *Courier* according to a Lloyd's survey (Lloyd's survey certificate, London, 19 March 1840, National Maritime Museum, Greenwich), can be seen in Rees's steamer, and were evidently required by the wall-sided *Surprise*. The vessel set off from Sydney after 'having had her paddle boxes planked up and caulked to enable her to carry sail on her intended passage to the Derwent in lieu of steam' (*SH* 9 Jan. 1832). The other approach was to flare the topsides of the hull itself to part if not the full breadth of the wings, as is implied in descriptions of the *William the Fourth* which had 'curved sponsons in place of perpendicular sides' and its paddle boxes 'flush with the vessel's sides, by which she is more secure than on the common principle, and not liable to injury in her paddles from head or following seas' (*SH* 2 May & 5 Dec. 1831).

The rudder worked in a groove without pintles. While this might have implied the provision of a knuckle joint, it is more likely that the head worked in a bearing at deck level and the weight was carried on a heel bearing,

with the forward edge of the rudder rounded to match a hollow in the stern-post and thus reduce turbulence. Such an arrangement can be seen in a nicely timed article on 'Designs for a regatta yacht, and merchant vessel' by 'Noah' in the *Mechanics' Magazine* for 29 September 1827.

The *Surprise* was 'neatly painted and gilded', no doubt black above the copper with the planksheer moulding picked out in gold.

Reconstruction of the machinery

Goldsworthy Gurney

Although a surgeon, Gurney was interested in chemistry and mechanical science, and shared the current interest of inventors in developing a steam-driven carriage that was light enough to avoid damaging the roads (Ferris 2004). Like others, he paid great attention to the boiler and the water it contained since this was a major contributor to the weight, but had to consider the other components required for a successful vehicle. When he took over the 'Regent's Park Manufactory' of American inventor and engineer Jacob Perkins in Albany Street in 1826, he had already taken out a patent for steam-driven apparatus which employed shoes working on the pavement to propel a carriage on rails or common roads since he doubted if the rolling action of the wheels would give sufficient traction in the light of his personal observation of problems experienced by Trevithick with his locomotive, and another for a boiler containing a small quantity of water compared to the surface exposed to the heat (British Patents 5170 & 5270; Harris 1975: 11). Then followed the steam carriage that employed a more compact form of the boiler but whose patent documents provide details of his engine (British Patent 5554).

The steam carriage was provided with a coach body, such as is seen in a model in the Science Museum, South Kensington, as well as contemporary engravings and the patent drawings. Gurney later favoured a 'drag', with modified steering arrangements and simpler bodywork, which instead towed trucks or carriages. Such drags were employed by Sir Charles Dance on the Cheltenham–Gloucester run for a considerable period in 1831, making four trips daily and attaining a speed of 24 miles per hour (38.6 km per hour). Technical drawings of them appeared in Alexander Gordon's *Elemental Locomotion* of 1832. Two other Gurney drags were sent to Scotland, and, astonishingly, the near-complete chassis and engine of one of these survives in the Glasgow Transport Museum at Kelvin Halls. Despite variations, both basic forms of vehicle had a two-cylinder engine mounted horizontally on the chassis with connecting rods onto cranks on the rear axle (Fletcher 1891: 97–104; West 1999, 2000; Kirby 1956: 270–3).

To put Gurney's steam-carriage into the context of current railway and locomotive development, the first steam railway, from Stockton to Darlington, had opened in 1825, and his patents pre-date the Rainhill trials of 1829 for locomotives to be used on the Liverpool–Manchester line, a competition which brought Robert Stephenson's winning *Rocket* to fame. Innovation forced by the need to

reduce weight in road vehicles led the way and Stephenson recorded in 1828 that he endeavoured to 'reduce the size and ugliness of our travelling-engines, by applying the engine either on the side of the boiler or beneath it entirely, somewhat similarly to Gurney's steam-coach' (Rolt 1978: 147; Warren 1923: 143).

The patented boiler had what Gurney called a 'separator' to take off the steam and both circulate and automatically replenish the supply of water. Because of space requirements the carriage boiler was not only more compact but had twin separators, while limitations on the height of the funnel led Gurney to provide a forced air draught, produced by means of a centrifugal air-pump driven by an auxiliary engine, to ensure that the fuel (coke) was burnt efficiently and without creating excessive smoke. The layout of the various elements of the carriage necessitated the provision of a water pump also worked by the auxiliary engine, the amount of water admitted to the boiler being continually monitored by the engineman.

As a result of the differing requirements of carriage and steamer, the engine and boiler will be discussed separately.

Engine

The most common form of early marine engine was the Boulton and Watt side-lever type, for which low-pressure steam was produced in a rectangular boiler within which large flues conducted the products of combustion from an internal firebox to the funnel. Cold sea water was sprayed through the exhaust steam in a 'jet condenser' to produce a partial vacuum and thus the required pressure differential, and the contents of the condenser were removed by an air pump. Gurney on the other hand employed a simple horizontal reciprocating engine, direct-acting, and without a condenser so that it operated entirely above atmospheric pressure, the feature leading to it being referred to as a 'high-pressure' engine.

As already noted with regard to the *Surprise*, the 'engine is one of the latest patents, by Gurney', and 'is on a novel and greatly improved construction, having tube boilers', suggesting that engine and boiler were to be considered as one patented unit. As we have also seen, the several forms of steam carriage had two cylinders, that is, two engines in the parlance of the day, working on cranks set at right angles to each other to ensure that there could never be a situation where the piston was at precisely an end-point and the engine refused to start. Like many other early steamers, including the *Sophia Jane* and *William the Fourth*, the *Surprise* was said officially to have one engine. While it is possible that there was only one 10-inch cylinder, it seems more likely that standard plant was purchased by Smith since Gurney had devised the means to reverse its motion and to avoid dead points, features of great advantage to steamers although essential for road vehicles, and mention of just one engine may be the result of misunderstanding. The drawings therefore arbitrarily show two cylinders.

In an engineering context, 'work' is said to be done when a force overcomes some resistance and there is resulting motion. Its magnitude can be expressed by the

force exerted (in pounds, say) multiplied by the distance (feet) over which it acts, while horsepower is the rate of performing this work measured in units of 33000 foot-pounds per minute (746 watts). Hedderwick commented that river boats commonly had engines of one horsepower for every two to three tons of register measurement, thus the 10 hp engine of the *Surprise* is appropriate for the vessel's total 25 tons (Hedderwick 1830: 393).

At this time, engine power was not recorded on the ship's register and even the certificate of registration issued in accordance with the *Merchant Shipping Act 1854* simply called for an 'Estimated Horse-power' rather than the result of practical testing. However, it is not clear how an estimate of horsepower was arrived at for high-pressure engines as formulae involving cylinder diameter (D inches) or stroke (S feet) can be traced back to James Watt's findings that piston speed in his low-pressure engines was $128 \sqrt[3]{S}$ feet per second and the mean cylinder pressure seven pounds per square inch. The resulting work can be expressed as $D^2 \times \sqrt[3]{S} / 47$ horsepower, with another common formula, $D^2 / 30$, assuming that the stroke was a typical 3.5 feet and that the cube root of differing strokes would result in minimal variation. Twenty low-pressure engines fitted to early Australian steamers as recorded in the 'List of Steamers' were reviewed in preparing this paper, and while most conformed roughly to the above formulae, it is apparent that their horsepower had been arrived at by the manufacturer and not re-calculated by Customs on the basis of details provided (NA BT167/54). Of the seven high-pressure engines under consideration, the reported horsepower of five with cylinders 10 to 12.5 inches in diameter was roughly three times the figure derived from Watt's assumptions, but erratic results with larger cylinders throw this approach into doubt.

The cylinders and driving shaft of Gurney's engines were mounted on three longitudinal timbers, known as 'perches' in the steam carriage, which formed the foundation of the engine. The alignment of the piston rod was maintained by the outer end being carried on a roller which ran between guide-bars bolted to the cylinder cover, and the connecting rod was formed by two heavy straps straddling the guide-bars and running between the crank bearing and inner bearings working on the axle of the roller. The stroke of the Gurney engine preserved in Glasgow is only 1 ft 5 in (433 mm), and the external diameter of the cylinders is 8 in (203 mm) so that the bore would be around 6 in (152 mm). It is thus a rather smaller engine than that fitted to the *Surprise*, although the leading dimensions, and presumably other details, were in proportion.

The 'steam box' through which the steam was admitted via passages or 'ports' to either end of the cylinder was mounted on top of it, and contained a sliding valve which in Gurney's words resembled a 'small drawer or box placed with its bottom upwards, its edges being accurately fitted to the bottom of the steam box'. Between the apertures from steam box to each passage was another leading to the exhaust port; however, the 'sliding valve extends over

so much of the bottom of the box as to cover all three openings when it is at the middle of its course.

Although unusual, this accords with the observation made during an internal inspection of valve gear and steam passages of the Glasgow engine by means of an endoscope that there is a 'transverse bar' across the face of the cavity in the valve such that the exhaust port is almost blocked off at mid-travel (West 2000). There is no longitudinal section of the main cylinders amongst the patent drawings, but there is one for the auxiliary engine in which can be seen a 'short D' slide-valve without a cross-bar. Also seen are pistons which for the main cylinder were 'packed round their circumferences with hemp in the usual manner, or else with any suitable metallic [*sic*] packings, as is practised in small high-pressure engines' (British Patent 5554).

The valve was operated by the reversing gear devised by the Messrs Carmichael of Dundee for use in twin ferry-boats on the Tay in 1818, and known to have been employed with unimportant variations by Gurney amongst others (Colburn & Clark 1871: 58). For each cylinder there was just one eccentric on the main shaft working a drive-rod. One or other of the notches in the upper and lower edges of a fitting at the end of this drive-rod worked on one of the studs projecting at each end of a double arm carried on a rocking shaft on which the lever to operate the valve was also mounted and thus carried the motion of the drive-rod through to it. Flanking the notches were open vee-shaped guides in the case of the Glasgow engine or a closed 'elliptical ring' in the patent drawing, and upon lifting or lowering both drive-rods in tandem, these engaged the other stud and slid one valve forward and the other back so as to change the direction of movement of each piston.

As explained by Gurney, to

...diminish the expenditure of steam...and to obtain as much power from the steam as can conveniently be done, the passages by which the steam enters...are closed when the pistons have moved about half way through their strokes, and consequently, when the cylinders are about half filled with dense steam from the boiler, the pistons are impelled through the remaining halves of their courses by the expansive force which the charge of steam...will exert in the act of dilating itself to occupy greater spaces.

A small 'sluice valve' fitted in a box mounted on the side of the steam boxes in the carriage drawings but on top of them in the Glasgow engine and not depicted at all in the drawings of the drag employed by Sir Charles Dance was open and admitted steam when the piston commenced its motion in either direction. It is reported following internal inspection that they too are in fact 'D' slide-valves, no doubt to reduce friction (West 2000). The valve was hauled shut by a light connecting rod activated by a cam on the main shaft, but operation of this cam requires closer attention. The rod was connected to a lever on a rocker-shaft which the patent drawing shows as having a second curved arm lifted by the rising edge of the cam and maintained in this raised position for the

desired period. It then dropped abruptly as it passed a step in the cam's profile, allowing the valve to open under the action of a leaf spring working on its stem. However, it appears that the curved arm would have buckled if the engine motion was reversed. The Glasgow drag offers no guidance in this regard as the operating gear has been damaged and lost. Nor is there any sign of the cam required for each cylinder, and it seems they were worked through the agency of a gear wheel set in a slot in the central perch.

The obvious alternative is to have a symmetrical cam rising to lift a small roller mounted on the arm, and with a plateau on it concentric with the drive shaft to keep the arm in its raised position for the required time. Such an arrangement was certainly described some twenty years later, except that rather than a fixed cutoff point at half-stroke, the roller could be shifted across a nest of cams slightly offset from each other so cutoff could be varied to optimize steam usage (Murray 1852: 19–20; Richards 1987: 13). Robert Stephenson used a different approach. In 1828 he fitted a rotary plug valve driven by bevel gears from the rear axle to cut off supply in the main steam line of his *Lancashire Witch*, making this the first locomotive that could work expansively, with the further refinement that by re-orientation of the outlets in a sleeve surrounding the valve, the cutoff point could be varied or even eliminated (Rolt 1978: 148–9; Warren 1923: 147).

Boiler

The 1825 patent specification established the basic features of Gurney's 'Apparatus for Raising or Generating Steam' (British Patent 5270). Instead of flues as in the usual boiler, he proposed that the heat be applied to the outside of tubes 'made of wrought iron welded in the manner of gun barrels or gas pipes' and of about one-inch bore. The small quantity water they contained had a large surface area exposed to the heat, with the added advantage that there was less danger in the case of accident (British Patent 5554). A further alternative, the provision of fire-tubes in the manner to be seen in locomotive boilers and the much later Scotch marine boiler was introduced in the 1840s (Sennett 1885: 5). Seaton's *Manual of Marine Engineering* still ignored the topic of water-tube boilers in the 1890 edition, but by the time of the 1913 edition the water-tube boilers of such firms as Babcock & Wilcox, Yarrow and Thornycroft were firmly established and historical interest was again focussed on Gurney's boiler (Seaton 1913: 586–8).

The boiler tubes connected cylindrical upper and lower header tanks, set horizontally, although Gurney took care to cover the option of thin curved tanks, rather like water-jackets. In the preferred arrangement the tubes were bent into a broad sweeping S-shape alternately facing each way so as to form two clear cavities within the insulated furnace casing, whereas in the carriage they were given a long U-shape to surround the fire and suit the available space. Firebars were placed on the lower sweep of the tubes, and a metal cross-plate at mid-depth of the furnace but cut short

at the far end encouraged the products of combustion to pass forwards and back past the tubes rather than escaping through the gaps between alternate pairs directly to the funnel.

The upper header tank was not completely full of water and a mixture of steam and vapour passed into the separator, a tall vertical cylinder. Any water carried over dropped to the bottom of the separator, and being cooler and denser than that in the boiler, was able to pass through a non-return valve into the lower header while the steam passed from an outlet at the top to the engine. The tanks were connected by a larger pipe at the far end, as well as the small tubes, to ensure that there was vigorous circulation of water between the tanks. There was no mention of a safety valve in the boiler specification, but one with a spring-loaded steelyard arm was shown in the steam line near the junction of the pipes leading from the twin separators of the steam carriage.

Additional feed water was introduced from a closed vessel at the top of separator. Two tubes descended from the vessel via a double cock and were opened at the same instant. One carried cold water to the bottom of the separator, and the other went as far as the desired water level so that if the open end was exposed, steam was admitted to the closed vessel to force out sufficient water to again close off the steam supply. The engine operated this double cock regularly and automatically, but the required mechanism was not shown and no attempt has been made to devise a suitable one. A further cock placed in the water supply line was opened as the others closed to allow further fresh water to gravitate into the vessel, assisted by a vacuum created by the condensation of any steam remaining in it. In both steam carriage and Glasgow drag, water added to make up that lost as steam was introduced into the boiler by force pumps as required, and while such an arrangement could have been used in the *Surprise*, the system not requiring constant attention seems preferable.

The removal of scale from the inside of the small tubes was to be effected by use of very dilute muriatic (hydrochloric) acid that was introduced into the boiler when it was cold. A small fire was set sufficient to circulate the solvent throughout the system, then the fire increased so as to build up pressure and blow out the solution and any suspended solids when a special cock in the bottom of the boiler was opened. As soon as the boiler was emptied, the fire was doused and it was refilled using a hand pump as seen in the carriage drawings.

Although Gurney made no remarks about water quality in the patent specifications, he is quoted by Elijah Galloway as recommending the use of rain or distilled water to 'avoid encrustation' (Harris 1975: 27). Rainwater could be easily taken on board the *Surprise*, operating on the Parramatta River or the Derwent, but vessels making long voyages were obliged to use sea water in the days before distilled water could be readily produced.

In the carriage, expended steam was led up the funnel to escape almost invisibly, but in the *Surprise*, as with the

Brilliant, it could be allowed to discharge through a pipe in the ship's side within the paddle box.

The *Surprise* carried four tons of coal 'in boxes', which if at say 48 cubic feet per ton would have occupied 192 cubic feet (5.4 m³) (NA BT 167/54; Murray 1852: table XII).

Engine room layout

With the length of the engine room deduced from the tonnage allowance, another factor in considering the internal layout of the hull was the location of the paddle boxes. Hedderwick considered that paddles and midship frame were ideally about 40 per cent of the waterline length back from the stem rabbet, their position in both the *Brilliant* and Rees's steamer (Hedderwick 1830: 386).

Boiler and side-lever engine were placed off-centre and side by side in Rees's steamer, and that is of course possible with the *Surprise*. However, Gurney's was a reciprocating engine working directly on the crank shaft and installed in a horizontal position. With the boiler and its funnel and steam separator central in the engine room, the obvious location for the engine is to one side with its foundation timbers supported on the paddle beams even though such a position would have interfered with a single paddle shaft. In any case, the engine as envisaged would have been 10 ft (3.05 m) long, with the drive shaft close to one end, so inevitably it must have been connected to separate paddle shafts each side by pairs of spur wheels as was also necessary in Rees's steamer. Thus the engine room would have been centred on the paddles, leaving suitable areas for cabin aft and steerage forward.

Conclusions

The obvious importance of the *Surprise* is that it was the first steam vessel to be built in Australia, and the first to proceed under steam in both New South Wales and in Tasmania. The vessel received wide press coverage during construction, from which it is clear that the hull was built locally and the machinery imported despite past speculation otherwise, and the various records suggest it conformed to usual British practice with regard to proportions and general details.

The claim of the *Surprise* to priority has been muddled by the arrival under sail of the *Sophia Jane* from London just prior to her launch. However, the *Surprise* had undergone trials and made a voyage to Parramatta before the refitting of the *Sophia Jane* as a steamer was complete, and over-enthusiastic reporting of the latter's trial trip and subsequent excursions for Governor and general public has led to continuing confusion.

Later writers have emphasised perceived shortcomings; however, some modification during early operations was inevitable in an ambitious project for which there was no local precedent. The abandonment of the Parramatta service as uneconomic in less than a year resulted rather from the impossibility of maintaining a regular timetable in the tidal shallows just short of the town. On the Derwent, the *Surprise* operated to a busy schedule with few problems for close on eleven years from 1832. Once at work, in fact, there was rarely need for advertisement or comment.

It is the machinery of the *Surprise* that is of outstanding interest and importance. Rather than employ the usual flue boiler and side-lever condensing engine, Henry Smith took advantage of a business trip to Britain to purchase lightweight plant developed by Goldsworthy Gurney for use in road vehicles. Being the subject of patents, detailed drawings and description of both Gurney's water-tube boiler and the high-pressure engine as fitted to his steam carriages are available. An actual example of his engines can also be examined.

The boiler fitted to the *Surprise* originally operated at 70 pounds per square inch (483 kPa), and while it has been suggested that leakage at the connections of tubes to headers was the reason for soon halving the pressure, the stated intention was to effect repairs that would result in diminished pressure and thus coal usage, and make the vessel's progress through the water 'more easy and rapid'. The aims were evidently achieved, and the only reported failure of tubes occurred thereafter. Gurney overcame the impossibility of physically removing scale from the inside of the tubes, as could be done inside flue boilers, by using dilute hydrochloric acid as a solvent. The success of this approach can be judged from the employment of the original boiler until 1841, when it was replaced following mismanagement that resulted in a fatal accident. The lightness, compact form, and comparatively safe operation of Gurney's water-tube boilers were features joined by the desire for higher pressures and operational flexibility in successors developed later in the nineteenth century to meet changing needs.

The two horizontal cylinders of Gurney's engines worked cranks set at right angles to each other, thus avoiding dead spots that prevented the engine from starting. Rotation could be reversed using Carmichael's pioneering reversing-gear, involving one eccentric for each cylinder and a single operating lever. Further, there was a cam-operated valve that cut off the steam supply at half-stroke to allow that already admitted to the cylinder to work expansively with resultant economy in usage, one factor leading to the claim that for its power the boiler consumed half the usual amount of fuel.

Innovation forced on those interested in developing steam carriages by the need to reduce weight influenced locomotive design, and it might be noted that Gurney patented his boiler the year the first steam railway opened, and use of steam expansively in his engines pre-dates Stephenson's application of it to locomotives.

Acknowledgements

Thanks must go to the late Ian Hawkins Nicholson, descendant of a part-owner, for arousing my interest in the *Surprise* and giving me his copy of the *Dog Watch* article. Through Dr Alan Platt of Saline, Fifeshire, who has provided assistance over the years, Peter McOwat of Glasgow brought the Scottish drag to my attention, provided some first photographs, and both facilitated my later inspection of it and kindly obtained copies of relevant patent specifications.

References

- Anon., 1961, *A Surprise* for Sydney (Extracts from family letters written by Henry Gilbert Smith and Thomas Smith from Sydney, 1827 to 1835...). *Dog Watch*, 21: 119–126.
- British Patent No. 5170, G. Gurney, Apparatus for propelling carriages on common roads or railways, 14 May 1825. [Steam carriage propelled by legs.]
- British Patent No. 5270, G. Gurney, Certain improvements in the apparatus for generating and raising steam, 21 October 1825. [Boiler]
- British Patent No. 5554, G. Gurney, Certain improvements of locomotive engines, and the apparatus connected therewith, 11 October 1827. [Steam carriage]
- Carbonell, B., 1931, Letter quoting the diary of the Rev. Rouse, *The Times*, London, 31 Jan.
- Colburn, Z. and Clark, D.K., 1871, *Locomotive engineering*. William Collins, London.
- Cox and Co.'s *Sydney Post Office Directory*, 1857. Second year of publication, Sydney.
- Directory*, 1832. *The New South Wales Calendar, and General Post Office Directory*, 1832. Sydney. Reprinted by the Public Library of NSW, 1966.
- Ferris, F.J., 2004, (Heritage Group of the Chartered Institution of Building Services Engineers), Sir Goldsworthy Gurney, "the forgotten Cornish engineer", 1793–1875. Web page of the CIBSE.
- Fincham, J., 1851, *A history of naval architecture*. Reprinted by Scolar Press, London, 1979.
- Fletcher, W., 1891, *The history and development of steam locomotion on common roads*. E. & F.N. Spon, London.
- Fox, T.W., 1964, *They reigned supreme*. Hobart.
- Gardiner, L., 1967, *Australian dictionary of biography*, vol. 2. Carlton. Entry for A. Thomson.
- Gordon, A., 1832, *Elemental locomotion*. London.
- Harris, T.R., 1975, *Sir Goldsworthy Gurney 1793–1875*. Trevithick Society Occasional Publication No. 2, Truro.
- Hedderwick, P., 1830, *A treatise on marine architecture*. Edinburgh.
- Kirby, R.S., et al., 1956, *Engineering in history*. McGraw-Hill, New York.
- Murray, R., 1852, *Rudimentary treatise on marine engines and steam vessels*. John Weale, London.
- 'Noah', 1827, Designs for a regatta yacht, and merchant vessel. *Mechanics' Magazine*, 29 September.
- O'May, H., n.d., *Hobart river craft*. Government Printer, Tasmania, Hobart.
- Parsons, R.H., 1967, *Paddle steamers of Australasia*. Lobethal.
- Pike, A.F., 1967, *Australian dictionary of biography*, vol. 2. Carlton. Entry for H.G. Smith.
- Portus, A.B., 1904, Early Australian steamers: period 1831–1856. *Royal Australian Historical Society, Journal and Proceedings* 2: 178–226.
- Rees, A., 1819–20, *The cyclopædia; or, universal dictionary of arts, sciences, and literature*. Longman et al., London. Article on 'Steam-Engine', vol. 34 (text) & vol. IV (plates).
- Richards, M.P., 1987, *Workhorses in Australian waters*. Turton & Armstrong, Wairoonga.
- Rolt, L.T.C., 1978, *George and Robert Stephenson: The railway revolution*. Pelican, Harmondsworth.
- Seaton, A.E., 1890 and 1913, *Manual of marine engineering*. Charles Griffin & Co., London, 9th & 17th editions.
- Sennett, R., 1885, *The marine steam engine*. Longman's, Green & Co., 2nd edition, London.
- Smith, 1830, Letter to Sir G. Murray dated 29 April. *Historical Records of Australia*, Series I, 15: 462–3.

- The National Archives of England and Wales, 1838–1850, List of steam vessels 1838–1850, NA BT167/54.
- Warren, J.G.H., 1923, *A century of locomotive building by Robert Stephenson & Co., 1823–1923*. Andrew Reid & Co., Newcastle-on-Tyne.
- West, D., 1999, Goldsworthy Gurney and the steam drag. *The Steam Car. The Journal of the Steam Car Club of Great Britain*, No. 2.
- West, D., 2000, Gurney Drag Update II. *The Steam Car* (The Journal of the Steam Car Club of Great Britain), No. 7.
- 6 Geo. IV, c. 110 [5 July 1825], An Act for the registering of *British Vessels*, clause XIX.

Neolithic and Early Bronze Age reed boats and watercraft from Mesopotamia and the Persian Gulf: An overview

Nicolas Bigourdan

c/o Wessex Archaeology, Portway House, Old Sarum Park, Salisbury, WILTSHIRE, SP4 6EB, United Kingdom

Email: n.bigourdan@wessexarch.co.uk



Figure 1. Map of the study area (after Potts 1994).

Introduction and background

This paper is partly based on a research topic from a thesis conducted by the author as part of the requirement for the fulfillment of an Honours Degree in Archaeology (Bigourdan 2003) and submitted at the Université Paris 1 Panthéon-Sorbonne in 2003 (Paris, France). The focus of the original study was the naval architecture of boats and watercraft from Mesopotamia and the Persian Gulf (see Fig. 1) from 5000 BC to CE.

Etymologically, Mesopotamia means in ancient Greek: ‘the country between two rivers’, which in this case is the Tigris and the Euphrates. These take their source in the Taurus and Zagros mountain chains before merging with the Persian Gulf waters. Both rivers are considered difficult to navigate on their upper part because of frequent and sudden floods, rocky rapids, and high-energy sand-banks. However, in their lower section, they traverse a vast plain where they drop only 4 and 8 cm over the last 300 km. In addition, combined with the annual inundation these have created extensive marshes where reeds grow abundantly. On the other side the Persian Gulf is affected by large seasonal variations due to several climatic factors (wind, elevated temperatures and small precipitation), which makes navigation on this body of water unpredictable, restricting travel to coastal areas, or during favourable weather periods.

These two elements, (axes of communication and exchanges) have played a central role in the development of one of the first and oldest civilizations. Therefore, riverine and marine transportation (and its associated naval architecture) became an essential tool for the expansion of an active commercial network. The sixth and fifth millennium BC saw the birth of an economic organization to support a constantly growing community, for which durability relied on mastering cultivated lands and controlling irrigation (McGrail 2001). During the

fourth and third millennium independent city-states appeared (such as Eridu, Uruk, Nippur, Kish, Ur and Lagash) administered by a central power. At this time, they were also expanding their long distance exchanges to Anatolia, the Iranian plateau, the Persian Gulf and beyond. Indeed, cuneiform tablets mentioning trading relationships with regions such as Dilmun, Magan and Meluhha have now been identified as the areas between Failaka Island and the Qatar Peninsula, the present day Oman, and the Indus Valley respectively.

Within this region our understanding of ancient naval traditions and architecture does not rely solely on the analysis of primary physical evidence, but essentially on iconographical representations such as cylinder seals, reliefs and models. The reason for such paucity of preservation and conservation of direct evidence is due to the highly perishable nature of the construction materials used in watercraft building (wood and reed) and to the strongly arid conditions of the region. However, exceptions exist and these have materialized in the form of bitumen slabs which showed imprints of reeds on one side and shells on the other (Cleuziou & Tosi 1994; Carter 2003). Additionally, among previous classifications of known Mesopotamian/Persian Gulf watercraft/boat representations (Qualls 1981; De Graeve 1983) it appears clear that three major watercraft types would have been in use, namely: floating buoyed skins, reed watercraft and wooden boats. Even if this material differentiation does not initially imply a chronological evolution of the typology, it suggests potentially an architectural development based on principles such as need (to travel further away) and adaptation (to local constraints).

Hence according to these considerations, reed watercraft seem more suitable to assist in the clarification and improvement of the current knowledge concerning their varieties, characteristics, functionalities and construction. So this study aims specifically to gather previous and more recent information, data and evidence from various studies about early Mesopotamian and Persian Gulf reed watercraft in order to combine and correlate sources with the aim of drawing a picture of the shape, design, making and use of this ancient watercraft as precisely as possible.

Artefactual evidence

Most of the iconographical representations of reed watercraft which have been recovered from excavations of ancient Mesopotamian and Persian Gulf archaeological sites have been catalogued by either Qualls (1981) or DeGraeve (1983), gathering over 500 examples of seals, reliefs or models. Both corpuses relied on the work of



Figure 2. Green jasper cylinder-seal and its imprint (after Amiet 1973).

Frankfort (1939), Porada (1948) and Amiet (1961), providing not only detailed descriptions and classifications but also simple interpretation and basic analyses for each representation. However, for the purpose of this study attention will focus on the review of relevant and representative samples of these representations.

Pictographical examples of a feature only allow a certain level of interpretation and retrieval of information depending on the presence or absence of certain details. This situation is even more accentuated by the highly stylized nature of the representations in the size of the material resource, as is the case for cylinder-seals and their imprints. In this regard, reliefs provide greater support permitting a finer elucidation of details.

On another level, boat models, regardless of their primary use (toy, funerary recipient, etc.) would tend to suggest a greater resemblance with reality because of their three-dimensional property. Nevertheless, within the frame of this study, the use of clay to shape models did not provide enough structural dispositions to allow great detail at the time. Finally, imprinted bitumen slabs (fragments of pure bitumen with reed impressions) are the only remains available that do not require graphic interpretation. Their simple existence corroborates the hypothesis about the use and building tradition of reed watercraft and boats in ancient Mesopotamia and the Persian Gulf, and are the reason why this watercraft category deserves closer attention in order to comprehend its characteristics.

Cylinder-seals

Cylinder-seals appeared for the first time during the Uruk period (4100–3300 BC) in Mesopotamia. The cylinder-seal (see Fig. 2) is an engraved small cylinder carved out of hard stone, ceramic or glass, which holds a picture story and which was used to roll an impression onto a two-dimensional surface, generally wet clay, and functioned to identify its owner. It was a personal object, used primarily for administrative purposes to seal jars, doors, clay balls containing descriptions of exchanged goods, and later during the third dynasty of Ur (2200–2000 BC) to authenticate official documents. Occasionally, they were also used as amulets with attached magical characteristics, and were found in funerary contexts as grave goods.

Only a few cylinder-seals have been identified representing the outline of a watercraft built with reeds. A brief description of a selection can give an insight

into the content of the existing corpus. An example of a dark brown chalcedonic cylinder-seal (De Graeve 1983, N°32) that has been dated from the Middle Assyrian period (1600–1000 BC) shows the contours of a boat. This was later described as ‘very slender in shape and characterized by oblique lines’ (De Graeve 1983: 92) while possessing a high bent forward prow with a stern turned vertically. Comparatively earlier instances allowed a categorization to be secured within the reed craft boat class (De Graeve 1983).

An undated cylinder-seal has been found at the Tell Asmar (Eshunna, Mesopotamia) archaeological site (Frankfort 1955, N°621) that shows a mythical feature at the prow steering the watercraft with a long, fork-ended pole. Both the prow and the stern are turning upright at 90°, leaving the base completely flat with oblique lines. The boat itself is marked by several parallel lines, sectioned by vertical lines, suggesting the lashing of reed bundles. The boat depicted on the surface of the cylinder-seal N°1496 from Amiet (1961) also suggests a mythical scene. The display shows a very high, upturned prow and stern as well, together with oblique stripes along the side, also evoking a watercraft built using reeds.

Two cylinder-seal impressions on a clay fragment found in Susa and dating from the Proto-Elamite period (3200–2700 BC) both similarly show the outlines of a reed craft boat. Qualls (1981: 224) describes them (N°388 and N°389) as follows:

A boat which has sides of medium height and low ends is paddled toward the left...the low ends of the boat project only slightly above the shallow curve of the body before terminating in triangular form bulges. The body is marked by a pair of raised vertical lines in its center and by a pair of lines towards the left end; the latter pair consists of one vertical and one diagonal line. A second pair may be found in the same position on the right end. The top of the side is marked by two parallel lines.

Once again the visual materialization of a reed frame is depicted by this association of vertical and horizontal parallel lines to indicate reed bundles and tied lashings.

Bas-reliefs

This sculptural artwork can be identified as modelled compositions being raised or projected from a flat background without being disconnected from it (see Fig. 3). They were, (in some locations when they survived), and are still seen on many palace walls throughout ancient Mesopotamia or present day Iraq. Despite the use of standard figures by the stonemasons in Mesopotamia, there is a particularly remarkable sense of detail and a general coherence in the scene’s composition of most of their bas-reliefs (De Graeve 1981). This decorative component of monumental buildings contains a vast variety of scenes among which are some marine/riverine compositions.

De Graeve (1981) suggested that within her corpus, 9 bas-reliefs (n° 51, 52, 60, 61, 62, 63, 64, 65 & 66) could be interpreted as depicting scenes with reed watercraft or boats of various size, according to its owner (soldier or



Figure 3. Bas-relief from the North Palace of Kuyunjik (Photo: N. Bigourdan).

native). All of them were carved in the region of Nineveh and more specifically from the facades of the Kuyunjik palace, and date to the reign of either Sennacherib (705–681 BC) or Ashurbanipal (669–626 BC). The fine degree of detail offers no possible interrogation on the type of boat depiction, clearly evoking military scenes (battles, conquest of tribes, conquest of cities, attack of cities and deportation of dwellers, etc.) which all took place in the marshes south of Babylon. They all bear a flat bottom surface with more or less high upturned prows and sterns. Along the length of the watercraft parallel lines are running from one end to the other (showing reed bundles), being truncated by bands of 2–3 vertical lines describing the lashings. Three bas-relief slabs (n° 61, 62 & 64) demonstrate several methods for manoeuvring these watercraft, either by pushing with a long punting pole or by towing it with long ropes from the river-bank in order to navigate up the stream. In contrast, n° 66 provides an example of an oarsman placed at the prow for rowing.

Boat models

The case of boat models (see Fig. 4) is more complex, and at first sight there is less information and detail compared to cylinder-seals or bas-reliefs. Their discoveries (Wooley 1934; Strasser 1996; Carter 2006) have been

made throughout a geographically wide range of sites (including those where at least five models have been found: Ur, Tello, Nippur, Susa, Diqdiqqah, Kish and Uruk) and have been dated from the early stage of the Mesopotamian chronology (Ubaid, Proto-Literate and Early Dynastic periods, 5000–2334 BC). Moreover, their exact use and purpose has yet to be clarified. The catalogue of representations created by De Graeve (1983) has gathered over 100 examples, of which the majority were affiliated to a funerary context e.g. graves from the Royal Cemetery of Ur. But their interpretive nature (Strasser 1996) is controversial and probably further related to the intrinsic characteristics of their constitutive materials. There are four components (clay, bitumen, silver and copper) more commonly used for these boat models, of which clay appears to have been the preferred medium. However, clay has proved not to be the best medium, as its internal properties do not allow fine details to be represented. It contributes to an overall bulky, outward aspect and consequently a lack of technical trait often associated with a rather fragmental structure, giving a restricted impression for their analysis.

Within this context the particularities of reed watercraft and boats are seldom distinguished on the surface of boat models. The content of both major

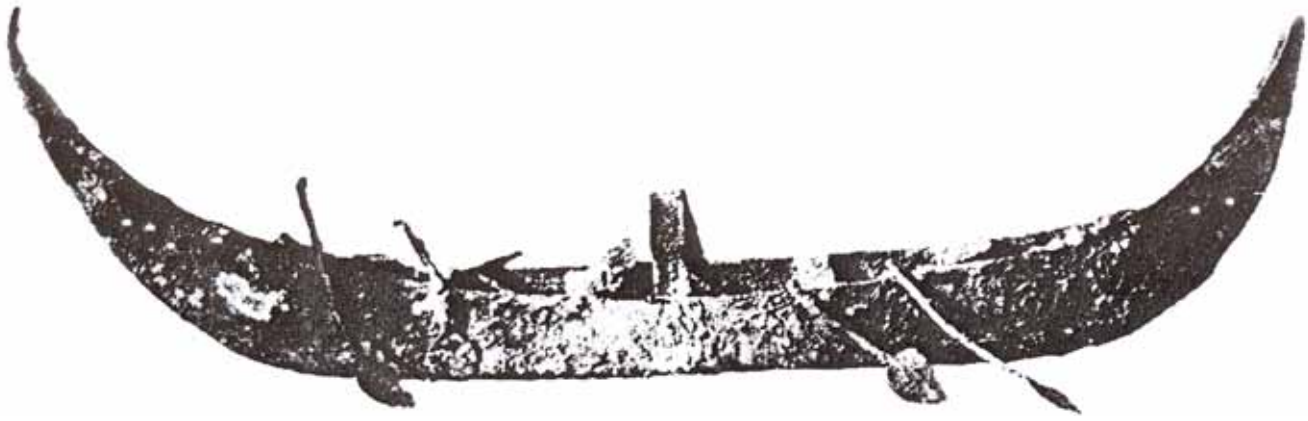


Figure 4. Silver model boat from Ur (Woolley 1934).

corpuses mentioned earlier seems to contain only two model fragments identified as possibly reed watercraft or boats (from Tell Abu Sharain and Tepe Djowi) and are of unknown period. Both 'bear painted markings which seem to reflect the [similar] vertical markings on the cylinder seal representations' (Qualls 1981) such as the Tell Mashnaqa clay boat model (Akkermans & Schwartz 2003). More specifically the Tell Abu Sharain example displays vertical lines along the upper section of the sides that according to Qualls (1981) may represent bundles of reed composing the watercraft's structures.

Recently in Kuwait, at As-Sabiyah H3 site, a clay boat model made from a coarse Arabian Gulf ceramic ware was discovered. Its particularity lies in raised prow and stern and parallel light incisions along the external sides (Carter 2003) suggesting schematic as well as detailed interpretive elements for the indication of reed bundle representations.

Bitumen fragments

The assemblage of previously mentioned pictorial evidence which provided the first understanding of reed watercraft and boat design, shape and building has been greatly enhanced during the last 20 years by the discovery of boat remains comprised of impressed bitumen slabs located in Turkey, Kuwait and Oman. These artefacts are 'fragments of the waterproof coating used to cover a reed bundle hull' (Carter 2006: 55). At these three locations, none of the slabs found contained pure bitumen, but preference was often given to a mixture containing organic material (crushed reeds) in order to lighten the bitumen's density, and a combination of asphalt, tallow, bituminous rock and gypsum to 'increase the plasticity and adherence when applied, as well as elasticity against humidity and thermoclastic stress' (Cleuziou & Tosi 1994: 754). However, through the experience of experimental archaeology with the rebuilding of reed boats using ancient techniques, Vosmer (2001, 2003) observed that while the addition of such materials to pure bitumen seemed to have enhanced its capacities, natural bitumen from Iraq already contained most of these properties and required almost no additives

to improve its performance beyond that of artificially altered bitumen.

The earliest examples of this category of artefact were found in Kuwait on the site H3 at As-Sabiyah which is located along the side of a former sheltered bay. This material dating from the Ubaid period (5300–4900 BC), has been geochemically analyzed and according to its isotopic signature seems to be locally sourced from Burgan (Connan *et al.* 2005), an inland oil field located 70 km to the south (Carter 2006). This place is known historically for its surface bitumen (Lorimer 1908; Dickson 1956; Carter 2006) and its important flint source (Carter & Crawford 2003; Carter 2006). The polygonal shape of the slabs range in size from 5 to 8 cm across and 1 to 3 cm thick, and among the 51 pieces discovered 35% (18) show parallel impressions of reeds on one side and the presence of barnacle on the opposite (potentially external) face (Carter 2006).

The second oldest collection of impressed bitumen has been found in Turkey on the site of Hacinebi Tepe. These pieces, of which the largest fragment measures approximately 20 cm across and weighs 0.66 kg, have been dated to 3800 BC by stratigraphically associated C_{14} samples (Schwartz 2002). Technical studies demonstrated that during the 4th millennium access to common reeds (Brown 1979) and various bitumen sources (Schwartz *et al.* 1999; Lebkucner 1969) were available close to Hacinebi Tepe. These artefacts also bear reed and rope impressions on their surface suggesting the negative imprint of reed bundles tied together with ropes being 'similar to archaeological and ethnographical patterns of reed boats and unlike the impressions of waterproofed basketry and reed mats that also appear at Hacinebi' (Schwartz 2002).

During ten years of excavation (1985–1994) the Omani archaeological site of Ra's al-Jinz has yielded approximately 300 bitumen slabs and fragments among which impressed artefacts were found (Fig. 5). The latter are on average smaller, weighing from 70 to 800 g and can be separated into two categories: slabs and three-sided pieces (Cleuziou & Tosi 1994). The first examples are square in shape, 1 to 4 cm thick, and no more than 25 cm long. These show deep impressions of either mats or lashed reed bundles on



Figure 5. Fragment of impressed bitumen (after Cleuziou 1994).

one side while the other face appears smooth (Cleuziou & Tosi 1994). The second examples are reduced in size, bear knot impressions, have two faces with the negative imprints of reed bundles and have been identified as ‘lumps of bitumen pushed between corner sections of bends in the bundle setting...might be associated with the strengthening of the keel in critical parts’ (Cleuziou & Tosi 1994: 750). On the non-reed impressed face, variable densities of barnacles remain and imprints appear to be visible on 20% of the relevant conserved material, suggesting long-term contact with sea water (Cleuziou & Tosi 1994). Finally, an isotopic analysis has traced the source of the Ra’s al-Jinz bitumen fragments to a northern Mesopotamian provenance (Connan *et al.* 2005).

Alternative evidence

Clay tablets were the means used to materially record cuneiform (Akkadian, Sumerian) texts. The translations of these texts provided numerous administrative and organizational data for various periods and have been considered as highly valuable sources for direct evidence. For instance, in naval contexts, Mesopotamian texts give the opportunity to expand knowledge on early watercraft (Pedersen 2003). The written literary proclamation from Sargon of Agade (second half of the 3rd millennium BC), acknowledges the contemporary existence of long distance voyages (Johnstone 1980) by the fact that: ‘Ships from Meluhha, Magan and Dilmun made fast at the dock of Akkad’ (Sargon 2b). Even during the 1st century AD, Strabo, described twice in *Geographikon* (16.1.9, 16.1.15) the particularities and contemporary existence of elongated Mesopotamian bitumen-coated, reed bundle boats (Cleuziou & Tosi 1994; McGrail 2001), and Pliny the Elder quoting Eratosthenes, mentioned rigging reed vessels with the capability to connect the Ganges to Ceylon in twenty days (Johnstone 1980; Cleuziou & Tosi 1994).

However, maritime related cuneiform texts listing the boats’ parts or materials used have potentially suffered from mistranslations (e.g. Salonen 1939) when using modern Iraqi boat building terminology for interpretation (Pedersen 2003). Nevertheless, textual information gives an idea of the size of naval-related goods needed.

For instance, an Ur III administrative text from Girsu (Heimpel 1987), CT 7-31, details a list of materials connected to boat building, and mentions specifically Magan boats (which is currently accepted to refer to present day Oman). The very large quantities listed (4260 bundles of *sid* reeds; 12384 bundles of reed; and 951 cubic metres of asphalt for coating of boats) implies that this material may have been gathered for the making and repair of numerous wooden and/or reed watercraft and boats (Cleuziou & Tosi 1994) of up to 300 *gur* loading capacity as attested in Ur III records (Potts 1996).

Being used for a wide array of purposes, textual references to bitumen use and transportation may also be useful. For example, an Ur III economic text mentions the *mar-sa*, a widespread and particular institution in charge of bitumen trade among other things (shipbuilding and navigation) (Cleuziou & Tosi 1994). Additionally, the re-use of bitumen has been attested to in an Ur III cuneiform text (WMAH 3, RVI 25) which quotes ‘900 kg of bitumen recuperated [literally ‘stripped’] from a boat’ (Petrequin 1989: 34, Cleuziou & Tosi 1994).

During the 1970s, at the conception of middle range theory, Lewis Binford established a tool linking arguments from the present state to a past dynamic. Admittedly, archaeological interpretation is based upon and ‘ultimately depends on analogy’ (David & Kramer 2001: 1), meaning that it uses data in one context to explain data in another context. In practical terms, McGrail (1984: 149–150) stated that while

...using ethnographic analogies...the archaeologist can... propose reconstruction of incomplete objects or structures, suggest the possible function of enigmatic structural elements and describe in some details how an object or a structure was made.

Such analysis and interpretation, however, requires caution regarding data description, variables determination and assumptions (Blue 2003). Hence, because the topic under study may be considered poor in terms of artefactual evidence, ethno-historical and ethno-archaeological perspectives might enlighten the subject, and establish a degree of correlation between indications throughout time, as well as help for the confirmation of primary assumptions. However, caution has to be taken because ‘traditional technologies which appear changeless, are often far more dynamic than the average observer might suspect’ (Potts 1996: 136). For this reason only general assumed similarities can be taken into consideration.

Layard (1853) and Chesney (1868) made observations along the bank of the Euphrates, and within the southern Iraqi marshes, recording the sight of ‘boat-shaped crafts which had a hull of rushes or reeds and straw consolidated by an internal wooden framework and waterproofed by hot bitumen producing an external surface’ (McGrail 2002). This statement may demonstrate the existence of a long-lasting technological tradition; and, may support archaeologically suggested principles, namely the extensive use of reed as main constituent for watercraft and the external application of bitumen as a waterproof

agent. This simple, general, but complete observation may suggest a potential link to the construction of reed watercraft and boats through time.

More recently, in his book *The Marsh Arabs*, Thesiger (1964) gives a detailed ethnographical account of the way of life, the traditions, material culture and knowledge of tribes adapted to an almost entirely liquid environment. On a branch of the Euphrates he witnessed the presence of a *zaima*—a watercraft almost analogous to the one previously seen a century before by Layard and Chesney. Its construction involved the amalgamation and lashing together of prepared bundles of reed to be shaped into a boat, before the application of bitumen coating to the whole exterior of the hull. This simply-described building process seems equivalent to previous deductions from the catalogue of evidence. Alternatively, Thesiger found that according to the *zaima*'s owner this type of watercraft would not last more than a year, and that their use, (now obsolete because of its replacement by wooden boats), coincides with a time 'when communications were precarious and wood difficult to obtain' (Thesiger 1964: 128).

The ethno-archaeological work undertaken at al-Hiba (southern Iraq) by Ochsenschlager (1992) aimed at providing direction and suggestions regarding part of the archaeological data previously gathered during the 1970s excavations at Tell al-Hiba. He showed the traditional technological processes and various multiple uses of bitumen. Even if most of the boats under consideration were shaped from wood, the technical record of bitumen application to boats might equally be relevant for reed craft. Hence, apart from the double layer needed and the long drying period, it appears that bitumen seems to have been repeatedly re-used and stripped from discarded boats. This process coincides completely with the textual references mentioned above. But perhaps the most valuable information (which does not have any archaeological equivalent) is the description of the 'semi-carnival atmosphere' (Ochsenschlager 1992: 52). It takes place during the bitumen bearing, and has also been accounted as an important moment of distribution, as 'an opportunity to strengthen friendships and secure positions in the community' (Schwartz & Hollander 2001: 85).

Evolution and adaptation

The development of knowledge and techniques for the control of transportation and resources of each body of water during the Holocene followed a pattern of population shifting and development of resource consumption, from hunter-gatherer status to the exploitation of coastal and marine subsistence which was providing almost as many resources as agriculture (Tosi 1986). Hence, apart from technological modification during the Paleolithic period, it seems that

...the progressively increasing body of accumulated knowledge allowed the technological load to be stored in men, before it was in objects, and so this change shows up as barely visible in the archaeological record...but it precedes the emergence of urban and statal societies (Tosi 1986: 95).

This situation can be illustrated by the sporadic nature of direct archaeological indications, and may explain the fast progression of navigational and boat building skills during the fourth and third millennium BC, which has been based on pre-existing knowledge among riverine and coastal societies (Tosi 1986). Perhaps the most significant and durable trend has been for the establishment of water transportation that met the need for buoyancy (river crossing) before evolving towards the creation of watercraft (Casson 1994) for longer distance ventures and consequently trade. The overseas trade (through the Persian Gulf) was driven from the early third millennium BC by the city states through the expansion of their need for material resources, such as timber, stone and metal, to build monumental palaces. This situation rapidly impacted on the development and evolution of watercraft into boats (McGrail 2002), which is suggested by the pre-existing maritime contact illustrated by the widespread distribution of Ubaid pottery around the Persian Gulf (McGrail 2002; Carter 2006).

As a general principle, it is necessary to understand naval architecture as a mean by which adaptation and evolution occur according to constraints and parameters dictated by the natural environment, geography, climate, history and culture. The technological evolution of floating devices as transportation tools during the Neolithic and Early Bronze Age periods in the Mesopotamian and Persian Gulf region followed increasingly specified needs, without any apparent or definitive chronological changes between watercraft and boats' major categories. More practically, it appears clearer at present that within this technological evolution process, reed watercraft or boats can be located in the development scale half way between buoy or pot craft and wooden boats. However, the emergence of different types did not inevitably precede the disappearance of a tradition, as confirmed by the presence of buoyed inflated skins on the wall of Ashunasirpal II palace during the first millennium BC. For example, McGrail (2002: 59) asserts that 'by the late third millennium BC wooden boats were in use on the rivers and canals of Mesopotamia'. The progression from the use of one material to another does not seem to have been linear from reed to wood but rather simultaneous as technologies and material became available (T. Vosmer, 2009, pers. comm., 6 Sept.).

As Adams (2001: 303) stated, the characteristics of an environment 'exert powerful practical and mechanical constraints on the possible ways in which a vessel can be constructed'. Therefore, according to circumstances, adaptive responses can change according to a set of references mediating the relationship between culture and nature (Coomes 1992). This principle relates to the degree of adaptability of an artefact to its function and purpose. In this case, watercraft from the early periods of Mesopotamian development have been adapted to riverine and maritime transportation by design choices and material necessities.

Reeds have been, and still are, heavily abundant along the course of the Euphrates as well as the Tigris (especially

within the southern Marshes areas), and around the Persian Gulf. Due to the scarcity of wood in the region, this primary resource probably became the first preference for the constitution and building of watercraft, instead of using mere floating hides as a device which would not permit long distance ventures of cargo (Casson 1994). This point suggests a rather simplistic technical reaction, by adapting an obvious and necessary need to access local resources. In this context, the bitumen slabs from As-Sabiyah (Kuwait), where reed imprints have been observed on their internal side, support the use of reed as an early adaptive response to environmental determinism in the same way that the usage of bitumen as a waterproofing agent by boat builders is proof of a perfect adaptation process to 'overcome one of the chief defects of the reed craft, the short-lived nature of its buoyancy' (Johnstone 1980: 10).

By looking at cylinder-seals, boat models, and some of the bas-relief depictions, the most observable reed watercraft or boat profile representations display an elongated U-shape and high (almost vertical) upturned ends. This particularity might originate from the Sumerian literary composition *Nanna-Suen's Journey to Nippur*, where men were sent by the moon deity to collect material for her Magur boat (Ferrara 1973) which 'was said to resemble the moon in its crescent phase when seen above the night skies of Iraq' (Potts 1996: 123). However, there may be a more practical and pragmatic reason for this specific adaptive character. Indeed, McGrail (2001) proposes that this characteristic arose from the compelling aspect for both a sense of communication (down to the sea or upstream) and a necessity for crossing reed beds of the delta region, where river mouths and sea dispersed into a liminal zone of interrelation, merging two water bodies into a third one.

Interpretation and discussion

It is generally agreed that 'in an archaeological perspective, the understanding of cultural and technological evolution depends on material remains' (Cleuziou & Tosi 1994: 745). Hence contextually, maritime societies are mostly artefacts related to their available type of water transportation. The theoretical understanding of Persian Gulf and Mesopotamian reed watercraft or boats has suffered from a lack of direct evidence, relying extensively on figurative representations (Qualls 1981; De Graeve 1983) until the discovery of reed impressed bitumen slabs recovered from Oman, Kuwait and Turkey (Cleuziou & Tosi 1994; Carter 2003; Schwartz 2002). Although some seals or reliefs are usually lacking precise and definite details (Pedersen 2003), the stylized aspect of reed boats can be easily recognized by the presence or absence of parallel striations. But the representation of bundles and the associated lashing has created an unequivocal degree of recognition for the structural entity of reed watercraft or boats (Potts 1996). Accordingly, Cleuziou and Tosi (1994) have been able to place, and consequently classify, bitumen-coated vessels within McGrail's water transport typology as a type C-12 which is described as

a 'skeleton built with water proofing envelope made by transformation' (1985: 298).

In general, and regardless of the limited information they contained, all types of evidence corroborate the contours of the earliest type of reed watercraft or boats as being an elongated hollowed shape with upright bow and stern, formed of a hull composed of a series of reed bundles firmly tied together and covered externally by a smooth bitumen coating. From this brief description and from her analysis of cylinder-seals and bas-reliefs, De Graeve (1983) suggested the existence of four other categories. The first is a simple, small raft with only one up-curving end; the second can be compared to 'the shape of a mattress' (De Graeve 1983: 90); the third is the most common, and more frequently represented, with both ends upright; and, finally, the last category has been represented as being 'very slender in shape and is characterized by oblique lines' (De Graeve 183: 92). Although, this classified identification is based on theoretical observations, some categories are actually concordant with some of the watercraft photographed by Thesiger (1964) in the southern Iraq marshes. However, like the extract from the Sargon of Akkad's text, design differences were dependant more on provenience than on shape. But, along this line of reflection, Potts (1996) proposed another alternative that categorized boats during the Ur III period by their size (volumetric capacity) more than by their appearance or origin.

Carter (2006: 53) reminds us that Tom Vosmer's recent 'reconstruction of a Bronze Age vessel shows bundle shapes, even after coating with bitumen'. This aspect of such an experimental archaeology project puts in perspective the appearance of striation details in the iconographical depictions by suggesting a more precise level of details being represented, and a closer similarity between the reality and its representation. Subsequently, the mention of bitumen usages (application, re-use, and repair) and quantities (amount gathered) in ancient textual references allowed Potts (1996) to extrapolate various sizes of boats by calculation. Bitumen has been an extensive primary source (from the ground, in lakes or from outcrops) for waterproofing and adhesive purposes all across the ancient Near East from Turkey to the Indus Valley and from Egypt to Mesopotamia (Schwartz & Hollander 2001). The spatial distribution of the impressed bitumen slabs seems to indicate the extremities and central point of a fluvial/maritime long-distance trading network, which certainly started to take place between the sixth and third millennium BC and demonstrates the widespread use of this technology.

Although, the distance coverage of coated reed bundle craft boats from Mesopotamia is difficult to assert at this stage (Cleuziou & Tosi 1994), the widespread use of these watercraft along the Arabian coast would have been conspicuous (Johnstone 1980). However, the association of evidence (Al-Ubaid pottery found in Saudi Arabia, Bahrain and Qatar) for early (sixth and fifth millennium BC) interaction linking the southern part of Mesopotamia and the Persian Gulf (Burkholder 1972; Golding 1974;

Masry 1974; Oates *et al.* 1977) with direct indications for the presence of elaborated reed water transportation at the archaeological site H3 at As-Sabiyah (Kuwait), strengthen the possibility of a real, complex and ancient maritime exchange relationship in this region (Carter 2006). The antiquity of this long-distance trade is further confirmed by the boat remains from Hacinebi Tepe, because 'the presence of boats and the lack of fishing equipment at the site adds further weight to the argument that the people of Hacinebi were developing long distance exchange relationships of their own before the arrival of Mesopotamians to the site' (Schwartz 2002).

Conclusion and perspective

By accepting the emergence of the basic navigational skills during the Mid-Holocene, and the fairly minimal nature of advancement in water transportation safety, it seems apparent that the true technological process which enabled the development of high risk, long-distance maritime voyages parallels the social progression of cities and states in and around Mesopotamia, India, Iran and Arabia (Cleuziou 1994).

This study has attempted to assemble and correlate the interpretation of various types of indications concerning the constitutive characteristics of Neolithic and Early Bronze Age reed watercraft and boats from Mesopotamia and the Persian Gulf. Where possible, it has been shown that combining and interrelating sources of various nature, and providing different types of information, is an efficient and useful tool to use for archaeological analysis, one that provides a relative confirmation of preceding presumptions. In the topic under study, it was observed that material evidence provided insights into the technology employed, whereas the iconographical evidence supplied a stylized visual perspective. Additionally, the ethnographical comparison proposed and confirmed the nature of usage.

Limitations have been put on this study, but further avenues of research should be exploited, such as the topic of sailing, which has been previously regarded through the controversial nature of the clay model from Eridu (Cleuziou & Tosi 1994; McGrail 2002), or the more recent discovery of a two-masted boat painted on the face of a clay disc (Carter 2003). Johnstone (1980) suggested that

...by examining the representations of watercraft on stamp seals from Bahrain and Failaka in the Gulf, it would be possible to gain at least a partial understanding of the sorts of ships which must have sailed between Mesopotamia and the Indus valley in the late third and early second millennium BC (Johnstone, cited in Potts 1996: 134).

Additionally, the future launching of a traditionally reconstructed, reed bundle bitumen-coated boat in Oman by Tom Vosmer would provide an unquestionably relevant set of direct data, following previous examples of reconstruction (Vosmer 2001, 2003).

Acknowledgement

I would specially like to thank Dr Serge Cleuziou and dedicate this article to him. Unfortunately, on 7 October

2009, his illness took him too early. He initially supervised and suggested the topic of study, and was also the first person to have directed me towards my present career in maritime archaeology.

References

- Adams, J., 2001, Ships and boats as archaeological source material. *World Archaeology* 32.3: 292–310.
- Akkermans, P. and Schwartz, M., 2003, *The Archaeology of Syria: from complex hunter-gatherers to early urban societies (c. 16,000–300 BC)*. Cambridge University Press, Cambridge.
- Amiet, P., 1961, *La glyptique Mésopotamienne archaïque*. CNRS Editions, Paris.
- Bigourdan, N., 2003, L'architecture Navale des Bateaux et Embarcations de Mésopotamie du Sud et du Golfe Persique de 5000 à Jésus Christ. Thesis (Honours) Université Paris, 1 Panthéon Sorbonne, Paris.
- Blue, L., 2003, Maritime ethnography: The reality of analogy. In C. Beltrame (ed.), *Boats, ships and shipyard, Proceeding of the Ninth International Symposium on Boat and Ship Archaeology*, Oxford Books, Oxford: 334–338.
- Brown, L., 1979, *Grasses: an identification guide*. Houghton Mifflin, Boston.
- Bukholder, G., 1972, Ubaid sites and pottery in Saudi Arabia. *Archaeology* 25: 264–269.
- Casson, L., 1994, *Ships and seafaring in ancient times*. British Museum Press, London.
- Carter, R.A., Crawford, H.E.W., 2003, The Kuwait/British Archaeological Expedition to as-Sabiyah: Report on the fourth season's work. *Iraq* 65: 77–90.
- Carter, R., 2006, Boat remains and maritime trade in the Persian Gulf during the sixth and fifth millennia BC. *Antiquity* 80: 52–63.
- Chesney, F.R., 1868, *Narrative of the Euphrates expedition, carried on by Order of the British Government during the years 1835, 1836, and 1837*. Longman, London.
- Cleuziou, S. and Tosi, M., 1994, Black boats of Magan: some thoughts in Bronze Age water transport in Oman and beyond from the impressed bitumen slabs of Ras al-Junays. In: A. Parpola and P. Koskikallio, *South Asian archaeology 1993*, *Annales Academiae Scientiarum Fennicae, série b*, 271.2, Université des sciences d'Helsinki, Helsinki.
- Coomes, O.T., 1992, Blackwater Rivers, adaptation, and environment heterogeneity in Amazonia. *American Anthropologist*, New Series, 94.3: 698–701.
- Connan, J., Carter, R.A., Crawford, H.E.W., Tobeu, M., Charrie-Duhaut, A., Jarvie, D., Albrecht, P. and Korman, N., 2005, A comparative geochemical study of bituminous boat remains from H3, As-Sabiyah (Kuwait), and RJ-2, Ra's al-Jinz (oman). *Arabian Archaeology and Epigraphy*, 15: 1–46.
- David, N. and Kramer, C., 2001, *Ethnoarchaeology in action*. Cambridge University Press, Cambridge.
- De Graeve, M-C., 1981, *Ships of the ancient near east*. *Orientalia Lovaniensia Analecta* 7, Katholieke Universiteit, Leuven.
- Dickson, H.R.P., 1956, *Kuwait and her neighbours*. Allen & Unwin, London.
- Ferrara, A.J., 1973, *Nanna-Suen's Journey to Nippur*. *Studia Pohl, Series Maior* 2, Rome.
- Frankfort, H., 1939, *Cylinder seals*. MacMillan, London.
- Golding, M., 1974, Evidence for pre-Seleucid occupation of east Arabia. *Proceeding of the Seminar for Arabian Studies* 4: 19–31.
- Heimpel, W., 1987, Das Untere Meer. *Zeitschrift für Assyriologie* 77: 23–91.
- Johnstone, P., 1980, *The seacraft of prehistory*. Routledge and

- Kegan Paul, London.
- Layard, A.H., 1953, *The monuments of Nineveh, including bas-reliefs from the palace of Sennacherib and bronzes from the ruins of Nimroud. From drawing made on the spot, during a second expedition to Assyria.* John Murray, London.
- Lebruckner, R.F., 1969, Occurrences of the asphaltic substances in southeastern Turkey and their genesis. *Bulletin of the Mineral Research and Exploration Institute of Turkey* **72**: 74–96.
- Lorimer, J.G., 1908, *Gazetteer of the Persian Gulf, Oman and Central Arabia, Volume 2, Geographical and statistical.* Superintendent Government Printing, Calcutta.
- Masry, A.H., 1974, *Prehistory in northeastern Arabia: the problem of interregional interaction.* Field Research Project, Miami, FL.
- McGrail, S., 1984, *Aspects of maritime archaeology and ethnography: papers based on those presented to an international seminar held at the University of Bristol in March 1982.* Trustees of the National Maritime Museum, London.
- McGrail, S., 1985, Toward a classification of water transport. *World archaeology* **16.3**: 289–303.
- McGrail, S., 2001, *Boats of the world.* Oxford University Press, Oxford.
- Oates, J., Davidson, T.E., Kamilli, D. and McKerrel, H., 1977, Seafaring merchant of Ur? *Antiquity* **51**: 221–234.
- Oschenlager, E.L., 1992, Ethnographic evidence for wood, boats, bitumen and reeds in southern Iraq. *Bulletin on Sumerian agriculture*, **6**. Sumerian Agriculture Group, Cambridge.
- Pedersen, R., 2003, The boatbuilding sequence in the Gilgamesh Epic and the sewn boat relation. Unpublished Thesis, Texas A&M University, Texas.
- Pétrequin, G., 1989, Le bitume en Mésopotamie aux époques néo-sumérienne et paléo-babylonienne d'après les sources cuneiformes. Unpublished manuscript, Institut d'Art et d'Archéologie, Université de Paris 1.
- Porada, E., 1948, *Corpus of ancient Near Eastern seals in North American collections, Volume 1.* The Pierpont Morgan Library, New York.
- Potts, D.T., 1996, *Mesopotamia civilisation: the materials foundation.* Cornell University Press, Ithaca.
- Qualls, C., 1981, *Boats of Mesopotamia before 2000 BC.* Unpublished Thesis, Columbia University, New York.
- Salonen, A., 1939, Die Wassfahrzeuge in Babylonien. *Studia Orientalia* **8**: 4, Helsinki.
- Schwartz, M., Hollander, D. and Stein, G., 1999, Reconstructing Mesopotamian exchange networks in the 4th millennium BC: Geochemical and archaeological analyses of bitumen artifacts from Hacinebi Tepe, Turkey. *Paléorient* **25.1**: 67–82.
- Schwartz, M. and Hollander, D., 2001, Annealing, distilling, reheating, and recycling: Bitumen processing in the ancient near east. *Paléorient* **26.2**: 83–91.
- Schwartz, M., 2002, Early evidence of reed boats from southeast Anatolia. *Antiquity* **76**: 617–618.
- Strasser, T.F., 1996, The boats models from Eridu: Sailing or spinning during the Ubaid period? *Antiquity* **70**: 920–925.
- Thesiger, W., 1964, *The Marsh Arabs.* Penguin Classics, New York.
- Tosi, M., 1986, Early maritime cultures of the Arabian gulf and the Indian Ocean. In: S.H.A. Al-Kalifa and M. Rice (eds.), *Bahrain through the ages.* KPI, New York.
- Vosmer, T., 2001, Building the reed-boat prototype: problems, solutions, and implications for the organization and structure of third-millennium shipbuilding. *Proceedings of the Seminar for Arabian Studies*, **31**: 235–240.
- Vosmer, T., 2003, The Magan Boat Project: A process of discovery, a discovery of process. *Proceedings of the Seminar for Arabian Studies*, **33**: 49–58.
- Wooley, C.L., 1934, *Ur Excavations Volume II, The Royal Cemetery.* British Museum Press, London.

Towards an understanding of the importance of the HMAS *Sydney II* and HSK *Kormoran* sites. Part 1: The genesis and evolution of the controversies

Michael McCarthy

Department of Maritime Archaeology, Western Australian Museum, 47 Cliff Street FREMANTLE, Western Australia WA 6160
Email: michael.mccarthy@museum.wa.gov.au

Introduction

What follows is the first of a three-part series that seeks to explain to fellow maritime archaeologists why the wrecks of HMAS *Sydney II* and the German raider HSK *Kormoran* are two of Australia’s most significant maritime archaeological sites.

In this paper the genesis and development of the controversies surrounding the loss of the two ships is examined. Allied to this is a second paper examining the reasons why the search for the two wrecks took so long in commencing, despite both lying very near the positions provided by the German survivors and within a few nautical miles of each other. In the third paper the archaeological evidence will be examined and conclusions drawn against the issues raised in the first two papers.

Overview

Much of what is presented here is about human behaviour. As a primary observation it is readily evident that all mysterious wrecks be they treasure ships, unexplained disappearances or military losses, generate controversy and speculation. As but two local examples, IJN midget submarine *M24* and the Hospital Ship *SS Centaur* are two other World War II (WWII) wrecks where, like the *Sydney/Kormoran* sites, there have been fraudulent claims as to their location in years past. Mysterious military wrecks especially become the font of ‘conspiracy theories’ with the *Sydney/Kormoran* case perhaps the foremost example of the problems caused by official inaction. It is also a truism of some value to maritime archaeologists tasked with the management of this type of site that the proponents of even the wildest notions regularly defend them with a passion that to the uninitiated can be difficult to comprehend. Further, officials seeking objective analysis and calm debate in these circumstances need to recognize that they will be readily dismissed by conspiracy theorists as gullible at best, tools of a corrupt officialdom, or at worst, themselves part of a massive ‘cover-up’ designed to deny justice to the aggrieved.

The genesis and development of wartime controversies surrounding the loss of HMAS *Sydney*

When HMAS *Sydney*, the pride of the Royal Australian Navy (RAN) fleet disappeared with all hands on 19 November 1941 a large cross-section of the Australian populace was unable to accept that it could have been destroyed by a disguised cargo ship the HSK *Kormoran*. Many refused to accept the German account of its loss. Speculation was rife, rumours were endemic and accusations were levelled at both the German crew and Australian officialdom. The former were accused of war crimes and the latter of ‘covering up’ the truth. Surprisingly, one of the most potent forces in fuelling the controversies in WWII and in the decades after, right up to the commencement of

the successful search in 2008, were former and serving RAN personnel.

Because so much has been written about the battle in which HMAS *Sydney* was lost, and because what appears below is effective in providing an overview, the sequence of events is not reproduced here. Rather the focus of this work is to set the scene for an understanding of the archaeological remains in the context of the controversies surrounding the course of the battle, the loss of the two ships, around 80 of the *Kormoran* men and the entire crew of HMAS *Sydney*.

The abridged table below shows how the HMAS *Sydney* controversies commenced and then grew in WWII. It is based on research conducted by this author subsequent to the opening of wartime archives in 1975 and subsequently provided to a number of official inquiries. Copies of each original entry forming the basis of this table appear in the Museum’s HMAS *Sydney*-HSK *Kormoran* files (WAM File MA-630-81), a 56-volume pre-finding series that was closed when the wrecks were found early in 2008. Many secondary works were also consulted and these appear referenced in text. Finally, when the list appearing below (which is not exhaustive) is read, it becomes readily apparent that broad-based speculation about the loss of HMAS *Sydney* was to be expected.



Figure 1. CDR Rupert Long’s October 1945 decision to do nothing further on HMAS *Sydney*.

The wartime controversies

Date	Issue	Notes
24/11/1941	Rear Admiral Crace writes in his personal diary that the Naval Board thought that there was a possibility that a Vichy submarine was involved .	Genesis of submarine Theories.
25/11/1941	Navy Board records ...at 2030 H '...appreciate possibility severely damaged HMAS <i>Sydney</i> proceeding Singapore or Sourabaya where nearest dock is located'.	Where is <i>Sydney</i> ?
25/11/1941	Signal ex Navy Office records <i>Kormoran</i> survivors rowing towards <i>Sydney</i> which ' disappeared believed sunk '.	Conflicting report.
26/11/1941	Advisory War Council meeting including the PM, Chiefs of Staff, Blamey, Hughes, Menzies, debate whether to admit that the men are missing, noting that rumours are everywhere .	Public disquiet mounts.
28/11/1941	Signal ex Navy Office 'HMAS <i>Sydney</i> sank enemy raider in position 026°S, 111°E'. Last seen heading south.	Position of <i>Kormoran</i> .
28/11/1941	Catalina sights oil slick 5 NM south-east of the 'battle position'. 26°S, 111°E.	Position of <i>Sydney</i> ?
29/11/1941	Captain J.S. Airey, Master of MV <i>Koolinda</i> which picked up German survivors records a statement from a German sailor that HMAS <i>Sydney</i> fired first .	Genesis of an alternative battle sequence.
1/12/1941	Navy advise the PM that the Naval Board have 'continuously under review the possibility of two raiders '. They wish to delay announcing the loss in the hope that the other will break radio silence for an announcement may serve to deny 'the opportunity of locating her by direction finding ' [DF]. Concerns were expressed that <i>Sydney</i> 's crew ' could have been taken off or picked up by these vessels'.	Two raider issue surfaces. DF operating? Survivors from <i>Sydney</i> ?
1/12/1941	Bernard Hall of the London <i>Daily Express</i> made the claim that <i>Sydney</i> had defeated <i>Kormoran</i> and was then sunk either by it or an 'attendant submarine' using torpedoes . Later he advised that his source was a RN press briefing.	Surrender and submarine theories spread.
n.d.	Undated. Aeradio Geraldton hear via SL Cooper (RAAF) weak ' Call from Sea...Men on board... This "MS" <i>Sydney</i> ...calling Darwin Distress Sig Strats Lykard'. A transcript of the same message? contains similar & the times 2140–2255H with '[<i>HM superimposed</i>] AS <i>Sydney</i> Calling 2450...Heard...at the Esplanade hostel... passed to COIC by secraphone '. Also in SWACH log for 4/12/1941.	Genesis of signals from HMAS <i>Sydney</i> .
1/1/1942	R.S. Close (also of the <i>Melbourne Truth</i>), in an article dated 1/1/1942 provides a reconstruction in which <i>Kormoran</i> sank <i>Sydney</i> with torpedoes after its (<i>Kormoran</i>'s) crew had abandoned ship and were rowing towards the victorious <i>Sydney</i> , but at the same time abandoning their wounded on <i>Kormoran</i> .	Surrender? Questions arise re the <i>Kormoran</i> wounded.
c. 16/2/1942	Radio Tokyo claims the crew of HMAS <i>Sydney</i> are prisoners in Tokyo.	First claim of Japanese involvement.

c. 17/2/1942	A Chinese Radio announcement of the ' internment of Sydney's officers in Tokyo '. Reference also made to submarine and 'other ships which sank the Sydney' .	Second claim re POWs in Japan.
1941-42	Unprovenanced Australian press c. late 1941, early 1942, reads: ' Tell us the whole story of the Sydney . Australians have reason for some wonderment at the fashion in which a more detailed description has been at last allowed to reach them. Now by way of New York, we learn another instalment of a story which was presumably obtained from survivors of the <i>Kormoran</i> in Australia...Australians are entitled to the full story of this action which has been gradually revealed in a piecemeal fashion'.	Public disquiet. American sources.
9/6/1942	RAAF unable to declare its 6 aircrew on <i>Sydney</i> dead until 9/6/1942. 'The Naval Board has presumed the deaths [of RAN personnel] on the basis of reports from prisoners of war ' interviewed by International Red Cross and the negative results of the air and sea search. The RAAF were not convinced that a plane was not in the air when HMAS <i>Sydney</i> sank.	POWs an issue to 6/42. RAAF at odds with RAN.
	'The evidence negating this possibility was not at all conclusive'.	
13/6/1942	Box marked HMAS <i>Sydney</i> and Japanese flag are found by the army (44th Battalion) at Green islets, near Jurien Bay, Western Australia.	Adds to Japanese stories.
1943	Former HMAS <i>Sydney</i> Lt-Paymaster W.H. (John) Ross publishes <i>Stormy Petrel</i> ; believes the <i>Kormoran</i> survivors were 'obviously well coached ...very little fact could be garnered'; <i>Kormoran</i> was flying the Norwegian [neutral] flag . Believed the battle had taken place on 22 November , part-based on the clean shaven appearance of the men taken on board <i>Aquitania</i> on the 23rd.	Genesis of Norwegian Flag. Former <i>Sydney</i> officer casts doubts.
1943	The noted maritime writer E. Keble Chatterton in an account of the 'Commerce Raiders' says <i>Kormoran</i> was flying a Norwegian Flag .	Norwegian flag.
22/9/1945	<i>The West Australian</i> carries a story taken from an account of August 1944 from Dr Habben who had been repatriated ex <i>Kormoran</i> . Refers to the mystery of radio silence during the battle being resolved by Habben's statement neither ship used their radio.	An indication of the extent which the silence issue was a concern to the press.
1/10/1945	Minute Paper prompted by the re-emergence of the Japanese POW story reads: 'In accordance with your instructions...Commodore Collins...was directed to ascertain any information regarding the fate of HMAS <i>Sydney</i> from Japanese sources . German Naval Attaché at Tokyo...does not know whether ship was torpedoed but stated that subsequent Japanese broadcast that ship was towed to Japan were definitely incorrect...no survivors were picked up by any Axis vessel and none were brought to Japan ...Collins feels... no information is known anywhere in Japan which could support hopes that any personnel of HMAS <i>Sydney</i> are alive'.	POW rumours remain till 1945.
	Allied to this were wartime rumours HMAS <i>Sydney</i> had been seen at anchor during Lt Col. Doolittle's allied raid on Tokyo in April 1942.	

October 1945	Despite urgings from RAN staff in WA, CMDR Long, Director of Naval Intelligence, refuses to publish data compiled by Third Officer Westhoven (WRANS) on the basis that the analysis would still not be accepted by some people as being absolute confirmation of the loss of all of the crew. He then stated that 'it is intended not to publish anything further concerning this action, and its results, unless the Board is forced by Ministerial pressure...' .	The case is closed without satisfactory explanation.
December 1945 and January 1946	Letters to and from politicians including Mr K.E. Beazley (Snr) expressing concern about the loss of the ship and crew and urging further investigation.	Disquiet in Parliament.

The controversies and conspiracies in the 1970s

While there was a period of relative calm in respect of HMAS *Sydney* in the three decades after 1945 a band of Western Australian-based researchers, including former Naval staff, became increasingly active as the release of wartime archives in 1975 coincided with a post-Vietnam War populace beginning to lose its trust in government, politicians, the armed forces and the intelligence service. Called the Sydney Research Group (SRG), the thrust of their claims is visible in the wartime sequence above. They were also following in the footsteps of Lieutenant Jonathan Robotham. He had been a former POW in Germany during WWI, and in WWII was a German-speaking guard to the *Kormoran* survivors, accompanying some on board SS *Centaur* from Carnarvon down to Fremantle. Later he became an Intelligence Officer at their prison in the East and served there for two years. Convinced something was wrong with the existing accounts, his became an obsessive post-war quest to find evidence, such as film and a camera he believed remained buried where two lifeboats from HSK *Kormoran* had landed soon after the battle. Part driven by a belief that the *Kormoran* had surrendered and that another vessel, a submarine, was involved in sinking HMAS *Sydney*, he was also writing a book detailing these claims and he kept an archive of his work until he died in 1978, his work unfinished. A reading of his manuscript titled 'Eagle in the Crow's Nest' shows that he was prepared to fabricate evidence apparently in order to force an official response.

The first hoaxes after Robotham

Apart from another hoax in the form of a message found during WWII in a bottle, the first 'archaeological evidence' relating to the battle surfaced when, in 1980, a W.P. Evans, formerly of the Australian Army, advised that he had found an HMAS *Sydney* kitbag on the beach north of Kalbarri. It contained a wooden box, in which were authentic wartime memorabilia. There was also a 'letter of proceedings' ostensibly typed by HMAS *Sydney*'s last surviving officer Sub-Lt B.A. Elder. This typescript, purporting to account for the last hours of HMAS *Sydney* is an important piece, again echoing much of what is produced above, but with some additions. According to the 'Elder' typescript, an hour after first sighting a Japanese submarine *Sydney* came across the *Kormoran*. When challenged, *Kormoran* hoisted a Dutch flag and after providing the flag hoist of *Straat*

Malakka hove to under threat from a suspicious *Sydney*. Then, amongst other things, *Kormoran* opened fire with six salvos before surrendering to the then badly-damaged warship. When in the process of sending an anti-scuttling party boat across, *Sydney* was struck by a torpedo fired from *Kormoran*'s underwater tube.

The bag, the box, its contents and the typescript, were later proved by a team assembled by the Australian War Memorial (AWM)—after the expense of considerable time, effort and resources, with teams arguing for and against—to be the result of an elaborate fraud. The bag had been washed in fluorescing soap powder of a type not invented until the 1960s! This instance is relevant to fellow archaeologists as an example of the ends to which some are prepared to go in order to fill a vacuum and/or to promote their own theories. Of equal importance are the ends to which a fellow institution the AWM felt it had to go in order to satisfactorily deal with the matter (WAM, HMAS *Sydney* File MA-630/81). The Western Australian Museum was also involved as part of its brief in managing reports of relics believed to be from historic vessels. It advised from the outset that it was impossible for organic materials to survive the ravages of white ants in the environment in which the box had been 'found'. Staff had learnt this while working the wreck, land camps and on-shore remains associated with the Dutch East Indies ship *Zuytdorp*, which lie along that same stretch of coast.

The debate spreads to a wider public

In 1981, angered at what he perceived as flaws in the accounts of how his father was lost, Michael Montgomery, son of HMAS *Sydney* Navigator Commander CAC Montgomery RN, published under a provocative title *Who sank the Sydney?* adding further to the existing controversies. Other than those appearing above, and claims that the battle took place other than at *c.* 26°34'S, 111°E, the position given by Fregattenkapitän T.A. Detmers, Commander of the HSK *Kormoran*, these are in the main that:

- the RAN was aware of a raider presence near the West Australian coast;
- *Kormoran* was lying in wait for the troopship RMS *Aquitania*;
- *Kormoran* had heaved to after receiving a salvo from HMAS *Sydney* that injured part of the raider's crew;

- *Sydney* had lowered a boat to render medical assistance to prevent scuttling; and
- *Kormoran* had fired an underwater torpedo before hoisting its true colours.

Finally, Montgomery claimed that there had been an official cover up; that the lighthouse tender *Cape Otway* had subsequently found bodies; and, that its log was later tampered with removing all relevant entries from the record. Also new to the burgeoning list of controversies at this time were claims that the *Kormoran* injured were deliberately abandoned, rather than having been lost in a capsized life-raft as explained by Detmers, in his interrogations and in a later book on the subject (1959). As but one example of how these early notions evolved, the latter morphed into claims from another researcher John Doohan who headed a group called End of Secrecy on *Sydney* (ESOS)—which included members of some bereaved families—that the *Kormoran* wounded had been taken onboard HMAS *Sydney* to be housed in the sick bay. He also claimed they subsequently died there when it sank (Doohan 1991). This particular thread evolved even further when he was advised quite some years ago that the Museum would not countenance entry into the two ‘war graves’ (as they were then loosely called) if they were ever to be found. This he perceived as evidence that the Museum was an integral part of the ‘official cover-up’ by trying to hide this crucial evidence.

In April 1984 Barbara Winter, an Australian-born, German-speaking scholar, published *HMAS Sydney: Fact, fantasy and fraud*. She successfully challenged much of what appears in Montgomery’s work (Winter 1984). Rather than quashing speculation as perhaps she had hoped, her attacks on Montgomery, the SRG and others served to intensify the debate and to draw many otherwise passive observers into an increasingly acrimonious debate. In presenting the middle ground in a November 1984 review of Winter’s work appearing in *Australian Sea Heritage* (the Journal of the Australian National Maritime Museum), W.O.C. Roberts—writing in his official position with the Royal Australian Historical Society—observed that:

Most of those who have studied the action would agree and would join in her contempt of the more esoteric rumours which have circulated from time to time. Nevertheless, be that as it may, I must confess to having trouble divorcing from my mind a small recurring seed of doubt... (Roberts 1984).

These examples are doubly important—a pointer firstly to the effect of the inordinate rumours that emanated in WWII and secondly to the underlying reasons why the controversies, conspiracies and false claims became so prominent after these two works were published. One factor in the many claims was the sometimes innocent, but often self-serving and occasionally fraudulent, filling of the vacuum left by official inaction post Commander Long’s October 1945 decision not to publish anything further on the loss of HMAS *Sydney* until ‘forced by ministerial pressure’ (see letter and table). The second was the parallel evolution of an uncritical press willing to carry even the most

implausible stories relating to HMAS *Sydney* as hard copy in the papers, as television news, as current affair, and later in the virtual media. Speculative reporting these last two decades has been the major driver in spreading controversy and conspiracy theories. Hundreds of press items of this nature, most centring on the sensational, appear in the Museum’s files. Further, some journalists evolved becoming activists and researchers in their own right, often presenting their concerns in a ‘Robothamesque’ attempt to force official action. Much of the conspiracy and controversy post-finding appears of that ilk, for example. On the other hand, it all served to ensure nothing remained hidden or unsaid. Additionally some journalists obtained important primary source information in the course of their inquiries.

The 1991 HMAS *Sydney* Seminar

The extent to which the controversies and belief in a government conspiracy evolved and became endemic also became evident as the Museum co-ordinated, chaired and assisted with conferences, seminars and inquiries centring on the loss of the two ships and the question whether their wrecks could be found. The first was convened by the Museum on the 50th Anniversary in 1991 subsequent to it receiving a positive response from Woods Hole Oceanographic Institute (WHOI), finders of *Bismarck* and *Titanic*, regarding a possible combined search for HMAS *Sydney* (see Article 2 in this series). The origin of the body of the ‘Unknown Sailor’, who arrived at Christmas Island in a Carley float some months after the battle, also vexed the meeting. Some supported the post-war opinion of the then Director of Naval Intelligence, Captain George Oldham (RN), that the float could not have emanated from HMAS *Sydney* and others strongly held the opposite view. While often at loggerheads and fragmented in their understanding of the battle sequence and subsequent events, the assembly unanimously agreed to eight recommendations, including an endorsement of the need to search the waters at or near the battle position of 26°32–34’S, 111°E provided by *Kormoran*’s commander (the Detmers’ position). It also recommended searching the archives, again utilising government support and funds; having an HMAS *Sydney* book written by the then Lieutenant Tom Frame RAN, who had just completed his Doctoral thesis on the loss of HMAS *Voyager* in 1969; the release of all who may be constrained from any provisions of the *Official Secrets Act* in order to effect those searches; the examination of a float known to have come from HMAS *Sydney* housed at the Australian War Memorial; and, the examination of the waters off Red Bluff north of Carnarvon where one boatload of German survivors had come ashore and had later abandoned materials.

Tom Frame subsequently produced a book entitled *HMAS Sydney, Loss and Controversy* (1993). While that work debunked much of the controversies and speculation referred to above, Frame left room for doubt as to the true course of the battle. This and his book on the loss

of HMAS *Voyager* also unequivocally showed that internal investigations of Service tragedies were undeniably fraught by Service and external politics and that nothing other than an independent inquiry, staffed by independent, yet militarily savvy legal counsel trained in such matters, would even begin to satisfy the relatives and the nation at large. Though the seminar was supported by some leading political and naval figures, at the time there was little stomach for action by government. As some indicator of official attitudes at this time, when Frame's book was in press, John Doohan, leader of ESOS independently recruited Greens Senator Chamarette to ask the question: 'Will the Minister instigate an archival search within the Australian War Memorial and Australian Archives and other holdings of naval historical records to draw together all records relating to the sinking of HMAS *Sydney*?' This reply was received:

There is no justification for the conduct of a nation wide search for documents which may sometimes in an obscure way, relate to the loss of HMAS *Sydney*. The loss of *Sydney* has already been the subject of previous books and the authors of these books have conducted their own search of the Archives. The conduct of such a search would not convince the sceptics and the revisionist historians who will still claim that the Government of the day was hiding something (Hansard 14/12/1992).

The Chamarette exchange in this and other equally unsatisfying instances (e.g. including the question whether public servants and former Service personnel were still constrained by the provisions of the *Official Secrets Act* was nonetheless indicative of the fact that the HMAS *Sydney*/ HSK *Kormoran* saga was gradually creeping back into a wider political psyche, albeit via the political fringe.

The 1997–98 Parliamentary inquiry

As a result of the growing political awareness, in 1997–98 a Parliamentary Inquiry was convened in all states. It examined and recorded all the controversies and conspiracies presented to them in a series of public hearings. A full 18 volumes of evidence was received much of it conspiratorial in nature. The fact that people voluntarily appeared before the Parliamentary Inquiry, including inventor Lindsay Knight and his proponent Warren Whitakker who claimed to have located *Sydney*, *Kormoran* and a Japanese vessel with their Knight Direct Location System (KDLS) attests to a confidence in their ability to defend their beliefs on a political stage. The Committee then made numerous recommendations, urged further work at Christmas Island in locating the remains of the 'Unknown Sailor' buried there and recommended the convening of a seminar/workshop to augment the 1991 Forum 'to try and confirm the accuracy of the wreck locations, prior to a full in-water search' commencing at or near the 'Detmers' position' as described above. A search of British archives also resulted with a subsequent publication produced in 2001 by Capt. Peter Hore (RN ret'd.) indicating that while nothing new had

been found there, his work again reinforced the need to search the Detmers' position.

The 2001 Sea Power Centre Seminar

A seminar hosted by the RAN's Sea Power Centre at the request of the Parliamentary Inquiry subsequently advised against a search on the basis that researchers could not agree whether the battle took place at the 'Detmers' position' or near the Abrolhos Islands. The reasons for this decision are apparent in the range of submissions received in favour of a southern battle position (see papers in McCarthy, 2002)—a notion supported by a not-inconsiderable number of RAN specialists former and still serving. By then, this 'southern battle' theory had become a key plank in many conspiracy theorists' platform and in the lead-up to 2001 it neatly dovetailed into new claims by Whitakker and Knight to have again located *Sydney* and *Kormoran* and a Japanese submarine with a newer version of their KDLS technology. This claim, albeit a few kilometres away from the original 1989 report was repeated as front-page news. To many, the Museum's public denial was proof of its duplicity in trying to hide the wrecks, with some relatives of those lost especially vociferous and critical.

That the seminar concluded with a recommendation that a search was not warranted, partly because the various researchers could not agree, was itself a matter for controversy, adding further to claims of a 'cover up' on the part of a navy reluctant to be committed to a search in any way (RAN Sea Power Centre, 2001). In that context, the efflorescence of support for a southern battle position evident at the seminar was strengthened by advice from former RAN specialists contributing to the seminar and then by another group of RAN officers later assembled by the SPC as an expert committee. They found that the German survivor's lifeboat voyages were impossible unless they emanated from a place much further south than the 'Detmers' position'.

Wes Olson's *Bitter Victory* (2000)—where little in support of conspiracy theories appears—was published the year before the SPC Seminar. It was followed, in 2005, by Glenys McDonald's *Seeking the Sydney: A quest for truth*. In contrast with Olson, who tends to remain with comparative and technical studies, McDonald's work carried many of the theories above with a few regional additions. Though poles apart—again engendering controversy and causing considerable discussion from the various camps—both were the result of exhaustive and comprehensive research and both were published by the University of Western Australia Press, a very well-respected publishing house, with strict editorial standards. Both were also highly acclaimed.

On the other hand, a phenomenon that appeared before the search got underway was manifest in a number of self-published books. A rarity previously, self-publishing is common today adding yet another dimension to conspiracy theory and the spread of controversy re HMAS *Sydney*. While ensuring that nothing remains unsaid, that self-published material is generally produced without

the benefit of peer review or editorial scrutiny became a growing problem. Appearing under titles like *The truth is so precious* (Barker 2001); *Enduring deception* (Manning 2005); *The lost souls and ghosts of HMAS Sydney II* (Montagu 2006); *Somewhere below: The Sydney scandal exposed* (Samuels 2007); and *HMAS Sydney 1941: The analysis* (Bathgate 2007); they reflected the conspiracy theories that remained after 2000 to then vex the Commission of Inquiry convened soon after the two wrecks were found in 2008.

Legally based, led by Commissioner Terrence Cole QC, supported by experienced Counsel, the COI was given powers of coercion and cross-examination not afforded any prior seminar, forum or Parliamentary Inquiry. Above and beyond the evidence received from those called before it, the COI also examined the search and survey data gleaned after the wrecks were found and in that exercise was assisted by experts from the Defence, Science and Technical Organisation, the War Memorial and elsewhere. Like the WA Museum before it, the COI—which recognised the author's role as a persistent campaigner for action—had much to contend with in attempting to help resolve the HMAS *Sydney* mysteries and to assist the nation attending to its duties in respect of the lost crews and their relatives. As one newly emerged example of direct relevance to the archaeological record, in taking over the mantle of chief conspiracy theorist from J. Robotham, the SRG, ESOS and others who went before, one researcher James Eagles claimed that the location of the two wrecks and the subsequent identification of HMAS *Sydney* and HSK *Kormoran* is an elaborately staged fraud designed to lull a gullible populace into believing the German accounts. Sadly, there are some who still believe him.

These claims—that the wrecks are a cunningly designed set constructed from other ships similar to the two wartime proponents—while continuing to this day, even in the face of overwhelming evidence to the contrary, are indicative of the damage to hearts and minds caused by Commander Long's decision in 1945. How far entrenched the conspiracy theories have become and the continuing effect on all involved, is clearly evident in the Eagles' case. Finally, while most of the issues that went before the HMAS *Sydney II* Commission of Inquiry proved spurious, without foundation and even fraudulent, it is the archaeological evidence, rather than historical data and oral testimonies that served to resolve most, if not all the mysteries. This will be discussed in the final part of this work.

References

- Barker M., 2001, *The truth is so precious*. M. Barker, Perth.
- Bathgate G., 2007, *HMAS Sydney 1941: The analysis*. Boolarong Press, Brisbane.
- Cole, T.R.H., 2009, *The loss of HMAS Sydney II*. <http://www.defence.gov.au/sydneyii/finalreport/index.html>
- Detmers, T., 1959, 1975, *The Raider Kormoran*. Kimber, London.
- Doohan, J., 1991, With friends like these...a revisionist's view of the official 'cover up'. In: M. McCarthy and K. Kirsner (comps), *Papers from the HMAS Sydney Forum*, Fremantle 21–23 November, 1991. Report—Department of Maritime Archaeology, Western Australian Museum, No. 52.
- Frame, T., 1993, *HMAS Sydney, loss and controversy*. Hodder and Stoughton, Sydney.
- Hore P., 2001, *HMAS Sydney—the cruiser and the controversy in the Archives of the United Kingdom*. Royal Australian Navy Sea Power Centre, Canberra.
- Joint Standing Committee on Foreign Affairs, Defence and Trade, 1999, *Report on the loss of HMAS SYDNEY*. Parliament of the Commonwealth of Australia, Canberra.
- Manning B., 2005, *Enduring deception*. 17 Mile Well Publishing, Perth.
- McDonald G., 2005, *Seeking the Sydney: A quest for truth*. University of Western Australia Press, Perth.
- McCarthy, M. and Kirsner, K., (comps), *Papers from the HMAS Sydney Forum*, Fremantle 21–23 November, 1991. Report—Department of Maritime Archaeology, Western Australian Museum, No. 52.
- McCarthy, M., (comp.), 2002, *Submissions to the HMAS Sydney II Seminar*. Report—Department of Maritime Archaeology, Western Australian Maritime Museum, No. 164.
- Montagu J.A., 2006, *Lost souls and ghosts of HMAS Sydney II*. John A. Montagu, Perth.
- Montgomery, M., 1981, 1983, *Who sank the Sydney?* Cassell, Melbourne & Penguin.
- Olson W., 2000, *Bitter victory: The death of HMAS Sydney*, 2nd edn. University of Western Australia Press, Perth.
- Robotham, J., (n.d.) *Eagle in the crow's nest* (MS copy held by State Library of Western Australia).
- Roberts, W.O.C., 1984, Review—B. Winter: *HMAS Sydney—fact, fantasy and fraud*. *Australian Sea Heritage*, November 1984.
- Ross, W., 1943, *Stormy petrel: The life story of HMAS Sydney*. Paterson's Printing Press, Western Australia.
- Royal Australian Navy, Sea Power Centre. *HMAS Sydney II. Proceedings of the Wreck location Seminar, 16 November 2001*. Department of Defence, Canberra.
- Samuels J., 2005, *Somewhere below: The Sydney scandal exposed*. Halstead Press, Sydney.
- Summerell R., 1999, *Sinking of HMAS Sydney: A guide to Commonwealth Government records*, 3rd edn. Australian Archives, Canberra.
- Winter, B., 1984, *HMAS Sydney: Fact, fantasy and fraud*. Boolarong Publications, Brisbane.
- Winter, B., 1994, *The intrigue master, Commander Long and naval intelligence in Australia, 1913–1945*. Boolarong Publications, Brisbane.

Towards an understanding of the importance of the HMAS *Sydney* and HSK *Kormoran* sites. Part 2: The inordinate delay in commencing a search

Michael McCarthy

Department of Maritime Archaeology, Western Australian Museum, 47 Cliff Street, FREMANTLE, Western Australia WA 6160
Email: michael.mccarthy@museum.wa.gov.au

Introduction

The over 13 million ‘hits’ on the Finding *Sydney* Foundation (FSF) Website during the successful 2008 search attests to national and international interest in finding HMAS *Sydney* and its adversary HSK *Kormoran* (<http://www.findingsydney.com/>). When the two ships were eventually located within a few nautical miles of the positions given in WWII by the German survivors and also appearing in a number of Royal Australian Navy (RAN) analyses in 1941, the question why the search took so long to be launched was foremost in many minds.

The books that followed the opening of archives 30 years after the war ended produced such efflorescence of interest, and in some cases speculation amongst the general populace, that they can be seen as the genesis of nationwide communal, rather than a purely familial or service-based, desire to have the two wrecks located.

This paper seeks to provide some insights into why the delay occurred despite that widespread interest. It is allied to Part 1 of this series of articles (this volume) in that the controversies surrounding the loss of the two ships were a major factor in producing doubt and in effecting a delay. To many the delay was further evidence of an official reluctance to find the wrecks.

Concluding the series will be a synthesis of the evidence gleaned from the two wrecks, now indisputably two of Australia’s most important maritime archaeological sites.

As with the first paper, sources for this article are primarily the 56-volume HMAS *Sydney*/HSK *Kormoran* files (WAM File MA-630/81, vols 1–56) housed at the Western Australian Museum’s Department of Maritime Archaeology, together with a number of research papers and works referred to in text.

The Western Australian Museum and HMAS *Sydney*

In 1976, the federal Minister responsible for the then newly-promulgated Commonwealth *Historic Shipwrecks Act* delegated authority for the management of all wrecks off the coast of Western Australia to the Director of the Western Australian Museum. Though they still remained the property of the Australian and German Governments, this delegation also covered the wrecks of HMAS *Sydney* and its adversary HSK *Kormoran*. On behalf of the Director, and as is standard practice with any historic wreck, staff of the Department of Maritime Archaeology at the Museum then sought to become better acquainted with the wrecks and their story. From 1976 through to the early 1980s Scott Sledge led this interest, opening a file entitled Naval Wrecks and entering into it record of a number of wartime losses and of research into HMAS *Sydney* that came to the Museum’s attention.

At the time, the waters in which the *Sydney–Kormoran* engagement were believed to have taken place were too

deep for search and analysis. There remained, however, the possibility that HMAS *Sydney* was attempting to make the coast before it disappeared. While conducting research for his book on the subject, Michael Montgomery, son of HMAS *Sydney*’s navigator first proposed that an examination of oil search data held at the Department of Mines might reveal indications of a wreck. This in turn led to the finding of a very promising magnetic anomaly off the Zuytdorp cliffs north of Kalbarri. Being outside its normal operating parameters, the author, then Inspector of Wrecks with the WA Museum requested the RAN to assist in the analysis of the ‘find’. As a result, in October 1981 a combined Museum/RAN team joined on board the hydrographic survey ship HMAS *Moresby* to locate and analyse the anomaly, finding it to be a geological formation lying *c.* 200 m below the seabed (Green *et al.* 1982). Despite this, interest in the possibility remained. A specific HMAS *Sydney*/HSK *Kormoran* file (WAM file MA-630/810) was opened and the relevant materials copied from the former Naval Wrecks file. From then on entries to the file included correspondence, research and reports of promising anomalies or seabed features indicative of a wreck. In May 1985, for example, the Department of Defence advised that in the course of a survey conducted off Shark Bay HMAS *Moresby* had encountered ‘irregular bottom topography consistent with wreckage’ on the 100 m contour north of Cape Inscription on Dirk Hartog Island.

Thereafter the Department of Defence and the Museum either independently, or in harness, examined (relatively) shallow-water HMAS *Sydney*-related reports, eventually proving all to be to be non-magnetic and geological in origin. Some reports were totally spurious. In May 1987, for example, the RAN received an astonishing report from diver Wayne Sampey advising of a dive on the wreck of HMAS *Sydney* in *c.* 30 m of water, 10 n miles off Dirk Hartog island. Without consulting the Museum, the Services then commenced an extensive airborne magnetometer search utilising a P3C Orion aircraft, but no evidence of a ship was found. Having also received a report of the grave of a sailor on the cliffs overlooking Turtle Bay on Dirk Hartog Island, HMAS *Geraldton* was asked to examine the area of the report. A ‘possible grave site’ was found but not investigated. An analysis later conducted by the Museum showed that the report was entirely spurious and that there was no evidence of a grave, or sub-surface disturbance of any sort (McCarthy 2007). In all, over 25 shallow-water reports of finding a wreck or relics believed to be associated with HMAS *Sydney* or HSK *Kormoran* were received at the WA Museum and/or the RAN right up to the announcement of what was to be an ultimately successful search late in 2007. This resulted in the examination of snags, magnetic anomalies, unusual

echo sounder traces or other indications of a wreck. Some reports were most promising, but all eventually proved spurious.

In this same period the Museum also requested the United States Navy (USN) to provide any of their geophysical data that might prove to be indications of a wreck in the region of the battle position *c.* 100 n miles off the coast of Shark Bay. Reply was received to the effect that their tracks did not pass close enough to be of any value. Later, the Museum also inquired of Telstra in respect of any remote-sensing indications of a wreck that might emerge in their preparations for a Singapore to Fremantle cable, again in the negative.

Successful deep-water searches lead to the Museum's 1991 'Finding Sydney Seminar'

The Woods Hole Oceanographic Institute (WHOI) location of SS *Titanic* and the German battleship *Bismarck* in the mid 1980s posed the obvious question, 'could *Sydney* be also located' and if so what was the search area? In July 1990, Dr David Gallo on behalf of WHOI met with the author and expressed interest in joining in the search. A formal invitation was issued and in the expectation that the search area would be narrowed down significantly, Gallo wrote back accepting an offer to join the Museum in the search. The Office of War Graves, the RSL (with some reservations), the Australian War Memorial, the German Government, the *Kormoran* Survivors Association and the federal Minister responsible for the Historic Shipwrecks Act then all formally expressed support for the notion of a non-disturbance search and survey regime. The German Navy was invited to participate, and the RAN offered a platform for the search. The Western Australian Museum's Maritime Archaeology Advisory Committee, the Director and its Board of Trustees also provided formal support. The Museum and the then Commonwealth department responsible for the operations of the *Historic Shipwrecks Act 1976*, developed contingency plans for the protection of the wrecks, should they be found. This included the declaring of a restricted zone around the site(s) prohibiting access, for all bona fide research purposes (WAM File MA-630/810).

Again using funds provided by the Commonwealth Government under the Historic Shipwrecks Program, visits were made to the archives in Canberra, Melbourne and elsewhere. Many researchers, too numerous to list, also provided their insights. As but a few examples of the widespread nature of the interest and the expertise provided to the Museum, local remote sensing companies ASI, Aerodata and Fugro McLelland offered to assist as did Dr T.O. Paine Head of the American Submarine Warfare Library in California, a noted engineer and former NASA (Apollo lunar space program) chief. He was a submariner stationed in Fremantle during the war and having married a West Australian had strong links with Fremantle despite being based in America. Another specialist Professor Kim Kirsner of the University of Western Australia analysed the value of oral histories in accurately recalling past events. He also provided the results of his hindcasting—with

other scholars, including Sam Hughes of AMSA—of a position for the battle based on the drift of wreckage and boats. Prof. Kirsner also proposed the convening of a data-gathering, commemorative seminar on the HMAS *Sydney* at the 50th anniversary of its loss. Further specialist support was provided in April of 1991 when local remote sensing firm Associated Survey International, later Fugro Survey offered their services to the Museum. Local and international film-makers also jostled for position should a search get underway.

Researchers, serving and retired naval personnel, archivists, oceanographers, climatologists, search and rescue operatives (Australian Maritime Safety Authority [AMSA]), the RAN Hydrographic Service and other experts then joined at the Museum on 19 November 1991 for a 50th Anniversary Forum on the loss of the *Sydney*. Naval Officer Commanding Western Australia, Commodore Peter Briggs opened the proceedings. Letters of support from Otto Jürgensen, representing the *Kormoran* survivors association, and the Hon. Kim Beazley, then a Minister in the Australian Government, were read. The letters, the many papers and the discussions that followed were recorded and collated for the major archives and institutions (McCarthy & Kirsner 1992).

One of the 'key' questions put to the oceanographers, climatologists, search and rescue specialists present was the issue of whether the spread of wreckage (not counting anything that could have been propelled or steered) supported Fregattenkapitän T.A. Detmers' assertion that the battle (and the place where HSK *Kormoran* was scuttled) took place at or around 26°32–34'S, 111° E. The answer was unequivocally 'yes'. On the other hand, the notion that *Sydney* could be found was dealt a severe blow when the specialists proved unable to reduce the search area down to anything like the proportions of the two previously successful deep-water searches. The area for *Kormoran* was *c.* 350 n miles in area. In comparison, the area for the successful *Bismarck* and *Titanic* searches was around 500 km². On the other hand, no one was able to say with any certainty where HMAS *Sydney* went down. The *Kormoran* sailors had given inconclusive accounts to their interrogators with some thinking it had sunk nearby and others believing it had headed off towards the coast. RAN signals of the time indicate that, while some thought *Sydney* sank at or near the battle position, others felt it could have been trying to make the nearest floating dry dock at Surabaya, a port then in allied hands. It was for these reasons, and the spread of the very sparse amount of wreckage from HMAS *Sydney*, including possibly a carley float that arrived at Christmas Island in mid 1942, that the area in which HMAS *Sydney* was thought to lie was estimated by Kirsner *et al.* at *c.* 7 200 km² (Kirsner 1992; Kirsner & Hughes 1993). It was with all those imponderables in mind that WHOI understandably declined to proceed with the search, though the author on behalf of the Museum made one final attempt to involve them as indicated below.

Political and other expressions of interest in finding HMAS Sydney

In 1994 federal Minister, the Hon. Kim Beazley, who had a keen interest in military history and whose father was in government at the time of HMAS Sydney's loss, invited Museum staff to meet and discuss the best means of seeking funds from government for a search and, (as a necessary preliminary), the archival search. Later in that same year, another senior local politician and war veteran Mr Graham Edwards also met with staff with a similar aim in mind. When approached for assistance, the Department of Librarianship, Archives and Records at Monash University also offered its services in the search, management and analysis of the resultant archives, subject to funding. Despite this enthusiasm and support, funding was not obtained. Nor did anything come from the approaches made by the Museum, politicians and other researchers when RV *Knorr*—the vessel on which RMS *Titanic* was found—called into Fremantle in 1994. Thus, in the absence of deep-water search expertise and with it the possibility of government funding for a search of the Detmers' battle position, the Museum's plans to commence a search in harness with Woods Hole were shelved.

The formation of private search companies

In March 1995, the Western Australian Government looked towards supporting a search utilizing petroleum industry expertise should the proposed archival search narrow the search zone down to manageable parameters. In this period three public groups began gearing up to raise money to find the HMAS Sydney. Two fell by the wayside leaving the HMAS Sydney Trust led by Mr Wayne Sydney Born the primary force. His group included local politicians such as the Hon. Stephen Smith, the Hon. Graham Edwards, elements of the SRG and other researchers, including Mr Ted Graham of Fugro Survey. They eventually hoped to perform a deep-water search in the 'Detmers' area'. In May of that year, local member Paul Filing, another member of the Trust, made a bipartisan call in parliament for the Australian Government to support any moves to locate the HMAS Sydney. He also called on the House to support a call for public subscriptions, for the government to fund a memorial, to establish an Act of Parliament protecting the wreck from unauthorized access and to keep the coordinates of the wreck (if found) a secret.

As its first project the Trust sought to have an anomaly located in *c.* 100 m of water SW of Carnarvon examined. Though the Museum and the RAN indicated they were committed to examining the site in due course, convinced it was very significant, the Trust elected to proceed independently. After obtaining sponsorship from the *West Australian* newspaper, a team led by Mr Born including Mr Edwards and Mr Graham set out to examine it the following May. The subsequent news item advising of the failure to locate a wreck also ominously noted that in the terrible weather encountered on site, 'most members of the party had become very sick—Mr Born very ill'. Though

he recovered from the combined effects of seasickness and a virus sufficiently to conduct an interview with the *West Australian*, it was not long after, that Mr Born died of heart failure.

On his death, the Trust collapsed and at the instigation of Mr Edwards was reformed as the HMAS Sydney Foundation, under the leadership of Ed Punchard (author, former oil industry diver, graduate of the Post-Graduate Diploma in Maritime Archaeology course at the Museum and film-maker). Having learnt of HMAS Sydney while working with the author, he and Julia Redwood formed Prospero Productions and completed 'No Survivors' one of the first documentary films on its loss. It won the International Maritime and Exploration Film Festival award in Toulon, in 1994. Having most of the former Trust, including Ted Graham, Kim Kirsner, and Mr Born's widow, Karen on board, the Foundation under Punchard's leadership garnered further high-level political and academic support and was launched at a public ceremony held at the Western Australian Maritime Museum in December 1995.

Eventually senior Parliamentarians Kim Beazley, Graham Edwards, Paul Filing, Tim Fischer, John Panizza and Steven Smith sat on the Foundation's board attesting to the success of its leaders and organizers in garnering very high-powered support and national interest. Despite this great success and as was the case with the Trust, the Museum declined invitations to join the HMAS Sydney Foundation, offering to provide every assistance, yet at the same time maintaining its independence and thereby be best placed to provide independent advice and expertise to the Australian Government should the need arise. A Memorandum of Understanding (MOU) was entered into nonetheless, outlining the searcher's duties under the Act and formalising a reporting and protective structure should the wreck(s) be found.

While the Foundation continued to narrow down the search area by conducting its own research and oceanographic analyses the Museum also continued to assist and encourage bona fide research under its volunteer and outreach programmes. One of these independent researchers, Wes Olson, not only proved that the Carley float recovered at Christmas Island was from HMAS Sydney, for example, but also showed where it had come from on the ship. A comparative study examining other ships, losses and engagements where similar damage to that inflicted on HMAS Sydney occurred also resulted from his work (Olson 1995, 1996). Later these reports evolved into an exhaustively researched and highly acclaimed book (Olson 2000). In this same period, some researchers also came to espouse conspiracy theory, and though advised to remain objective and at least to provide references or corroborative evidence, they failed to do so and sadly continued to produce unsubstantiated speculation.

A southern battle is postulated: splitting the search camps

In early 1993 Mrs Glenys McDonald, a mid-west resident advised on the basis of her extensive oral histories and archival study that a search of the Port Gregory region was

required. Later she suggested that the Museum conduct a grid search of the region in a search for HMAS *Sydney*. This followed on from earlier reports to the Museum from former Geraldton resident Mrs Adeline Cox and Mr Ted King of Kalbarri. In 1991 they reported sightings that they believed were indicative of a WWII 'battle' in sight of those regions. In November, airborne geophysical company Aerodata, that was later to be incorporated into World Geosciences, advised the Museum of the location of two aeromagnetic anomalies found north of the Abrolhos Islands and thought to be *Sydney* and *Kormoran*. Their subsequent analysis—at a significant cost to their company and covering an area of 10 000 km² over several weeks—showed them to be geological. The extensive publicity given to this search and the research and reports that preceded it, swung public attention to possibility that HMAS *Sydney* could have been trying to make for Geraldton before it succumbed.

The sightings of a 'battle' referred to above also caused some to further question Detmers' veracity and postulate a southern battle position somewhere north of the Abrolhos and west of the Kalbarri/Port Gregory region. This notion was reinforced through a number of analyses by experienced navigators, including some past and serving RAN officers. They concluded that lifeboats from HSK *Kormoran* that landed north of Carnarvon emanated from the Abrolhos region and not from the Detmers' battle position. These combined with earlier claims by Lt Col (retd.) T. Warren Whitakker and inventor Mr Lindsay Knight to have found HMAS *Sydney*, HSK *Kormoran* and an unidentified Japanese vessel in the region by a combination of 'map dowsing' and Mr Knight's controversial detection system (KDLS). (This is also mentioned as part of the development of the conspiracy theories in the first paper in this series.) Convinced of naval and government duplicity (including the Museum) in hiding the true battle position, many researchers—no matter how implausible the Whitakker/Knight claims were—then came to turn their attention to that area. This proved to have disastrous consequences, delaying the search by well over a decade.

The archives are thoroughly searched

Partly with a view to the growing national interest and subsequent to one of the key recommendations of the Museum's 1991 Forum, in April 1996 the Australian Archives produced its comprehensive *Source analysis for HMAS Sydney and HSK Komoran* (Summerrell 1999). It was an update of a listing prepared for the 1991 Forum and continued the process of identifying all Australian Government archival records known to exist concerning the sinking of HMAS *Sydney*. It was an essential preliminary to any projected in-water search.

In June a very well attended forum, hosted by Glenys McDonald and World Geosciences was held at the Western Australian Museum—Geraldton. Many views were aired and it proved another focus for interest in the possibility that the wrecks lay in that region. In 1997, at the Flying Angel seafarers club in Fremantle another researcher John Doohan ran a well attended, but ultimately very

acrimonious forum inquiring into the battle and its aftermath. Doohan, who had left the SRG to form his own group End of Secrecy on *Sydney*, also became a very aggressive activist, using what he saw as flaws in the HMAS *Sydney* story to press his own agenda and to lobby government at all levels. As but one example, in one short period he is found writing to the Prime Minister, P. Keating; G. Edwards, Minister for Police (WA); J. Pollard Chief of Staff, *Sunday Times*, Sir Frances Burt, Governor (WA); J.M. Berinson, Attorney General (WA); the Chairman, War Crimes Commission; N. Bolkus, Minister for Administrative Affairs; and, Bill Hayden, Governor General. This broadly cast net is an example of how otherwise uninvolved decision-makers were becoming affected by the conspiracies and controversies in the mid 1990s, even if it was only to sign a reply prepared by staff.

A Parliamentary Inquiry is called

The diverse, sometimes controversial and occasionally acrimonious views expressed at both the 1996–97 Geraldton and Fremantle gatherings alerted many to the growing controversy. These two public events, the resultant publicity and the interest of a growing number of politicians were followed by two Private Members Bills tabled in the Federal Legislative Assembly, one by Paul Filing and the other by Steven Smith, both of the HMAS *Sydney* Foundation. These provided for the establishment and composition of a committee to investigate the loss of HMAS *Sydney*.

In June the parameters for the inquiry were set. One of its six aims was to examine the:

...desirability and practicability of conducting a search for HMAS *Sydney* and the extent to which the Commonwealth Government should participate in such a search should one be deemed desirable and practicable.

The question of whether archival material was still to be found was also raised as a matter of considerable priority. Finally, after an exhaustive round of national hearings and after collating all the evidence received into an 18-volume set, the Committee made 17 recommendations, including:

Recommendation 10. The Royal Australian Navy sponsor a seminar on the likely search areas for *Sydney* and *Kormoran*, involving as many of the individual researchers and groups as possible.

Recommendation 11. After the search area is more accurately defined, some preliminary surveys be undertaken to try and confirm the accuracy of the wreck locations, prior to a full in-water search. An initial search for HSK *Kormoran* at or near 26°32-34'S, 111°E, if supported by the seminar, would seem a logical starting point (Joint Standing Committee on Foreign Affairs, Defence and Trade 1999).

The 1998/9 Parliamentary Inquiry was followed by an independent analysis produced by the Department of Geomatics at the University of Melbourne. This found in support of the 'Detmers' position' adding further evidence of the need to search that region (Brown & O'Leary 1999).

HMAS Sydney Search Pty Ltd—the successful search company is formed: wreck hunter David Mearns joins

Towards the end of 2000, the HMAS *Sydney* Foundation ceased activities. In mid 2001 its place was taken by HMAS *Sydney* Search Pty Ltd, led by Ted Graham, Assoc. Prof. Kim Kirsner and Dr Don Pridmore a remote sensing specialist who had also been very active in promoting a search for HMAS *Sydney*. Later, they were joined by Ron Birmingham QC; Keith Rowe; Commodore Bob Trotter (RAN ret.), as CEO; Bob King OAM; and, finally Glenys McDonald AM. They too proved extremely successful in obtaining external support with Professor Geoffrey Blainey AC, former Deputy Prime Minister Tim Fischer and Rear Admiral David Holthouse its patrons. A number of senior politicians including Commonwealth Ministers Julie Bishop, Chris Ellison, Ian Campbell and Senator David Johnson also assisted. Led by Kim Kirsner and his Associate Dr John Dunn the search company continued to narrow down its search zone, successfully analyzing, not only oceanographic data and archival records, but also building on their analysis of the oral histories (Kirsner & Dunn 1998 a–c).

Later highly successful deep-water searcher David Mearns of Blue Water Recoveries, finder of HMS *Hood* and numerous other deep-water sites, began making contact with both the Museum and the HMAS *Sydney* Search Company, which became known as the Finding *Sydney* Foundation seeking to be involved in the search. As a high profile deep-water wreck finder along with WHOI, the Museum strongly supported Mearns' candidacy as a service provider to the FSF.

As with its earlier counterparts, the Museum continued to maintain its independence of the FSF, providing assistance and advice where requested. It also continued with its brief in respect of the inspection and evaluation of all reports of finding wrecks or relics believed to be historic, including those reputed to be from HMAS *Sydney* or its adversary. As indicated, claims of finding HMAS *Sydney* or its adversary had been regularly received by the Museum and the RAN since the early 1980s. Where indications of a wreck were provided e.g. in the form of verifiable echo sounder traces, relics, magnetic or other anomalies, the Museum took steps to have the site inspected either with the assistance of the Services, or with oil industry help. This included a number of anomalies found during a combined RAAF/RAN sweep in the area north of the Abrolhos Islands in late 2000, conducted at the instigation of Glenys McDonald. Examined by HMAS *Huon* in the following year they proved to be geological phenomena.

The 2001 RAN/SPC HMAS Sydney Location Seminar: Hopes for a search are temporarily dashed

Following the 1998/9 Parliamentary Inquiry, in November 2001, was the 60th Anniversary HMAS *Sydney* Location Seminar. Held at the Western Australian Museum and hosted by Royal Australian Navy's Sea Power Centre (SPC), it was opened by the Deputy Chief of Naval Staff who stated that the aim of the seminar was 'to more accurately define the potential search area for the wrecks'

and he advised that the results were to be forwarded to the Chief of Navy to allow him to make recommendations in respect of the search.

Adding to the confusion, another report from Warren Whitaker and Lindsay Knight appeared in mid 2001. In their press release they again claimed to have found the *Sydney* and *Kormoran* using the Knight Direct Location System (KDLS). This was a derivative of the system they had used earlier to find the two wrecks and what they later claimed to be a Japanese submarine, with bones and samurai swords evident in the wreckage. Global Position System (GPS) positions were also provided. Though clearly of a problematic nature, with the methods having a dubious historic and technical record, the report received uncritical national press, some of it front page under the heading 'HMAS *Sydney* Found'. While the vast majority of reports were made in honest belief, some have proved fraudulent and others blatantly self-serving with a view to promoting untried technology, or for financial, or personal gain. That these claims received the credence they did, especially in the press, and were then passionately defended by a large cross-section of relatives and stakeholders is remarkable.

These factors, and the failure to table scientific advice advising of the absolute impossibility of the KDLS System—that had been used as proof that the wrecks lay in that area—all led to sharp divide and a lack of consensus amongst those present with those supporting a search of the Detmers' battle position on the basis of the oceanographic evidence, passionately opposed by those who argued for a search of the Abrolhos region. In essence the 2001 SPC seminar, which extensively reviewed the archival, oral, oceanographic and scientific evidence, foundered in respect of the hoped-for narrowing of a search area. This was partly due to the strength of the beliefs expressed by Whitaker, and supported by a surprisingly large number of serving and former RAN navigators mentioned above, that it was impossible for the *Kormoran* lifeboats to have travelled from the Detmers' position to the Carnarvon region. They had all concluded that the boats came from a 'southern battle' site, near the Abrolhos Islands. This all led the Chair, Professor Peter Dennis, of the Sea Power Centre to conclude:

... more research... is needed so that those who have to make the decisions about using large amounts of money, at least some of it public money, can do so on the best possible and informed basis. I have to say as a concluding comment, that I am disappointed that several years on from the parliamentary report and given all the work various groups here today have been doing, a greater measure of agreement and precision does not yet seem to be emerging. Until it does, talk of mounting searches at this stage is still premature (Royal Australian Navy, Sea Power Centre 2001).

By 2007 all claims to have located HMAS Sydney are proved false: The first Australian Government grant is received

In 2002 a group brought together by Mr John Begg, comprising the Italian Oil major Agip, Sydney based

ROC Oil, in partnership with Apache Northwest of the US and local companies, Voyager Energy and Bounty Oil and Gas approached the Museum and subsequently combined to examine gratis (and at quite considerable expense to themselves) eight 'Sydney-related' sites that had been reported off Geraldton. This included the shallowest of the Whitakker/Knight sites, showing all to be either geological or non-existent. Still refusing to accept this as proof, and citing deficiencies in the remote-sensing equipment used, those supporting a southern position rejected the conclusions in respect of the Whitakker/Knight sites, with some again claiming it was part of a cover-up by the government and the Museum.

Despite the lingering, and still passionate, support for a 'southern battle site', in 2005 the Hon. John Howard, then Prime Minister, announced a grant of \$1.3 million dollars to the HMAS Sydney Search Company to pursue the search, and it then established an MOU with Mr Mearns as its chosen in-water operative. The Western Australian Government also provided support to enable the company to function. In March 2007 the company reported that Perth-based Geo Subsea Pty Ltd which had its research vessel *Geosounder* travelling en route from Fremantle to Dampier, had investigated gratis the KDLS southern GPS site off the Abrolhos Islands. Using a state-of-the-art multi-beam echo sounder system capable of mapping the seabed for a distance of 3 km either side to a depth of 5 000 m, nothing but a bare seabed was found. This served to unequivocally remove the Whitakker/Knight positions from the agenda. Together with the 2002 results in mind, the results also unequivocally rendered the 'southern sites' of secondary importance in any search and survey regime. The way was finally opened for government to provide full financial support to the search of the 'Detmers' position' at or around, plus or minus a degree of 26° 34'S, 111° E.

Even then there were still other well-publicised reports to contend with, one from as far afield as Britain, from Timothy Akers, claiming to have found the two wrecks using satellite technology. The science which was considered doubtful at best received great publicity. After the press later published his claim to have located a Japanese aircraft carrier in the battle area all official interest in his claims evaporated.

Even then, it was all nearly derailed again when, in August 2007, filling front page news and TV prime time slots nationally were images provided of a team who thought they had found HMAS Sydney, despite Museum advice to the contrary. Of importance to site managers and those tasked with curating 'mysterious wrecks' as outlined in part one of this series, this author later found that this site had been located years earlier by Shark Bay interests. It also found that, in believing it was HMAS Sydney-related, the wreck's position and other details including an echo-sounder survey had been deliberately withheld from the government by the then Chief Executive Officer, the then President, and other Councillors in the Shire of Shark Bay in order to keep the wreck to themselves. Here is an example of the regional jealousies at work, with Shark Bay and Carnarvon implacably

opposed to any suggestion from Geraldton interests that the battle had taken place near the Abrolhos.

Unable to effect an inspection due to the depth, again the Museum sought RAN assistance and an examination out of the survey ship HMAS *Leeuwin* showed the site was that of a small vessel clearly not related to HMAS Sydney or its adversary. After a short delay caused by the need to attend to this claim Senator Bruce Billson, the Minister assisting the Minister for the Navy, announced a Commonwealth Government grant of \$4.2 million for the search. This, when joined with \$550 000 provided by the Western Australian Government, a further \$250 000 from the New South Wales Government and some public and corporate sponsorship, made a search for HMAS Sydney and, as a necessary preliminary, its adversary HSK *Kormoran*, finally possible.

Subsequently, on 19 November 2007, at a ceremony held at the Western Australian Museum—Maritime, the HMAS Sydney Search Company formally launched what was to ultimately be a successful search. At that ceremony the author delivered a speech on which this paper is based explaining to those who could not understand why the search for two of Australia's most significant maritime archaeological sites took so long to effect. Clearly, a distrustful populace, unwilling to accept the veracity of the German accounts as to the whereabouts of the battle and the subsequent course of HMAS Sydney, an officialdom (other than the WA Museum) unwilling to countenance a search until c. 2005, and the credence given to unfound, spurious, and even fraudulent claims were the key.

References

- Brown, N. and O'Leary, T., 1999, *A network approach to the definition of a search area for the HMAS Sydney and HSK Kormoran: final report*. University of Melbourne. Dept. of Geomatics, Parkville, Victoria.
- Cole, T.R.H., 2009, *The loss of HMAS Sydney II*. <http://www.defence.gov.au/sydneyii/finalreport/index.html>
- Detmers, T., 1959, 1975, *The Raider Kormoran*. Kimber, London.
- Green, J., McCarthy, M. and Penrose, J., 1984, Site inspection by Remote Sensing—the HMAS Sydney search: a case study. *The Bulletin of the Australian Institute for Maritime Archaeology*, 8.1: 25–42.
- Hore P., 2001, *HMAS Sydney—the cruiser and the controversy in the Archives of the United Kingdom*. Royal Australian Navy Sea Power Centre, Canberra.
- Hore P., 2009, *Sydney cipher and search: Solving the last great naval mystery of the Second World War*. Seafarer Books, Suffolk, UK.
- Joint Standing Committee on Foreign Affairs, Defence and Trade, 1999, *Report on the Loss of HMAS Sydney*. Parliament of the Commonwealth of Australia, Canberra.
- Kirsner, K., 1992, The search for HSK *Kormoran* and HMAS Sydney: A preliminary analysis based on search and rescue procedures. *The Great Circle* (Journal of the Australian Association of Maritime History), 14: 88–104.
- Kirsner, K. and Dunn, J., 1998, May, Feasibility of the search for HMAS Sydney and HSK *Kormoran*: Oceanographic and cognitive issues. *Submission to the Joint Standing Committee on Foreign Affairs, Defence and Trade Defence Sub-Committee: Inquiry into the circumstances of the sinking of HMAS Sydney*, 11: 2727–2742.

- Kirsner, K. and Dunn, J., 1998, June, A review of the oceanographic and cognitive evidence that HSK *Kormoran* is at 28°39'S 113°22'E. *Submission to the Joint Standing Committee on Foreign Affairs, Defence and Trade Defence Sub-Committee: Inquiry into the circumstances of the sinking of HMAS Sydney*, **16**: 4023–4058.
- Kirsner, K. and Dunn, J., 1998, June. Cognitive problems associated with the use of oral history data: Supplement to 'Feasibility of the search for HMAS *Sydney* and HSK *Kormoran*: Oceanographic and Cognitive Issues'. *Submission to the Joint Standing Committee on Foreign Affairs, Defence and Trade Defence Sub-Committee: Inquiry into the circumstances of the sinking of HMAS Sydney*, **18**: 4311–4313.
- Kirsner, K. and Hughes, S., 1993, HMAS *Sydney* and HSK *Kormoran*: Possible and probable search areas. Report—Department of Maritime Archaeology, Western Australian Maritime Museum, No. 71, November 1993.
- McDonald G., 2005, *Seeking the Sydney: A quest for truth*. University of Western Australia Press, Perth.
- McCarthy, M. and Kirsner, K., (comps), 1991, Papers from the HMAS *Sydney* Forum, Fremantle 21–23 November, 1991. Report—Department of Maritime Archaeology, Western Australian Maritime Museum, No. 52.
- McCarthy, M., (comp.), 2002, Submissions to the HMAS *Sydney* II Seminar. Report—Department of Maritime Archaeology, Western Australian Maritime Museum, No. 164.
- McCarthy, M., 2007, The Turtle Bay 'Grave'. In: J. Green, (ed.) *Report on the 2006 Western Australian Museum, Department of Maritime Archaeology, Cape Inscription National Heritage Listing Archaeological Survey*. Report—Department of Maritime Archaeology Western Australian Museum, No. 223. Special Publication No. 10, Australian National Centre of Excellence for Maritime Archaeology: 203–206.
- Olson, W., 1995, HMAS *Sydney* (1934–1941) possible and probable cause of her loss. Report—Department of Maritime Archaeology, Western Australian Maritime Museum, No. 104.
- Olson, W., 1996, With all hands, a study of the circumstances surrounding the loss of the 645 officer and men aboard HMAS *Sydney* in November 1941. Report—Department of Maritime Archaeology, Western Australian Maritime Museum, No. 116.
- Olson, W., 2000, *Bitter victory: The death of HMAS Sydney*, 2nd edn. University of Western Australia Press, Perth.
- Royal Australian Navy, Sea Power Centre, 2001, *HMAS Sydney II. Proceedings of the Wreck location Seminar, 16 November 2001*. Department of Defence, Canberra.
- Summerell, R., 1999, *Sinking of HMAS Sydney: A guide to Commonwealth Government records*, 3rd edn. Australian Archives, Canberra.
- Winter, B. 1984, *HMAS Sydney: Fact, fantasy and fraud*. Booralong Press, Brisbane.
- Winter, B., 1995, *The intrigue master: Commander Long and naval intelligence in Australia 1913–1945*. Booralong Press, Brisbane.

NOTES TO AUTHORS

All authors are required to present completed manuscripts, together with illustrations. The manuscripts should follow the style of this edition. Original illustrations should accompany the manuscripts together with a caption list. The manuscripts must be typewritten, properly titled and referenced. Essentially, the *Bulletin* follows the style of the *International Journal of Nautical Archaeology*. Where there are discrepancies or ambiguities, authors are referred to Commonwealth of Australia, 2002, *Style Manual for Authors Editors and Printers* (Sixth edition) Australian Government Publishing Service, Canberra. Spelling is to conform with the *Oxford Dictionary*, and where there is an alternative, the first (preferred) spelling will be adopted. Additional guidance may be obtained from Oxford English Dictionary Department, 1981, *The Oxford Dictionary for Writers and Editors*, Clarendon Press, Oxford. All foreign words are to be italicised, together with titles of publications. Endnotes or footnotes will not be used in future editions of the *Bulletin*. All measurements should be given in metres where appropriate. However, it is appreciated that 19th-century British shipping measurements, for example, were given in feet and inches and some workers still may record in these units. Authors should indicate where measurements are made this way by giving the measurements in feet and inches and metric conversion in parentheses (likewise, for measurements taken from published sources). Otherwise, metric units should be given with Imperial (or other) conversions, where appropriate, in parentheses.

It is essential that proper acknowledgements are given in the text to material by other authors, and where copyright material is used, permission from the publishers must be obtained. Authors are reminded of the Copyright Laws and further information on this matter can be obtained from the website <<http://www.copyright.org.au/>>. References should use the author-date system and in the text can either appear as: 'Jones (1986) discovered water at...' or 'water was discovered at Cambden (Jones, 1986)'. Authors can refer to specific pages; thus (Jones, 1986: 223) or Jones (1986: 44–56), note: number spans must use an en-rule not a hyphen. The list of references should be listed at the end of the paper and must conform to the format of the references within this volume. For example: Jones, C.W., 1986, Water in the transport system. *Bulletin of the Australasian Institute for Maritime Archaeology*, 6.1: 44–86. Adams, C.F., 1984, *Restaurant at the End of the Universe*. Penguin, London. (Note, published references must include the publisher and place of publication). At present no particular style has been decided for unpublished material and such decisions will be made at the editor's discretion. Authors are particularly requested to present references correctly. Authors failing to do so will be required to resubmit manuscript with correct reference style.

Illustrations can be submitted either as hard copy or in an electronic format, the latter being the preferred format. For hard copy, drawings must be originals, either inked on plastic drawing film or paper, or good quality black and white photographs. Originals will be returned to authors if requested, but editors take no responsibility for originals. Presentation must take into account reduction to the size of the *Bulletin*. Thus, where reduction is anticipated, line thickness and lettering size should be carefully considered. As a general rule, the thinnest reproducible line is 0.1 mm. Photographs should be presented to fit the format page size of this issue of the *Bulletin* (i.e. single column 85 mm wide, two column 175 mm wide). All illustrations must have their figure numbers included in pencil. Illustrations unsuitable for publication will be returned with manuscript to author for modification. A list of illustrations with captions should be included in a separate document. In the case of electronic copy the following formats are the only formats accepted:

RASTER IMAGES

TIFF is the only format that will be accepted and should be a greyscale image. If the image is scanned, then this should be in a form so that the final image has a resolution of 300 dpi along an image width of either 85 mm or 175 mm (file size will be about 1 MByte). Note graphs and text-based figures are best produced in vector format.

VECTOR IMAGES

Either Adobe Illustrator or Macromedia FreeHand format are the only formats acceptable. Text should be in Ariel font, no more than 10 point, for reproduction at an image width of either 85 mm or 175 mm. Line widths no less than 0.1 mm. It is recommended that charts are produced in this format rather than using Microsoft Excel charts.

EXCEL CHART

Excel charts are difficult to typeset. Authors, who do not have access to vector computer programs, are asked to ensure that the data is included with the chart.

TABLES

Complex tables are best set in Microsoft Word table format. Authors should remember the limitations of the *Bulletin* format and design the tables to fit accordingly. Hard copy of tables should always be included for editors to cross check, as often formatting does not carry over.

EQUATIONS

Complex equations can be produced in the *Bulletin*; however, authors will need to liaise with editors on this matter. This edition of the *Bulletin* has been set entirely on a Macintosh computer using Microsoft Word for text, Adobe InDesign CS4 for typesetting, the graphics were scanned using an Epson scanner and Adobe Photoshop CS3, some illustrations were produced on Macromedia FreeHand MX.

A I M A

CONTENTS

The archaeology of military mismanagement: an example from New Zealand's colonial torpedo boat defences, 1884–1900	J.W. Hunter III	1
Raising the War: Japanese salvage divers and allied shipwrecks in post-war Darwin	D. Steinberg	11
Site formation process (wing inversion) at Catalina flying boat wreck sites lying in Roebuck Bay, Broome, WA	S. Jung	19
Archaeology of an Australian steam tug: The SS <i>Dumaresq</i>	M. MacLellan Tracey	32
The <i>Surprise</i> : Australia's first steamship	R.T. Sexton	48
Neolithic and Early Bronze Age reed boats and watercraft from Mesopotamia and the Persian Gulf: An overview	Nicolas Bigourdan	63
Towards an understanding of the importance of the HMAS <i>Sydney II</i> and HSK <i>Kormoran</i> sites. Part 1: The genesis and evolution of the controversies	Michael McCarthy	72
Towards an understanding of the importance of the HMAS <i>Sydney</i> and HSK <i>Kormoran</i> sites. Part 2: The inordinate delay in commencing a search	Michael McCarthy	78

A I M A