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**Deep Structures:  
An Examination of  
Deliberate Watercraft Abandonment in Australia**

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BA. (Hons.)

A thesis submitted in fulfilment  
of the requirements for the degree of  
Doctor of Philosophy

Department of Archaeology  
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DECLARATION OF CANDIDATE

I certify that this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any university; and that to the best of my knowledge and belief it does not contain any material previously published or written by another person except where due reference is made in the text.

Signed,

A handwritten signature in black ink, appearing to read 'Nathan Richards', with a large, sweeping loop at the end.

Nathan Richards

09/09/2002

## DECLARATION OF SUPERVISOR

I believe that this thesis is properly presented, conforms to the specifications of thesis presentation at Flinders University and is *prima facie* worthy of examination.

Signed,

A handwritten signature in blue ink on a light blue rectangular background. The signature reads "M. Staniforth" in a cursive, slightly stylized font.

Dr. Mark Staniforth

09/09/2002

**DEDICATION**

This thesis is dedicated with affection to my parents  
Robert and Raelene Richards.

## ABSTRACT

This thesis is an examination of deliberately discarded watercraft in Australia. It represents a comparative, non-particularist approach that seeks to understand abandoned vessels within a diverse theoretical framework. This view sees the remains of abandoned watercraft as an important component of Australian maritime heritage with the potential to shed light on a number of areas.

A database of over 1500 discarded and demolished watercraft sites, containing over 6000 primary and secondary historical records, and information from archaeological inspections was collated. This data was used to assess degree of correlation between discard activities and economic, social and technological events. The logistics of discard, as reflected in commentaries describing discard procedures, and as seen in the discernible signatures of these events in the archaeological record were observed during the examination and survey of over 120 beached and submerged abandoned watercraft all over Australia. This information was used to illustrate the causal mechanisms between landscape, economic trends, regulatory frameworks and cultural site formation processes associated with harm minimisation, placement assurance, salvage and discard activities.

This combination of historical and archaeological data illustrates that discard events and demolition activities are intimately connected to economic trends, and technological developments throughout the many phases in the life history of a vessel. Additionally, this illustrates that abandoned watercraft are not only a prominent part of the Australian landscape, but also have theoretical consequences for how we see the relationship between the archaeological and historical record.

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## LIST OF ABBREVIATIONS

AHSD	Australian Historic Shipwrecks Database
ANAVD	Australian National Abandoned Vessel Database
ANMA	Australian National Maritime Association
ANMM	Australian National Maritime Museum
COIITC	Committee of Inquiry into Technological Change in Australia
DASETT	Department of the Arts, Sport, the Environment, Tourism and Territories
FAD	Fish Aggregation Device
GIS	Geographical Information System
GMT	Greenwich Mean Time
GRG	Government Record Group
GRT	Gross Registered Tons
IMO	International Maritime Organization
MAAQ	Maritime Archaeological Association of Queensland
MAAT	Maritime Archaeological Association of Tasmania
MAAV	Maritime Archaeological Association of Victoria
MAAWA	Maritime Archaeological Association of Western Australia
MAGNT	Museum and Art Gallery of the Northern Territory
MAS	Marine Archaeological Society
PAHS	Port Adelaide Historical Society
SUHR	Society for Underwater Historical Research
UARG	Underwater Archaeological Research Group
VAS	Victoria Archaeological Survey

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## PREFACE

In 1997 I completed an honours degree by thesis into a ships' graveyard site at Port Adelaide, South Australia called the Garden Island Ships' Graveyard (Richards, N. 1997). During research into this site I found that a more comprehensive interpretation of vessel discard and maritime refuse areas come about through more than just the examination of the individual ships' histories, or indeed the combination of their histories. The findings of my thesis were that there are ways of using primary source historical documentation to examine and expose cultural transformation processes of a maritime nature, and that ship abandonment areas are some of the best sites to communicate this. In other words, a broader, comparative, non-particularistic, more anthropologically orientated approach was needed to uncover and better understand behavioural and cultural aspects of maritime sites.

Abandoned watercraft were not the traditional subject of maritime archaeology. In part this, and my interests in technology and ship construction is what drew me towards this subject. Additionally, the "fetishistic nature" of many artefact-based studies (Johnson 2000: 21), which can equally be applied to the particularist shipwreck approaches that have dominated maritime archaeology did not seem to have the generalising potential that I perceived in this particular resource. Furthermore, many of these unwanted vessels had significantly useful secondary lives before abandonment, and sometimes similarly fulfilled interesting uses following abandonment. Yet, to a great extent these stories are unknown, and the wider phenomenon of their deliberate abandonment has equally lacked exposure.

It was also my belief that the comparative, non-disturbance analysis of discarded watercraft has the potential to shed light on many aspects of history and archaeology. Hence part of this study is linked with understanding the

forms of deliberate abandonment that have existed over time, and how these changes can be seen as a reflection of cultural behaviour and the changing symbolism and perception of watercraft through time.

To begin with this thesis was intended to be the next natural step from the site-based study at Garden Island, as well as the most comprehensive overview of the potential of the abandoned watercraft resource in Australia. It was eventually realised that the true extent of the discard and demolition of watercraft in Australia is not known, and may be unknowable. Such is the truly hidden nature of this resource. As a consequence much of this research is provisional in the sense that it is based on a currently incomplete, but growing database of sites. In the coming years, this information will hopefully undergo a range of amendments, including additions and serious reconsiderations. Once this is completed many of the figures, numbers and statistics may change. For this reason I have tried to include all of the information that I collected during this research with this thesis.

Attached at the back of the document a number of compact discs have been included. These CDs are have been formatted to be accessible on both PC and Macintosh computers. CD #1 includes all relevant documentation including a viewable version of the *Australian National Abandoned Vessel Database* (ANAVD) current at the time of the submission of this thesis. CDs #2 and #3 contain site photographs of the abandoned watercraft visited in most states of Australia during fieldwork from 1995 to 2002. The images were scanned as high-resolution images and saved in a JPEG format. Originals were colour 35mm slide, and colour and black and white 35mm print held in the collections of author, and the Department of Archaeology, Flinders University. In the end, this thesis, while hopefully proving the research potential of this aspect of maritime archaeology has posed more questions than this work has answers. It is hoped that research into this hitherto untapped potential will be explored further in the future.

## CONVERSIONS

This thesis uses contemporary imperial units of measurement. The following are approximate conversions:

1 inch	2.54 centimetres
1 foot	0.3 metres
1 yard	0.91 metres
1 mile	1.61 kilometres
1 pint	0.57 litres
1 gallon	4.55 litres
1 ounce	28 grams
1 pound	454 grams
1 ton	0.98 tonne or 1016 kilograms
1 tonne	1000 kilograms
1 knot	1.85 kilometres per hour

# CHAPTER 1

## Introduction

*The hulks especially are a forgotten group and instead of viewing them as they now appear ... they can be a fascinating starting point for further study of history and archaeology (McCarthy 1979b: 1)*

## CHAPTER 1

### INTRODUCTION

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#### Introduction

In the past the historical importance and archaeological potential of deliberately discarded watercraft has not been a major feature of maritime archaeological enquiry. This thesis is an examination, of this undervalued resource – fundamentally it is an assessment of the behaviours associated with deliberate discard in a maritime context. It takes into consideration a number of aspects of discard behaviours, examining many of the cultural processes that have contributed to the spatial patterns of dumping areas, the historical, economic and technological causes of abandonment, and archaeological signatures of such events and activities. Its aim is to show that the remains of discarded vessels are a significant cultural resource, and have the potential to illuminate aspects of the past that other kinds of cultural resources cannot. In particular this research aims to illustrate that when appropriate comparative methods are employed, the importance and archaeological potential of many aspects of our hitherto undervalued maritime heritage may have considerable light shed upon them.

It will be shown that watercraft abandonment is a process almost as old as shipbuilding, and that the discard of ships follows every aspect of maritime commerce. Hence discarded vessels are seen to have the capability to communicate many of the characteristics of technological change and diffusion, evolving economic conditions (especially in relation to ship owning and shipbuilding), and social history (the effect of changes within technology

and economy). They are also objects imbued with the cultural codes of the peoples who created them, and are rich with the evidence of the people who used, and disposed of them.

Within this thesis it is argued that the perspectives that predominate in the study of shipwrecks (the main subject of maritime archaeology here and abroad), are generally not appropriate for understanding abandoned watercraft. Moreover, this stance maintains that those views have negatively impacted the study of discarded watercraft, and that they have influenced how maritime archaeologists have perceived the significance of discard sites.

This introduction is separated into three parts. It begins with a discussion concerning what a “shipwreck” represents. This is seen as a fundamentally important step in coming to realize the nature of abandoned watercraft, and how their vestiges are different from their catastrophically lost equivalent. This is followed by another discussion focussing on the clarification of definitions which concentrates on categorising the many types of discard sites. Illustrating these differences is a pivotal aspect in re-contextualising the broad range of events, activities and processes that watercraft discard represents. These two discussions are important, and are not undertaken simply for the sake of creating arbitrary definitions – they illustrate why deliberately discarded watercraft need to be examined through generalist eyes. Furthermore, a comparison of these definitions serves to define the importance of discard and abandonment processes in the assessment of archaeological remains for meaning and significance, and sets the scene for subsequent criticisms regarding the use of particularistic methods for a resource more suited to comparative analysis. Finally there is a general discussion of the research represented in this thesis, communicating briefly how the structure of this dissertation will develop, and the rationale behind the arguments and questions presented within these pages.

### The Shipwreck-Abandonment Dichotomy

Although “shipwreck” is a popularly used term, it evokes many different meanings. The *Oxford English Dictionary* (Simpson and Weiner 1989: 280) defines a shipwreck as: “What is cast up from a wreck; the remains of a wrecked vessel; wreckage”, and the, “Destruction or loss of a ship by its being sunk or broken up by the violence of the sea, or by its striking or stranding upon a rock or shoal”. This explanation of shipwreck in relation to cataclysmic events is also provided by Lorimer (1988b: 39), who wrote, “Wrecks are defined as those vessels in use sunk by misadventure. It does not include scuttled or abandoned vessels...”. Indeed, this concentration on destructive processes is to some writers, such as Baker (1998: 17), problematic because of the implications it has for the perception of the destruction of cultural material. Nevertheless, at the heart of these definitions it is clear that catastrophic events are what turn ships to shipwrecks. They also indicate (both implicitly and explicitly) that scuttled and abandoned vessels are not shipwrecks. This distinction is not just a matter of semantics – it is pivotal to understanding the nature of abandonment processes and discard activities.

Likewise the term “abandonment” has many meanings, and it is often seen to be synonymous with ideas of “relinquishing”, “throwing away” and “rejecting”. In relation to shipping terms and phrases the term simply refers to the giving up of control of a vessel upon its constructive total loss (see Stevens 1947: 6, 64; Holman 1953: 45, 53-54; Lloyd’s of London 1973: 423, 1981: 488, 500-501, 1991: 370, 380). These definitions, however, are also about the catastrophic loss (wrecking), or damage of a vessel, and not about deliberate discard. Nevertheless, they are useful definitions because they illustrate that on some level all watercraft, irrespective of their fate come to be abandoned in some way by the people who used them. In this study, the term “abandonment”, however, has a very specific meaning because it falls outside of the definitions used by marine insurance in the assessment of loss,



although insurance underwriting remains an important aspect of abandonment (as outlined in Chapter 6). This study stresses that while the term “abandonment” may often imply a relinquishing of mercantile, support and/or post-discard function it does not imply a loss of cultural value. Although vessels are abandoned because they are perceived as refuse - sometimes the act of discard is carried out in relation to an intended function for the vessel following its deposition (see Chapter 8 on post-abandonment functions). Subsequently abandoned watercraft often retain cultural, economic and technological value.

Despite the obvious differences between catastrophic and deliberate depositional processes, many maritime historians tend to group discard events together with wrecking events, and do not consider the major differences that these two processes represent. Similarly, maritime archaeologists have not often considered the almost opposed events that wrecking and abandonment processes represent. If it is taken into consideration that the shipwreck event entails the partial (if not complete) loss of control over the fate of a vessel, and that the discard of a vessel represents the more or less total control over this fate, it is obvious that these two categories of maritime archaeological sites exist at opposite ends of a behavioural spectrum.

One author who has commented upon this shipwreck-abandonment dichotomy is Donald Shomette (1995b: 6-7 see also Babits & Corbin-Kjorness 1995: 38-39). While Shomette considers abandoned vessels as an “important variation of the shipwreck category”, he sees these vessels from a behavioural perspective, paying more attention to the cultural behaviours that define them historically, and influence the landscape and the archaeological record. In doing, he touches upon many of the features of abandoned watercraft that will be discussed in this thesis. His distinction between “abandonments at sea”, which emerge from catastrophic events, and the vessels that are

abandoned as “old or useless wrecks”, is one that allows for the behavioural aspects of this resource to be better understood (this will be discussed further in this chapter, and also in Chapter 5). Additionally he examines the abandonment of unwanted vessels from the perspective of their commonness and artefact sterility, but also considers that they represent an amalgam of industrial, technological, economic and regulatory developments in human societies (to be discussed in Chapters 6, and 7). Finally he touches upon the processes that are involved in their abandonment, such as the location of discard, their use as recyclable materials and structures after abandonment (addressed in Chapters 7 and 9).

The direction of this work differs from Shomette in only one important aspect. This research does not maintain that abandoned vessels are a variation of shipwreck; rather it considers shipwrecks and abandoned watercraft as two related but separate and highly discrete aspects of the maritime archaeological record. This is an important distinction in justifying the generalist/nomothetic analyses that are undertaken in this thesis (see Chapter 2). This research also suggests that there are many more separations that need to be made when assigning watercraft remains to a particular type of abandonment, and that this distinction is important when demonstrating the relationships of particular cultural processes to discard activities.

### **Degrees of Deliberation – the Breadth of Abandonment**

As already indicated, marine insurance definitions are not adequate to describe or understand deliberate acts of discard. Furthermore, the word “abandonment” has many uses in the English language, and therefore it can be applied to many circumstances that occur throughout the history of a vessel. Three categories of “abandonment” described below serve to illuminate the different cultural behaviours associated with the loss and

discard of watercraft that are relevant within maritime archaeology. Central to the study of any submerged or exposed maritime archaeological resource are the site formation processes involved in the creation of the archaeological record. The main distinction between “shipwreck” and “abandoned vessel” material is the level of accidental or deliberate; natural or cultural; catastrophic or predetermined aspects of the site formation processes present at these sites. Highlighting these differences serves to communicate the behaviours that are the focus of this research.

### *Catastrophic Abandonment*

The best-known type of abandonment can be considered “catastrophic abandonment”. Catastrophic abandonment takes place, where abandonment is a requirement for the preservation of life, and where staying with the vessel would result in death. The famous *Titanic*, for instance, was abandoned when it hit an iceberg, HMS *Pandora* when it struck the Great Barrier Reef, and the not so famous *Star of Greece* when ran ashore in South Australia (Ballard & Archbold 1995; Gesner 1991: xi, 13, 14, 2000: 1; Sexton 1982). There are innumerable examples, all of which have been categorised as “shipwrecks” by historians and archaeologists alike. In other instances, a crew may abandon a vessel because of an impending disaster when they feel that there is a threat to life, but the vessel does not sink. This can be defined as a vessel becoming derelict (see Lloyd’s of London 1973: 425, 1981: 493). This definition places more importance on the perception of danger, than on the process of wrecking.

### *Consequential Abandonment*

In some cases ships were scuttled in order to protect other vessels or structures from damage. Such was the case when the vessel *General Knox* was found to be on fire alongside a wharf at New York while in the process of

being loaded with cargo bound for San Francisco. The vessel was scuttled as a result of attempts to extinguish the fire (Matthews 1987b: 135). This raises the question, “Are such vessels shipwrecks”? While it cannot be denied that there were catastrophic circumstances leading to such destruction, the act of abandonment here was only enacted due to other mitigating circumstances. Without the element of catastrophe, and more importantly, the possibility of the emergence of larger catastrophes because of inaction, these candidates are arguably more shipwreck than anything else. The fate of these watercraft may be termed a “consequential abandonment”, and their discard seen as a consequence of actual or imminent catastrophe.

There are also many cases of the non-accidental wrecking of vessels after mishaps at sea, or due to the possibility of worse catastrophe. The most famous, and probably oldest reference to this kind of act of abandonment, is “Saint Paul’s Shipwreck”, described in the *Book of Acts* in the Christian New Testament. This tale describes an incident involving Saint Paul, who, while on the way to Rome from Caesarea as a prisoner for trial was wrecked in the vicinity of Malta (Moore 1970: 112, 172; Throckmorton 1970, 1987a: 79). Although this event is similar to the other catastrophic events already cited, it varies because the master of the vessel had the opportunity to get closer to land, and run the vessel aground at a place more conducive to the safe landing of passengers. In this case, the degree of deliberate action as opposed to catastrophic event becomes clear.

This case is also demonstrated with the shipwreck of *Sydney Cove* near Preservation Island, Tasmania in 1797. While *Sydney Cove* is definitely a shipwreck, the circumstances of its wrecking illustrate the degree to which abandonment is often a part of the wrecking process. In this case, the threat of losing cargo due to prevailing natural forces impelled the captain to deliberately run the vessel aground on the closest piece of land available (see Strachan 1986: 1; Nash 1992: 11, 1996: 22). An important consideration here is

the concept of “risk”, be it to human life or cargo (see Duncan 2000 for an extended discussion of shipwrecks and “risk”). This type of deliberate abandonment can be clearly categorised as the premeditated running aground of a vessel. An important distinguishing factor in these cases, however, are that the choices for the geographical location of the running ashore are frequently limited. The act of abandonment represented by this category is most often geared towards the preservation of human life and/or cargo, and not towards the discard or destruction of the vessel. In these cases it can be seen that there is still a catastrophic, or potentially catastrophic circumstance that brings about a particular behavioural response.

This illustrates that some process of abandonment will always occur during the wrecking of a vessel. What is also evident is that there is often an element of deliberation; sometimes circumstances surrounding catastrophes mean that there is an element of human decision making in relation to where and when a vessel is deposited during the wrecking event. In these instances the historical definitions from marine insurance still holds true; the abandonment of a vessel due to wrecking, even when a vessel is run aground, can still be covered under marine insurance. Indeed, a captain who does not choose to run a vessel aground, in order to save cargo and passengers, rather than allow the complete loss of the vessel is likely to be seen as negligent.

#### *Deliberate Abandonment*

There are other categories of abandoned vessel that do not involve wrecked vessels. These occur where the act of abandonment is deliberate in every sense. In these cases marine insurance definitions do not apply, because of the planned nature of the act of abandonment, and in these circumstances the discard of a vessel is not covered under any insurance policy. Here the performance of an abandonment is so wilful that the owner is damaging or destroying the vessel in order to dispose of it. These vessels are significantly

different from the other cases described above because they represent actions not associated with a catastrophic event.

The true nature of “purposeful abandonment”, or “deliberate abandonment” implies processes that are planned, without urgency, and where there is no genuine threat to human life or cargo. Within this context, motivation for the movement of the vessel, is often centred on the cessation of the vessel’s function as a floating tool of trade, although there are exceptions. In certain cases, wrecking incidents may occur to watercraft that were to be deliberately discarded. For example, the barquentine *City of Adelaide*, was wrecked on Magnetic Island, Queensland before the proposed time for disposal, and one bay from its intended destination (Parsons 1990: 66; Parsons & Plunkett 1995: 3; Stone & Loney 1983: 16, 58). With these cases, the location of abandonment is not the most crucial factor in the process. Of more importance are the *decisions* to abandon, and the *implementation* of the abandonment processes. In such cases all that was lost or damaged was what was going to be scuttled or beached at a time in the extreme short-term future. The intentions of the “abandoners” to lose the vessel itself remained relatively unchanged, despite the variation in the final place of deposition, and fundamentally their aims were satisfied. The only exception to this rule occurs when final deposition is intended to culminate in the creation of a post-abandonment function for the vessel. This illustrates, that while discard processes are important mechanisms facilitating the transformation of objects from systemic to archaeological contexts, they sometimes also exist as reuse mechanisms that bring about the continued function of objects systemically. In direct contrast to catastrophic and consequential abandonment, geographical constraints upon the disposal of deliberately abandoned vessels are linked more to the expenses involved in their removal, and the limitations imposed by regulation.

## Deep Structures

Throughout this thesis the diversity and potential of the abandoned vessel resource, and the benefits of generalist approaches are made clear through a number of mechanisms. This is evident from the next chapter (Chapter 2), which communicates the diverse theoretical background to this study. Chapter 2 examines the theoretical underpinnings of this research and extends an argument endorsing the benefits of comparative approaches to the remains of watercraft with specific reference to site formation processes and the systematic analysis of discard activities. While it is acknowledged that particularist approaches are an important part of the theoretical toolbox available to maritime archaeologists, this thesis instead represents a nomothetic/generalist study that proposes that deliberately abandoned watercraft can be seen as “deep structures” (after Gould 1983a: 6-8). Although it is not the intention to cast this approach as the antithesis to historical particularist approaches in maritime archaeology, the author has specifically sought to exclude detailed case studies in order to illustrate that comparative methods have the potential to make significant contributions to archaeological theory and the reappraisal of history through archaeological investigation. This view not only maintains that these sites have important archaeological, social and historical layers (as noted by McCarthy 1979b: 1), but that they have the potential to illuminate, and bring about a reappraisal of the consequences of technological and economic development and change on Australian maritime trade. This argument contends that in order to understand this resource, and to draw meaningful evidence from it, a rather different approach from some of the traditional methods and perspectives of maritime archaeology is required. This approach can be described as one that is broadly comparative, and anthropologically oriented. Such an approach enables the examination of economic and technological trends in association with documented discard activities, and allows general statements about developments in many aspects of maritime history to be made, while also

contributing to our understanding of the archaeological signatures of cultural site formation processes. One of the consequences of comparative methods of analysis is that abandoned vessels can be better viewed as structures deeply layered with social, technological, economic and archaeological meaning.

Relating to the predominance of particularist examinations of abandoned watercraft in the past, Chapter 3 presents a literature review of international examples concerning the study of abandoned vessels spanning many thousands of years. These international case studies have shown that discarded watercraft have a long and significant history. Additionally they have demonstrated that these vessels are amongst some of the oldest, and most intact specimens of craft encountered to date. Similarly, they have also played a role in the many aspects of the developing discipline of maritime archaeology; from re-defining our understanding on ancient Egyptian shipbuilding and shedding light on the evolution of watercraft in northern Europe to providing insight into the sailing characteristics of ancient Saxon ships (see Johnstone 1974: 10, 13; Crumlin-Pedersen 1991c: 72; Brouwer 1993: 44-45; Gifford & Gifford 1995). This is not to imply that some examinations of deliberately abandoned watercraft have not contributed to shifts in our thinking. Studies of watercraft such as HMS *Vixen* have been at the forefront of recent changes in the approaches of maritime archaeologists to material culture, as well as the transition to a reliance upon *in situ* investigation and non-disturbance techniques. Nevertheless, it seems that while most of these studies have succeeded in communicating the richness of the abandoned watercraft resource, few have contributed archaeological theory. This is largely because by and large they have concentrated on the remains of “significant” or famous watercraft at the expense of those that are more representative of human behaviour and behavioural processes.

This is also a vein that runs through Chapter 4. This chapter outlines the Australian studies and perspectives on watercraft discard sites. While there



have been studies of abandoned watercraft in Australia from the 1970s, a comparison of Chapters 3 and 4 make it clear that the themes and site-types in Australia and abroad, while sharing many characteristics are very different. Indeed, many of the categories of sites, and abandonment themes represented in international studies have few, or no equivalent in Australia (and therefore could not be analysed). Although some investigations overseas have shown that abandoned vessels can be used in scientific studies (see for instance Leone (1983: 177) regarding environmental changes to the Patuxent River, Chesapeake Bay due to vessel abandonment) – this is a particular predilection evident in comparable Australian examinations. This is illustrated in a number of examples. They have, for instance formed the centre of corrosion potential analysis and sacrificial anode studies of vessels in South Australia (with particular focus on the River Murray) and Western Australia. Data from the abandoned vessels *Santiago* (Port Adelaide, South Australia), *Undaunted*, *Ventura* (Berri, South Australia), *Albion*, *Uranus* (Goolwa, South Australia), *Corowa* (Morgan, South Australia), and the modern recreational dive site *W.H. Gemini* (Fremantle, Western Australia), have been analysed because the vessels were more intact than most shipwrecks (MacLeod 1992: 1-10; Kenderdine 1995a: 274-276; Kentish 1995; McCarthy 1996: 347).

McCarthy also touched upon the scientific potential of the abandoned vessel resource in his comparison between the remains of the wooden ship *Redemptora*, and the remains of the wooden vessel believed to be *Gemma*. While they are both wooden hulled, and within close proximity, the difference in the nature of the sites, with *Gemma* being buried and *Redemptora* being protected by a layer of stone has illustrated the conditions required for the best preservation of wooden vessels (McCarthy 1996: 204-205). On this basis O'Reilly (1999) was also able to use abandoned watercraft for her analysis of methods and materials used in the construction of South Australian intrastate trading vessels built between 1850 and 1899.

These studies, and those from overseas had a major impact upon the methods and arguments outlined in this dissertation. In particular they are important because they reinforced the close methodological relationship shared between past investigations of shipwrecked and discarded watercraft sites. This has undoubtedly contributed to the grouping of discarded watercraft and shipwrecks as a single category of archaeological material, and also contributed to the perception of abandoned vessels as sites of diminished significance. Such a tendency is seen as a major fault in the analytical techniques previously utilised and led to a decision that a vastly different approach was required for this study – one that would allow for an examination of the resource while also better establishing their historical and archaeological potential. As a consequence, this research, and its methods stand in stark contrast with those previously employed. This is explained in Chapter 5 along with the sources and analytical techniques used for analysis. Indeed, as much as discarded watercraft are archaeologically seen to be a category apart from shipwrecks, they are also atypical in relation to the range and nature of historical sources available.

For this reason Chapter 5 also outlines how the compilation of historical data concerning abandoned vessels is significantly different than for shipwrecks – specifically because abandoned watercraft tend to be less visible in historical records. This is particularly a major problem when establishing the fate of a vessel, and for determining whether there are likely to be extant physical remains surviving. Additional problems are also connected with establishing dates of abandonment. This is attributable to the blurring lines between the dereliction, laying up and final disposal of a vessel, and which event constitutes its actual “abandonment”. Nevertheless, a major aspect of this study involved the collection of information about deliberately abandoned vessel remains. This was done firstly through the examination of secondary source documentation relating to shipwrecks in Australian waters.

The nature of secondary source material on the Australian shipwreck heritage as it refers to abandoned vessels is twofold. Firstly there are those sources that report abandoned vessels as shipwrecks, and include them with shipwreck entries. Secondly there are those that have separate sections dedicated to abandoned vessels. The information gleaned from these sources was then combined and supplemented with additional details on particular vessels and checked using primary source materials. The information was collated into an archive and entered onto a custom designed relational database (Microsoft Access 2000), which allowed historical sources for each relevant diagnostic field to be recorded and the resulting data to be analysed. This database has become the *Australian National Abandoned Vessel Database* (ANAVD) and can be found on CD #1 accompanying this thesis.

The chapters following Chapter 5 are predominantly concerned with the analysis of this database. Briefly stated, the ANAVD is a database containing the records of over 1500 watercraft discarded over the entire period of European settlement in Australia. These analysis chapters have been split into three sections.

Chapters 6 and 7 concentrate on the examination of historical correlations between the tendency to discard watercraft (the discard trend) and a number of historical events and processes, such as environmental change, economic recession and boom, war and its aftermath, changes to regulatory and legislative frameworks, port development and the role of these factors on the location and use of official and unofficial dumping areas. Due to the fact that abandoned watercraft are used and come to the end of their mercantile and support functions non-catastrophically they can be seen as a microcosm of trade, and changing commercial conditions. Since Australia is an island, as well as one of the most urbanized countries in the world with one of the lowest population densities of any nation – it has always been very transport dependant (COIITC 1980b: 17). In light of this the abandonment of watercraft

can not only be seen as an indication of general economic health, but also as an index of the economic effects of certain regional, national and global events. This is discussed via a range of diachronic analyses correlating significant national and regional events with changes in discard trends that illustrate the degree of correlation between discard activities and the ebb and flow of economic conditions throughout Australian history. Trends in the abandonment of watercraft can be seen as indications of the distinct economic consequences particular types of economic events, such as depression and war have on the shipping industry, and the economy in general. Abandoned watercraft data can for instance add substance to the assertions of authors such as Bach (1973: 7) who have stated that there were, “major dislocations of shipping economies caused by the two world wars” by showing such disorder in relation to real case studies.

Chapters 8 and 9 are concerned with the use-life of watercraft, and the many site formation processes that they go through on their systemic journey through mercantile use, possible support roles, and post-abandonment utilisation and their transition into archaeological contexts. These chapters progressively move away from historical analyses and into an examination of the archaeological signatures of discard activities. Additionally, these chapters concentrate on the use, modification and discard of watercraft, and their status as documents of the site formation processes of these activities. Chapter 8 is a discussion of the archaeological signatures of use and modification that can have ramifications for the time of discard, position of abandonment and condition of remains upon disposal. The signatures of these uses, and modifications tell us much about the technologies that were at their pinnacle at the time of a vessel’s manufacture, and their “flexibility” in changing to new economic, social and technological conditions over time. In this way the type of vessel constructed, and the events that bring about its transformation in a systemic context are seen as directly relating to later discard processes, and as important pre-depositional cultural site formation

processes. This is also related to legislative and regulatory frameworks defined by bureaucracy and acting as forms of cultural constraint that bring about the creation of designated dumping areas and ships' graveyards (as discussed Chapters 6 and 7). Chapter 9, on the other hand is a discussion of the archaeological signatures of discard in the lead up to, and following the discard event. These signatures are more related to the processes that act upon a vessel that bring about its transition from a systemic to an archaeological context. It concentrates on a number of the site formation processes that represent actual discard events such as structure minimisation, hull reduction, and placement assurance strategies, all of which may be read from the archaeological signatures following abandonment.

It is important to point out here that because this was the first known dedicated comparative study of abandoned watercraft, and because it was undertaken on a national level – the potential breadth of scope of this dissertation was huge. For this reason, some degree of judgement had to be exercised by the author in order to keep the dissertation within practical limits. Indeed, most of the analyses undertaken in this research appear to have the potential to become dedicated studies in their own right. This is particularly the case in relation to economic analyses represented in this thesis – and particularly true when referring to regional economic analyses. It is also true in relation to a dedicated study of the role of technology and technological change in directing discard trends. Likewise many of the archaeological aspects of this thesis warrant expansion.

The last chapter (Chapter 10) concludes by summarising the findings of the dissertation, and brings the common threads within preceding chapters together. These linked arguments reinforce the contention that the many discard remnants of beached hulks, and scuttled ships dotted all around the Australian coasts and waterways are important tools for the creation of theoretical models – particularly when concerning cultural site formation

processes in the maritime archaeological record. Moreover, as reminders of the commencement and culmination of maritime trade in Australia over many generations they are a resource for researchers in the re-assessment of historical trends. This is founded in the view that collectively, these sites represent the inter-connected nature of political, technological, economic, and policy driven processes made sense of through their discard. Their use in this manner, as the consequence of using general comparative methods should only make it clear that other aspects of our maritime heritage have similar, but hitherto untapped potential.

## CHAPTER 2

### **Abandonment Within a Theoretical Framework**

*Viable maritime archaeology should aim to provide insights into the past that are not necessarily available through other means, such as archival sources. At the very least it should act as an independent test of histories created through other sources. It should have its own status as a reconstructable science (Veth & McCarthy 1999: 12).*

## CHAPTER 2

### ABANDONMENT WITHIN A THEORETICAL FRAMEWORK

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#### Introduction

This chapter is a synopsis of the theoretical directions and assumptions that underlie this thesis. Since deliberate watercraft abandonment relates to maritime economies, technologies and societies it is theoretically rich, and can be approached from many perspectives. Therefore this chapter is also concerned with the approaches that have contributed to the interpretative methods of this research. It is not the intention of this chapter to discuss the nature of archaeology, or the history and development of maritime archaeology. Neither is it intended to explore the direction or lack of direction of theory in maritime archaeology, as this has already been done by others (such as Staniforth 2000). Instead this chapter will provide insight into the theories that have been relevant in the direction of this thesis.

As a researcher the author agrees with Hodder's assertion that, "We need to move towards the recognition that there is not only one right way to do archaeology. There are many right ways" (Hodder 1999: 19). Thus there are a number of underlying theoretical perspectives evident in this thesis, drawn from a diverse array of theoretical traditions both within, and outside, archaeology. This array of perspectives owes much to the work of Staniforth (1997, 1999), in particular the assertion of the value of "diverse, complex and ambiguous" archaeological theory within the discipline (Staniforth 1997: 159). This investigation revealed that many tenets of theory are relevant to the study of watercraft abandonment and discard behaviour. The adoption of this approach can also be attributed to Murphy's (1983: 69) conclusions:



The archaeology of shipwrecks should not merely [be] the embellishment of the maritime historical record, but the elucidation of otherwise unattainable aspects of human behaviour. The combination of shipwreck archaeology with the methodologies of other disciplines will result in the authentic reconstruction of behaviour patterns, and will prevent the formulation of generalities regarding maritime lifeways and social processes.

This thesis uses approaches and methods from many diverse theoretical views. As a consequence, this research provides a mix of perspectives, which allows for the exploration of these frameworks, and conclusions to be made about their compatibility.

On the most general level there are a number of theoretical assumptions present in this research. These range from the author's views concerning the idealistic nature of the planning of discard events concerning watercraft, to assumptions that artefacts (here represented by watercraft of different design) can be seen as expressions of cultural ideas and norms that can be defined temporally, spatially and ethnically.

The analysis undertaken in this thesis leans heavily towards processual approaches. Much of this investigation entails the testing of statistical data against propositions evident from an understanding of the nature and effect of events in Australian history. The tendency of this method to produce generalising statements concerning cultural processes and the inclination to reduce the role of individual agency in the creation of archaeological sites (as noted by Hodder 1999: 2-3, 5) must be acknowledged as a part of this research. However, this thesis does not embrace, or strive towards the idea of the creation of universal and global theory. Its findings are an attempt to contribute to the understanding of the interaction between national and regional events and archaeological phenomena that exist in relation to highly specific Australian historical contexts. This post-processual perspective is re-

enforced with the questioning of evolutionary assumptions that are evident in technological paradigms. The manner in which the author has viewed historical data as systematic information that can be correlated in a scientific way is not an admission of a strict scientism within this study. This relates to what Veth and McCarthy (1999: 12) have stated:

One vital component of any maritime archaeological reconstruction of the past must be clear and explicit statements of how specific nautical behaviours and belief systems can be reliably correlated with patterns in the material record; regardless of whether we are dealing with assemblages of artefacts, vessels, or indeed, coastal ports and settlements.

Indeed, the nature and richness of the historical record, and the multiplicity of its effects on human behaviour is the major interpretive/hermeneutic aspect of this study – something conceivably equivalent to what Hodder (1999: 60) has communicated as a movement from *testing* theory to *fitting* theory in order to accommodate a scientific component into archaeological analysis. The incorporation of the diverse historical contexts and the meaning behind such events illustrate the influence of post-processual ideas on the analysis undertaken (Hodder 1999: 5).

Furthermore, these generalising aspects of the study are a major aspect of what this research is centrally focussed upon. The creation of general anthropological accounts regarding human behaviour is pivotal to the argument that is made throughout this thesis concerning the usefulness and significance of the abandoned watercraft resource, and the worth of broad comparative studies within maritime archaeology. This is also a reflection of the author's views regarding the social relevance of the study in understanding the past in order to plan the present and predict the future – another attested theme in early processual theory (Hodder 1999: 14).

### Comparative Analysis

To some degree the theoretical framework and methods of analysis outlined in this thesis are a challenge to the traditional theoretical orientation of maritime archaeology in Australia. The author agrees with McCarthy (1990: 35, citing Green 1990: 235) who sums up the predominant philosophical position of maritime archaeology in Australia in the following quote:

Historical particularists are artefact oriented and are concerned with artefacts and their functions. This approach is particularly appropriate of the archaeology of shipwrecks, because, being a new field of study, the material artefacts are often not well understood. It is important, therefore, to build up a clear understanding of the material before constructing deeper hypotheses.

Historical particularism, as commented by other researchers (such as Bass 1983; Veth & McCarthy 1999: 12; McCarthy 2000: 1, 191-192) has an important place in maritime archaeology, however we need to be open to other approaches. In particular there is a need for a broadened thematic basis to studies, and increased attention to the comparative aspects of research. Arguably, this expansion will not be facilitated through a continued adherence to historical particularist approaches. This need for a movement towards comparative analysis can be seen as reflected in the “3-stage approach” to the investigation advocated by Babits and Van Tilburg (1998: 2):

First, ... sites ... must be exploited to the fullest informational extent possible; second, sites of a given locality or type must be interrelated with each other to provide both interpretations and predictive modelling; finally sites must be presented within interdisciplinary and regional, if not global, perspectives to allow determinations of importance and provide better understanding of each individual site.

Generally work within maritime archaeology today still constitutes a site-based, particularist mind set, lacking what Staniforth (2000: 90) has termed “theoretical sophistication”. There has been some recent commentary over the benefits of combined approaches. Veth and McCarthy (1999: 12), for instance, have asserted that:

... maritime archaeology may well be served by research which aims to create both general and predictive models about nautical behaviour (i.e. functional/systemic processual approach) and to characterise the motivation and meaning behind strategies adopted by maritime societies and individuals (i.e. A critical deconstructionist post-processual approach).

Likewise McCarthy (2000: 1), and Martin (2001) have endorsed a combination of particularist and generalist approaches. For Martin (2001: 383-384), however, this is for the purposes of “de-particularizing the particular”. Martin maintains that because shipwrecks in the post-medieval period are often rich from the perspective of archaeological and documentary evidence they tend to be “over-particularised”.

Anthropological studies have been relatively scarce in Australian maritime archaeology, and commentators on the subject of the directions of the sub-discipline in this nation have generally only credited the work of Gould and Muckelroy as representing such approaches (see Hosty & Stuart 1994: 16). Although this has recently changed, as demonstrated by the work of researchers such as McCarthy (1996), Staniforth (1997, 1999), Richards (1997), O’Reilly (1999), Veth and McCarthy (1999), Doyle (2000), Duncan (2000), and Gibbs (2002, 2003) the impetus to pursue generalist studies in maritime archaeology is a phenomenon predominantly from overseas, and is particularly the result of work undertaken in the United States. While the work of Muckelroy and Gould does represent these perspectives to a large degree, other notable work such as that of Souza (1998) and Corbin (2000) are

also important recent examples that build upon these previous studies. A tangent to Corbin's recent work on the material culture of steamboat passengers entailed the compilation of about 1400 vessels operating in the inland rivers of the United States in the nineteenth century (Corbin 2000: ix). Included in this were the details of a large number of which were either abandoned or dismantled (Corbin 2000: 150-225).

There have, however, been some examples of an increasing attentiveness to comparative, behaviourally focussed work in Australia. Work undertaken by Dr. Leonie Foster on behalf of the Victoria Archaeological Survey (VAS) (Foster 1987b, 1988, 1989b, 1990) culminated in one of the first, and most extensive comparative studies in Australian maritime archaeology, which would later influence similar studies (such as Jordan 1995; Kenderdine 1995b; Coroneos & McKinnon 1997; Coroneos 1997b). The four reports in this series were limited to regions of Port Phillip Bay and included 280 vessels wrecked and abandoned between 1835 and 1985. Although the study presented shipwrecks in a traditional site-by-site approach, it also attempted to analyse the data that they represent. Included in this analysis were abandoned vessels, set aside as a sub-category for analysis (Foster 1987b: i, 1, 1988: i). Foster also attempts to compare a range of vessel attributes such as "Propulsion Types", "Rig Types", "Construction Types", "Country of Origin", trading patterns, principal or last function, reasons for loss and age at loss (Foster 1987b: 17-27, 1988: 14-21, 32-34, 1989b: 15-21, 31-36, 1990: 15-23, 28-37). In one particular case, Foster (1987b: 15) used aggregate data to assess the behavioural processes associated with ship abandonment during the period 1921 - 1940, which corresponds with analysis undertaken during this research (included in Chapters 6 and 7). This study is featured in this thesis because of its consideration of abandoned watercraft in the analysis and will be discussed further in Chapter 4.

In 1989 Jeffery published a study concentrating on the examination of aspects of shipbuilding using a comparative approach. The study compared the design attributes of 84 coastal vessels wrecked in South Australian waters from 1840 to 1900. Jeffery's comparisons allowed for the testing of historically based assumptions concerning the Tasmanian origins of wooden coastal sailing ships and the provenance of the timbers used in their construction. Jeffery's main comparative method was his use of length to breadth, and breadth to depth ratios, and the coefficient of under deck tonnage that allowed for comparison of design elements, methods similar to those used in this research (see Chapter 8). While Jeffery considered his archaeological conclusions as speculative, his approaches went some way towards making general and predictive statements about the maritime archaeological record that have relevance to archaeological research (Jeffery 1989: 54). Jeffery followed this study with an examination of Australian-built coastal shipwrecks in South Australia (Jeffery 1992).

In 1991 Coroneos published an interpretation for the short working lives of early Australian wooden sailing vessels in Victorian waters presented along similar lines as Jeffery's 1989 study (Coroneos 1991: 7). Although the stated intention of Coroneos' study was not to undertake comparative analysis in the same way as Jeffery, his study was able to make conclusions about the relationship between wrecking events in Victoria and the quality of the construction of vessels between 1836 and 1845 using comparative methods (Coroneos 1991: 9). Coroneos would carry the comparative nature of these studies to later work, especially the analysis and discussion of the shipwreck resource in regions of South Australia (see Coroneos 1997b: 101-111, and Coroneos and McKinnon 1997: 95-102).

Another example of comparative archaeological research can be seen in O'Reilly's 1999 honours thesis. This work concentrated on the materials and ship construction methods of vessels built between 1850 and 1899 operating

the South Australian intrastate trade. The study compared the material remains of wooden sailing vessels (which were coincidentally also predominantly abandoned watercraft) in an assessment of cultural continuity and cultural adaptation in ship design and construction.

Two large comparative studies have recently emerged from James Cook University. These studies include Duncan's examination of shipwreck patterning and cultural seascapes in the Gippsland region of Victoria (Duncan 2000), and Doyle's examination of loss and discard correlates in the vicinity of Townsville between 1865 and 1981 (Doyle 2000). While Duncan's study was by far the larger of the two studies (with around 130 shipwrecks in a larger geographical area), Doyle's study (41 wrecked and discarded watercraft) has particular importance to this research because many of the perspectives outlined by Doyle are similar to those expounded by this research. In particular his view of shipwrecks as artefacts, discussion of historical particularism, the symbolic character of watercraft and the nature of the "spectacular wreck", use of site formation theory and the inclusion of abandoned vessels as data, are major similarities (Doyle 2000: 8-10, 25, 42). Additionally Doyle considers marine insurance, risk calculation, the nature of trade, economic fluctuation, regional historical events, and port development as aspects of site formation processes (Doyle 2000: 13, 29, 31-32, 42, 44, 71, 131-139). His comparative approach was highly successful in describing the aspects of loss, such as the convincing relationship perceived between increased tonnage, increased trade and increased catastrophic loss (Doyle 2000: 170).

These studies are good examples of the evolution and development of new theoretical and methodological tools in Australian maritime archaeology. Nevertheless they have not fundamentally moved beyond small-scale regional settings concerning the nature of shipwreck remains. Such studies, it should be acknowledged do illustrate a movement towards an "opening up"

of approaches to more comparative studies set within much wider geographical and thematic environments. Nevertheless, there is much room for further expansion of thematic studies to a national level (as noted by Edmonds *et al.* 1995: 70).

To some degree the resistance to pursue comparative aspects of research is the result of the tendency to view individual shipwreck sites as isolated time capsules. As Gould (2000: 13) has commented, “The drama of a shipwreck focuses attention on the event, but the conditions that produced the wreck and the consequences arising from it are as significant as the event itself”. In light of this comment we can understand what Watson (1983: 31) calls the, “perpetual tension between the idiographic (particularist) and nomothetic (generalist) approaches”, is also fundamentally a tension between the notion of the event and the notion of process. Gould (2000: 13) again communicates the problems associated with event based studies in comparison with what process oriented approaches can achieve:

If archaeological events derived from assumptions about Pompeii-like or “time-capsule” associations are illusory, so, too, are historical events such as the wrecking, scuttling, and even construction of ships. Upon close examination, these so-called events prove to be embedded in ongoing processes linked to social, economic, and even symbolic activities.

This tendency for the preoccupation with process within comparative studies to draw archaeological inference towards anthropology is deliberate. As Gould (1983a: 6) has noted, “Anthropology has been a useful source for generalisations about human behaviour”. From another perspective the resistance to generalist works can be summed up in the words of Watson (1983: 36):



A final sobering and complicating factor is that, at the present moment in the real world of shipwreck archaeology, the only thoroughly and comprehensively published work is idiographic; the generalists have yet to prove themselves by designing projects, carrying them out, and publishing them in detail so the results can be evaluated and used by interested experts and scholars of all kinds.

This thesis is an attempt at a nomothetic study.

### **Watercraft as Document and Artefact**

The comparative analysis of watercraft remains is responsible for a major shift in how watercraft are perceived by archaeologists. Ships have been viewed from a range of perspectives by researchers. In terms of design, some researchers such as Bach (1976: 2) have recognised the richness of watercraft as documents with ethnic origins:

Broad and narrow, deep or shoal, bluff or fine, high or low-wooded, square or fore and aft rigged, each type of ship had been, over centuries fashioned for a particular role that had, in broad terms, been created by her country's special characteristics.

Similarly researchers such as Valdaliso (1996: 95) have understood watercraft as objects imbued with technological meaning:

When analysing technological change in the merchant marine, there are a number of peculiarities that must be taken into account. Perhaps the most important is that the sector in question is a consumer of technology: a ship is an 'artefact' with its technology already incorporated, and the skill required to manipulate it is much less complex than that needed to construct it.

Likewise shipwrecks and ship remains have been perceived as many things throughout the development of maritime archaeology. In the 1970s Muckelroy (1978) created a major paradigmatic shift within maritime archaeology away from the purely descriptive with the proposal that ships could be seen to represent, “machines”, and “closed communities” (Lenihan 1983: 49; Lenihan & Murphy 1998: 235). Since then watercraft remains have been seen from many different perspectives, all of which have had ramifications for the way they are incorporated into theoretical frameworks. Lenihan (1983: 50) has seen them as “the material expression of more generalised cultural dynamics”. Likewise Gibbins and Adams (2001: 281) have commented that, “Ships are conceived and designed according to the influence of various mental templates and ideologies”.

Of most relevance to this research is the idea that a ship or shipwreck can be seen as an “artefact”. Just as maritime archaeologists endeavour to consider artefacts in relation to shipwrecks, or terrestrial sites in spatial and temporal ways, watercraft can be viewed as artefacts, but at a level that is much less easily defined, and on a much larger scale. A ship is a composite artefact in many ways. Not only are there variations in materials, but the sources of materials, the types of components of vessels, the manufacturers of those components and how it is all put together. For these reasons we can see watercraft as artefacts from many different perspectives. The statement by Murphy (1983: 75) that, “the life of a ship and its use will be reflected in material remains”, is pivotal to this thesis. As McCarthy (1996: 22) has asserted, this statement brings to light the fact that a ship is not a monochronic unit, and is diachronic in nature. This not only makes it an object highly sensitive to the cultural conditions of the time of its creation (as reflected in elements of its design), but also to the cultural transformations that it may also reflect (in the form of archaeological signatures). Throckmorton (1970: 31-32) was probably the first to outline such a view when he commented:

A sailing ship, seen as an artefact, is one of the most interesting and beautiful of human creations. In it is concentrated the accumulated knowledge of half a dozen crafts through many generations. Like public buildings, ships are expressions of the societies that create them.

Since then, many authors have commented along similar lines (Throckmorton 1987c: 211; Lenihan 1983: 53; Murphy 1983: 70-71; Shomette 1995b: 6-7; Martin 2001: 393). Such a concept is important to this thesis because it links method and theory when carrying out generalist studies on the structural remains of watercraft. As Watson (1983: 31) has proposed, "Logically speaking ... the empirical data from shipwrecks can be recorded and recovered for any purpose or set of purposes from the highly idiographic to the highly nomothetic". Of more relevance to this study, Martin (2001: 383) has written that, "Set into wider contexts ... shipwrecks can be regarded as wide-ranging paradigms of the societies to which they belong ...".

What can we learn from such a vast resource? By considering elements in design, build and technology in ship construction as well as particular historical documentation concerning each vessel we can identify diagnostic features. We can allude to or explain certain trends in technology, see quite clearly the effect of economic or historical change, and understand why certain incidental changes had wide repercussions in legislative and bureaucratic aspects of communities worldwide. It may also be a way to demonstrate the effects of technological change upon society and the effect of societal change on technological development and innovation. It can also be seen, that when certain elements are examined quantitatively, certain trends and developments can be demonstrated.

## Technology

Despite a declining belief in technological progress (Trigger 1995: 148), technology has traditionally played a major role in archaeological theory (indeed Johnson (2000: 163) considers it an archaeological meta-narrative), and assumptions about technology and technological progress are not always made explicit. To some degree this is because of a common view that culture is comprised of three interrelated subsystems made up of technology, social organization and ideology. From another perspective, culture is said to be composed of techno-economic, social and ideological components (Trigger 1995: 290, 323). As a consequence, technology features prominently in theories of cultural development, and some studies may be considered techno-environmentally deterministic because of their perception of change in technological terms (Trigger 1995: 291-294). This is because diffusion, as a force of cultural change, is a pivotal aspect of uni-linear evolutionary concepts that enable broad economic trends to be easily discussed (Trigger 1995: 250). Even where the technological aspects of society are only seen as one important catalyst of societal change, technological notions are often used to explain cultural differences. Trigger (1995: 254) has commented on this in relation to the early work of Childe:

... instead of interpreting cultural change as the result of technological innovation, he saw broader economic and political contexts influencing the uses that were made of innovations. This allowed him to explain how the same technological innovations could produce very different types of societies in Europe and the Near East.

There have been many archaeological studies that describe social change in relation to technological change. Indeed, technological change features prominently in empirical studies outlining social change (e.g. Eighmy 1981: 35). Gould (2000: 18) has also noted that:

The materialist-Marxist assumption that human behaviour and history are structured primarily by the relations of production – that is, the technological and economic factors involved in the development of human institutions coincides nicely with the remains found in the archaeological record.

Alternatively the dominance of technological paradigms in archaeological theory can be attributed to the view that the formation of the archaeological record is a continuous process that has been occurring over the entire duration of the human past. In this way the archaeological record can be used to test and challenge the history of human development, which itself tends to be based on economic and technological assumptions (Trigger 1995: 15).

Many studies of technology, especially in relation to maritime technologies also consider the role of consumer choice in the adoption of new technology. For this reason they are also related to studies of consumer choice in historical archaeology (see Miller 1987, Spencer-Wood 1987; Henry 1991; Purser 1993; Gibb 1996). Additionally some models of consumer behaviour include loss, abandonment and discard (such as that proposed by Henry 1991: 5).

The idea of technology and technological progress is pivotal to maritime archaeology. The nineteenth and twentieth centuries have been important in the history of technology. While the nineteenth century is credited as a “revolution in the history of seafaring, a turning point upon worldwide cultural, economic and technological development ...” (Johnston 1996: 231), likewise the twentieth century has been cited as the century within which “[e]very aspect of transport – speed, convenience, comfort, availability – has undergone dramatic development” (COIITC 1980b: 318). As one author has noted:

Waterborne craft have been basic human tools since prehistoric times. Many societies rose or declined as a direct result of whether they successfully utilised ships for subsistence, transport, and protection. Ship production and deployment have been the focus of intense human cooperation and organizational efforts for several millennia. Ships have been, and still are, the largest and most complex mobile structures produced (Murphy 1983: 65).

While this research does not seek to specifically comment on, or discuss the many factors and historic events that have constituted the processes for and against technological innovation, diffusion and change, it nevertheless discusses many issues associated with technology (for an overview of these processes see COIITC 1980a; Kasper 1980; Mokyr 1990; Volti 1995, and see case studies such as, Graham 1958; Musson & Robinson 1959; Guthrie 1971: 37, 43, 46; Mak & Walton 1973; Hutchins 1974: 42; Fletcher 1975; Tann & Breckin 1978; Goldrick 1995: 20; Griffiths 1995; Jervis 1995: 48-49, 58; Thompson 1995: 104; Armstrong 1998: 76; Robinson 1998; Weski 1998: 19).

In particular, technological change plays a particularly important part in the economic analyses carried out in this thesis (see Chapters 6 and 7). Technological change may be constituted by changes in scientific knowledge, engineering know-how or managerial processes. These aspects of technological change concern processes such as production, methods of design and maintenance, and also establish successful markets for product (COIITC 1980a: 8). Technology and the nature of technological change is a complex subject, and it is generally accepted that it is not possible to estimate general rates of technological change due to the differences between technologies (COIITC 1980a: 25). A central aspect of the history of transport and maritime trade is the impact of technological change. It is additionally important because it is often cited as one of the main factors in economic growth. This is due to the ability of new technologies to lower costs, increase output, increase competition, implement product improvement, and increase

wages and living conditions (COIITC 1980a: 1, 66, 69, 166; Kasper 1980: 246). As one source notes, “technological change has been linked to economic growth so closely that within the long-term growth trend one can identify recurrent accelerations and decelerations related to various technological changes” (COIITC 1980a: 67). These cycles of growth are known as 50-year long “Kondratieff cycles” (Kasper 1980: 242). The connectedness of economic and technological issues is evident from the beginnings of the use life of watercraft, as mentioned by one author:

The economic factor is of prime importance in designing a ship. An owner requires a ship which will give him the best possible returns for his initial investment and running costs. This means that the final design should be arrived at taking into account not only present economic considerations, but also those likely to develop within the life of the ship (Eyres 1980: 3).

It is almost impossible to separate the technological and economic aspects of any aspect of history. This is because more often than not economic development is dependant upon technological innovation and diffusion, and that these processes themselves are dependent upon economic development. There have been many studies on the connection between technological change and economic growth. Noted studies include Ojala’s study of technological change and economic growth in eighteenth and nineteenth century sea transport in Finland (Ojala 1997), and Henning and Henning’s (1990) study on the transition from sail to steam in the export lumber shipments of the Pacific Northwest 1898 - 1913.

The process of technological change also contains important notions that shed light on the historical and economic processes that underlie such transitions. It is traditionally accepted that at many times in history certain events have pitted technology against technology, culminating in a *revolution*. Such “revolutions” are described as turning points in history and are credited as

times of cataclysmic and almost overnight change that bring about the acceptance of a new technological status quo, in place of an old one. Many such revolutions have been written about from the Neolithic to the Industrial Revolution (COIITC 1980a: 66). In other cases certain historical events, such as the opening of the Suez Canal, or conflicts, such as the Crimean War and the Second World War have been regarded as revolutions (see Pearce 1881: 1; Hurd 1922: 163; Fletcher 1958: 556, 558-560; Parkinson 1960: 6; Palmer 1971: 39; Fisher 1977: 144, 177; COIITC 1980b: 351-352). The defeat of the Spanish Armada (1588), the battle of Trafalgar (1805), the stand off of the USS *Monitor* and the CSS *Virginia* (1862), and the creation of the HMS *Dreadnought* (1906) have all been noted as revolutionary events in naval history of significance to general technological change (Wood 1962: 97-98; Robertson 1968: 262; Kemp 1988b: 113; Gould 1989: 44; Bound 1998: 19-20; Van Der Vat 1998: 46). The notion of “technological revolution”, however, is problematic because it erroneously implies overnight change. Technological change is best understood as a prolonged process accompanied by complimentary theoretical breakthroughs. In light of this, the “rude test of war” can be better viewed as a catalyst for drastic technological transformations, as well as a vehicle for dramatic economic change (expanded in Chapter 6) (Millar 1881: 130; Robertson 1968: 3, 35, 249; Harley 1971: 215-216; Hunter 1993: 124).

Maritime archaeologists have traditionally been interested in a range of issues concerning technology and it has played a fundamental role in how the past is interpreted. Early examinations, however, tended to be focussed on the nature of, and relationship between, commerce, distribution, and shipbuilding, and were seen in relation to the opposing “evolutionist” or “diffusionist” theories (see Basch 1972: 9). In some instances this may be in relation to the correlation of individual shipwrecks to aspects of technological progress, or the nature of technological change itself. Studies replete with technological facts, figures and theories are common within the sub-discipline and are often quoted in theoretically rich ways (see for instance Lenihan 1983:



54-56). In other cases, archaeologists have attempted to use archaeological data to reassess technological adaptation, as communicated in the following quote by Lenihan (1983: 55):

Adaptive change in design is far from the rational, step-by-step, upward evolution implied in many works on marine history. Industrial archaeologists on land have demonstrated the anxiety that using new materials causes in structural engineering.

To a large degree this is because of the nature of ships as catalysts of change. The work of Murphy (1983) for instance is replete with technological notions. Ships are seen as “vectors of the spread of technology”, and ship design (a reflection of technological norm at one time) is seen as a major component in the assessment of social organization, the exchange of ideas, the flow of influence, and understanding national identity (Murphy 1983: 71, 83-84). Likewise, Gould has commented on the nature of technological obsolescence, and the accidental nature of technological innovation (Gould 2000: 18, 249).

Another important aspect of maritime archaeological investigations of technology is associated with the role of archaeological enquiry in re-assessing and augmenting the history of maritime technology. This is best summed up by Murphy (1983: 71) who maintains that, “The developmental history of the design and construction of vessels, is not complete, and often the only means of study is the archaeological record”.

The idea of technological change also fits with theories of site formation. In particular maritime archaeologists can understand changes in the technology represented by watercraft design in relation to environmental adaptation (Leone 1983: 174) and socio-economic adaptation (Murphy 1983: 85).

### Taphonomic Theory and Site Formation Studies

A processual approach to material culture in the form of site formation theory is central to the theoretical work in this research, and is the predominant middle range method utilised in this study (Hodder 1999: 27). Site formation studies have a particular view of archaeological evidence:

Archaeological evidence results from two processes - initial human behaviour (i.e. the phenomenon of a shipwreck which is a culturally-derived event) and subsequent transformational actions (effect of natural processes and subsequent human activities) (Oxley 1998: 48).

Oxley (1998: 46) has described formation processes as, "how archaeological evidence (in the form of artefacts, structures etc) came to be buried, and what events distorted or destroyed it subsequently, regardless of whether those events were of human or natural origin". Formation processes are the causal mechanisms that facilitate the movement of artefacts from their systemic or use context (where an artefact is participating in a behavioural system) to their archaeological context (where an artefact is only interacting with the natural environment). Previous studies on abandonment and abandonment processes (such as the ethno-archaeological work done by Cameron (1991), and Cameron and Tomka (1993) on domestic and prehistoric sites in African villages) have made much use of site formation theory. Site formation theory is best represented by the work of Schiffer (1972, 1996, and Schiffer *et al.* 1981) and Muckelroy (1978).

There is a large degree of similarity between the ideas of Schiffer and Muckelroy, especially in relation to Muckelroy's "extractive filters" which resemble Schiffer's transformation processes (Lenihan & Murphy 1998: 234-235). These processes can also be seen as the factors that create the historic and archaeological record. Within maritime archaeology, site formation theory is best known in relation to Muckelroy's work on the evolution of a

shipwreck, which outlines processes that are comparable with many of the aspects of Schiffer's site formation theory, and have been built upon by Ward *et al.* (1998, 1999). Muckelroy's site formation theories concentrate on the natural aspects of shipwreck site disintegration, and are not as developed or universal as Schiffer's concepts, hence the latter's work seems to be increasingly preferred (see Simpson 1999: 4). Likewise, Schiffer's version of site formation theory and his terminology are preferred in this research because of the greater attention paid to cultural processes (as noted by Lenihan & Murphy 1998: 235). There are two main types of such transformation processes:

- Non-cultural/natural (or n-) processes which represent all natural factors that impinge upon and affect archaeological material, and;
- Cultural (or c-) processes that are represented by a diverse array of human behavioural processes that affect and modify material culture after their initial use for a particular function (Schiffer 1996: 3-4, 7).

The uses of n-transformation processes are well known in archaeology (see Schiffer 1996: 141-261). They are also prominent in maritime archaeology, mainly because of the preoccupation with shipwreck site disintegration processes. The uses of site formation processes have, however, tended to be used in a particular manner in maritime archaeology. As Gould (2000: 9) has noted, "much of contemporary archaeological theory is aimed at recognising post-depositional processes and measuring their relative effects on the archaeological record". These post-depositional (i.e. post wrecking event) processes have characteristically focussed on the natural aspects of site formation (wrecking processes and wreck disintegration) (see for instance Guthrie *et al.* 1994; Anuskiewicz 1998; Ward *et al.* 1998; Randell 1999). Generally, this is because, "The cultural aspect of *formation process concepts* has not been appreciably developed" (Schiffer 1972: 156). Moreover, this is

because shipwrecks are normally seen as accidental events and are rarely perceived as being the result of human intent (as noted in Chapter 1). Lenihan and Murphy (1998: 237, see also Murphy 1983: 66) make particular reference to the work of Basch (1972) and Muckelroy (1978) in propagating this view. Despite this, Murphy (1983: 85) has also highlighted the cultural aspects of wrecking event, "Although it is frequently asserted that the final location of a wrecked vessel is an accident; in a more general sense wreck concentrations represent patterns of human activity in an area over time". Gould (2000: 3-4) also refers to the socio-cultural processes of wrecking events in relation to the poor maintenance of the vessel *Marine Electric*.

Other than acknowledging that non-cultural formation processes act on cultural materials at all times, and are relevant in relation to salvage because of the decision making processes focussed on the degree of natural attrition on salvageable materials, this thesis predominantly disregards n-transformation processes. This is because of the major role human decision-making plays in adopting technology, determining obsolescence, choosing discard locations, and undertaking salvage activities on unwanted vessels.

Although site formation and the investigation of culturally derived archaeological signatures has been the subject of many studies, such as Gould's examination of the Archaeology of War (Gould 1983b), arguably cultural site formation is a neglected aspect of the study of shipwreck disintegration. In the case of the Bird Key wreck, a range of behavioural inferences were made according to the investigation of the articulation and orientation of structural remains (in relation to the running aground of the vessel) that caused the proposal of certain theoretical possibilities regarding the deposition of the vessel (Gould 1995: 9). Of particular interest is the analysis of the ships' propeller, which suggested that the vessel had been running in reverse (with propeller moving in a counter-clockwise fashion) just before grounding, supporting the notion of an accidental wrecking

(Gould 1995: 12). This is a major departure from the normal investigation of shipwreck sites, where the absence and position of any number of structural and diagnostic elements of a vessel seem to be taken to be as consequence of natural attrition upon the hull. The Bird Key wreck is also a case study that takes into account the cultural site formation of events, such as the use of explosives on the vessel, and how this contributed to its disintegration (Gould 1993: 336).

McCarthy's investigation of the steamship *Xantho* is one of the best examples of the representation of cultural transformation processes occurring in one vessel. It is also important because it links site formation theory with the perception of watercraft as artefact. Additionally it is pertinent to this study because McCarthy explicitly considers disposal or abandonment behaviour in his consideration of these processes:

Through this particular transformation process, a redundant artefact (the *Xantho*) was modified and re-used, rather than being broken up in order to retrieve useful materials before deliberate scuttling or abandonment, as was the norm (McCarthy 1996: 139, see also McCarthy 2000: 56-58).

The quote embodies not just an admission that abandonment was a behaviour associated with shipowning, but that such an act of abandonment is also common, and involved notions of salvage and technological obsolescence (as will be discussed in Chapters 8 and 9). It also communicates that objects are imbued with the signatures of use that can illustrate the way they interact with humans in their systemic context.

Combining ideas about abandonment and redundancy with site formation theory can also lead to the distinction between, and analysis of, pre- and post-depositional processes that have been caused by cultural processes. Indeed,

the assessment of site formation processes is important in the examination of all watercraft remains, as Babits and Corbin-Kjorness (1995: 34) indicate:

Site formation processes are relevant because they affect information potential and site condition. Was the vessel present at the site because it was a derelict, wrecked or abandoned; accidentally or deliberately grounded, stripped or burnt before ultimately being examined as an archaeological site.

Fundamentally this thesis is concerned with c-transformation processes in the archaeological record. There are major distinctions between c- and n-transformation processes in the archaeological record. Whereas n-transformation processes are concerned with the interaction of the natural environment upon artificial constructions, their effects can to some degree be seen as universal, constant, and therefore highly deducible by scientific methods (Hodder 1999: 28). On the other hand c-transforms are borne out of behavioural processes. For this reason some archaeologists, such as Hodder (1999: 28) have commented, "We cannot generalise easily nor can we construct universal c-transforms about human behaviour because human intentionality intervenes". Such a statement is impossible to argue against. This does not mean, however that we should not attempt to find and describe these processes. Neither does this suggest that c-transforms cannot be determined from the archaeological record, and are not important signatures of behaviours represented in archaeological remains. Furthermore, the understanding of cultural site formation is pivotal to the understanding of discard behaviours. As Trigger (1995: 36) has noted, "The realisation that large numbers of artefacts are found in contexts of disposal rather than those of manufacture or use has stimulated much ethnoarchaeological research that aims to discover regularities in patterns of the disposal of refuse". Indeed, it seems increasingly obvious that where archaeologists have historical records we can make many correlations between historical events and the archaeological remains that signify such events. Here it becomes more

obvious that c-transformation processes are an important part of interpreting the archaeological record. Another reason for the consideration of cultural site formation theory in ship abandonment studies is cited by Oxley (1998: 89), who has asserted that, "Reviewing the formation of shipwreck sites in relation to other marine sites (e.g. drowned landscapes) and the consideration of "ship traps" and "ship graveyards", has potential for the future study of shipwreck site formation processes". Additionally, ships' graveyard sites are characteristically diverse in vessel types. Schiffer (1996: 281) cites that, "Artefact diversity is a characteristic of deposits particularly sensitive to cultural formation processes". This is undoubtedly another indication of the use of site formation theory in order to understand the complexities of the behaviourally defined aspects of such sites.

### **Types of C-Transformation Processes**

There are many cultural transformation processes discussed at length by Schiffer (1996: 25-140) including reuse, discard, loss, abandonment, reclamation, and disturbance processes, most of which are relevant to the study of watercraft abandonment. Site formation studies rest upon the fundamental principle that after use, artefacts can be either reused, or deposited in some manner (Schiffer 1996: 14). Fundamentally these processes can be seen from three general perspectives where watercraft abandonment is concerned:

- Formation processes that are evidence of activities during use;
- Formation processes that are evidence of the process of abandonment, and;
- Formation processes that are evidence of activities after abandonment.

### *Reuse Processes*

A number of reuse processes can be seen in the archaeological evidence from watercraft abandonment sites. Generally, reuse processes or mechanisms are behaviours that see a change to the user, use or form of a particular artefact (Schiffer *et al.* 1981: 68; Schiffer 1996: 28, 36). Different reuse mechanisms, however, are associated with quite different and distinct behaviours. Of these there are a number of general processes:

- *Lateral cycling* occurs where there is a change in the user or the transfer of the ownership of an artefact without a change in the form and use of the object. This process in maritime commerce is best understood as the transfer of a vessel from one owner to another while maintaining its use as a tool for trade (Schiffer 1972: 159, 1996: 29). The object remains in a systemic context (Chapter 9).
- *Recycling* entails the re-introduction of cultural material into an industrial process that sees a transformation of an object's fabric into some other form and/or function (Schiffer *et al.* 1981: 68; Schiffer 1996: 29-30). Recycling from a maritime archaeological perspective is best understood in terms of salvage, and in the case of this research from the view of the dismantling and salvage of abandoned and unwanted watercraft.
- *Secondary use* is a term that refers to changes in the function of cultural material without substantial alteration to the form of that material. This usually occurs in objects that have undergone extensive wear (Schiffer *et al.* 1981: 68; Schiffer 1996: 30-32). Within the context of this study, such processes are seen in relation to the conversion of vessels into secondary support roles such as hulks and lighters or other more specific and distinctive functions (see Chapter 8).



- *Conservatory processes* constitute the transition of an object from its techno-function (related to use) to socio- or ideo-function (Schiffer *et al.* 1981: 68; Schiffer 1996: 32-35). Such processes are not common within this study, and are only represented when vessels cease to serve primary or secondary functions in relation to trade and are conserved for the perception of their historical value (often for tourism purposes).

### *Discard Processes*

“Abandonment” has been described by Schiffer (1996: 89) as, “the process whereby a place – an activity area, structure, or entire settlement – is transformed to archaeological context”. As abandonment is a form of cultural deposition it can be seen as a discard process. Whereas reuse mechanisms describe the transformation of cultural remains through a range of systemic functions; discard processes are concerned more with the transformation of objects from systemic contexts to archaeological contexts. Such processes are generally brought about by an inability for artefacts to fulfil any kind of use role (their techno-function). This is often due to unrepairable damage, or mechanical ineffectiveness (because of breakage, use-wear or deterioration) (Schiffer 1996: 48).

Site formation theory, and particularly discard processes are also relevant to the analysis of space and the location of abandonment areas. This is reflected in the following quote from Schiffer (1996: 17) concerning the *spatial dimension* of archaeological evidence that:

In the field, artefact locations are recorded with reference to grid systems, but locations can also be described in terms of behaviourally significant divisions of space, such as activity areas and the domains of various cultural units.

This relates to the reasons for the location of watercraft abandonment sites, and is an important premise for interpreting how major ship discard sites (such as ships' graveyards) have come to be formed. While the quote that, "people tend to dump trash where others have previously dumped trash; thus concentrations arise" (Schiffer 1996: 62), does explain the behavioural processes involved in the creation of some ships' graveyard sites, there is a relationship between watercraft discard and what have been defined as primary refuse sites, where artefacts/watercraft have been discarded at the location of their use/salvage, and secondary refuse sites where artefacts/watercraft have been discarded elsewhere (Schiffer 1972: 161-162, 1996: 58). This distinction is also important in relation to salvage activities. Often secondary refuse sites are indicative of what is called *maintenance processes* or *waste streams*. These processes are linked to complex activities that create much refuse that needs to be cleaned away periodically and sees the complete or partial removal of materials to other locations. This is a behaviour known as the "Schlepp effect" in economic geography and refers to the transportation and discard of material from large game animals as represented in the faunal assemblages found at kill sites (Schiffer 1996: 64-69). These are the reasons, to a large extent, for the creation of watercraft abandonment sites that can be seen to represent secondary refuse sites. Due to the large amount of material retrieved during salvage, and because of the logistical aspects of vessel dismantlement, watercraft remains are often abandoned away from their location of salvage (see Chapter 7).

Similarly Schiffer's notion of the *relational dimension* relates to the spatial dimension of archaeological evidence because watercraft abandonment sites can be seen as being locations of *singular association* where two or more objects (in this case watercraft) are located in close proximity to one another. On a larger scale they can be seen as *recurrent associations* because these sites seem

to occur within the same spatial and behavioural contexts from state to state around the nation (see Schiffer 1996: 20-29).

### *Abandonment Processes*

Although abandonment processes are often related to discard behaviours they are more specifically related to the abandonment of sites or collections of artefacts. Within the context of this research, this is more related to the cessation of the use of particular areas for watercraft abandonment. Abandonment processes can be seen in relation to *De Facto Refuse* and *Curate behaviours*. De Facto Refuse is described as:

... tools, facilities, structures, and other cultural materials that, although still usable (or reusable), are left behind when an activity area is abandoned (Schiffer 1996: 89).

In the context of watercraft abandonment this is most relevant when considering why abandoned vessels cease to be used for the purposes of raw material procurement, and when ships' graveyards cease to be used for the dumping of unwanted watercraft. The formation of de facto refuse sites is linked with a number of variables; the rate of abandonment, the degree to which abandonment is planned, the available transport for access to the site, the season of abandonment, the distance to the closest populated area, and the size of the local community (Schiffer 1996: 90-91). In the context of this study de facto refuse sites can be understood in relation to salvage behaviour and the interaction between spatial factors and logistic factors in the procurement of raw materials for recycling. Schiffer (1996: 90) defined curate behaviour as "the process of removing and transporting still-usable or repairable items from the abandoned activity area for continued use elsewhere". In this way, it can be seen as a force that works against the creation of de facto refuse and occurs where sites are completely stripped of

usable materials, leaving the abandonment site to re-enter systemic context. Both processes are related to the planning phases of abandonment and whether there is an expectation of a return to the site (Schiffer 1996: 92). We can see this especially in relation to intertidal ships' graveyard where the highly exposed remains of unwanted watercraft become sites of repeated return for the purposes of salvaging materials.

### *Reclamation Processes*

Reclamation processes can be seen as reuse mechanisms where recycling occurs. Reclamation processes take place where artefacts are transformed from an archaeological context back into a systemic context (Schiffer 1996: 99). While such behaviours are more likely to be exhibited at archaeological sites that are recurrently occupied (Schiffer 1996: 101), these practices may also occur in conjunction with curate behaviours that see sites (such as ships' graveyards) visited periodically over an extended period of time during which cultural materials are removed. Salvage and scavenging processes are the most relevant reclamation mechanisms in this research. This is reflected in two behaviours - the salvage of structures (de facto refuse items) and the salvage/scavenging of raw materials from related structures. Scavenging is a generic term related to the exploitation of previously discarded objects. In relation to this study scavenging also has a socio-economic context in that it refers to unsanctioned, illegal and often clandestine salvage of material from watercraft abandonment sites. This is important because scavenging is often associated with economic factors (Schiffer 1996: 106). More specifically, scavenging activity from ships' graveyard sites (which tend to be secondary refuse sites) can be categorised as gleaning behaviours associated with resource-use strategies (Schiffer 1996: 107). Scavenging can also be seen in relation to the re introduction of defacto reuse items (such as watercraft) into some kind of systemic context. This behaviour is based upon the assessment of de facto refuse items for continued use. As Schiffer (1996: 109) explains:

Several variables influence the likelihood that particular artefacts will be scavenged. For example, all other variables being constant, intact artefacts and those with greater remnant usefulness have a higher probability of being scavenged. One also expects replacement cost to directly influence scavenging probabilities.

Another case where reclamation processes can be seen in the archaeological record is associated with in-filling procedures where refuse is actively used in the reclamation of areas to be used as areas of construction (Schiffer 1996: 111-114). Such material is termed displaced refuse, and is well reflected in the archaeology of watercraft abandonment from antiquity to the present day.

### **Conclusions**

The historically recorded, deconstructed elements of a vessel are not just historically interesting, which has been the predominant way that these sites have been researched (as illustrated in the following chapter). When examined diachronically and comparatively they are also analytically significant clues to changing technological and economic circumstances (see Chapters 6 and 7). Similarly the archaeological signatures of use, modification, reuse and discard are opportunities to see historical processes reflected in archaeological remains (expanded in Chapters 8 and 9).

In the words of Lenihan (1983: 63), "Shipwrecks are an extraordinary database for anthropologically oriented archaeologists". Abandoned watercraft are also an "extraordinary database", and a comparative approach can provide the framework for understanding this database. Additionally, the development of comparative approaches to maritime archaeological materials is important for other reasons. As Murphy (1983: 84) has noted, "The shift from considering ships as discrete time capsules to viewing them as integral aspects of a larger parent culture can produce methodological and theoretical developments heretofore not readily apparent". He has also stated

that, "Shipwrecks can properly contribute much to the study of human behaviour in many areas, and the only limits are imposed by the nature and scope of the questions developed by researchers (Murphy 1983: 67). It is within this framework that this study finds meaning.

## CHAPTER 3

### The Archaeology of Abandoned Watercraft: An Overview

*Ships abandoned in harbours and waterways sometimes became eyesores, nuisances, or even hazards to navigation, and were removed; others provided the basis for landfill and other marine engineering works, such as rudimentary piers, wharves and breakwaters (Moore 1970: 3).*

## CHAPTER 3

### THE ARCHAEOLOGY OF ABANDONED WATERCRAFT: AN OVERVIEW

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#### Introduction

Previous studies into the discard of watercraft can be separated into two categories; those that have examined isolated abandonment sites, and those concerned with discard accumulations. This chapter uses selected case studies to provide a critical overview of the work that has been undertaken on watercraft discard sites. The intention here is to communicate the historical background to deliberate discard and illustrate how many of the themes that we see in the history of watercraft abandonment in Australia are also mirrored in international case studies. However, during the passage of time many of the reasons for discarding watercraft have changed – and consequently many of the activities described here cannot be found in Australian cases. Nevertheless, it is important to communicate that internationally the reasons behind vessel abandonment have been characteristically diverse and have changed with time and geography. Hence this chapter endeavours to explain the history of deliberate watercraft abandonment through time, citing historical and archaeological literature. In doing so it also highlights the continuity of variations in discard behaviour concurrently with variations in human behaviour. This serves to illustrate the changing role and importance of abandoned vessels from a range of perspectives. This work is useful because it provides a background to the archaeological site formation processes and signatures that can be found at similar Australian sites (discussed in Chapter 6 and expanded in Chapters 8 and 9). These case studies are also evidence of the particularist orientation



within maritime archaeological studies of discard sites (as discussed in Chapter 2).

Within examinations of isolated watercraft discard sites there are a number of divergent, yet ultimately connected themes represented by quite distinctive site types. First, there is the history of insights gained from the analysis of grave ships and boat-burials, described first here owing to their established place in antiquity, but mainly because of their apparent prevalence. Secondly, there is the history of watercraft as votive offerings, a category of abandonment older than the boat grave, but more widely dispersed and scarce. These two categories of “discard” are linked because while they represent the abandonment of a vessel for its aquatic function, it still maintains a function related to its religious reuse, and connected with the afterlife. Lastly, there are activities related to the functional reuse of watercraft, in the form of the reuse of articulated hulls, and disarticulated watercraft remains.

Many of these themes are concerned with “sacrifice”, a term which implies that carefully planned decision making processes have been undertaken in relation to the discard of watercraft, whether for religious or economic reasons. This notion of sacrifice is an important one because it can be seen in sites thousands of years old, and from more recent times. Despite the changes in shipping technology and use, the concept of what was worthy of sacrifice, or indeed could be sacrificed, means that the creation, retention and destruction of vessels can illuminate perceptions of the importance of watercraft. A ship is not only a tool of commerce or warfare, but is also an object imbued with ideational qualities.

The sacrifice of watercraft entails the abandonment of one function, and the adoption of another. These changes are not just about the structural or functional transformation of watercraft. On many levels it can be seen as a

symbolic reuse, and a reflection of the changing needs and desires of maritime people. Demolition, which involves the systematic separation of vessel components, is a different form of sacrifice because it represents a change in the importance of a vessel from its function as a structure, to the versatility of its component parts. This recycling, while more pragmatic is still imbued with ideational qualities, such as suitability of these components for other applications. The transformation of an object as large as a vessel from its initial use to another function requires a range of behaviours, from the ability to take risks through to the ability to think ingeniously in times of stress.

Discard accumulations, otherwise categorised as ships' graveyards, are sites that can be seen as the modern nexus of many of the behaviours represented in watercraft abandonment. Such sites can be seen as the culmination of many of the behaviours linked with carrying out sacrifice and demolition. Woven into the fabric of the everyday occurrence of vessel abandonment in the modern world are the same behaviours and ideals that constituted the discard of watercraft in ages gone by. Even watercraft deliberately abandoned in the present day, can be seen as a record of the circumstances of their working lives, and operating environment. They are also representations of the continuation of traditions inextricably linked with the economic and technological transitions of human societies, and are indeed documents of such changes themselves.

### **Grave Ships and Boat-graves**

The existence of burials in boats in Scandinavia has been reported since at least the seventeenth century, but the practice can also be found in poetic works from many hundreds of years before this time (Muller-Wille 1974: 187; Bruce-Mitford 1974: 81-82). When we consider the place of the grave-ship in European archaeology (or more specifically Northern European archaeology)

there is an apparent discrepancy in perspective. Crumlin-Pedersen (1991b: 70), for instance, has asserted that:

An analysis was made in 1978 of southern Scandinavian and northern German ship finds dating from AD 800-1200, in order to see whether the sites of these finds were randomly distributed. Of the then-known 26 ship finds from the period, 5 were grave ships and 5 were used in a blockages (Skuldelev). The remaining 16 ships were all wrecks, but only one of these had foundered on the open coast.

While this may suggest that boat-graves are not an extensive resource, Muller-Wille (1974: 199-204 see also Greenhill and Morrison 1995: 175; Muckelroy 1998a: 27; Gould 2000: 175) has noted that at 290 separate sites across seven Northern European nations (Finland, Sweden, Germany, Norway, Iceland, Great Britain and France) there had been at least 422 separate watercraft burials recorded. Some analysis of boat building from boat-graves has come from the evidence of vessel fragments from such places as Karmoy and Holmedal in Sunnfjord, Norway (Christensen 1972: 167). The number of boat-burials is credited as having expanded greatly, at least in parts of Northern Europe in the first millennium AD (Randsborg 1991: 21). Despite the apparent wealth of boat-burial sites, there have been comparatively few examples of large-scale excavation of such sites, and the investigation of this resource on a broadly comparative basis appears to be absent.

To suggest that a vessel is a boat grave is to imply that it has been deliberately abandoned. Five European sites, the Snape Boat, Sutton Hoo vessels (Figure 3.1), the Oseberg Ship (Figure 3.2), the Tune Ship and the Gokstad Ship (dating to between the seventh and tenth centuries AD) are boat graves that have a large amount of relevant, accessible published material (see Bruce-Mitford 1974: 1-5, 17-73, 114-119; Johnstone 1974: 68-70, 102-112; Fenwick 1978: 195, 197; Christensen 1972: 166, 168, 1987: 6, 20-22, 27; Evans 1987a: 114,

1987b: 116, 1997a, 1997b, 1997c, 1997d; Martin 1987a: 122, 124; Brouwer 1993: 163-165; Gould 2000: 174-175). While they only represent a small portion of the European boat-grave resource, they have been extensively recorded.



**Figure 3.1** The Sutton Hoo vessel excavation nearing completion in 1939 (reproduced from Johnstone 1974: 105)



**Figure 3.2** The excavation of the Oseberg ship (reproduced from Johnstone 1974: 71)

Despite the wealth of information concerning the boat-burials that have been analysed, the tendency has been to concentrate on the artefactual and human remains on such sites, and not to analyse the behaviours associated with the abandonment of the ships and boats as structures. It is easy to acknowledge that the religious symbolism behind watercraft is, in many cultures, a very strong one, and some interpretations have been made suggesting the relation of boat-graves to a priestly class engaged in fertility cults in Northern Europe (see Crumlin-Pedersen 1991b: 51). The pragmatic concerns related to the choice of vessel, and the likelihood of the construction and use of custom-made funerary ships has not been discussed at any great length, and could only serve to enhance the understanding of the boats' symbolic role in religious life (although see Cockrell 1983: 212). For instance, references to repairs made on the keel section of Sutton Hoo 1 ship are mentioned as a source of confusion, rather than a diagnostic feature arguably relating to the use and advanced age of the vessel before its utilisation as a boat grave

(Bruce-Mitford 1974: 121). This is despite the assertion from authors such as Ole Crumlin-Pedersen (1991a: 7) that, “in recent decades it has gradually become the aim of archaeological research in the Nordic countries to interpret the past in a wider context, going beyond what the individual find or site can reveal”. Furthermore, while some authors (see Randsborg 1991: 11) discuss the existence of the symbolic connection between boat/ship and burial, this symbolism is not discussed in depth, and seems to be considered only as a means of diagnosing questions of ethnicity, religion and status.

While it has to be acknowledged that much of the work was carried out in the middle of the nineteenth century, this site-specific, particularistic approach is still evident today with an apparent lack of comparative work on the structural remains of these vessels. Moreover, there appears to be a continuing pre-occupation with the comparison of artefacts, and artefact types. Furthermore, it seems that few authors consider the distinction between those watercraft utilised as boat-graves or votive offerings, and those used for everyday commerce to be a fundamentally important question (an exception being Crumlin-Pedersen 1991c: 72-74).

### Votive Offerings

The deliberate discard of vessels as votive offerings is another theme that is well documented in maritime archaeology. Often there is some difficulty in defining sites as boat inhumations due to the lack of *in situ* human remains. It has been stated that some of the identifications made concerning vessels such as the Sutton Hoo ship could be mistaken due to the fact that the vessel may have been abandoned as a cenotaph or monument (Bruce-Mitford 1974: 1). This would put such vessels in the category of votive offering rather than within their current classification of ship burial. Additionally, the existence of stone ship-settings, as described by Randsborg (1991: 21), are important because of the evidence they provide concerning the symbolic status of

watercraft as grave monuments (they have not been discussed here because they cannot be defined as watercraft). Meaney (1964: 171) and Fenwick (1978: 197) have also listed similar “pseudo-ship burials” at Caister-on-Sea, Norfolk where graves had not been filled, but were instead covered with a piece of the side of a vessel.

Documentary sources about votive offerings are particularly old in Europe. Johnstone (1974: 80) cites the Roman historian Tacitus (55 – 120 AD) in reference to votive offerings made by Germanic tribes, “When they meet in battle, they generally promise the spoils of war to the God of War. After the victory, captured materials are sacrificed to him and the rest of the booty is put in the same place”. This behaviour is best shown in the case of the Hjortspring boat (300 – 350 BC) and other possible sites found in Danish bogs at Thorsberg, Ejsbol and Nydam (Southern Jutland), Vimose and Kragehul (Funen) and Illerup (Skanderborg) (Christensen 1972: 162, 167, 1987: 86, 114; Randsborg 1991: 16; Delgado 1997e: 193; Gould 2000: 111).

In Egyptian examples of votive offerings, the vessels are often referred to as “boat-graves”. This does not appear to reflect their direct use as places to hold the dead, but rather implies that the vessel was associated *symbolically* with the afterlife, or more specifically as a vehicle for the use of the departed during the afterlife. Egyptian boat-graves, it has been noted, only show up in the archaic period (first and second dynasties) as illustrated by the royal graves at Saqqara, in the necropolis of the nobles at Helwan, and in the fourth dynasty at Giza (Jenkins 1980: 158). Votive sites in Egypt are represented by a number of well-known studies, like the Cheops Ships and Dahshur Boats (c.1850 BC), as well as other archaeological work that indicates that many other pyramids had pits that once held ceremonial watercraft (Jenkins 1980; Throckmorton 1987b: 92; El-Baz 1988; Miller 1988; Patch and Haldane 1990; Haldane 1992, 1997b; Jones 1995; Gould 2000: 104, 122-125). There are two dominant theories regarding the reasons for the burial of the boats,

concerning the use and symbolism of the boats in the Pharaoh's journey to the afterlife. These theories, which relate mainly to whether the vessel was functional or purely symbolic, will not be discussed here, but fundamentally relate to the deliberate, votive abandonment of the vessels (Johnstone 1974: 9-16; Jenkins 1980: 161; Lipke 1984: 1, 1985: 19, 30; Kadry 1986: 123-124; Miller 1988: 545; Haldane 1992: 103, 1997b: 223; Jones 1995: 18-19, 27).

It is understandable that the investigation of these sites has concentrated on the analysis of portable material culture. There has, however, been no appreciable attempt to discuss the suitability of some vessels for abandonment, or the pressures contributing to abandonment. While some discussion about the perceived age of vessels as a source of evidence regarding the abandonment, or the desire not to continue to use vessels for transport or commercial purposes have been made, there have been no attempts to fit these vessels into a psychological framework of abandonment. Such an analysis would make contributions to how we understand the behaviours associated with ship use and ship owning and the interaction of commercial and social activities. Given that there appears to be much in the way sites reflect the votive use of watercraft, the possibilities for a preliminary comparative assessment of such sites must be considered extensive, yet currently untapped.

### **Articulated Watercraft as Construction Material**

The use of intact, articulated hulls as building foundations or as buildings, is one that is well documented archaeologically, especially in European literature. There are three variations on this theme of abandoned vessel as building which relate to the types of post-abandonment uses that watercraft often serve: in reclamation schemes, as foundations, and as buildings (expanded in Chapter 9). What binds all of these variations is that they depend, to a large degree, on the articulation of the extant hull.



## Reclamation

Abandoned vessels are often used as a way of reclaiming ground adjacent to waterways, thereby creating more secure foundations upon which other buildings may be built. Notable examples of this are at Portus Augusti (Ostia, Italy), the B&W Engine Factory Site (Christianshavn, Denmark) and a range of separate sites in the ancient port of London such as the New Guys' House boat (second century AD) and the County Hall ship (190 - 225 AD) (see Meiggs 1960: 155; Johnstone 1974: 100-101; Marsden 1994: 11, 97, 104; Lemee *et al.* 1996; Delgado 1997c, 1997f; Lemee 1997; Gould 2000: 115).

The investigations of the County Hall ship are important because they provide us with of an insight into the benefits that incorporating ideas of discard into the archaeological investigation of vessel fate can provide. The early work on this site does not make much mention of the fate of the vessel (see Marsden 1974). This is rectified later with Marden's 1994 (pps. 11, 109-129) account of the County Hall ship where the loss of the vessel is attributed to an act of abandonment around 293 - 300 AD. The vessel did not appear to be particularly old, and was noted as only having been repaired a few times during its lifetime - suggesting that it was relatively new when disposed of. While alternate views of its fate suggest that it was sunk around 296 AD during a battle, the abandonment hypothesis is still valid for a number of reasons (for discussion see Merrifield 1983: 201-202). While no evidence of burning or other disposal activity associated with its loss was found, Marsden supports an abandonment theory due to its location in the marshy southern bank of the Thames, which is the same kind of area used for the abandonment of unwanted vessels in more modern times (a theme developed further in Chapter 7). Its position close to shore, and away from areas of major port activity is also seen as indication of some kind of deliberate disposal. Both Merrifield (1983: 203) and Marsden (1994: 129) also make the analogy between

ship abandonment in the region around the 1920s and at the time of the abandonment of the County Hall ship. Merrifield's discussion of the vessel contributes an additional piece of information to the debate on the County Hall ship in relation to its fate. He states that a block of stone was "thrown from a considerable height" and deposited within the hull of the vessel at some stage and considers the possibility that the vessel had been used as target practice, with such a stone projected from a catapult (Merrifield 1983: 203). While it may also be likely that the stone was dropped in the hull in order to ensure that its hull was adequately breached, and that it was weighted to the location of its intended abandonment, such an assertion is an important clue in why an in-depth discussion of vessel fate is an important aspect in extracting the behavioural aspects of such sites.

Two other sites studied by Marsden, the Blackfriars Wreck 1 and 3, are representative of the different perspective that Marsden brings to the analysis of ancient boat remains by incorporating theories of abandonment into his interpretation of sites. Abandonment hypotheses were integrated into the interpretation of both sites, but eventually discounted due to the pronounced list and lack of support seen in the remains of Blackfriars 1, which indicated that it had not been reused as construction material. Likewise the absence of holes in the bottom of Blackfriars 3 discounted a theory of deliberate discard (Marsden 1972: 130-132, 1994: 33-108, 1996: 55-104; Delgado 1997a). In both cases it is significant that Marsden asked whether the vessel was wrecked. His consideration of the location of the vessels (impeding navigation), and as a navigation hazard is also an indication of the depth of his enquiry.

## **Foundations**

Similar to activities surrounding reclamation, vessels are sometimes used to provide solid foundations, upon which other buildings may be

erected. Probably the most famous case of articulated hull material being used in the context of land reclamation is the Ronson ship.

The Ronson ship is especially relevant to this thesis because it represents many of the signatures of abandonment that can be found on more recently abandoned watercraft. The vessel had been used in the reclamation of New York's East River until sometime before 1750 when it was stripped, sunk deliberately, spiked through its hull with a set of piles, and almost filled with sand and rocks for use as a caisson or "crib hulk" within the reclamation project. By the time that reclamation had concluded the vessel was situated under metres of debris, and two street blocks from the waterfront. There was also evidence of a crude rock fireplace, a bow-mounted capstan, a small loading crane, and excessive wear to the upper deck - indications of the later post-abandonment functions of the vessel as a harbour wharf or quay prior to its next use as part of the landfill (discussed in Chapter 9) (Ingram-Brown 1982: 308-309; Runestone Press 1994: 26; Reiss 1987: 90, 1997: 349-350; Steffy 1996: 125-128).

## Buildings

In other cases the hull itself is transformed into a building. The reuse of ship's hulls as above ground structures also has a long history, and is well represented in historical and archaeological literature. There are many examples of watercraft being converted into terrestrial structures in the archaeological literature, such as the Port Stanley hulks (to be discussed), an unidentified vessel at the Royal Navy Dockyard, Bermuda (believed to be either *Dotterel*, *La Tourterelle* or *Antelope*), *Niantic* (Figure 3.3) and *Apollo* (San Francisco waterfront), and two vessels abandoned in New Zealand *Edwin Fox*, and *Inconstant*. These watercraft served a variety of functions from victualling stores and slave dwellings, to warehouses, barns, taverns, hotels, restaurants, offices, jails, churches, landing stages and wharves (Bullen 1979:

326-327; Delgado 1979: 316-317, 1983: 321, 1997g; Parker 1980: 51; Lawson 1986: 17-18; Edwin Fox Restoration Society Inc. 1987; Johnston 1996: 240, 242-243; Aldsworth 1989: 109-110, 128-129; Brouwer 1993: 152-3; O'Keefe 1999, 2001). Such activities can also be seen to continue to the present day, albeit more infrequently. Ships and boats can still be found in a variety of reuse functions, such as one example of old herring boats from Lindisfarne, England, which were halved and boarded up to be used as fisherman's sheds (Fisher 1979: 468-469).



**Figure 3.3** Painting of San Francisco Harbour, showing the beached remains of *Niantic* (left foreground) by John Stobard (reproduced from Johnston 1996: 236)

The cases of *Niantic* and *Edwin Fox* are especially interesting on account of the methods used in their disposal. In particular many of the placement assurance strategies, such as the removal of masts and ballast for beaching and the driving of piles for stabilisation at these sites can be seen in Australian case studies (see Chapter 9) (Delgado 1979: 319, 1983: 322; Parker 1980: 51-52; Johnston 1988: 242).

### Disarticulated Watercraft as Construction Material

Related to the utilisation of watercraft as foundations and buildings is the use of abandoned vessels as material source. What makes this behaviour different is that the vessel is perceived more for the worth of its component parts, rather than the worth of its entire hull. In essence, this behaviour can be defined as salvage behaviour.

Salvage of material from watercraft has occurred since the first vessel was placed on the water. As Basil Greenhill (in White 1995: 1) has alluded to, all watercraft, irrespective of their hull material, are inherently biodegradable, and are destined to be condemned. Indeed, it is this virtually unknowable, but anticipated “use-by-date” of a vessel that is an important part of the way that we view the archaeological traces of vessel remains. Furthermore it has been asserted that in many ancient cultures, “An unknown number of boats, including wrecks, have been broken up and used for building or other purposes, or simply as firewood” (Christoffersen 1991: 57). This is a fundamental assertion that must be made if we are to understand the evolution or transition of behaviours in relation to deliberate abandonment. From the time of manufacture the owner of a vessel was forced to make contingencies for a range of scenarios, including the fact that any vessel bought, owned and used would one day need to be retired and replaced. There is no better example of this than the status of replica ships as significant vessels, where the inherent biodegradability has been hampered by massive overhauls in order to ensure continued seaworthiness and rather paradoxically their “heritage value”. This is noted by Alan Villiers (in White 1995: 4) who was quoted as saying, “All old ships are either wrecks or replicas”. This biodegradability, coupled with continuing requirements for maintenance, is an important factor to consider when examining the tendency for shipowners to opt for the abandonment and/or breaking up of a

particular vessel. This is because all vessels predictably come to the stage where the costs to maintain or repair watercraft outweigh their beneficial use or the cost of a brand new vessel. This is only offset by curate behaviours associated with vessels of significance that have been salvaged and converted into other items specifically for their historical importance (see case of Drakes' *Golden Hind* in White 1995: 1). Such cases are however, rare, and vessels are normally broken down for more pragmatic economic reasons.

The salvage of vessels is a very complex issue, and will be expanded upon further in Chapter 9. Salvage behaviour is inevitably guided by the perception that the economic benefits gained from the salvage, (mainly from the subsequent use or sale of hull material and fixtures) will be greater than the economic costs associated with the salvage activity (i.e. wages, wharfage). Often the burden of having a derelict vessel, which continues to accrue wharfage fees and is in danger of sinking where it floats (causing further economic burdens due to removal and cleanup) also guide the decisions to finally dispose of a vessel.

The usual incentive in the dismantling and breaking down of wooden vessels (besides as a source of fuel) is their value and suitability for the manufacture of other structures. Although the possibility exists of wrecked vessels being used as significant features in terrestrial constructions, it must be considered to be unlikely. The costs associated with locating and salvaging a wrecked vessel's structural remains for this purpose can be expected to have been too much of a disincentive to justify such activity, especially in the pre-diving era. Old or unwanted vessels, no longer suitable for their originally intended function, are the most likely candidates to find their components used as building material, simply because of their proximity to, or ability to be transported to sites where they can be readily dismantled and utilised for this purpose. The use of ship's timbers in this way allows for economic reimbursement in some small way to the shipowner and decreased costs for

construction due to low raw material transportation costs and diminished costs associated with the processing of newly felled trees.

There are two main types of sites that represent the reuse of disarticulated watercraft timbers: evidence of ship breaking areas and industries that saw the reuse of old and unwanted vessels as spare parts for new vessels or in repairs, and the evidence of the timbers being reused in waterfront development. Marsden (1996: 133) mentions that, "When a ship or boat became too old and unsafe for further use it was broken up, and parts were often reused, as were the fragments described here which were mostly from waterfront revetments".

### **Ship Breaking Activities**

Sites representing ship breaking industries and activities are not common, and to date few have been identified. There are some individual sites, such as the Sea of Galilee/Kinneret boat that have been interpreted as working vessels subsequently used for spare parts (Wachsmann 1987: 81-82, 1997: 364-365). Such sites are difficult to identify due to the problems in distinguishing between the archaeological signatures of ship breaking and shipbuilding. Indeed, the high likelihood of both shipbuilding and ship breaking activities co-existing at the same site poses a major challenge to maritime archaeological research. This can be seen in work undertaken by Christoffersen (1991: 57) on the island of Funen (Fyn) in Denmark. Although covering a fifteen hundred year period (to 1500 AD), and not specifically stating the date of the site, Christoffersen has asserted that the first ship breaking or shipbuilder's yard had been discovered during investigations into Scandinavian Iron Age finds on the island. It is easy to understand why such acts of salvage occur, when in certain situations salvaged vessel remnants would have been the major source of raw materials, especially in regions largely devoid of timber suitable for the construction of large structures.

The remains of nine Late Roman Rhine boats found in part of an ancient warship harbour at Mainz, Germany in 1967 and dating from the early third to fourth centuries AD are probably the best-known sites believed to represent ship breaking activities (Hockmann 1993: 125, 1997: 255-256). These sites are located inside of a Roman river port that had at least two basins, surrounded by wooden jetties. From the large number of vessels located in one main area, the surrounding structures, and the instance of one vessel “hacked” in half length-ways, it has been surmised that the area amounted to a ship-breaking yard (Hockmann 1993: 126, 133). Furthermore, this site can currently be seen as the earliest evidence of timber salvage from any vessel in the world.

Similarly, a site found on the Thames foreshore in London in 1995 has also been interpreted as a ship breaker’s yard where ships’ timbers had been reused as decking (Milne in Hammond 1995: 4). These timbers, reassembled as a grid, were used as a platform on which ships being repaired were lain upon. This site is believed to date from 1838 when the vessel *Fighting Temeraire* was broken up in the vicinity (Figure 3.4) (Hammond 1995: 4).



**Figure 3.4** “The *Fighting Temeraire* tugged to her last Berth to be Broken up, 1838” oil painting by Joseph M. W. Turner (National Gallery, London, Sourced from <http://www.j-m-w-turner.co.uk/artist/turner-temeraire.htm>.)



### Archaeological Evidence of Ships' Timbers in a Reuse Context

The recycling of timber salvaged from watercraft is a very different process from the structural reuse of entire vessels. The timbers taken from unwanted vessels are chosen either for their shape, or lack of shape. This is the case, even when vessel components, such as large sections of planking, are relatively complete. With the odd exception, the selection strategy in the reuse of ships' timbers, as noted by Hutchinson (1998: 110) has been to choose, "flat planking of fairly constant width". The identifications of vessel types have then been made from rare occurrences of non-planking components and speculative observations made from treenail hole spacing and the dimensions of planks and fastenings. In this context, reuse is defined by individual examinations of timber specimens to note obvious and uncharacteristic modifications to usually more complete structural aspects of vessels. This reasoning has been used by Heal and Hutchinson (1986: 213) in the context of the reuse of an incomplete log boat found at Tamworth in Shropshire, where the vessel was purposefully cut down. The existence of holes and tool markings has been taken as a clear example of modification for subsequent utilization. Goodburn (1990: 332-333) has also used such a rationale to determine that the fragments of a vessel obtained after its destruction by a mechanical excavator were indeed those of a wrecked vessel, and not from a structure using reused components from an abandoned watercraft. The existence of recycled ships' timbers, be it in shipwrecks, abandoned vessels or even waterside structures can tell us about a range of behaviours associated with the tendency to retain, destroy or improve unseaworthy ships and even the costs in the production of ships at a given time. Other signatures on disarticulated timber indicate the possible use of fire in a hull reduction context (see Chapter 9). Traces of burning on planking from a medieval revetment (dating to around 1501 - 1571 AD) found in 1987 along a section of river between Hays Wharf and Abbots Lane in Southwark,

London could conceivably pre-date the reuse of the planks and plausibly could represent abandonment or salvage activity.

The oldest evidence of the reuse of dismantled ships' scantlings comes from Lisht, Egypt around the early twelfth dynasty Middle Kingdom pyramid of Senwosret I (1959 - 1914 BC) and believed to be from merchant vessels associated with monumental structures in the area (Ballard 1920, 1926, 1937, 1941, 1947; Solver 1926; Jenkins 1980: 131; Ward-Haldane 1988: 142; Wehausen *et al.* 1988: 295-296, 306; Patch and Haldane 1990: 28, 44; Haldane 1992: 102-103, 1997c: 241-242). The only other evidence of the reuse of ships' timbers in the context of subsequent building activity comes much later (between the tenth and seventeenth centuries AD) and is concentrated in western and northern Europe. Such sites have been found along a medieval period waterfront in Dublin, Ireland, and in Bergen, Norway. In particular, these sites have been extensively documented in Britain at a number of locations around London, York, Bristol, Hartlepool, Newport and Newcastle (Richardson 1959: 67-69, 113; Tatton-Brown 1975: 103, 109, 116; Hutchinson 1984: 29, 1998: 56, 65, 69, 105-106, 108-110; Friel 1993: 11; Clarke *et al.* 1993; Marsden 1994: 141, 152-159, 1996: 9, 22, 30, 41-54, 113-127, 136-144, 160-172, 175, 179, 181, 217-221; McGrail 1998: 41).

Many of these studies are important for what they tell us about the condition of the vessels before salvage, where timbers were old or constantly repaired and therefore illustrate the nature of watercraft abandonment in the past, and in doing so illustrate the nature of trade, watercraft use and technology at these times. Such comparisons are useful in our assessment of similar behaviours that are evident in the reuse of watercraft in more modern times, such as at the Falkland Islands (Stammers & Kearon 1992: 109).

In the era of iron and steel vessels, the reuse of raw materials from abandoned ships takes on a new characteristic due to the dominant role that ferrous-

hulled vessels and their salvage play in relation to watercraft abandonment in Australia (this will be discussed in Chapter 9). Whereas previously wooden scantlings on vessels could only be used according to the suitability of their physical form and an appropriate, compatible new usage had to be found to integrate that aspect into a new structure or object, iron and steel could be melted down and reformed. In this case the shape, condition and size of the material salvaged from the dismantled vessel was unimportant due to the transformable features of the ferrous materials.

### **Ships' Graveyards**

Ships' graveyards are a relatively modern phenomenon, becoming more prevalent during the nineteenth century and extending to the present day. These are places where vessels have accumulated in numbers for one reason or another. The term "ship's graveyard", however, is problematic in that it is often used for *all kinds* of vessel accumulations such as the Truk Lagoon shipwrecks, the region popularly known as the "Graveyard of the Atlantic", and Yassi Ada (Throckmorton 1970: vii; Bright 1993). These sites contain a high concentration of *wrecked* vessels rather than those that have been deliberately discarded. Such sites are arguably better defined as "ship traps".<sup>1</sup>

"Ships' graveyards" can be defined as accumulations of watercraft that were deemed to be ineffective or inadequate by their owners and were retired, or abandoned at some previously decided place or region. The vessels are therefore *not wrecked* and, are therefore not *shipwrecks*. The following criteria

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<sup>1</sup> Conlin (1997: 377) defines a ship trap as "A maritime hazard with an extensive collection of shipwreck sites". Yassi Ada (Turkey) and Dry Tortugas (Florida, USA) are well-known examples of such sites (Gould 2000: 82-91). Anuskiewicz (1998) has made specific reference to these "loss traps" in relation to the eastern Atlantic Ocean and the beaches of St. Catherine's Island, USA.

were developed during this research and serve as a basis for the determination of whether a region or location is indeed a ships' graveyard:

- A place, where there is a high concentration of the remains of ships and other watercraft;
- A place where the vessels have been placed deliberately (abandoned) due to a prolonged decision making process and a perception that they are no longer useful for the function that they were designed for, and;
- A place where it is agreed by a general consensus of either groups or a pre-existing management body that unwanted vessels should be positioned at the end of their useful life.

There are two types of ships' graveyard. The first involves the deliberate abandonment of vessels in the context of war. This often involves the strategic use of vessel remains as barriers against enemy penetration of waterways or sections of land. The other is a more general accumulation due to the dumping of unwanted vessels. This distinction is important for two reasons. The dumping of vessels within conflict-related graveyards often occurs at one given time, or at least over a very short period of time. The vessels are often disposed of due to imminent enemy capture, the perception that the vessels might be used against their owners, or as a defensive measure intended to slow the advance of an enemy. Due to the relatively short period for planning and implementation in this scenario, these sites often have rich artefact assemblages. This kind of graveyard is geographically widespread and, in many cases, has large numbers of watercraft.

The other type of ships' graveyard is best understood to be a designated dumping area (whether officially or unofficially). Here the vessel resource is disposed of over an extended period of time. These dumping areas therefore accumulate a large array of diverse types of vessel, most of which are artefactually sterile. Such dumping areas, or "rotten rows", are often made

reference to in a passing manner. Matthews (1987a: 52), for instance, in relation to the port of San Francisco mentions the vessel *Blue Jacket*, which was withdrawn from service and then towed “down to rotten row in the Bay and broken up”. Other examples are mentioned in the historical record, and archaeologists have examined some dumping areas (expanded below).

### **Abandonment During Conflict**

The history of conflict-inspired abandonment can be traced as far back as the Nydam boats (AD 350 – 400) in Europe (Arenhold 1918; Christensen 1972: 162, 164; Johnstone 1974: 80; Muckelroy 1978: 11; Evans 1987a: 112, 114; Crumlin-Pedersen 1991b: 42, 45; Rieck 1996; Cederlund 1997: 50; Delgado 1997h; Gould 2000: 112-113). Other similar case studies are the Clapton Logboat in London, the large assemblage of vessels in Kalmar Harbour, Sweden, the Mukran Wreck (believed to be *Hamborger Jegeeren*) and the blockships at Skuldelev, Jydedybet and Skane in Denmark (Akerlund 1951; Crumlin-Pedersen 1972: 69-70; Johnstone 1974: 74, 78; Linder & Raban 1975: 48; Martin 1987b: 130, 1987c: 134, 136; Marsden *et al.* 1989: 89, 95, 99, 109-110; Rieck 1991: 90-91, 1998: 84; Bill 1997: 388-389; Cederland 1997: 50; Einarrson 1997: 219-220; Hutchinson 1998: 4-5; Springmann 1998: 120-123). Abandonment in the context of conflict tends to follow a number of themes related to the strategic use of watercraft.

By far the most common strategies of abandonment during conflict entail the scuttling of one’s own vessel or fleet, the demolition of uncompleted vessels, or the destruction of a vessel by its captor. This was done to evade the capture or re-capture and transfer of useful vessels to one’s enemies. Such events occurred often. In Europe, these activities date from at least the seventeenth century with the English destroying their ships during the Second Anglo-Dutch War (1662 – 1667), in 1690 with the English and Dutch committing similar acts against their own fleets, and by the French in 1704

(during the English attack on Toulon) (Warner 1968: 50-51, 54-55, 58). In North America, similar events occurred in connection with the French and Indian War/Seven Years War (1756 - 1763), in the prelude to, and during the American War of Independence (1776 - 1783), during the American War of 1812 (1812 - 1815) and the American Civil War (1861 - 1865). Such sites are many, but are best exemplified in the archaeological work undertaken in North America on the Wiawaka and James River Bateaux sites, the French Frigates *Marchault*, *Marquis de Malauze* and *Bienfaisant*, the British Sloop *Boscawen*, the privateer *Defence*, and the remains of HMS *Betsy* and the Cornwallis Cave Wreck at Yorktown (Dugan 1960: 250-251; Still 1961, 1971; Wood 1962: 98; Mayhew 1974; Baker *et al.* 1981; Broadwater 1981, 1992, 1995, 1997a, 1997c; Switzer 1981a, 1981b, 1981c, 1983a, 1983b, 1987, 1997, 1998; Wyman 1981; Hazzard 1982; Shomette 1982, 1995b, 1997: 98-99; Leone 1983: 175; Sands 1983, 1996; Bryce 1984; Zacharchuk & Waddell 1984; Broadwater *et al.* 1985; Howe & Matthews 1986: 405-406, 588, 656, 743; Sullivan 1986; Matthews 1987a: 274, 1987b: 127, 214; Smith 1987; Beattie & Bernard 1996; Cassavoy & Crisman 1996; Crisman 1996, 1997; Watts 1996: 226; Cussler and Dirgo 1997: 183, 358, 367; Garrison 1997; Johnston 1997; Stevens 1997; Zarzynski 1997; Stephenson 1998; Abbass 2001).

These strategies have also persisted to the twentieth century, and many instances of the deliberate destruction of vessels have been noted during the First and Second World Wars. The largest conflict related destruction occurred on 21 June 1919, when seventy-four German Navy vessels were destroyed at Scapa Flow (Orkney Islands, Great Britain) to prevent British capture (Cousteau 1958: 33, 35; Canby 1965: 102-103; Lloyd's of London 1965: 653-654, 1973: 418; Kemp 1988a: 755; Broeze 1998: 48; Van Der Vat 1998; Smith 1999: 23).

In other situations, vessels are abandoned in a manner that makes them weapons in conflict. There are many terms that apply to the strategic

abandonment of vessels used in this way. These terms fall within two categories: vessels modified for aggression in war, and vessels modified for defence in war.

### *The Block Ship*

A block ship is a defensive measure, where a vessel is sunk to block a passage into a waterway during wartime.<sup>2</sup> The naval tactic of sea blocking is one of the oldest recorded. Such tactics have a long history, dating from the pre-Roman Iron Age period in Scandinavia, and are believed to stretch much further back. It is also contemporaneous with some of the first expansions of sea power and transportation in the region (Randsborg 1991: 17). One documented case of a deliberate blockage is an account entitled “Visit to India, China and Japan in 1853” and written while on board the American clipper ship *Sea Serpent* during a visit to Asia. It reads, “We passed the first bar, which was created by the Chinese sinking junks to prevent the English from reaching Canton” (Taylor in Howe & Matthews 1986: 557). Block ships have been used over a long period of time from their use at Skuldelev around the eleventh century, in the nineteenth century most notably during the American Civil War, and the twentieth century when the British sank vessels at Scapa Flow to protect its anchorage from submarine attack (Porter 1962: 128; Simmons 1996: 199; Van Der Vat 1998: 12).

### *The Fire Ship*

The term “fire ship” is used when a vessel is filled with flammable materials and sailed into or attached to enemy ships to destroy them. The use of fire in warfare normally associated with Spanish and English conflicts from 1587 when fire ships were used by the Spanish to force Francis Drake out of Cadiz,

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<sup>2</sup> The term has also been used in relation to “filling gaps” in existing breakwaters (Blackburn 1978: 49).

and by the English in the overwhelming defeat of the Spanish Armada in 1588 (Figure 3.5). Examples of this tactic however are known to date from at least the seventh century AD (Kemp 1988b: 112).



**Figure 3.5** Painting of fire ships being used in the English attack on the Spanish Fleet at anchor in Calais roads (reproduced from Kemp 1988b: 113)

It was also a major strategic tool in later conflicts. In 1672 the fire ship was turned on the English while at war with the Dutch (Warner 1968: 37, 52; Blackburn 1978: 142; Gould 1983b: 121). The Turkish fleet used fire ships in 1788, during the last Austrian-Turkish War, or the so-called Dubica War (1788 - 1791) (Stenuit 1976: 320). The use of fire ships by the British continued, with five fire ships being sailed into a French fleet blockading the mouth of the York River during the American Revolutionary War (Broadwater 1988: 812). Later, during the American Civil War, Confederate forces also used “fire rafts” (long and flat boats filled with combustible materials) in their military campaigns.



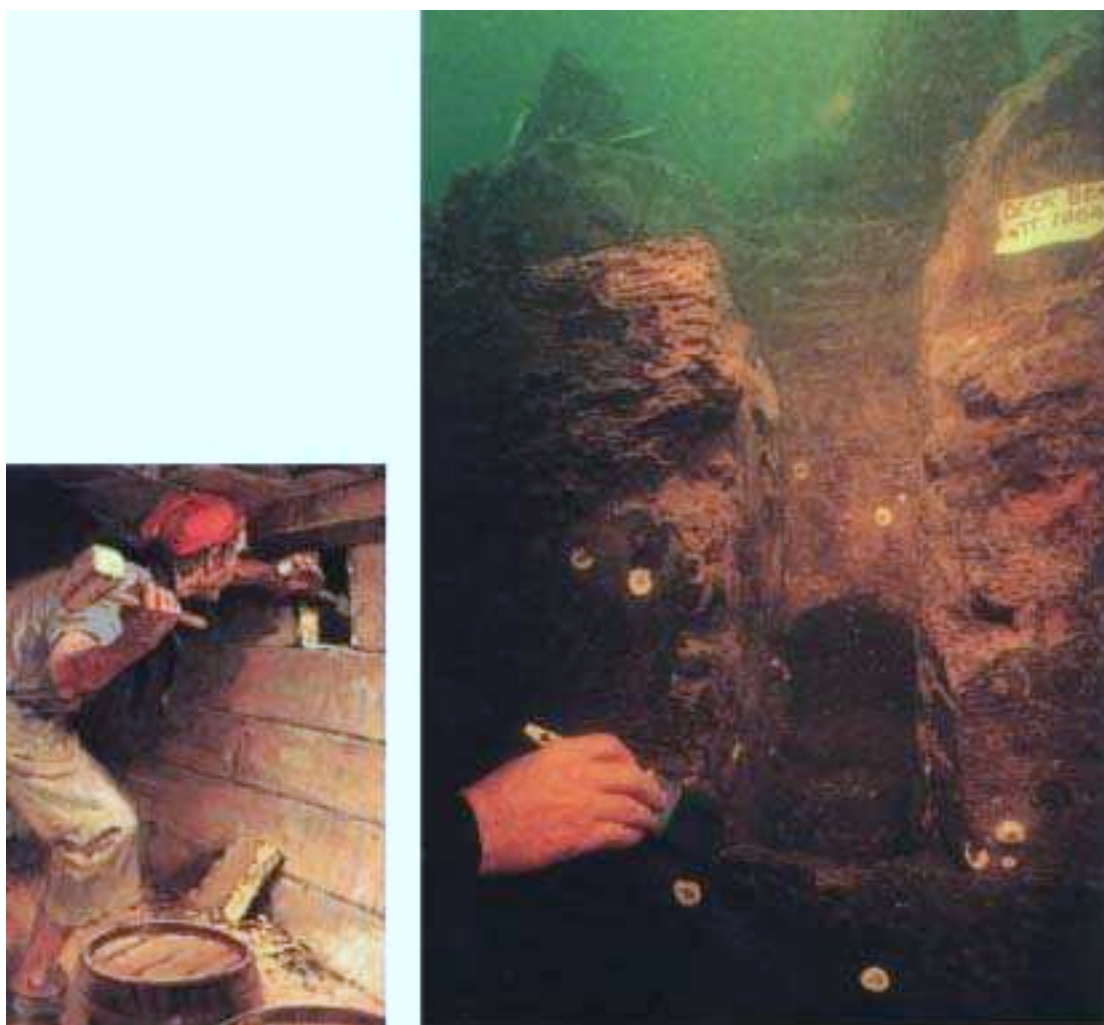
## The Signatures of Abandonment

Despite the fact that such events are akin to catastrophic abandonment many of these sites provide clues about the behaviours that brought about their abandonment. These signatures are useful because they can also be noticed in the Australian abandoned vessel record.

For instance, the Skuldelev vessels are important because evidence has shown that at least one vessel (Skuldelev 5) was of advanced age, had been constantly repaired, had been built with recycled materials, and at the time of deposition was probably bordering on unseaworthy (Crumlin-Pedersen 1991c: 75). Likewise the manner in which the HMS *Betsy* was scuttled in 1781 during the battle of Yorktown illustrates the methods used in ensuring its destruction. Archaeological investigation of the vessels showed that the vessels had been sunk with the use of a “scuttle-hole”, where the inner starboard planking of the vessel had been cut carefully with hammer and chisel to facilitate the sinking of the vessel (Figure 3.6) (Broadwater 1988: 806, 810).

These cases are also important since they tell us about the perceived artefact sterility of deliberately abandoned watercraft. In particular the case of *Boscawen* is significant in the analysis of the archaeology of the deliberately abandoned ship because of what it indicates about the possible artefact richness of disposed vessels:

The excavation of the *Boscawen* produced many surprises, not the least of which was the quantity and quality of artefacts contained within the hull. Prior to excavation we assumed that the sloop had been thoroughly stripped of equipment before abandonment, and that finds would consist of buttons, glass and ceramic sherds, musket shot and other minor debris (Crisman 1996: 143).



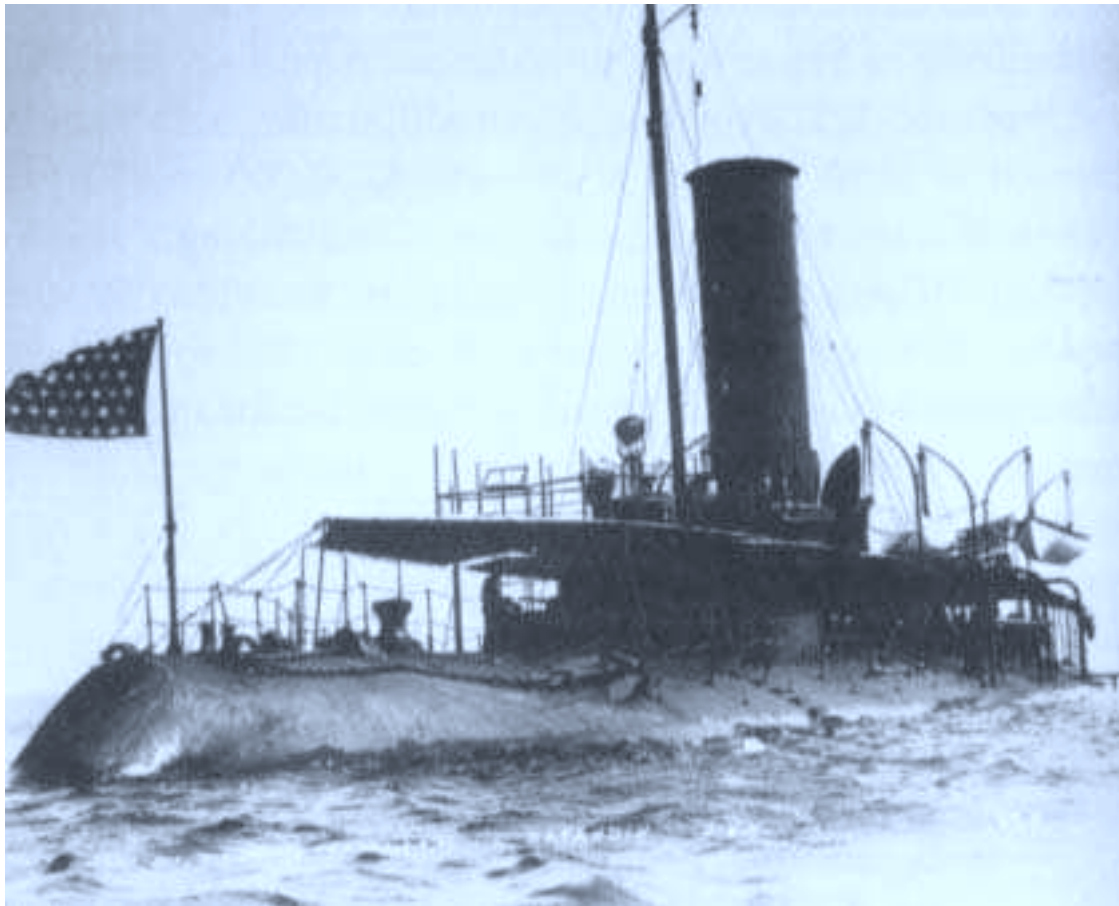
**Figure 3.6** Artistic representation (left) of what is believed to be a “scuttle hole” (right) (reproduced from Broadwater 1988: 810, painting by Roy Anderson, photograph by Bates Littlehales)

What was found was a rich assemblage of artefacts, such as an array of rigging, tools, clothing, armament, faunal remains and seed and plant materials which was able to provide some insights into life on board the vessel (Crisman 1996: 143-144, 146).

### The Aftermath of War

Another variation on the theme of conflict inspired abandonment relates to the aftermath of war. The changing economic conditions that emerge following the cessation of conflict often have a marked effect on the tendency to abandon watercraft (a theme further developed in Chapter 6). As Lenihan (1998: 294) has commented, “It is typical for societies to discard the tools of war when the conflict has ended. War weary nations focus on rebuilding and actively forgetting the carnage recently experienced”. While this tendency to discard may be for economic reasons in a burgeoning post-war world, and may be due to the decreased need for warships, and their eventual deterioration (see for instance the work on *Ticonderoga* and *Eagle* by Crisman 1995: 4-8 and Cassavoy & Crisman 1996: 177, 179, 185-186), in other circumstances this discard may be forced onto a defeated fleet by its victor. From this perspective, such activities are coloured with undeniable political meaning. It is noteworthy, for instance, that in the aftermath of the Second World War most of Japan’s remaining naval fleet were either scuttled or scrapped (Delgado 1996: 18).

In other cases this can be seen in the growth of the target ship phenomenon that persists to the present day. The target ship phenomenon occurs by and large outside of times of war, where nations test their weapons on naval targets to assess their worth. One example of an early target vessel was the steel hulled USS *Katahdin* (Figure 3.7), which was sunk during gunnery practice as “Ballistic Experimental Target A” in Virginia after decommissioning in 1898 (Paine 2000: 115-116).



**Figure 3.7** USS *Katahdin* (reproduced from Paine 2000: 116, held by the Maine Maritime Museum)

While target ships are normally isolated occurrences, there have been instances where military testing with target ships has created large ship discard sites. The ships associated with the Operation Crossroads atomic tests in the Kwajalein and Bikini Atolls in the Marshall Islands Group in 1946 (Figure 3.8) are the best example of this. These largely unsuccessful tests were brought about by American fears that the advent of atomic warfare at Hiroshima had made the world's navies fortresses of redundant scrap. The tests constituted the destruction of overage or obsolete ex-US Navy combat vessels that had been struck off of the active list, and German and Japanese war-prizes (Eliot 1992; Weisgall 1994; Delgado 1996; Askins 1997; Lenihan 1998). Today the tests are remembered as the first of the atomic era war games that were intended to remind the world of the power of the United States. This caused other nations to strive for nuclear capabilities, and

demonstrate such a capacity in the same manner. The fact that five of the submarines used in this operation were not considered redundant at the time of their use in the tests, serves to illuminate this insight (Delgado 1996: 22, 21).



**Figure 3.8** Photograph of the Baker blast of 25 July 1946 showing many of the battleships and cruisers that were a part of the test (reproduced from Delgado 1996: 75)

### **Economically-Derived Discard Contexts and Mercantile Obsolescence**

When we refer to the dumping of unwanted vessels within the context of mercantile obsolescence and economic redundancy there are two kinds of sites. Firstly there are sites that can be referred to as *isolated abandonment sites*, or watercraft that have been disposed of along inland waterways or coastlines in places that have not accumulated subsequent watercraft. Of this type there are many examples in historical and archaeological literature (Colton 1957: 6-

7; Rusho 1962: 37, 39; Gesner 1991: 1; Simmons 1996: 197, 199; Carrell 1997: 96-97; Cussler and Dirgo 1997: 42; Mackay 1999: 12, 13).

One of the most useful examples of an isolated abandonment site is also amongst the oldest found so far. The Graveney boat (AD 893 – 974) is particularly relevant to this study because it illustrates the way that discard can be read from the archaeological signatures on a site. In this case the evidence for the abandonment of the Graveney boat was derived from the combination of an absence of artefacts, and the beds of branches beneath the boat (which, incidentally, were the main source of datable material). These branches have been interpreted as the material which constituted the “hard” that allowed the vessel to be placed on the muddy foreshore of the river. The fact that this material was discovered *in situ* underneath the vessel was seen to be evidence that the vessel had been placed on the shore deliberately, and had not been wrecked there. In addition to this, rope remains could still be seen tied to the sternpost of the vessel. There was also evidence suggesting that at the time of the abandonment it had been on the shore for repair, as some of the frames and fastenings seem to have been replaced. It also appeared that the vessel was being cut up, as evidenced by axe cuts on the extremities of some planking (Johnstone 1974: 112-114; Fenwick 1972, 1978: 181, 183, 193, 223, 1997: 175-176; Gould 2000: 113-114).

One other noted study of an abandoned vessel is the nineteenth century schooner *Annabella* at Cape Neddick, Maine, USA, which was excavated in May 1995 by a group of archaeologists from the United Kingdom with assistance from Texas A&M University. The site was seen as an abandoned vessel due to its location and position on the beach and was identified as a derelict vessel, beached due to the expenses involved in its repair (Claesson 1996: 16-17). Merriman’s study of a North Carolina Sail Flat also discovered piles in association with structural remains. The piles became a major piece of

diagnostic evidence indicating that the vessel had been purposefully deposited in the bay for use as a breakwater (Merriman 1997: 1, 10).

Some of the most important work done on vessels that have been deliberately abandoned has been carried out on the Royal Navy Ironclad HMS *Vixen*. This vessel was strategically scuttled in order to block the Chubb Cut Channel off Daniel's Head in Bermuda, as a part of defence preparations for shore batteries (Gould 1989: 43, 45, 66-67, 1991: 144, 1997: 459-460, 2000: 281-289). The scuttling of the vessel meant that navigation along an important stretch of coastline was restricted, and enemy vessels would have to move closer to shore if they wanted to approach the Royal Navy Dockyard. In doing so they would come within close range to the shore batteries. Gould's work is important, because the act of abandonment has been seen as an important aspect of that subsequent archaeological site formation. In particular, reference to legislation, in the form of the *Daniel's Head Channel Act, 1887, No.6* has been considered as an aspect of site formation (see Chapter 6). A scuttling sequence was also made, taking into account the removal of guns, engines and deck fittings (Gould 1989: 53, 64, 1991: 145). While this was important to understand the nature of the archaeological remains, it was the structural remains that provided insight into the methods used to remove boilers and engines and explained the cultural elements of the site. Evidence of scuttling charges was also examined (Gould 1989: 69-70; 1991: 146). At the conclusion of the investigation of the vessel, an enlightened interpretation of the remains could be formulated that did not rely upon the natural aspects of the disintegration of the ship.

Irrespective of how such sites are reflected in the literature, the nature of shipping and ship owning makes it obvious that the number of vessels that have been abandoned over time simply because they are of no further use has to be considered immense. The frequency of this behaviour in relation to the use of the sea as a dumping ground is nowhere better illustrated by the

number and scale of watercraft disposal sites littered in and around the shorelines of almost every maritime nation over a considerable amount of time.

The findings from other ships' graveyard sites, have, however been inconsistent, and while there are many such sites of very fascinating historical interest, they have remained largely unexplored archaeologically. For instance, the boat finds from the Musee de la Civilisation in Quebec City known as the Quebec City Bateaux in 1974, and 1984 (dating to around 1751/1752), have only further illustrated the tendency to use vessels in waterside construction (they had been used as temporary dams), and added credence to the perception of abandoned watercraft as sterile husks (La Roche 1987: 108-110; Crisman 1996: 132-133; Delgado 1997i: 332).

This is also the case with another, more modern ships' graveyard, located at the southern end of the Great Cataraqui River in the inner harbour of the city of Kingston, Ontario. This site, containing a large collection of vastly different vessels, from unnamed barges discarded in the 1860s, to the abandonment of the screw steamer *C.D. 110* in 1965 has added to what we understand about similar post-abandonment uses (as breakwaters and pier-extensions), but little else (see Moore 1995a, 1995b). Similarly, while hulk surveys in the United Kingdom, at places such as Whitewall Creek (River Medway), Kidwell (Dyfed), on the River Tamar, and Shropshire Union Canal have become increasingly prominent (often for training initiatives) they appear to have remained largely descriptive, and have not addressed theoretical or behavioural issues (see Watson 1993: 7; Wood 1996: 6-7; Emery 1997: 4; Milne *et al.* 1998). One exception to this appears to be the Maritime Fife Project. While not yet extensively published, initial findings concerning one of the study areas dating to around the First World War have indicated that, "There is some evidence to suggest that craft may have been stockpiled in anticipation of periods of more favourable trading conditions that never



came" (Dobson 1997: 3). Such an assertion illustrates the economically derived reasons for abandonment (see Chapter 6), as well as showing how curate and reuse behaviours can exist concurrently at abandoned watercraft sites (see Chapter 9).

Other investigations of ships' graveyards shed light on the reasons for the placement of ships' graveyards, on both inter and intra-site levels. For instance, there is some historical literature around the world that links environmental damage to the abandonment of watercraft in certain areas. Environmental damage, caused by cultural activities in the landscape, is something that can be attributed to abandonment, and has been discussed in the literature to a small degree. Devendra (1993: 22), for instance discusses one case study in Sri Lanka where watercraft abandonment was brought about by landscape transformation attributable to environmental change. In this case alterations in the landscape were represented by changes along rivers and at river mouths, which had been brought about by deforestation connected with plantations. This resulted in alteration to the water levels of rivers, the erosion of riverbanks and the transformation of streams into mere trickles of water. The result of this was environmental ruin and the destruction of networks used by waterborne transport. The other inevitable effect was the eventual abandonment of large river craft, which could no longer travel the waterways, and their final burying by encroaching silt deposits. On a larger scale, environmental change on the fringe of the Sahara in the late 1980s was a cause for the abandonment of boats, with drought causing Lake Chad to shrink to such an extent that boats could be found resting 32 miles from the new shoreline (Ellis 1987: 164-165).

Factors related to location also played a role in the abandonment of watercraft at Port Stanley in the Falkland Islands. In this case vessels came to be discarded due to the island's strategic geographical position close to Cape Horn and its importance as a location for ship repair (Throckmorton 1976: 35,

1987c: 211; Dean & Miller 1979: 35; Smith 1985: 3; Southby-Tailyour 1985: 9; Dean 1997d: 148-150), whereas a ships' graveyard at Quail Island (Otamahua, New Zealand) was placed on the west side of Lyttelton Harbour, "because of its distance from shipping routes and its isolation from people especially during the period of the leper and animal quarantine stations" (Jackson 1990: 81-85).

While the sites at Port Stanley (Figure 3.9) have been extensively documented (see for instance Lellman 1933; Goold-Adams 1976; Throckmorton 1978, 1987b: 98-100; Low & Throckmorton 1977; Wilson 1983; Cumming & Carter 1990; Bound 1990, 1993; Stammers & Kearon 1991; Stammers & Baker 1994; Dean 1997b, 1997c, 1997e, 1997f; Delgado 1997d, 1997j; Stammers 1997), they are more important to this research as a result of the observations that they make concerning the placement assurance techniques that are seen at Australian sites (Chapter 9). In particular Stammers and Kearon (1992: 109) have suggested in the case of the hulk *Jhelum* that local quarried stone was dumped into the hold of the vessel to stop it floating off. This was also noted by Merriman (1997: 12) in the filling of an abandoned vessel discovered during development at the proposed Cypress Landing Marina Complex site in Chocowity Bay, North Carolina with haphazardly deposited debris and discarded half brick. While there was no extended discussion of why these bricks were in the hull, it was noted that there were neatly paved areas at the stern of the vessel (taken as an indication of cargo). It is likely that these materials were used for the purposes of abandonment



**Figure 3.9** Abandoned hulks at Port Stanley, Falkland Islands including the remains of *Vicar of Bray*, *Margaret*, *William Shand* and *Snow Squall* (left to right) (reproduced from Throckmorton 1987c: 213)

Port Stanley is also significant because it has a long history of vessels being converted into other structures, such as storage hulks and jetties. More importantly, this process of conversion has in some cases been extensively documented and interpreted. Each company trading in the Falklands is quoted as building:

... a jetty running out into the harbour, at the end of which were one or more hulks broadside on, some of which were partly disassembled for their lumber and used as working platforms for more complete hulks which were moored beside them. Tunnels were often cut through the tween deck of the end hulk so that cargo could be carried through to a waiting ship (Lawson 1986: 17).

In the case of some vessels, these jetties encompassed many watercraft which had piles driven through them, and were used for storage purposes almost to the present day (Throckmorton 1976: 39; Smith 1985: 25; Lawson 1986: 18; Dean 1997a: 18). Some other vessels were substantially salvaged, the jetty joining *Actaeon* and *Charles Cooper* being made out of the spars from *Fennia*

(Southby-Tailyour 1985: 10). In other cases the vessels were used for coal bunkering (Throckmorton 1976: 37). In the specific case of *Snow Squall*:

The Company strengthened the jetty in the 20<sup>th</sup> century by driving piles through the *Snow Squall's* hull and crushing her middle section with tons of rock fill. A barge sank on what was left of her stern, and warehouses were built atop the jetty (Bayreuther & Hovrath 1993: 104).

As noted in some of the literature, such amendments to the hull of the vessel often have major implications for the structural integrity, and hence the long term survival of the vessel. This is another important aspect of the cultural aspects of the site formation process. As Bound (1990: 44) has noted on *Jhelum* in particular:

An access way has been cut through the hulk at 'tween deck level. Unfortunately, this, on her port side, has severed the top timbers, waterways, shelves and clamps, or, in other words, those very timbers on which she most depended for her longitudinal strength and integrity.

But what can we read from this behaviour? Those individuals making such modifications would arguably not have been ignorant of shipbuilding and would have understood the ramifications of the modification. Does this imply that the new function of the vessel, as facilitated by this fundamental change to the structure of the hull was more important than the long term survival of the vessel, even as a structure with an alternative use? Was the use of the vessel in this manner expected to be short-lived? Was this reflected in the purchase and quality of methods and materials used in such a modification? Such questions will be asked again in Chapter 9.

One of the most relevant projects that relates closely to this study concerns investigations into a large ships' graveyard at Mallows Bay, Maryland (Shomette 1994; 1995a; 1996: 201-338; Hopkins 1995; Langley 1997 see also

Mattox 1970, and Webb 1975). Reported in this work are a number of observations that have repercussions for how we perceive the logistics of abandonment, and the cultural site formation processes at such sites. This includes observations about the time taken to burn a vessel, and the tendency to fill a vessel with sand, gravel, stone, or dredge spoil to ensure its sinking which resemble the placement assurance activities seen on Australian sites (see Chapter 9) (Shomette 1994: 63, 73, 79, 82, 84, 100; 1996: 234, 237, 254, 283; Hopkins 1995: 75). Additionally, Shomette's discussion of the lucrative (but risky) nature of the scrap metal industry and his description of the relationship between scrap metal prices and wartime economies, the growth of subsistence salvage during economic depression and the fluctuations in metal prices in the mid - late 1930s due to Japanese demand for scrap all mirror Australian experiences (see Chapter 7) (Shomette 1994: 83, 95, 1996: 256, 259, 262-263, 271, 275). Ships in the Mallow's Bay Graveyard are also noted as having piles driven through their hulls to stop them from floating into navigation channels, an activity already mentioned as having relevance in the placement assurance of unwanted watercraft (Shomette 1996: 283).

Nevertheless, these studies have often indicated that unwanted vessels are discarded for reasons that are not simply attributable to the age and condition of a ship. These causes vary from processes associated with general economic and technological change, to more specific, regional developments such as changes to port infrastructure, and the development of alternative modes of transportation (which will be discussed in Chapters 6 and 7). However, the effects of these processes themselves seem to change within different circumstances. For instance, there appears to be some divergence of opinion on the effects of the growth of alternative transportation and the redirection of resources into alternative transport infrastructure and its effects on economic growth (which is directly related to discard trends). For instance, Peterson (1968: 300) cites instances of alternative sources of transport being both the stimulus for growth, and the catalyst for failure in Mississippian trade, and

the well being of river cities. The example cited of the growth of railroads in the Mississippi valley associated with the westward movements of immigrants between 1850 and 1870 is seen as an augmentation to the river trades, due to the railroads not being constructed north-south but rather to the river which was explicitly used to carry people north and south. The later construction of the railroad to such cities as St. Paul is also cited as the “death-knell” of steamboating for this port due to the falling rates of passengers using the steamboats for transportation and freight movement, and the “general indifference to the opening of navigation” (Peterson 1968: 463).

The effects of the development of railroad infrastructure on riverine trade are well established. Hunter, for instance has outlined the devastating effect that this development had, not only through the competition between railroad and riverine transportation, but the effect that it had on creating detrimental competition between steamboat owners. Another limiting factor were the physical characteristics of the rivers. Although the rivers had a huge effect on the design of vessels, they were also the cause of their decline because of the inability to predetermine the route of commerce despite any attempt to construct expensive canal systems (Hunter 1993: 179, 181, 218, 484-488, 504, 585-606).

Other evidence from the United States cites the railroads as a major factor in the death of coastal regions. Paine (2000: 113) describes that around the 1870s the state of Maine put great efforts into the development of its railroads. More particularly, effort was put into the redirection of the coastal north-south axis of the state’s railroad infrastructure to an inward west-east axis aimed mainly at harnessing the interior. Instead of enhancing the state, through the better transportation of goods to and from the sea, and hence boosting maritime trades, it facilitated the movement of the population west. Maine in many ways became a place one went through on the way to somewhere else, and commerce followed.

## Conclusions

As illustrated in this chapter, there are many contexts within which watercraft are discarded. What connect these themes are the deliberate acts that bring about their transformation from a systemic to an archaeological context. Additionally, the site formation processes, and the archaeological signatures left behind after these wanton acts of destruction can be seen as important clues in the extraction of intention from the archaeological record. This in turn allows for some light to be shed on the psychological framework that defines abandonment behaviour and illustrates the technological, political, economic and social aspects of discard activities (see Chapters 6 and 7).

Additionally, many of the cultural site formation processes discussed in this chapter have strong links with the findings of this thesis, and are expanded upon further in Chapters 8 and 9. The identification of discard and reuse mechanisms in the material record, and the archaeological signatures that accompany them have the potential to illuminate many aspects of the past that have not hitherto been explored. While the particularist approaches within the case studies that have been discussed are important because they have described the behaviours and the signatures that may be found on similar sites, such as ones in Australia, they are limited on account of their lack of comparison.

The rest of this research suggests that such an outcome can only result from the integration of questions regarding vessel fate, and a concentration on taphonomic processes. Additionally, it is argued that this is more meaningfully done in a non-particularist, non-artefact focussed and broadly comparative framework that allows for the assessment of the reuse, salvage and post-abandonment processes that are represented in many of the case studies outlined above.

## CHAPTER 4

### Australian Perspectives on Watercraft Abandonment

*Here, I believe, is a valuable lesson. Amateur maritime archaeological groups throughout Australia, New Zealand and South-East Asia are in an excellent position to document, record and research such ships graveyards as Jervoise Bay and Careening Bay. There are such areas in Tasmania, South Australia, New Zealand and to my knowledge in most other Australian States. Once all sites within each area are found, documented, recorded and if possible identified, then work can and should begin on specific sites.*

*Ships graveyards often become excellent areas for development by virtue of their location and characteristics (e.g. shelving beaches to enable salvage, former isolation, calm water etc.). The hulks within it should be documented, recorded etc., now and not when under threat (McCarthy 1983c: 291).*



## CHAPTER 4

### AUSTRALIAN PERSPECTIVES ON WATERCRAFT ABANDONMENT

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#### Introduction

When McCarthy wrote the paragraphs on the proceeding page in 1983 for the second *Southern Hemisphere Conference on Maritime Archaeology* (held in Adelaide in March 1982) he may not have realised their importance to work that would be undertaken almost two decades later. Although some work had been occurring regarding watercraft abandonment sites in Australia before this time, it was McCarthy's work with the Western Australian Maritime Museum (WAMM), in the late 1970s and 1980s that marked the beginning of watercraft abandonment studies in Australia.<sup>1</sup> It was also the commencement of a transition towards the serious archaeological investigation of abandoned watercraft, and paved the way for changes in the way these sites were perceived (see McCarthy 1979b: 1, 1983b: 369-370). Additionally, the ideas that McCarthy outlined in these two short paragraphs are pivotal to this research. The ideas of a creation of a national database of sites, the analysis of characteristics of sites, and the recording of remains well before their imminent destruction were all central justifications for this study from its outset (see Chapter 2).

Around this time abandoned watercraft, like many other categories of maritime heritage, were considered to be of little importance, due to predominant views concerning archaeological significance, and the accepted image of a shipwreck. These views concentrated on a number of aspects; the

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<sup>1</sup> In 1978 Sledge (1978: 26) had made passing reference to a small ships' graveyard in the Alligator River that contained, "The remains of ... luggers and a schooner, probably the *John and Elizabeth*".

age of a vessel, its association with famous individuals or events, and were pre-occupied with the condition or environmental setting of sites (see Dumas 1972: 32; Green 1977; Muckelroy 1978: 60; McGrail 1989: 12; Baker 1998: 17-18). However, the 1980s saw a challenge to this position, which argued that more modern watercraft, representing unspectacular aspects of the past, irrespective of their degree of intactness or environmental conditions had archaeological potential. To a large degree this mirrored changes in terrestrial archaeology, which earlier had begun to reject the notions that “we must dig for our data, and that archaeological data must be old” (Rathje 1981: 51).

In particular this change was justified through the work on intertidal and exposed vessel remains (Delgado 1984, 1985, 1986; Bright 1993; Fontenoy 1998: 47; McCarthy 1996: 217), as well as the arguments against “celebrity ships” and “the shrine complex” (Gould 1983a: 3-4, 2001: 11), which were later supported in subsequent work (see Gould 1989, 1991; Souza 1998). While these works have undoubtedly had an enormous impact on the way that abandoned watercraft have come to be perceived (which are generally non-famous vessels in intertidal contexts), the arguments for the significance of iron and steam shipwrecks have the most direct relevance. In Australia this stems from the landmark publication *Iron Ships and Steam Shipwrecks: Papers from the First Australian Seminar on the Management of Iron Vessels and Steam Shipwrecks* (McCarthy 1988a). In this, a number of arguments were developed which saw the “grudging support” for the worth of this resource mentioned by Henderson (1988: 11) slowly give way to a much more inclusive view of significance.

In particular, the view espoused by McCarthy (1996: 21-23) that the significance of iron and steam vessels has multiple layers related to their historical, technical and anthropological potential is a premise at the core of this research. The analogy between the significance of the iron and steam shipwreck resource and the abandoned vessel resource is further

strengthened by a number of links. Firstly, four out of the five vessels that had recommendations made for them at the 1988 conference were also abandoned vessels. Secondly, the arguments that have brought about a high number of iron and steam vessels to be included in Brouwer's *International Register of Historic Ships* (1993) can likewise be applied for abandoned vessels (McCarthy 1988a: 7, 1996: 21-22).

The abandoned watercraft resource still suffers from a perception of a lack of significance, and abandoned vessels are generally viewed more for their educational potential. In particular there is a tendency to view these sites as "safe" for volunteers to work on without causing damage to the archaeological record (see for instance May 1988a: 19). This arguably is still related to the perception of being of low significance. In part this is because of the particularistic manner in which studies here and abroad (see Chapter 3) have approached the subject of discard behaviour.

This chapter is an acknowledgement of the work undertaken on abandoned watercraft in Australia before this study, and also the work that has directly influenced this thesis. This chapter is outlined on a state-by-state basis, with examples arranged chronologically, in order to chart the development of Australian investigation into abandoned watercraft. From another perspective it is a communication of the particularist approaches, which, with few exceptions have dominated the way that the resource has been investigated in Australia. This serves to illustrate the results of these studies, and show how they stand in stark contrast to the way that these same watercraft have been integrated into the current research to produce very different results (as seen in the following chapters).

## **An Overview of Historical and Archaeological Investigations in Australia**

### *Western Australian Case Studies*

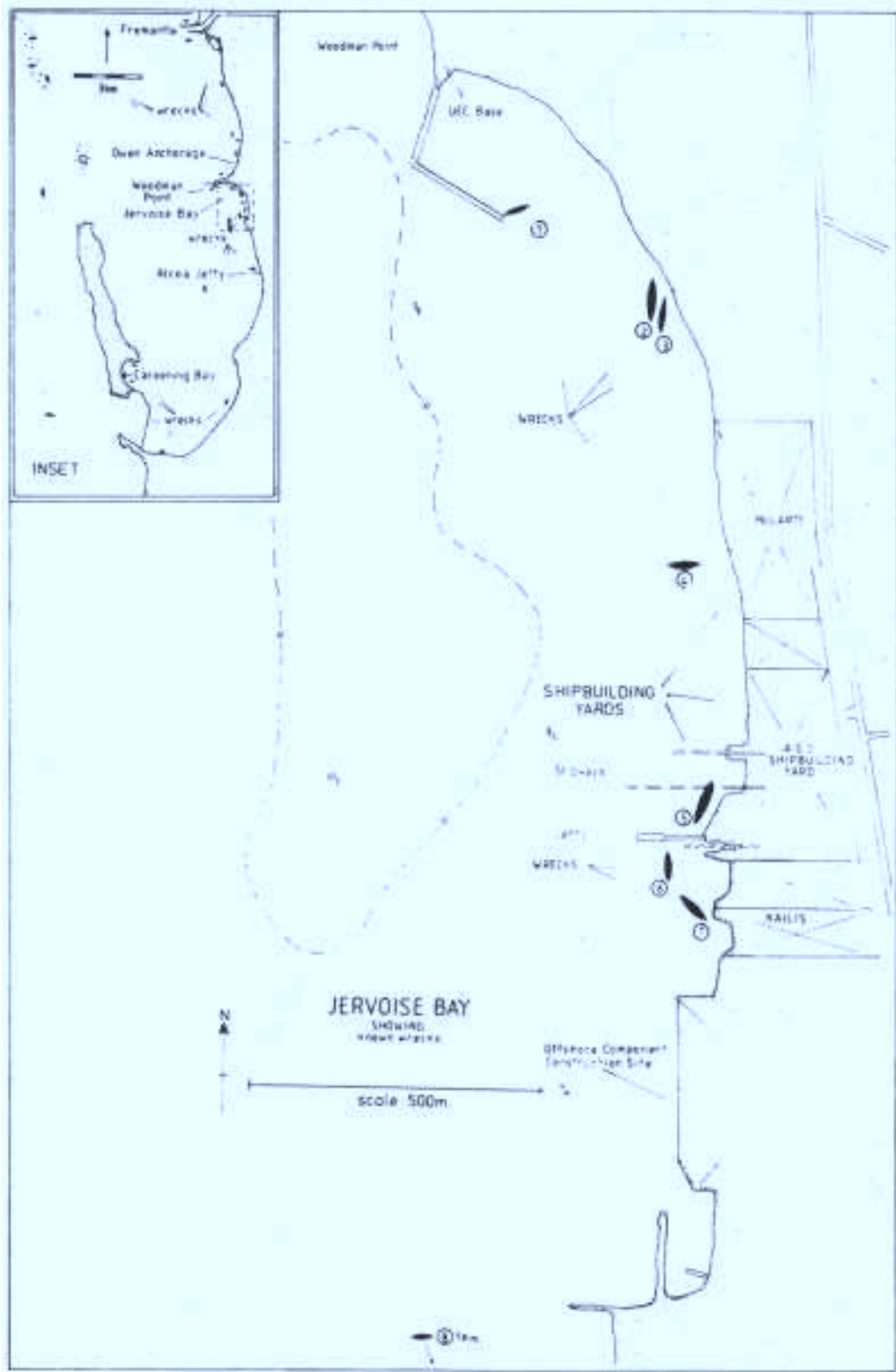
When commencing an overview of the history of watercraft abandonment studies in Australia the logical starting point is Western Australia. This is because the archaeological investigation of deliberately abandoned vessels and ships' graveyards, as already mentioned, largely emerged out of the work of the WAMM, and particularly the writings of Michael McCarthy in the late 1970s.

The first study of an abandoned vessel by archaeologists in Australia was during the Careening Bay Project. This project was commenced by the Western Australian Museum in 1976 when the partially buried hull of *Day Dawn* was discovered adjacent to the HMAS Stirling Naval Base on Garden Island (other hull remains had been found and destroyed in 1973) (McCarthy 1983c: 283, 285). The vessel, an ex whaler built in Fairhaven, Massachusetts in 1851 was used as a hulk in Careening Bay, Garden Island and was eventually abandoned in the same bay sometime between 1887 and 1900 (Warne 1986b: 63). Its remains were disturbed and damaged by harbour dredging in 1976 and moved to deeper water in 1979. The Maritime Archaeological Association of Western Australia (MAAWA) subsequently excavated it in 1980 (Sledge 1979: 245; Kimpton & Henderson 1991: 25; and see McCarthy 1980a). The vessel was again moved because of plans in 1988 for the Australian Navy's future development of the small boats harbour at HMAS Stirling, and was picked up complete for transportation to a new site before being covered up with tyres and silt to enable organic consolidation (Kimpton & Henderson 1991: 25). The remains of *Day Dawn* would also be the subject of a range of reports emerging from the 1995 Post Graduate Diploma in Maritime Archaeology at Curtin University, WA covering the construction,

history, biodegradation, relocation, and management of the vessel (Erskine 1997a, 1997b; Moran 1997; Thomson 1997; Williams 1997).

The WAMM, MAAWA and McCarthy were also the first to take a serious look at Australian ships' graveyards. A small ships' graveyard located ten kilometres south of Fremantle at Jervoise Bay (Map 4.1) was initially examined due to threats of the site's destruction from an expansion of the shipbuilding industry in the area (McCarthy 1983b: 285). This area was used as an official dumping area between 1890 and 1910 with eight known abandoned vessels, and two shipwrecks located in the area (McCarthy 1979a, 1979b: 1-2, 1980b: 30, 1983b: 285, 337, 339; Jeffery 1981: 54, 56; Loney 1991: 150; Garratt & Souter 1997). The detailed work undertaken at the ships' graveyard at Jervoise Bay can be seen as the first of its type in Australia.

This work is particularly important because it was the first to acknowledge the potential and significance of ships' graveyards and abandoned vessels. Additionally, it was pioneering because of its willingness to examine the site as a collection that was the product of a set of nationally and locally prescribed variables, such as legislative requirements in dumping (expanded upon in Chapter 6). Later work at Jervoise Bay would also establish the scientific potential of these sites (see Cushnahan & Staniforth 1982: 62). McCarthy also communicated that the Jervoise Bay Ships' Graveyard was not the only site of its kind, with other sites at Careening Bay and north of Fremantle (McCarthy 1979b: 2). Both the Careening Bay and Jervoise Bay sites were identified as focal locations for the disposal of watercraft and were operating in this function around the same time (Bathgate 1979: 39; McCarthy 1979b: 2, 1983b: 335).



**Map 4.1** Plan of the Jervoise Bay ship dumping area showing the location of the remains of vessels; 1) submarine KVIII, 2) *Alacrity* (shipwreck), 3) *Abemama* (shipwreck), 4) ?*Ellen*, 5) *Egmont*, 6) *Gemma*, 7) *Redemptora*, and 8) *Camilla* (reproduced from McCarthy 1983b: 338).

A number of other deliberately abandoned watercraft has been investigated in WA. These investigations, to a degree, were undertaken as cooperative projects between a heritage management agency (WAMM) and an avocational maritime archaeology association (MAAWA). Between 1975 and 1982 MAAWA played a major role in work undertaken on the vessels *Dato*, *Day Dawn*, *Redemptora*, and *Cheyne 3*, as well as abandoned vessels on the Swan and Canning Rivers, and unidentified wreckage at the Marmion Angling Club (suspected as being the lighter *Lalla*) (Scrimshaw 1978, 1986; Warne 1983: 104-105, 1986a, 1986b).

In particular, the work on the *Cheyne 3* whale-chaser in April 1982 (eventually scuttled off Michaelmas Island in King George Sound on 23 June 1982) is worth mentioning because of the observations made concerning many of the logistical issues of salvage and sinking (Buhagiar & Stevens 1986; Warne 1986c). In 1988 Scott Sledge (1988: 61) also used this vessel as an example of the value of the iron and steamship wrecks. The tourism potential arising from the opportunity to scuttle the vessel as an artificial dive site for scuba divers was also communicated, alongside the research potential that the site provided by giving some insight into the corrosion and deterioration of ferrous-hulled vessels. Another case study concerns a vessel known as the North Mole Wreck, a steel hulled barge identified as *Gareenup* (Robinson 1986: 69). While research would later prove that the vessel was not *Gareenup* (this vessel being timber-hulled) observations were made that the vessel may have been on its way to the deep-water graveyard off of Rottnest Island, but due to "short cuts" may not have made it (further expanded in Chapter 6).

Recent investigations into ship abandonment in Western Australia have concentrated on the largest watercraft dumping sites in that state. The Rottnest Island dumping area, located about sixteen nautical miles west of Rottnest Island (12 miles off the coast adjacent to Fremantle) is the major ship

dumping area in Western Australia (Loney 1991: 147; Tull 1997: 39).<sup>2</sup> Forty-seven identified vessels of a diverse array of types and functions are known to be in the graveyard, and have been identified in a preliminary gazette of the site (see Garratt 1999). Many other vessels and materials are suspected of being in the area. After 1910, with few exceptions all unwanted vessels were dumped in this deep-water graveyard (McCarthy 1983b: 335). Rottnest represents the changing attitudes to submerged vessel remains. *Miwok 2*, sunk in 1983, for instance was considered a “recreational asset” upon sinking, due to its potential as a dive site and Fish Aggregation Device (FAD). Indeed, archaeologists at the WAMM today play a major role in the decision making process concerning the scuttling of ships for tourism and fish aggregation purposes. In particular, the Museum was consulted in relation to the scuttling of two redundant barges as recreational dive sites in 1993.

#### *New South Wales Case Studies*

John Riley’s 1988 work *Known Shipwreck Sites in New South Wales* is the closest that New South Wales has come to an overall attempt at documenting the abandoned vessel resource. Although principally concerned with vessels catastrophically lost, this work does mention many abandoned vessels (Riley 1988: 9, 21, 29, 31, 75).

While most shipwreck publications in NSW, generally do not make mention of deliberately abandoned vessels, there are a large number of government and consultancy works concerning abandoned vessels in the state. The *Shipwreck Atlas of New South Wales*, for instance, makes no explicit distinction between wrecked and abandoned vessels. However, it does include historical information and illustrations of the Homebush Bay, Long Reef, North Sydney, and Sydney Heads abandoned watercraft areas.

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<sup>2</sup> Rottnest Island itself is also a well-known “ship trap” and the ships’ graveyard area should not be confused with the shipwrecks that make up the maritime heritage trail around it.



The most comprehensive listing of the vessels that are confirmed or have potentially been deposited off Sydney Heads has been compiled by Cosmos Coroneos (1998c) as a part of a maritime archaeological assessment of fibre optic cable landing sites. While this report does not exclusively mention shipwrecks, it lists all potential vessel remains in the area, and is dominated by the ship abandonment area.

Some work had previously been done on deliberate abandonment in New South Wales. The Underwater Archaeological Research Group (UARG) had commenced the investigation of, “above water wrecks and derelicts” by 1982 (Lorimer 1982: 84), and by 1988 Lorimer (1988b: 39) wrote:

The Underwater Archaeological Research Group (UARG) has taken measures to provide reliable and accurate information on the extent and nature of maritime archaeological sites in NSW. A number of projects are currently underway, including the locating and recording of ships’ graveyards; [and] individual derelict or abandoned vessels in the rivers and Harbours of the state.

The fact that a photo and site plan of the paddle steamer *Manning* is included in the *Principles and Guidelines Manual on Underwater Heritage* (New South Wales Heritage Office 1994: 9) put out by Heritage New South Wales may be seen as an indication of their openness to the use of this resource. Indeed, a range of regional reports (which will be discussed individually below) including abandoned vessel remains illustrates a more inclusive approach in NSW in regard to the treatment and investigation of vessel remains.

Two reports by Mike Richards (1996, 1997b), *Shipwreck Heritage of the Clarence River* and *Shipwreck Heritage of the Richmond River* include many references to abandoned vessels. This was a deliberate inclusion due to the proliferation of such sites in the area. Indeed, Richards notes that abandoned hulks still visible on the banks of the rivers are the predominant type of vessel remains along their banks (Richards, M. 1996: 23, 1997b: 35). Of particular interest are

the observations that there are numerous examples of barges along the Clarence River being used after abandonment to stabilise banks from erosion (see Chapter 9), and that smaller isolated towns in northern New South Wales had “rotten rows” (Richards, M. 1996: 53, 1997b: 36, 60).

A later survey of the maritime heritage of the Richmond River was also undertaken in 1996 that included some mention of vessels remains in the region (Curby 1997; Coroneos 1997a). While the survey was commissioned in order to assess surviving maritime structures (mainly wharf and dry dock remnants), one aspect of this was the assessment of abandoned vessel remains.

In 1999 the NSW Heritage Office carried out a maritime archaeological survey of the Myall Lakes and Tea Gardens region. Its main aim was to, “document the known abandoned wreck sites in the vicinity of Tea Gardens, and to document and search for wreck sites and submerged jetty/slipway sites in the upper Myall Lakes” (Nutley & Smith 1999: 4, 10). During this survey a number of abandoned vessels were documented; including two ships’ graveyard sites at Witt’s/Slip Island and in Pindimar Bay. This survey built on previous work undertaken in the area by Coroneos (1998a) in the *Myall Lakes Shipwreck Study*. Its focus was upon the extent and significance of located shipwreck and hulk sites in the Myall Lakes, on the NSW central coast, in the vicinity of Tea Gardens and Hawks Nest. Later research by Engel *et al.* (2000, 2001) makes reference to the abandonment of vessels in this area. This work was not archaeological in nature and differs substantially to the conclusions reached by the previous work of Coroneos and Nutley and Smith. In particular there is some difference of opinion regarding a lone boiler at Winda Whoppa, and whether it belongs to the vessel *Paterson* (as in Coroneos 1998: 47 and Nutley and Smith 1999: 14) or to *Breeza* (as in Engel *et al.* 2000). Nutley and Smith (1999: 14) acknowledge that archival material pertaining to both of these vessels is lacking, and their identification of the boiler as

belonging to *Paterson* is provisional. Nevertheless it is useful because it outlines the abandonment resource in a significant portion of the Myall River (see Map 4.2).



**Map 4.2** A map of the location of “wrecks” in the Tea Gardens and Hawks Nest Region of New South Wales (reproduced from Engel *et. al* 2000: 202)

The Pindimar Bay graveyard (known as “The Duckhole”) was also the subject of investigations in the Myall Lakes region, by a number of authors. None totally agree on the number or names of the abandoned watercraft. Callen (1978), for instance suggests the vessels *Brighton*, *Sydney* (ex *Mahinapua*), *Governor Musgrave*, *Kurrara* (ex *East Star*), and the *Duroby* are located at the site. While the naming of *Governor Musgrave* is wrong because the vessel is noted as having been dumped off of Sydney at an unknown time (Parsons & Plunkett 1995: 20; Parsons 1978: 18, 32-35; Customs House Register Fremantle: 05/1916), other authors have confirmed the rest. A personal communication cited in Coroneos (1998a: 62) notes that the Duckhole contains the remains of the vessel *Brighton*, *Dobroyd* and six to eight World War Two barges. While

no reference to a vessel *Dobroyd* could be found, it is probably the same vessel as the *Duroby*. Nutley and Smith (1999: 15) note the existence of four other vessels at Pindimar Bay: *East Star*, *Deroby* (apparently Callen's *Duroby* and Coroneos' *Dobroyd*), *Sydney* and *Bingara*.

In 1993 Rebecca Bower carried out an investigation into three hulks that lie in Homebush Bay. While these vessels were examined because they were in the vicinity of an area being redeveloped for a Bicentennial Park, they were part of a larger graveyard including a number of other vessels. The area, similar to other ships' graveyards in Australia (such as the Jervis Basin Ships' Graveyard, Port Adelaide) was once a ship breaking yard (the Maritime Services Board (MSB) Yard), and some of the vessels still lie in the vicinity of ship breaking equipment (Bower 1993: ii, 1, 7). The NSW Heritage Office (2001: 2) has confirmed the existence of at least four named and identified vessels, and in another publication (NSW Heritage Office 1996: B39) shows their location (see Map 4.3). Later this site was investigated in association with a remediation project on the Rhodes Peninsula in which an assessment of potential maritime sites was carried out (see Coroneos *et al.* 2001).



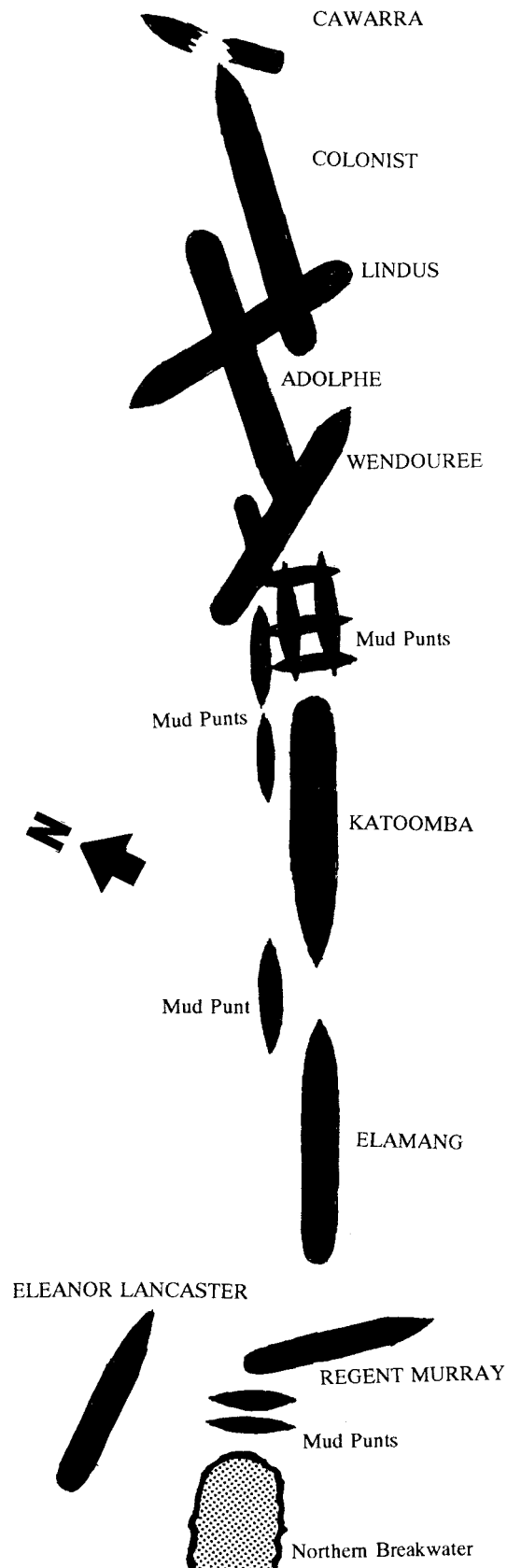
**Map 4.3** Plan of Homebush Bay showing location of identified and unidentified watercraft remains (reproduced from Nutley 1996: B39)

The Marine Archaeological Society of Newcastle (MAS) published a study on one abandoned vessel in 1984 (Waters *et al.* 1984; Riley 1988b: 141-142). The paddle steam tug *Commodore* (MAS Site No. 101) was investigated by this group and in 1983 became part of a cooperative effort between the MAS and the UARG. The study was carried out primarily to produce a descriptive report on the site, that focused on its two side lever “Grasshopper type” engines, which are not common in Australian sites. This study is significant because in identifying *Commodore*, it dispelled the notion that it was the wreck of *Southland*, and gave amongst their reasons for the identification (such as direct historical evidence and other identifying features) that:

- The site has the appearance of a scuttled vessel i.e. no brasswork, anchors, winches, personal artefacts, quarter fittings or coal fuel. Also the boiler inspection plate is missing and all steam pipes removed.
- The site is an area (approximately 3.5 mile radius) where other scuttled vessels are to be found.

Such observations illustrate the degree to which the spatial location and archaeological signatures of salvage and disposal are integral to the understanding of discarded watercraft (see Chapters 6 and 8).

In the same area, the vessels at the Oyster Bank, Newcastle (Map 4.4) have been a major focus of local maritime historical interest. Besides a host of newspaper articles and papers dedicated to the shipwrecks in the area, at least one thesis has been written on the site (Winspear 1978). Of more interest to this thesis is the archaeological work carried out on Stockton Breakwater (part of the Oyster Bank). The MAS carried out a number of inspections of the vessels that constitute the Stockton Breakwater from 1985, but concentrated mainly on the remains of the shipwreck *Adolphe* (1903) (Taylor 1985: 1-3; Randell 1985; Willcock 1986).

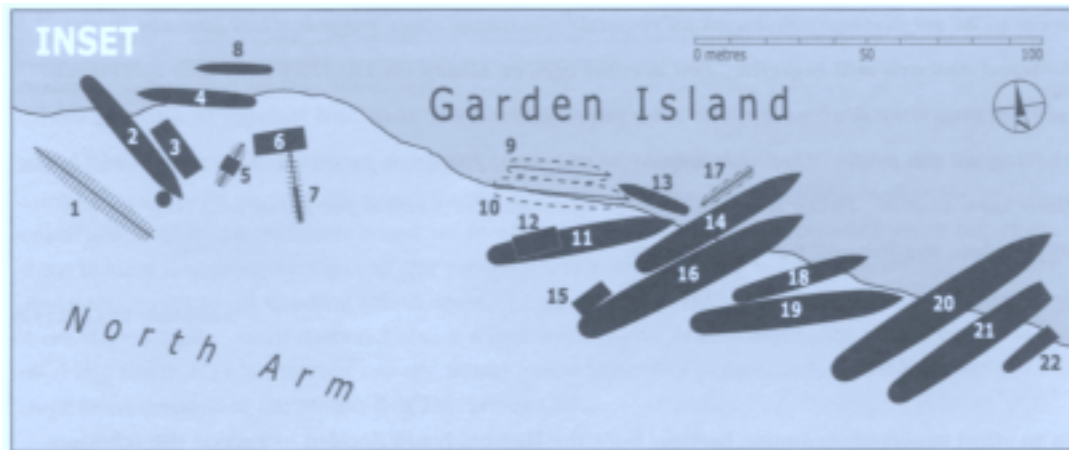


**Map 4.4** Wrecks and scuttled vessels in the path of the Stockton Breakwater 1905 (reproduced from Callen 1994: 67)

Some references to investigations of the vessel *Ajax* in the Hunter River also date from around this time (see Gomboso 1986). Later work by the MAS included a cooperative project with the Newcastle branch of the Shiplovers' Society and the Newcastle Maritime Museum Society (Newcastle Region Maritime Museum) in the renaming of the southern and northern breakwaters at the mouth of the Hunter River (Newcastle) to "Macquarie Pier", and the "Shipwreck Walk" (respectively) (MAS *et al.* 1991). This work also involved the archaeological inspection of the many of the sites in and around the northern breakwater between April 1991 and January 1994 (Callen 1994: 69). While the survey concentrated on a number of the wrecked vessels, it also included some survey of two unnamed hopper barges and an unnamed dredge (Humphreys 1991: 110).

#### *South Australian Case Studies*

The Garden Island Ships' Graveyard is South Australia's most documented, investigated and material rich watercraft abandonment areas (See Map 4.5). Newspaper articles referring to the area as the ships' graveyard are noted from the 1930s (*Adelaide Chronicle* 20 July 1933: 37) and the first comprehensive representation of the extent of the accumulation dates from the late 1970s, with Captain Neil Cormack's 1978 Marine Board Map (Cormack 1978c).



**Map 4.5** The Garden Island Ships' Graveyard showing the main accumulation of watercraft. Sites are: *Seminole* (1), *Sunbeam* (2), unidentified wooden barge (3), unidentified hopper barge/dredge (4), *Killarney* (5), unidentified iron pontoons (6, 12, 15), *Lady Daly* (7), *Enterprise* (8), *Sarnia* (9), *Gem* (10), *Moe* (11), *Stanley* (13), *Grace Darling* (14), *Flinders* (16), *Thomas and Annie* (17), *Juno* (18), *Mangana* (19), *Garthneill* (20), *Glaucus* (21) and unidentified iron dredge. *Dorothy H. Sterling* and *Santiago* located further east (reproduced from Hartell & Richards 2001: 7).

The first investigations at this site came in the study of one of the vessels in this ships' graveyard, the iron barque *Santiago* (Figure 4.1). This vessel is the most prominent abandoned ship, and the only protected abandoned watercraft site in SA (see Department of Environment and Planning 1983: 7; Jeffery 1979: 24, 1983: 84-85; Marfleet 1988: 55). *Santiago* has attracted attention for many years due to its unique technical details and status as an early iron sailing ship (built in 1856), and is reputed to be the earliest example of a restorable iron sailing ship. The vessel has also received attention by ship preservationists, and been the subject of testing for sacrificial anode cathodic protection, rust conversion and epoxy coating systems (Cormack 1979: 27; Andrews 1988: 110; Kentish 1995).





**Figure 4.1** Remains of *Santiago* in the Garden Island Ships' Graveyard, Port Adelaide, South Australia (Photo: Nathan Richards, 3 July 1997)

In the late 1980s and early 1990s the Society for Underwater Historical Research (SUHR) published other work on vessels at Garden Island that focussed on the identification of individual watercraft, and an examination of their methods of construction (Brown 1989a, 1989b, 1989c, 1990a, 1990b; Samuels 1989; Christopher 1990).

In 1996 Mark Staniforth of the Department of Archaeology at Flinders University began using the vessels at the Garden Island Ships' Graveyard as a component of undergraduate training in a range of archaeology subjects. Over the ensuing years, a number of vessel inspection reports on a large number of the sites were produced (such as Adamson 1996; Foster 1996; Attenborough & Roberts 1997; Baker 1997; Dalgairns & Peterson 1997; Darkin 1997; Ford, 1997; Briggs 1999; Jones 1999; Lewczak 1999; Matic 1999; Nash 1999; and Stevenson 1999). From 1997 Garden Island was also the subject of a range of honours and postgraduate student dissertations (see Richards 1997 and Matthews 1998) as well as being the genesis for this current investigation.

In particular the work of Richards (1997, 1998, 1999b) investigated the archaeological and comparative nature of the site, concentrating on a range of site formation issues. A number of published articles have also been produced from Flinders University (see Richards 1998, 1999a, 1999b, 2001). Additionally, booklets and reports have been produced associated with tours done by the South Australian Maritime Museum (South Australian Maritime Museum n.d.), and subsequently a maritime heritage trail was set up by Heritage South Australia (see Hartell & Richards 2001; Hartell 2002). However, the majority of this later work has been mainly of an historical and public education orientation and has little archaeological relevance. This is due to a concentration on the individual site histories of abandoned vessels with interesting stories (see Hartell & Richards 2001; Richards 1999a; 2001).

From 1997, work by Richards expanded and became associated with other discard sites at the Jervois Basin, and Mutton Cove (see Langeluddecke 1998: 12; Hartell & Richards 2001: 3; Hartell 2002), and subsequently the author discovered a range of other abandonment areas around Port Adelaide, at Broad Creek, and Angas and Barker Inlets. Some of the vessels located at these places were also included as case studies in a 1999 thesis by Rebecca O'Reilly (1999).

#### *Queensland Case Studies*

McLeod's *History Along The Waterways: the Abandoned Hulks of the Brisbane River and Moreton Bay* (1974) was the best source dedicated to the abandoned vessel resource in the state of Queensland. There has, however been some small amount of work done in Queensland on deliberately abandoned vessels. May (1988a: 19), for instance describes Maritime Archaeological Association of Queensland (MAAQ) work carried out in March 1983 by Nicholas Clark on the vessels *Bandicoot*, and *Gayundah* (see Figure 4.2).



**Figure 4.2** Remains of *Gayundah* at Woody Point, Redcliffe, Queensland (Photo: Nathan Richards: 6 June 2001)

*Gayundah* has been written about extensively over the years (see for instance Wilson 1996), mainly due to its connection with the colonial navy of Queensland as a gunboat, and flagship of the Queensland Marine Defence Force, and one of the first vessels in the Royal Australian Navy (Wilson 1996: 25).

May (1988b: 26) acknowledges that there is a wealth of abandoned vessel remains in Queensland (and particularly the Brisbane and Moreton Bay areas) and that many of them had been researched and identified. However, although most of these vessels were reported on (and published) over a decade ago, they do not currently have a place within Queensland's shipwreck database, and are therefore not likely to get much attention or protection.

The Curtin artificial reef (Map 4.6), “Tangalooma Wrecks” (Map 4.7), “Bulwer Wrecks” and the abandoned vessel *Cementco/Crusader 2* are all sites that are noted in the diving literature as major diving locations within Moreton Bay (according to a pamphlet entitled *Dive World Class Sub-Tropical Sites with South Bank Dive Aboard the Ugly Duck*), and the Tangalooma, Bulwer and Koorinal sites have been the subject of maritime heritage trail pamphlet produced by the Maritime Archaeological Association of Queensland (Maritime Archaeological Association of Queensland *et al.* 1997).

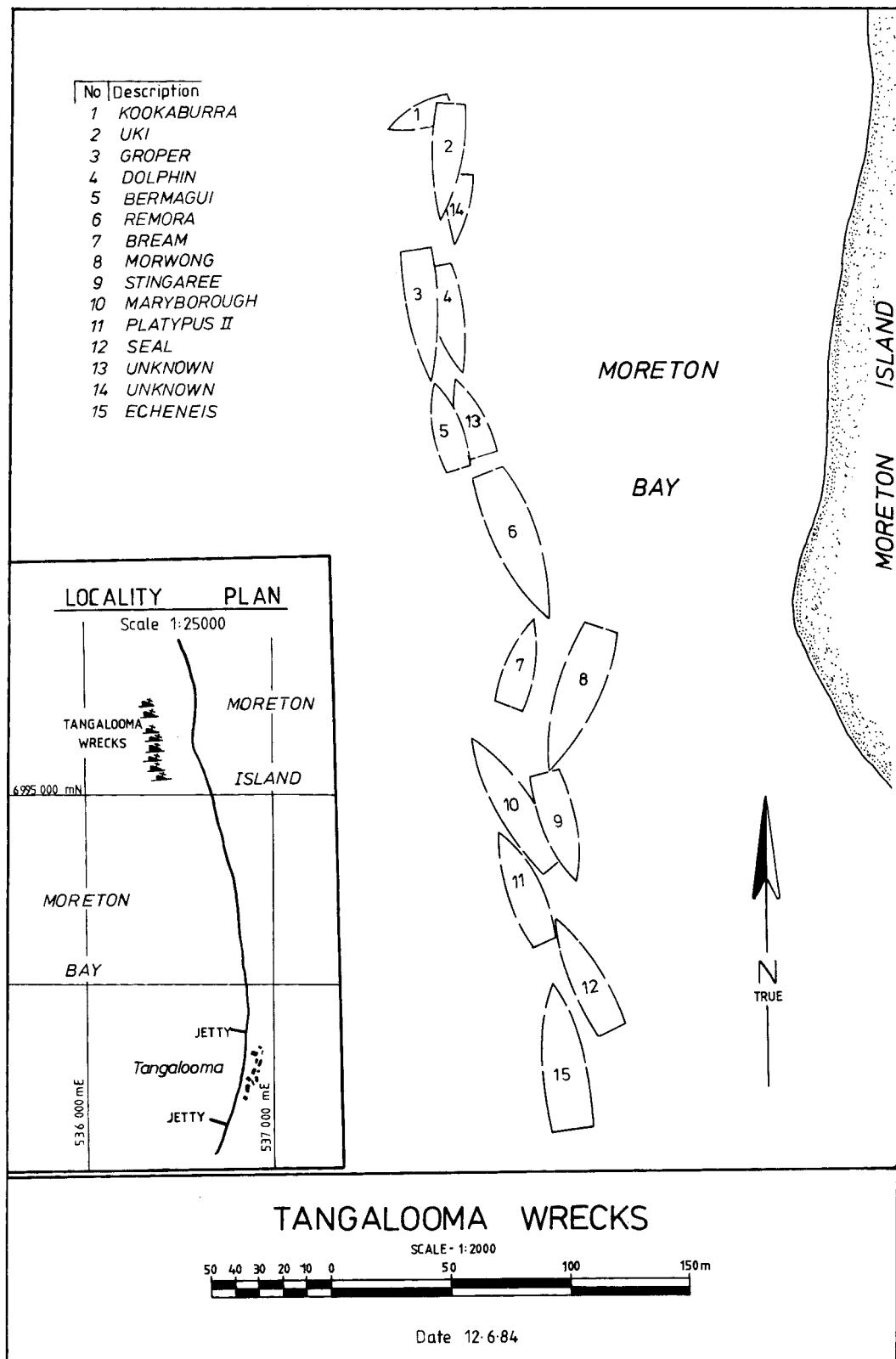
By and large the MAAQ undertook the only significant and accessible archaeological work on abandoned watercraft in the Brisbane region. This work has been focussed on some of the sites that once made up the Bishop Island Ships’ Graveyard (Map 4.8), and will be discussed below.

The maritime archaeology section of the Queensland Museum (which is now a part of the Museum of Tropical Queensland and located in Townsville) held much of the MAAQ’s work at the time of the first visit to Brisbane for research. Amongst the records held in these files are photographs taken by Warren Delaney (MAAQ) of what is suspected to have been *Lucinda*, *Queenslander*, and *Maida*, taken in June 1987, and February 1989. *Lucinda*, because of her perceived elegance, and important role in the road to Australian Federation has on many occasions been suggested for recovery and restoration (*Courier Mail* 4 July 1986: 1, 30).<sup>3</sup>

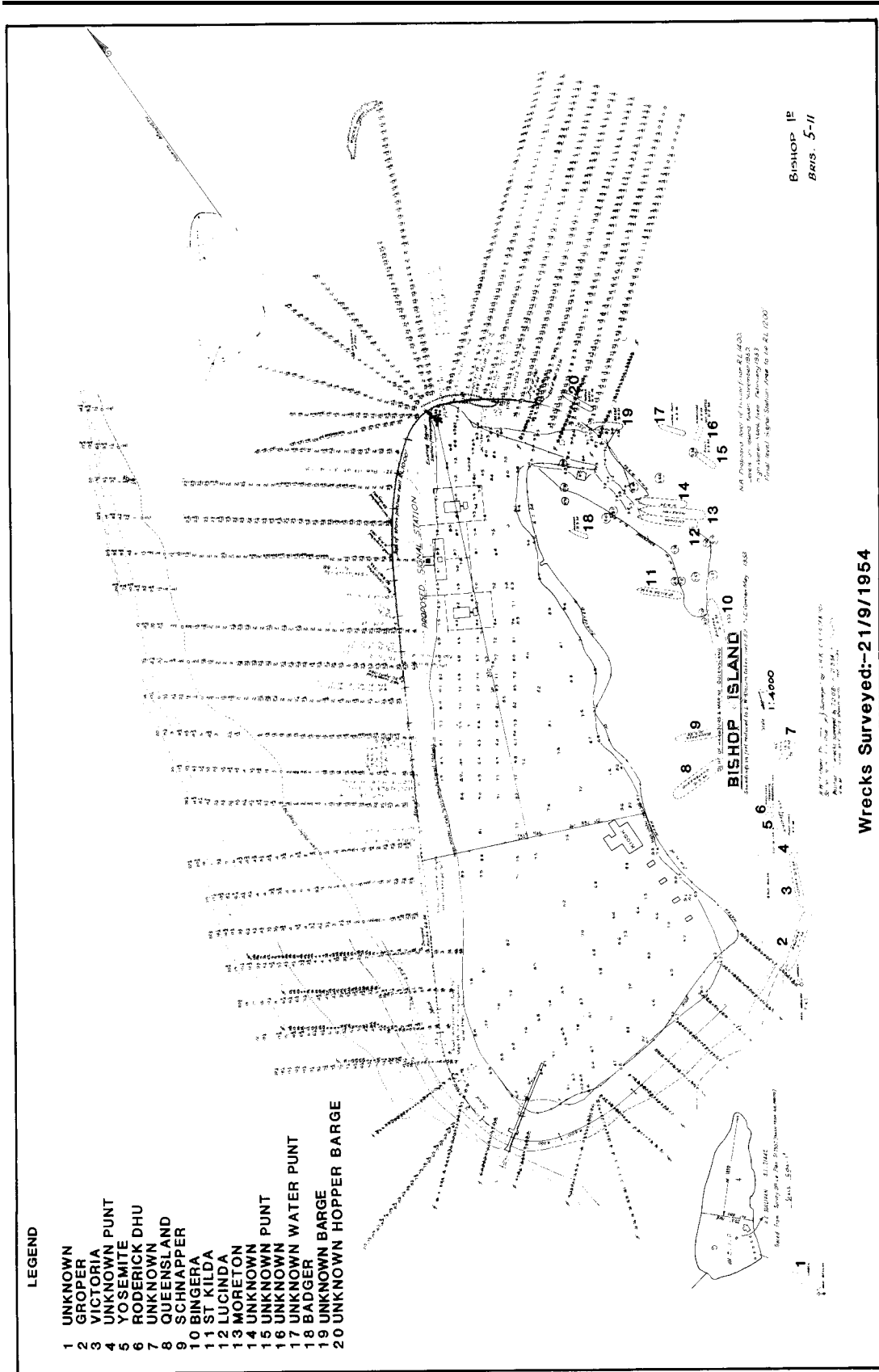
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<sup>3</sup> The final draft of the Australian Constitution was completed aboard *Lucinda* in 1891 (Miles 2001: 3). In 2001 a booklet on the vessel was produced by the Australian National Maritime Museum to commemorate this event (Miles 2001).





Map 4.7 Plan of the Tangalooma ships' graveyard (reproduced from Davenport 1986: 705 see also MAAQ *et al.* 1997)



Map 4.8 Plan of Bishop Island Ships' Graveyard (reproduced from Davenport 1986: 517, see also WBM Oceanics 2000 Figure 10.7.1)

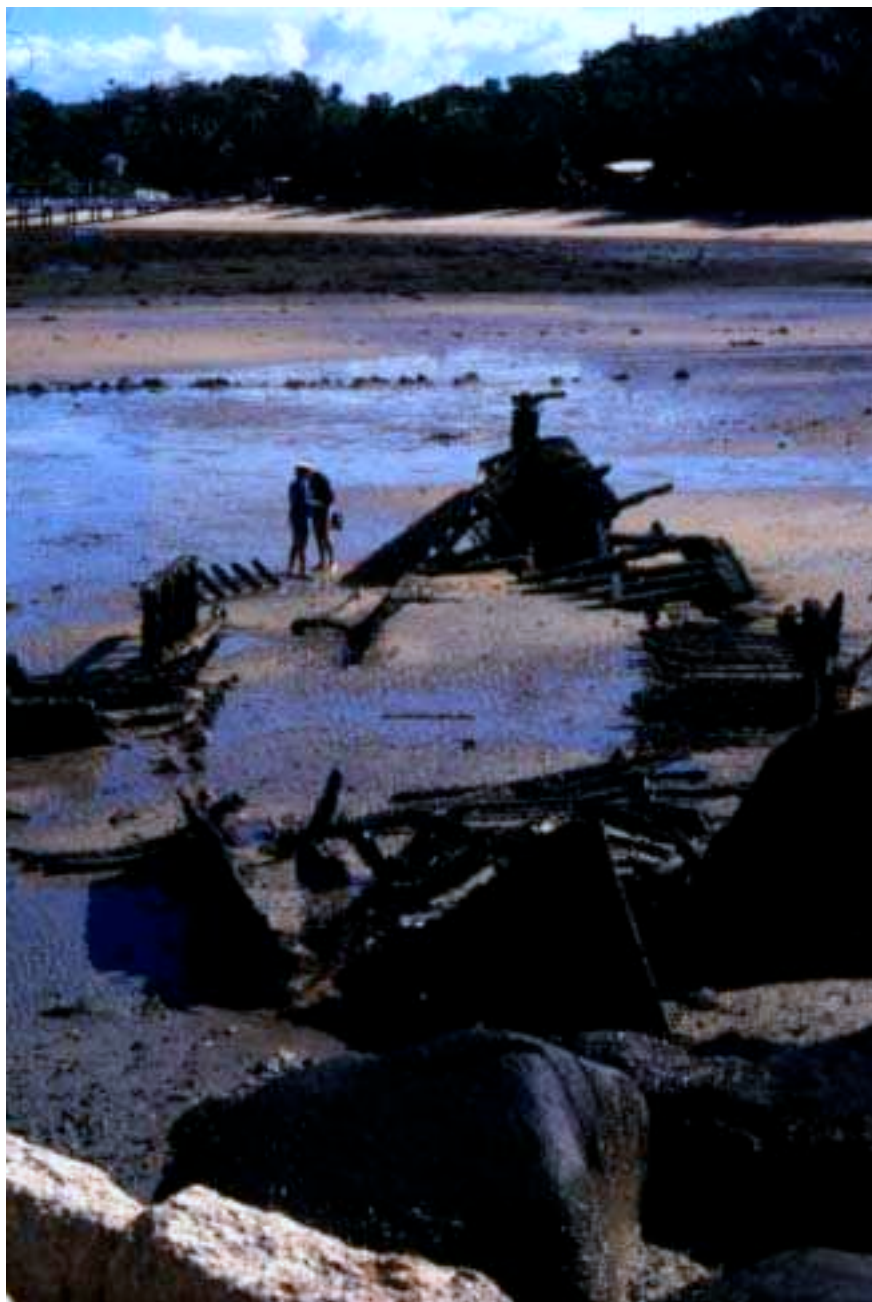
The emphasis of the MAAQ's fieldwork on Bishop Island focussed on the remains of *Maida*. Subsequently, the first real attempt at an archaeological analysis of the remains of vessels on Bishop Island can be seen in the report *The Maida Barque* (MAAQ n.d.). The report covered research and fieldwork (survey and excavation) on the vessel between 1986 and 1992 (when wharf development and reclamation finally destroyed most of the vessel remains on Bishop Island). This vessel, built in 1857 as a wooden barque at Moulamein, Burma and abandoned at Bishop Island in 1931 for breaking up (in 1932) was singled out because of its significance as a nineteenth century "country built" vessel. Despite the concentration on *Maida*, the MAAQ also carried out recording exercises on many of the other vessels at Bishop Island before their destruction. The sites were later bulldozed, or cut to the surface during the reclamation project.

In 2000 Cosmos Archaeology Pty Ltd (Coroneos 2000) was contracted to carry out a preliminary assessment of maritime archaeological remains at the mouth of the Brisbane River for Archaeo Pty. Ltd. (working for WBM Oceanics Australia) due to government proposals to extend the existing port facilities in the area. While this assessment included structures on the shoreline or seabed, submerged terrestrial sites, and other forms of cultural materials, its assessment of the shipwreck resource included a discussion of the abandoned ship resource that was once at Bishop Island. Although the report did not examine the site in great detail, one of its recommendations concerned the undertaking of research into the use of Bishop Island as a dumping ground for unwanted vessels. The Cultural Heritage section of the WBM Oceanics Australia report (WBM Oceanics Australia 2000: 10.1 - 10.19) concentrated mainly on the Indigenous cultural heritage of the area but includes much of the information outlined by Coroneos concerning the Bishop Island Ships' Graveyard.



In northern Queensland, archaeological fieldwork has been carried out on a range of vessels at Magnetic Island, as a part of an undergraduate maritime field school subject at James Cook University, Townsville since 1998. Out of this fieldwork numerous reports have been created on many of the abandoned vessels on the island, such as *Moltke*, *City of Adelaide* and *George Rennie* (Figure 4.3) (see for instance Cerny *et al.* 1999 and Lewczak *et al.* 1999a; 1999b). Despite the fact that the student reports tended to have a methodological focus, part of the investigation into the vessels, such as *Moltke* involved the examination of archaeological signatures in relation to the use of explosives on the hull (or, so called “detonation activities”), evidence of modification, and the post-abandonment uses of the vessels as breakwaters, all integral aspects of the investigation of deliberate abandonment processes were considered (discussed in Chapters 8 and 9).

In 2000 Doyle completed an archaeology MA thesis entitled, *An Examination of Associations Between Significant Historic Events and the Loss and Discard of Vessels in the Townsville Catchment, 1865 – 1981*. As already mentioned in Chapter 2, Doyle’s study is the most comparable to this study, despite its inclusion of the analysis of shipwreck data. In this thesis, Doyle specifically examines discard behaviour associated with a number of deliberately abandoned vessels in the Townsville Region. This research asks two fundamental questions; what are the correlations between the rate of loss and historically significant events? And, what are the correlations between the rate of discard and historically significant events?



**Figure 4.3** Remains of *George Rennie* at Magnetic Island (Photo: Mark Staniforth, July 1998)

#### *Victorian Case Studies*

There have been a number of studies carried out in Victoria on abandoned vessels. Victoria is different in that much attention has been directed to a large number of individual sites, as well as graveyards in general. These studies generally fall under two categories: studies undertaken by the

cultural resource management agency Heritage Victoria, and those by the state's avocational maritime archaeological association, the Maritime Archaeological Association of Victoria (MAAV). The MAAV has had a long-standing interest in the scuttled vessels in and around Melbourne, particularly those off Barwon Heads, and have written on vessels abandoned in Victoria (see for instance Charlesworth 1990; Caldow 1991). Indeed, much of the work on abandoned vessels seems to have some out of initiatives of this organization.

Three early studies on deliberately abandoned vessels in Victoria were started by the MAAV in 1983. A site called "St. Leonards Site A" was investigated by the MAAV from March 1983, and was believed to be one of three vessels (*Exile*) abandoned by Captain George Ward Cole in the 1850s as a jetty (Hewitt 1984b). The MAAV commenced an investigation of the Swan Island Torpedo Boat in April 1983, aiming to identify the structure. The vessel, buried in the sand was found to be the torpedo boat *Countess of Hopetoun* (Williams 1984). The search for the Queenscliffe torpedo boat *Lonsdale* was commenced by the MAAV in July 1983 (Cahill 1996: 51). The vessel had been decommissioned in 1889, and had disappeared after a time in the rotten row off Port Melbourne (Fitchett 1975: 39). The vessel was reported abandoned around 1920 on a beach at Queenscliff, but had since disappeared due to a natural reclamation of land in that area. Indeed, the site was found almost a kilometre from the shoreline in 1984 (Arnott 1984). The MAAV through their "Cerberus Group" also undertook research and survey work on the vessel from 1983 (Cahill 1984). Subsequently much has been published on the vessel (see Cahill 1988: 160-162; Charlesworth 1996). *Cerberus* was an early turret warship, designed for the defence of Melbourne, arriving there in 1870. Upon final sale following the disbanding of the Commonwealth submarine unit in 1924 the vessel was sold and was to be taken outside of the heads for breaking up, but was instead taken to Half Moon Bay where she was sunk in shallow water as a breakwater. Later, *Cerberus* was also part of a study by Foster

(1989a: 19-21) entitled *Defense and Victorian Shipwrecks*, and was part of work undertaken by Gould (2000: 268, 271, 277-281, 288-289, 290).

The remains of the “Port Welshpool lighter” (Figure 4.4), a flat bottomed timber vessel believed to be a bottom dump lighter was investigated by the MAAV in March 1984 and described by Hewitt (1984a, 1984c: 24-34). Little concerning the details of the abandonment it discussed, and the paper tends to concentrate on details of the vessel’s construction. Indeed the only mention of the vessel as an abandoned one is the concluding sentence, “The date of construction or date of abandonment have not been determined” (Hewitt 1984a, 1984c: 34). The vessel was supposedly abandoned in its present position for over fifty years (from 1984) and was used by local Cray fishermen as a coffer. Jordan (1995: 294) also adds that, from information from the Port Albert Maritime Museum the vessel was a hopper barge at Port Welshpool and was still in a floating condition in 1924-1925.

In the 1990s MAAV continued its investigations of abandoned watercraft, producing wreck inspection reports on the vessels *Anieura*, *Courier*, *Uralba*, *Carmen*, and *Ozone* (Charlesworth 1990; Derksen 1990; Caldow 1991, 1996; Charlesworth 1996a; Taylor 1996; Venturoni 1996). While all of these studies have been particularistic, and do not specifically address the nature of watercraft abandonment, they are important preludes to later studies, which eventually came to be major joint projects with Heritage Victoria. In particular the work of Foster (1987b, 1988, 1989b, 1990) in Port Phillip Bay is important, because of its comparative approaches and types of analysis (as mentioned in Chapter 2).

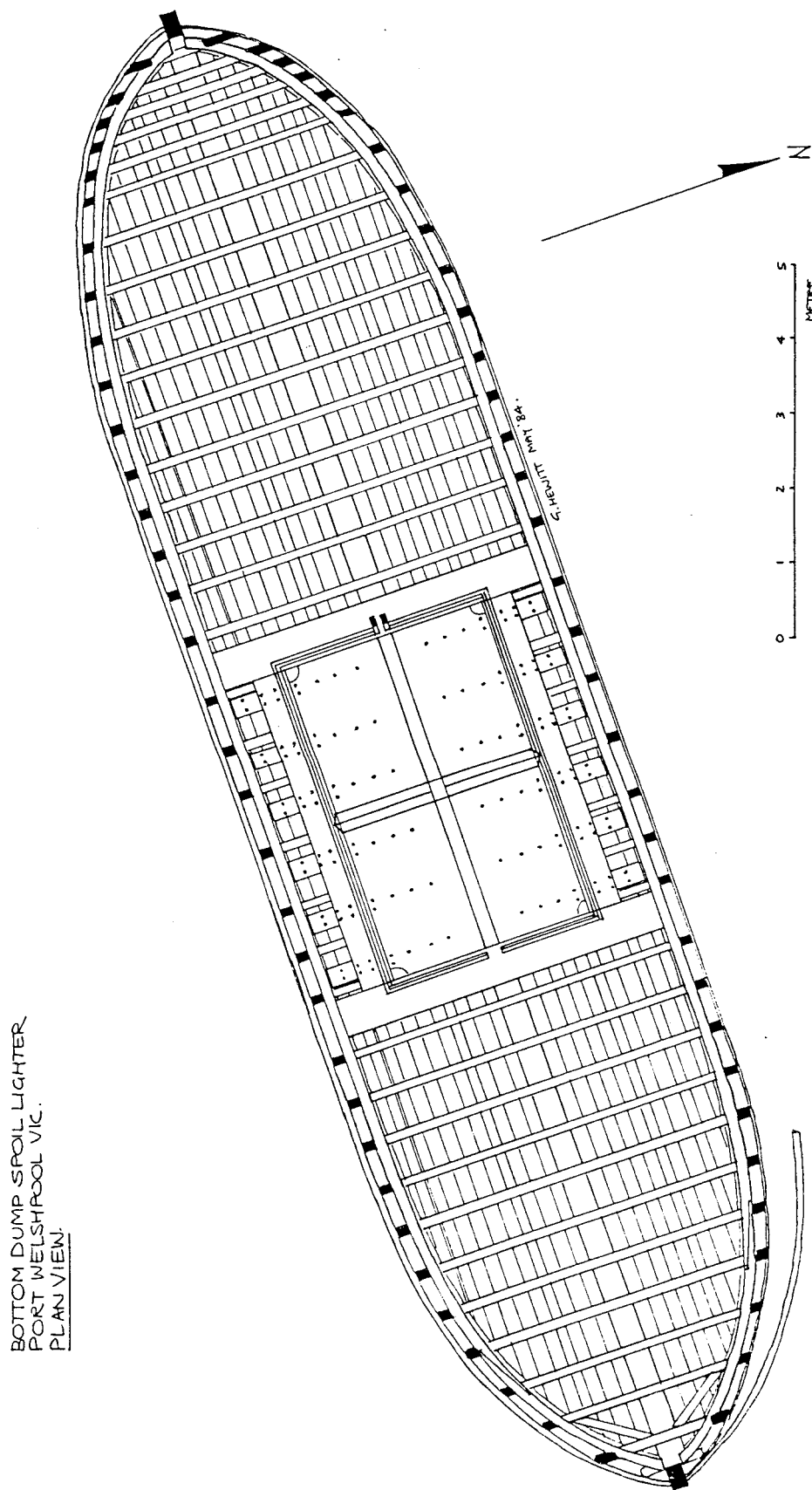


Figure 4.4 Plan of Port Welshpool Lighter by Geoff Hewitt (reproduced from Hewitt 1984a see also Hewitt 1984b: 25)

While this study was geographically defined it included abandoned watercraft sites that represent deliberate decisions such as beached vessels, and watercraft sunk as breakwaters and piers (Foster 1990: 28-37).<sup>4</sup> In other places Foster (1988: 21, 1989: 21) also listed hulked vessels and “scuttled or beached [vessels] as the result of legitimate decision-making”. The third volume had a section on, “Vessels broken up or deliberately beached” (Foster 1989b: 20, 40). It also makes reference to the sites of abandoned vessels such as an unidentified vessel on the Maribyronong River (Foster 1990: 14) and lists the abandonment of HMAS *Lonsdale*, *S.F. Hersey* and *Countess of Hopetoun* in relation to the defence of Port Phillip (Foster 1987b: 39). While these vessels are mentioned, the subject of abandonment is not discussed, despite commentary regarding other reasons for loss, such as weather and navigational error being made. Hulks feature prominently in Foster’s later study on the defence of Victoria (Foster 1989a: 24-26).

Although the Victorian shipwreck database does not have an extensive listing of their abandonment resource (see Heritage Victoria Shipwreck Database), the historical and archaeological investigations undertaken on abandoned vessels in the state of Victoria are probably the most developed. In particular the Barwon Heads Ships’ Graveyard (Map 4.9) and the J-class submarines (of which some are in the Barwon Heads graveyard) are noteworthy.

The MAAV commenced their investigation of the J class submarines in 1989 (Arnott 1996: 26), and since then they have become some of the most studied abandoned vessels in Australian maritime archaeology. The six submarines (J1, J2, J3, J4, J5 and J7) were part of a gift from the British Government after the conclusion of World War One and sailed into Geelong in 1920 (Smith

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<sup>4</sup> The first report (Foster 1987b) was limited to a ten nautical mile radius inside Port Phillip Heads, the second (Foster 1988) to a ten nautical mile radius outside Port Phillip Heads, the third (Foster 1989b) on the area between Indented Head and Point Cook on the west side and between Rye and Ricketts Point, Beaumaris, on the east side of Port Phillip Bay and the fourth (Foster 1990) concerned the area north of Point Cook on the west side and of Ricketts Point, Beaumaris, on the east side of Port Phillip Bay.

1990: 9; Victoria Archaeological Survey 1992). Within a few years, the vessels were decommissioned and four were sold to ship breakers (in 1922), the submarine J3 being converted into a pier and power station at Swan Island before being sold for salvage in 1926. The last remaining sub, J7 followed suit in 1924 (Smith 1990: 12). The remaining two submarines were sunk as breakwaters, J3 near Swan Island in Port Phillip Bay, and J7 off Hampton (Stone & Loney 1983: 35-36; Victoria Archaeological Survey 1992). Some interpretation has been carried out on the J-class subs. Namely the inclusion of the J2 submarine, also known as the "Shallow or 90 foot submarine" in two pamphlets comprising historical information and diving details presented in the *Underwater Shipwreck Discovery Trail* (Victoria Archaeological Survey 1992), a series of shipwreck pamphlets, of which this submarine is the only deliberately abandoned vessel. Some mention is made of the other located submarines, although their actual identification is not determined (due to their basically identical nature) and they have instead been named the "120ft or Broken Submarine", the "Deep Submarine" and the "New Deep Submarine" (being the J1, J4 and J5 submarines). A confused reference to the existence of the J6 submarine, located within close proximity to the Sandringham Marina is mentioned in these pamphlets, which instead should refer to the J7 submarine. The J6 submarine is elsewhere listed as having been, "accidentally attacked and sunk by the British Navy's Decoy ship the *Cymric*" (Victoria Archaeological Survey 1992). The J3 has also played a role in the development of new photogrammetric methods of underwater archaeological recording, when in 1999 it was one of the first vessels to be comprehensively surveyed using Photomodeler Pro software (see Franke 1999).

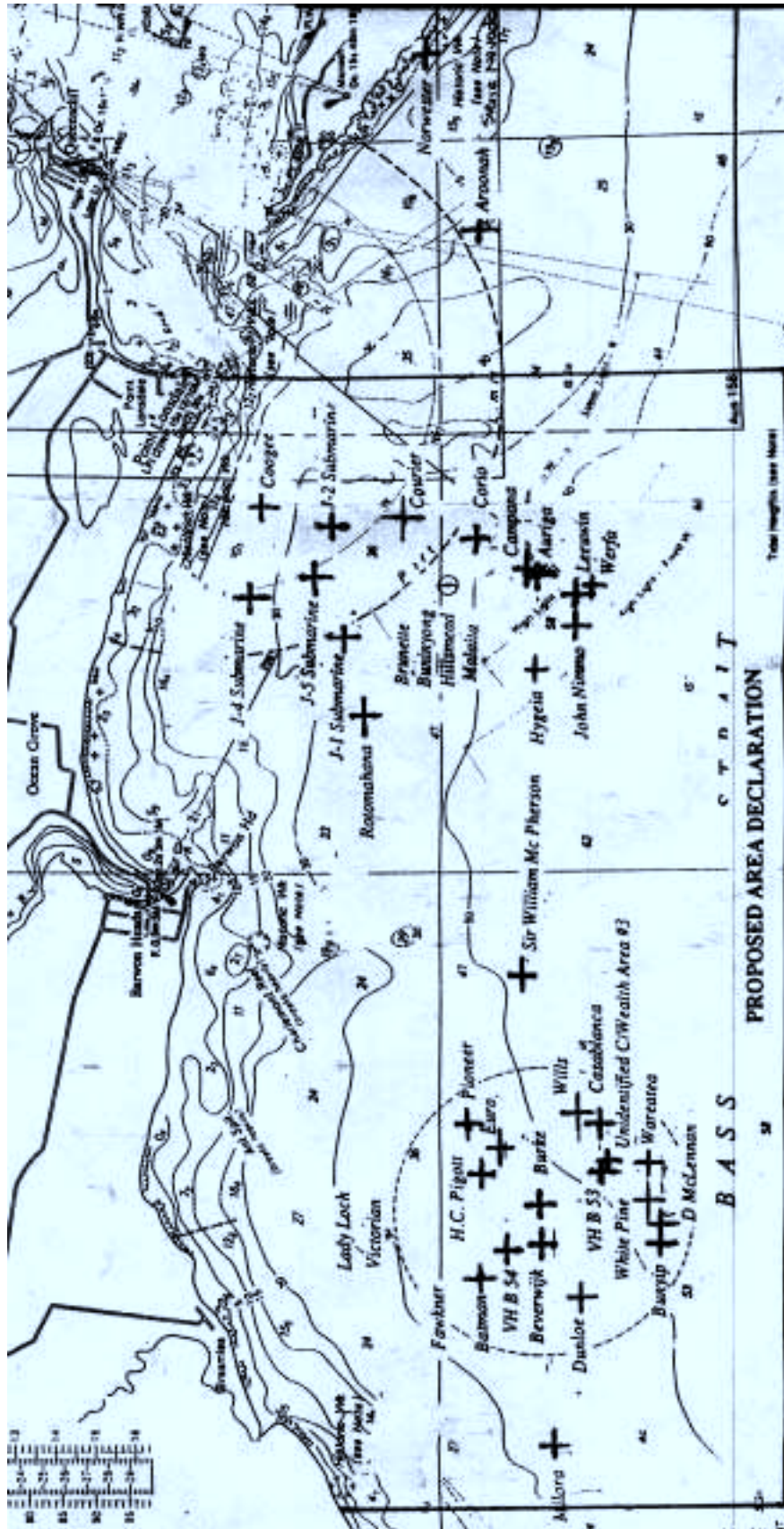
Some authors (Nayler 1974: 84; Loney 1980: 86, 1991: 143) have noted that the location of the main Victorian ships' graveyard as being approximately five nautical miles (8 kilometres) south west of Barwon Heads in depths up to twenty-seven fathoms. Publications have emerged from investigations into

this site including a declaration for protection (Duncan 1994) and a popular pamphlet.

This pamphlet covers the provisional declaration of the vessels in the ships' graveyard as historic shipwrecks under the *Historic Shipwrecks Act 1976* (as defined in Duncan 1994) and briefly outlines some of the historically significant vessels in the assemblage. Duncan's 1994 Barwon Heads Report follows fairly standard Australian reporting procedures including a database printout of the vessels in the graveyard, location information (noted positions and rudimentary mapping) before proceeding into site description, site plans, site significance assessments, and assessment of threat. The recommendations included in the report however were successful in gaining provisional declaration for the graveyard vessels and has made the site undoubtedly one of the best-documented ships' graveyard sites in Australia. Additionally it is the first (and currently only) protected ships' graveyard under the *Historic Shipwrecks Act 1976*. It is interesting, however, to note that it was the status of many of the individual ships as historic "shipwrecks", and not the standing of the area as an assemblage of sites that brought about their protection. This may be seen as indicative of the problems with sites of comparative potential and systems of significance assessment. Also their importance was considered low, as this quote suggests:

A number of the vessels were dismantled and sunk in the Ships' Graveyard off Barwon Heads have been located in recent years. MAU has accurate positions for most of the vessels obtained from contemporary records and the records of the Ports and Harbours Hydrographic Office at Queenscliffe. At present, these sites are considered of low priority (priority 5) for wreck inspection though they represent an interesting cross-section of vessel types and even the stripped hulls may be of some value for future research (Staniforth 1988: 43).





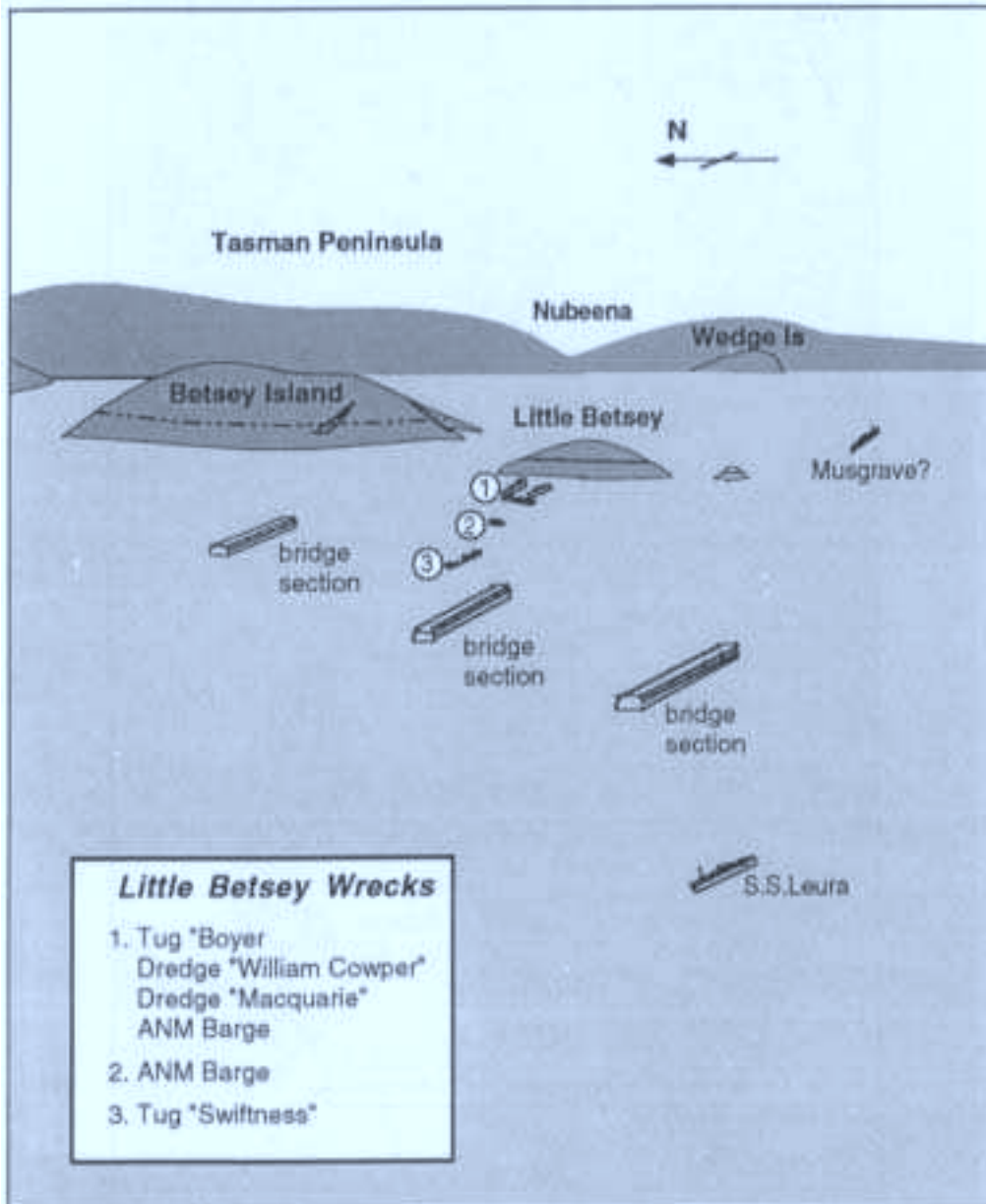
Map 4.9 Plan of the Barwon Heads Ships' Graveyard (reproduced from Duncan 1994)

More recently the remains of a possible deliberately abandoned vessel known as the Pier 35 wreck was found on a bank of the Yarra River, Melbourne during development for a Marina Complex (the site had previously been mentioned by Foster 1990: 14). The area where the vessel was found was a well-known “rotten row” known as “Siberia” adjacent to wharves and storage facilities (the same area mentioned by Fitchett 1975: 39 in relation to *Lonsdale*). The Pier 35 vessel was the hull of a wooden sailing ship, the timbers of which is believed to be of North American origin. The vessel could not be moved and was instead buried in order to preserve it beneath the fill of the development. An unpublished manuscript entitled *The Pier 35 Wreck* held by Heritage Victoria suggests that numerous vessels were abandoned in Melbourne during the Gold Rushes of the 1850s, and that vessels became derelict after being abandoned by their crews. This manuscript also tells of the conversion of old sailing ships for other uses such as storage hulks and prison hulks (Jordan 1997).

#### *Tasmanian Case Studies*

There are a range of texts from Tasmania dealing with the abandonment of watercraft. Of most note are the two volumes of *Tasmanian Shipwrecks* (Broxam & Nash 1998, 2000), which predominantly cover shipwrecks in Tasmanian waters between 1797 and 2000. Another work is Harry O’May’s *Wrecks in Tasmanian Waters: 1797-1950* (1985)[1954]. Some sites are mentioned in *Dive Tasmania* such as the steamship *Laura*, the Betsey Island Ships’ Graveyard (Map 4.10) and *William Pitt* (Jacques 1997: 21, 42, 50-52, 71). Isolated references to abandoned vessels found in Kerr’s book, *The Tasmanian Trading Ketch* (1998) were omitted because of the lack of specificity in relation to their fate. Many of the other vessels in this list (Kerr 1998: 127-128) were quite obviously abandoned, although the historical information supporting this is lacking. David Hammond’s book *Maritime Australia Volume 1: The Port of Hobart, Tasmania* (1996) contains many photographic images of vessels, and

objects from vessels contained within the ANAVD, including watercraft deposited at the Otago Bay Ships' Graveyard, and the screw steamer *Excella*.



**Map 4.10** Depiction of the Betsey Island Ships' Graveyard (reproduced from Jacques 1997: 42)

Investigations into a ships' graveyard along the Derwent River at East Risdon by the Southern Branch members of the Maritime Archaeological Association of Tasmania (MAAT) can be traced back as far as 1983 (Lester 1983: 28-29). The work, or at least the small amount of material that was mentioned

concerning the “Hulks in the River Wrecks Programme” tended to concentrate on the remains of *Otago* (Figure 4.5), because of its association with the famous writer Joseph Conrad, who was for a time the vessel’s Captain (see Foulke 1989).



**Figure 4.5** Remains of *Otago* at the Otago Bay Ships’ Graveyard, East Risdon, River Derwent, Tasmania (Photo: Nathan Richards 20 December 2000)

While Strachan (1988: 49) includes *Otago* among the most noted iron and steamship wrecks in Tasmania, its significance has never really been attributed for archaeological reasons. This vessel more so than any other abandoned vessel or shipwreck in Australia has had its remains diminished because of the perception of its significance. This damage, and the perception of the vessel’s significance have come about because of its association with Joseph Conrad. The barque was Conrad’s first and only command and has been credited with a range of aspects of his well-documented life from playing, “such a big role in fostering Conrad’s love of the sea...” (*Southern Star* 05/07/1989), to being the inspiration for writing short stories *The Shadow Line* (which was reputedly written on board the vessel) and even *Lord Jim*, *The*

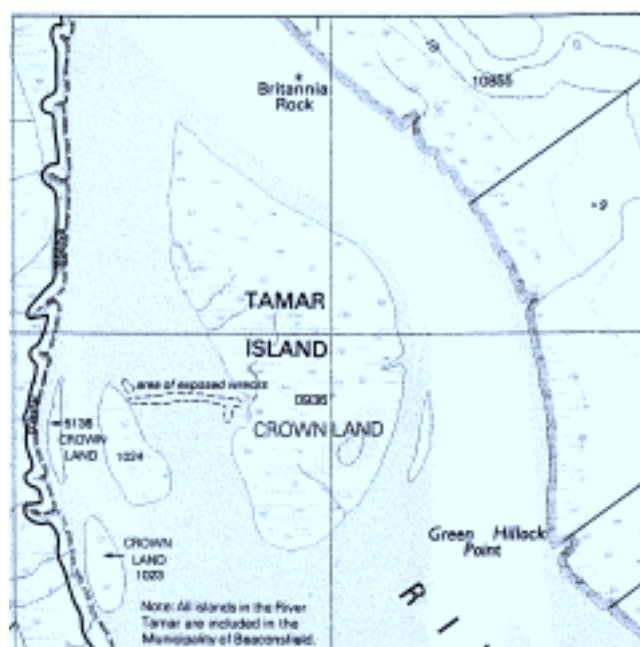
*Nigger of Narcissus* and *Typhoon*, despite being its Captain for only a relatively short period (Crowther 1975: 2; Bowes 1995: 54). Nevertheless, the site is a lost opportunity for cultural tourism, and as Bowes (1995: 54) has said, “if only people had had the foresight,[it could] have become one of the great literary pilgrimage sites of the world”.

This damage commenced in 1957 with its purchase by the Moreland Metal Company, which recovered metal from its rusting remains. In the 1970s, however removal of sections of the hull as souvenirs became more organised and a range of groups, including Polish Americans in the Conradian Society cutting sections of the hull away and turning the material into medallions (*Saturday Evening Mercury* 27/11/1971: 17; Loney 1980: 107). The vessel’s wheel is also reported as preserved in London, installed by the Honorable Company of Master Mariners on the sloop *Wellington*. Additionally, a five-ton section of the stern was removed and taken to Los Angeles to be displayed in their Maritime Museum. The bow of the vessel was also transported to a museum in Turin, Italy (*The Mercury* 27/11/1964: 5; *Sea History* Fall 1978: 41). There are however, some remnants of *Otago* in Tasmania, namely the old companionway superstructure, which sat in a residential backyard for some years before being restored and presented initially to the State Library of Tasmania, and then to the Tasmanian Maritime Museum, Hobart (Crowther 1975). Besides *Otago*, the wooden river steamer *Togo* and steel river steamer *Westralian* receive some mention in other texts (Stone & Loney 1983: 24).

Outside of the Hobart Region, only two sites: one at Strahan (on Tasmania’s west coast), and another on the Tamar River near Launceston have previously been examined for their heritage value. McConnell and Clark carried out a heritage assessment of the Strahan area in 1996 (McConnell & Clark 1996). As a part of this assessment the remains of the vessel *Glenturk* and Number 10 Lighter were included. The assessment contains brief historical information and makes no recommendations regarding the heritage of the vessels – they

are effectively seen as hazards to navigation, and development, despite being close to shore and perfect candidates for interpretation. In all cases the vessels along the Strahan foreshore were considered to be of low to medium significance.

The ships' graveyard on the Tamar River (see Map 4.11 and Figure 4.6) is on the western boundary of Tamar Island, west of the main channel for shipping on the River Tamar. A wildlife preserve has been set up that includes the 14-17 vessels within its boundaries. Historical research on the site is limited and comprised of interpretive labels at the Tamar Island Wildlife Preserve Interpretation Centre, two pamphlets produced by the Tasmanian Parks and Wildlife Service and some information in the book, *The Story of the Port of Launceston* (Ferrall 1983: 63). The vessels were sunk at the site between 1926 and 1971 in association with a dredging strategy on the Tamar that saw them used to produce a tidal scour. The site was visited at extremely low tides and could not be accessed due to deep mud and high surrounding vegetation that precluded both foot and boat access.



**Map 4.11** Map of Tamar River, Launceston showing Tamar Island and the location of the Tamar Island Ships' Graveyard (reproduced from 1:10,000 Map Series, Launceston (5041), Series 2, 1986)



**Figure 4.6** Section of 1998 aerial photograph showing main concentration of watercraft remains at the Tamar Island Ships' Graveyard (reproduced from 1:2000 aerial photograph flown 25 March 1998 Film No. 1297 Neg. No. 146)

#### *Northern Territory Case Studies*

Tom Lewis' *Wrecks in Darwin Waters* (Lewis 1992) is the only widely available source touching upon abandoned watercraft. Its focus is on the dive sites of Darwin, and therefore has limited historical information. Some information is available on the refugee boats seized by authorities and abandoned near the port of Darwin. Surprisingly most of the work in the publication of abandoned vessels has come from the diving and recreational fishing industries in the Northern Territory. Cullen Bay Dive has produced a small publication entitled the *Handbook on Diving in Darwin* (Cullen Bay Dive 2000). Although not comprehensive it helps to identify where many of the abandoned vessels and artificial reefs, such as the "Fenton Wrecks" and "Saigon Wrecks" are located.

The most comprehensive depiction of the vessel based artificial reefs and refugee boat dumping sites is found in a popular fishing magazine put out annually entitled *North Australian Fishing Maps: Fish Finder* (Flynn 2000). This publication covers the entire coastline from the Kimberly region in Western Australia to the northern reaches of Cape York and the Gulf country in Queensland. As its focus is the dissemination of information of good fishing locations the abandoned ship resource, which are often good artificial reefs and FAD are published. Of particular interest are the maps of Darwin Harbour and the Darwin foreshore (Flynn 2000: 69, 72-73, 76-77), which includes vessel plots on aerial photos, coupled with differential GPS locational data. Descriptions of the scuttled vessels in the region can also be found (Flynn 2000: 68, 70).

The recent draft survey of the submerged material culture of the Beagle Gulf Marine Park (including Darwin Harbour) compiled by the Museum and Art Gallery of Northern Territory (Clark & Jung 1999) is the only archaeological work done on abandoned vessels in this region. This report is mainly historical in content and appears to be based largely upon Lewis' work, but includes descriptions of abandoned vessel material alongside of shipwreck material. Nevertheless, this report is in its formative stages and will more than likely expand to incorporate further investigations and discoveries of abandoned vessels. The extent of the archaeological work carried out, as seen within the Beagle Gulf report, consists solely of site location and identification.

The abandoned vessel resource is well represented in the NT shipwreck database (Clark & Jung 2001: 46-52), which because of the Northern Territory's wealth of cultural remains from during the Second World War (especially the remains of vessels and aircraft destroyed in Japanese attacks in 1942) has been more open to the inclusion of non-shipwreck remains. This



has not just included refugee boats destroyed or abandoned in the vicinity of Darwin, but also artificial reefs (whether containing vessel remains or not).

### Conclusions

These Australian case studies are important preludes to the research represented in this thesis and illustrate the movement towards comparative and thematic investigations of this resource. They have also indicated the range and diversity of these sites, and their increasing acceptance as being worthy of archaeological investigation.

Additionally, they are significant for a number of archaeological reasons. Like many of the examples cited in Chapter 3 they have contributed to our understanding of how behaviours associated with activities such as demolition, salvage and scuttling translate to the archaeological record. This has been achieved through a range of observations that have been made of the historical and archaeological records. Moreover, these studies have also touched upon the scientific and experimental potential of discarded watercraft, the causal nature of discard activities, the spatial dimension of deliberate abandonment, and the changing nature of the disposal and post-abandonment use of unwanted watercraft. These are themes that will be further explored in subsequent chapters.

However these cases have also illustrated the problems associated with the particularistic methods employed in the previous analysis and interpretation of these sites. While some researchers such as Jeffery (1983: 85) have asserted that vessels such as “The *Santiago* does not fit the term shipwreck”, there is a continued trend to assess, and investigate abandoned watercraft as if they were the product of catastrophic processes. This is represented by a number of examples; the high level of significance associated with Conrad’s *Otago* for reasons that cannot be justified archaeologically, the tendency to see the

significance of other sites simply in relation to their educational potential, and the low number of abandoned vessels protected by legislation. To a large degree the determination of these vessels' significance can still be seen in relation to the preoccupations with celebrity, age, and intactness that have dominated maritime archaeology until recently. The archaeological significance of these vessels is yet to be explored properly. The following chapters will demonstrate that the sites that have been described here, as a part of a larger dataset have substantial significance that can only be appreciated through comparative research.

## CHAPTER 5

### Researching Abandonment: Methods and Sources

*The collecting of exact information about ships and boats is never easy, because they are generally large, often in movement, and always someone else's property (Moore 1970: 16).*

## CHAPTER 5

### RESEARCHING ABANDONMENT: METHODS AND SOURCES

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#### Introduction

This chapter communicates the analytical techniques and methodological aspects of the research design. It outlines the methods and sources used in carrying out this research and defines the framework within which historical references to abandoned watercraft were deemed suitable for inclusion in the study. Additionally, the research institutions visited, and the limitations of the archaeological literature, primary historical sources and the analytical, survey, inspection and sampling methods will be touched upon. These boundaries serve to illustrate the variations which have had an undoubted effect on the compilation of the national dataset used in this thesis, and the accuracy and representativeness of this data used in subsequent analyses.

This thesis also uses data from the archaeological record as evidence. Commentary on the archaeological methods covers the sources used in archaeological site inspection and the interpretation of archaeological remains. As this study is fundamentally an exploration of the potential of the abandoned vessel resource, it concentrates on structures and their spatial arrangement with an emphasis on the comparative analysis of the types of sites. All archaeological examination was non-disturbance, and portable artefacts were not analysed. The structural details of watercraft were the main focal point of investigation in historical research and archaeological inspection. This was done so as to incorporate them as aggregate data in an analysis of the technological and economic causes and ramifications of

deliberate abandonment (see Chapters 6 and 7). Aspects of both the historical and archaeological record were used to provide insight into a number technological and economic issues covered in this thesis, as well as to supply evidence for cultural site formation processes. Differences between the historical and archaeological record meant that the study could be approached from many perspectives. This ensured that a high degree of comparison could be undertaken, and illustrated the completeness of each category of evidence.

As historical and archaeological research had to be undertaken in all states of Australia, blocks of time spent locating and inspecting sites were carried out concurrently with the visiting of research institutions in a particular region. These research institutions included state cultural heritage management agencies, archives (state and national branches), libraries, historical societies, universities and museums.

When reading this chapter, readers should take note of the appendices of this thesis – reference is sometimes made to the textual sources that make up the dataset of this thesis (Appendix 1). Additionally, Appendix 2 serves as both a description of the field list of the database that became the major tool for analysis, as well as a glossary outlining the definitions and explanatory structures underlying discussion.

### **Historical Research**

The historical record was the starting point for the investigations, and a primary source of evidence. As a result this thesis and its findings are largely dependent upon the quality, proper use and interpretation of a large array of historical sources. This ensured that abandoned watercraft candidates selected from maritime historical sources matched the predefined selection criteria (outlined below) and were suitable for inclusion in the study and

investigation during field survey. Although first impressions indicated that there was a wealth of information about abandoned watercraft in Australia, it became increasingly clear that this evidence was highly fragmented. With regard to the number of sites, the comprehensive historical information needed to document the entirety of the abandoned vessel resource throughout post contact Australian history did not exist. This was largely due to the general lack of reporting about the fate of vessels in relation to vessel disposal and the often-clandestine abandonment of vessels without the knowledge of port and coastline management authorities.<sup>1</sup> Furthermore, these records, whether archival or anecdotal, often did not contain a full description of individual sites that would allow the analysis to be attempted. In particular, there were incomplete records relating to technical aspects of ship design, times and locations of disposal, and social and economic circumstances of discard. At the conclusion of the study the number of abandoned watercraft proved to be five times larger than initially expected. While this meant that a more accurate statistical evaluation of the evidence could be undertaken, its ramifications in relation to fieldwork was that less time and detail could be devoted to each region. It was not feasible for this thesis to include all the vessels that have ever been dumped in Australia, simply due to the volume of shipping over the period of this study and the large number of vessels that have been abandoned over that time. The sample of over 1500 vessels is thus considered adequate for the purposes of this analysis. The study was not initially temporally limited; it was defined by what was discovered, historically and archaeologically and upon the conclusion of data collection was found to cover the years 1806 to 2001 (being the year of the earliest vessel abandoned, and the final complete calendar year

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<sup>1</sup> In particular this is reflected in the number of unsanctioned “snapper patches” and illegal artificial reefs that have been created without the knowledge of regulatory bodies in Australia in the later period of this study.

of the study).<sup>2</sup> This was due to the fact that a study of this nature had not been previously attempted.

While the data collected concentrated on technical, spatial and temporal aspects of abandoned vessels, some information tangential to the main focus of this thesis was collected. Despite the fact that this supplementary historical data was not used for analysis it remained important for further research. In particular it was required when additional research was necessary to ascertain whether vessels suited the criteria for inclusion in a database of deliberately abandoned vessels (see below).

### **Previously Published Literature Concerning Abandoned Watercraft**

While there have been some attempts to compile lists of abandoned vessels in Australia (see Andrews 1987; Lawes 1987; Martin, T. 1987; Thomas 1987; Parsons & Plunkett 1995) generally there has been limited historical literature dedicated to watercraft abandonment. The secondary source historical literature dedicated to abandoned vessels in Australia is either sparse, or mixed in amongst general “shipwreck” publications. The four most noted publications in relation to previous historical research done on watercraft abandonment, from a general and national perspective has been:

- Parsons and Plunkett’s *Scuttled and Abandoned Ships in Australian Waters* (1995);
- Loney’s *Australian Shipwrecks Update Volume 5: 1622-1990* (1991);

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<sup>2</sup> It must also be acknowledged that there is a Euro-centric focus to this research. The author would like to acknowledge that Australian Indigenous people all over the continent have been manufacturing a range of watercraft types over a long period, and therefore must also have been engaging in discard and reuse practices in relation to these vessels. There have been, however, few finds of such vessels in Australia, and those that have been found do not have enough specific dating information, or corresponding relational features (in dimension or design) to the vessel types that have been used in post-contact Australian trade to facilitate any meaningful comparison.

- A section entitled “The Ships’ Graveyards” in Loney’s *Maritime Australia* (1980: 86-89) and;
- Stone and Loney’s *High and Dry: Visible Wrecks and Wreckage in Australian Waters* (1983).

These sources cover approximately 19% of the database. In addition to this Geoff Plunkett’s website on ship disposal hosted by Environment Australia was another comprehensive source.<sup>3</sup> This website additionally provided much of the spatial data derived from government hydrographical sources. The *Australian Historical Shipwrecks Database* (AHSD) was also used for cross-referencing historical details (<http://dbase.mm.wa.gov.au/WEBFM/Shipwrecks/Shipsearch.html>). The AHSD (accessed 24 June 2002) was found to contain almost 31% of the vessels in the thesis database, indicating that there are potentially 1070 new entries for the AHSD arising from this research. In most cases, separate state cultural heritage management and museum databases and archives, which are the building blocks of the AHSD were used in preference due to the inclusion of more up to date information. Other than these sources there are very few publications specifically on watercraft abandoned in Australian waters. While some of the literature pertaining to hulked vessels, such as Vernon Smith’s unpublished manuscript *Sailing Ships hulked at Port Adelaide* (Smith 1953) and R.W. Glassford’s *A Fleet of Hulks* (Glassford 1953) can be seen almost as a national “who’s who” of vessels that came to be abandoned in many ports around Australia, these are very fragmentary, and far from complete. There are many other similar “lists” of Australian vessels that have been broken up (see Loney 1980: 85). The problem with many of them however is that they are not specific in whether they were broken up in Australia or overseas.

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<sup>3</sup> <http://www.ea.gov.au/coasts/pollution/dumping/boats/index.html>. To a large degree the information is the same as what can be found in Parsons and Plunkett 1995, but has been updated since the date of publishing and includes hydrographic information.



The database that emerged from this investigation became known as the *Australian National Abandoned Vessel Database* (ANAVD). At the conclusion of data collection in February 2002 this was comprised of 6082 individual sources. Of these the main categories were: thirty-one archival sources, twenty-one maritime indexes (mainly marine insurance and Customs House Registers), four databases, three historical journals, thirty-four newspapers, 222 published secondary sources, and two websites. A list of these references can be found on the CD accompanying this thesis, and listed in Appendix 1. There proved to be few dedicated works on a regional scale regarding deliberate abandonment. The only such publication that appears to have been produced is Nayler's publication on the Barwon Heads graveyard, Victoria (Nayler 1979). Some of these local historical publications and a few of the archaeological investigations that have been more specific to certain regions of Australia will be noted separately in subsequent chapters. In some cases the archaeological remnants of study candidates had already been visited and reported on. This was sometimes reflected in published literature, but was more often found in unpublished literature produced predominantly by heritage management agencies.

Customs House Registers and published secondary sources were the most valuable resources. Many other sources, such as newspaper references, by and large were gained through previous work on individual sites, or through access to collections of historical material held by libraries, museums and heritage agencies. Other references were found in unindexed ports and shipping journals and amateur historical journals of limited distribution.

An obvious omission from this list of sources is oral historical sources. While oral histories may have been sought for a more geographically isolated study, the large database, and inability of this source to guarantee in-depth and accurate structural information regarding watercraft made it of little relevance in this investigation. In most cases assistance came in the form of advice from

other researchers on research material in existence, accessibility, accuracy and extensiveness. Photographic evidence was collected where available to augment the final database of vessels (and make it a more useful future research tool), and to provide evidence of the appropriate vessel being catalogued, where ship identity was in doubt.

It was initially hoped that this research would conclude with the compilation of a comprehensive list of all abandoned watercraft sites in Australia, but it was eventually realised that this was an impossible task within the time period allowed for research. Although it was a goal of this thesis to visit, and in some way document as many of the sites uncovered by the historical research as possible, it was never anticipated that a comprehensive archaeological survey of all of these sites would be possible. Whilst project funding and accessibility to many sites (especially those located in deepwater scuttling areas) were seen as initial limitations to such a goal, more importantly, it was understood that there was not enough time to carry out in-depth research and recording of every vessel. Further archaeological survey work, or detailed investigation into the histories of the sites of this study were seen to be the subject of further, more regionally oriented projects that might emerge from this overview of the resource.

Research into the historical record was a twofold process. In the first instance a range of resources were consulted in order to extract examples of watercraft that could be defined as deliberately abandoned for inclusion in the ANAVD. They were filtered according to whether or not they met certain selection criteria (see below).

## Selection Criteria

In the first place, this study is limited to vessels defined as ships and boats, and excludes other types of vessels such as rafts and canoes.<sup>4</sup> Ships *and* boats are included here mainly because of the problems in distinguishing between them, although this study is predominated by vessels that can be categorised as “ships”. This goes against other researchers’ tendencies to distinguish boats as separate and distinct (see for instance McKee 1976: 4). Nevertheless, some large undecked vessels defined as boats are included in this dataset because they often fulfilled the same (or similar) functions. The inclusion of such vessels alongside of “ships” in many historical sources supports their inclusion here.

Often a candidate was chosen because of an explicit statement in an historical source citing that it was “scuttled”, “beached”, “demolished”, “broken up”, or “dismantled”. The announcement that a vessel was “condemned” was also considered to be evidence of its demolition or discard. This is because upon condemning, the vessel has no other use, or possibility of remaining as a functional vessel, due to its inability to gain insurance to carry cargo. Likewise a notation concerning some vessels as “no longer required” was seen as a likely prelude to deliberate abandonment (see for instance Dundon 1997: 101-102). Some candidates, however, despite being described in the manner outlined above, still required exclusion from the study.

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<sup>4</sup> The definition of a raft in this study follows McGrail’s classification (1989: 298, 1998: 5) of a raft due its buoyancy being derived, “from the floatation characteristics of individual elements” whereas a boat derives its characteristics from the “floatation characteristics of a hollowed vessel, due to the displacement of water by a continuous watertight outer surface” (this classification also applying to a “ship”). No instance of a vessel defined as a raft, however, was found during research.

## Excluded Candidates

In certain cases, vessels were excluded because of the circumstances surrounding their abandonment. Often this was when a vessel was deliberately abandoned *after* a wrecking event. While such vessels still belonging to a category of “abandonment”, and still have many of the archaeological characteristics of other types of abandoned watercraft such as a lack of artefacts and extensive salvage (further expanded in Chapter 9), they were not included in this study because of the catastrophic and premature end to their working life and the consequences this would have to the temporal analysis of trends in abandonment. Where it was obvious that the breaking up, or abandonment of a vessel had been brought about due to the direct consequences of a catastrophic event, that vessel was excluded from the database. This was most obvious where a vessel had been recorded as having had an accident and within a short period of time had been de-registered and/or broken up. Where sources conflicted, and it was uncertain whether there had been a deliberate, catastrophic, or consequential act of abandonment it was deemed to be better to exclude such vessels (see for instance Curby 1997: 36; Richards, M. 1997b in the case of *Iluka*).

Certain exceptions were made however, where vessels that were awaiting abandonment sank prematurely within close proximity to their originally intended dumping location.<sup>5</sup> The inclusion of these vessels is considered justified because they sank close to the area where they were to be scuttled, and at a time not far removed from its previously planned abandonment. These events may also be seen as cases of consequential abandonment. Despite this, the plan to abandon can be understood to be an important part

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<sup>5</sup> One example is the vessel *Erringhi*, which in January 1951 was stripped of fittings and towed due east of Sydney to the Sydney Heads ship disposal area to be scuttled. Although its destination was the ten-mile limit the vessel filled with water prematurely and sank off Moreton Island of its own accord (Purtell 1995: 77). Another exception is the vessel *Cementco/Crusader 2* that was awaiting abandonment but sank during bad weather (Wright 1990: 54-55).

of the discard process, and the fact that the abandonment occurred on the same day of this intention means that the vessel is still laden with significance in relation to the causes and consequences of its abandonment.

### **Synopsis of Documentary Sources**

The initial source of historical information for this study was obtained from secondary sources not dedicated to, but often including information concerning disposed vessels. Such sources could be described as normally concentrating on shipwrecks within which some abandoned vessel histories have been included. Where these sources were referenced, the primary historical material was sought out. These primary sources were a diverse array of traditional sources, such as images, newspaper articles, and references to marine insurance and Australian Customs House Registers (see Appendix 1).

Of all of these primary sources, marine insurance and Australian Customs House Registers were of the most importance, due to the inclusion of technical details and references to time and place of build and abandonment. In many cases archival materials, mainly marine and harbours board documentation was sought to augment this information. Once an accurate indication of the technical specifications of a vessel was obtained missing details on candidate's profiles were tracked down and included where possible.

#### *Marine Insurance Registers*

There are many national marine insurance registers, which fall into what have been categorised as "primary" registers (Foster 1987a: 47; Eyres 1980: 27;

Kaukiainen 1995: 29).<sup>6</sup> Of all these the British Register, *Lloyd's Register of Shipping* was used most in this research. Primary marine insurance registers such as this are one of the most useful sources for the determination of vessel identity. The usefulness of the information within this source comes in two forms. The first form is information pertaining to the design, construction and nationality of the vessel included in each annual register, and the changes between yearly registers; the second form comes in the guise of the year of removal of a particular vessel from the register. One of the limitations noted by Staniforth and Vickery (1984: 3) in relation to the use of the *Lloyd's Register of Shipping* is the absence of reference to the fate of vessels. In this way, the absence of a particular vessel from the register can only be used to reinforce the identification of possible abandoned vessels, although its absence cannot be used to ascertain whether the vessel in question was wrecked, demolished or simply re-registered in a non-British register after sale.

The details contained in these Registers vary over time. As a consequence, the details compiled within such documents change, with new fields being added when new technological innovations become accepted. It is important to note this variation in separate registers over time in relation to the detail contained, which therefore has some ramifications on their use and importance as a source of research material. While many Australian built vessels are not likely to have been built to the specifications of Lloyds' and therefore not included in that register, many were enrolled in the *Register of Australian and New Zealand Shipping* from the 1870s (Sexton 1992: 33).

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<sup>6</sup> The variation used, in relation to the term "primary register" and "secondary register" refers to the method that registers were used in this research. It refers to the registers found to be of most important use, and next important use. In general it is acknowledged that there is a major difference between a shipping list and a shipping register (see Farr 1969: 3). A list, for instance can be categorised as a source documenting vessels existing at one time. While the *Lloyd's Register of Shipping* is termed a register, it is in essence a list. For the purposes of this thesis, the term register and list refer to the same sort of document, irrespective of the contents held within.

### *Customs House Registers*

These registers, although varying over time with changes in technology and legislation involved the recording of a number of ships' particulars in folios. These details included dimensions and tonnages and, after 1824, the division of ship ownership into sixty-four shares (Farr 1969: 4-7). Research notes, and a directory accompanying the microfilm copies of the *British Register of Australian Shipping* held at every Australian Archives branch in Australia outlines the history of the register, indicating the changes to it over time (see Australian Archives n.d.: 1). These changes are crucial in understanding the definitions and changing documentation of the register. There were a number of records that needed to be compiled by the Collector of Customs, and these records were slightly different for each Australian port (Australian Archives n.d.: 2). Customs House Registers are one of the best sources for certain vessel design characteristics. The registers exist for all major ports and original documents are available in the state of origin. Some other states hold most of these registers on microfilm. The *Eliason Index*, a two-volume index to these registers, has been compiled by Andrew Eliason (1992a, 1992b) and was used as a first point of reference. This was mainly for gaining index numbers, due to the large number of vessels and the order of the two volumes. Certain registers are noted as absent from these indexes, namely any references to registrations at Geelong (Victoria) before 1855, any at Warrnambool, or Port Albert (Victoria), Brisbane (Queensland) and Fremantle (Western Australia) before 1856, any from Albany (Western Australia), Hobart (Tasmania) before 1855 and Launceston (Tasmania) before 1846 (Eliason 1992a: 4). To some extent these have been augmented by references to Australian and foreign Customs House Registers mentioned by Ronald Parsons (in almost all of his publications).

As with most Customs House Registers for shipping in other nations, individual vessels are often registered in many different registers at different

times. One of the advantages of these records over other registers is that the fate of the vessel, and the time and place of the wrecking or abandonment is often recorded. This allows for greater insights into whether the vessel was wrecked, scrapped or abandoned. These documents are especially important because of the nature of shipping in Australia. As Sexton (1992: 33) notes, most vessels on the Murray River were not built to Lloyds' Rules, and therefore were not included in Lloyds' Register. Customs House Registers are therefore arguably one of the best official documentary resources available for research.

There are, however, some limitations with this source. One problem is that there are inconsistencies in recording details of hulks. For instance, in some cases customs house registration was delivered up upon hulking, and in other circumstances, vessels continued to be registered as hulks. Where a vessel was removed because it was hulked, the date of the close of the register becomes a minimum date for the abandonment of a vessel – the real date may be substantially later. It is also important to note that they are only periodically “purged” of vessels that are no longer registered or in existence and that this may be done at a time quite removed from the date of the abandonment of a particular vessel. Such a purge for instance, occurred to the Hobart Customs House Register on 30 June 1872 (Broxam & Nash 1998: 176). Also, if a vessel is hulked and a register is renewed it often coincides with the reduction in the details of a vessel, and the obscuring of the design elements of its construction. This is only remedied by looking at existing previous registers. Any changes to the fabric of the hull after hulking are unlikely to be reflected in subsequent historical literature because of the withdrawal of the status of the vessel as a sea-worthy and insurable vessel of commerce.



Other problems associated with the Australian Customs House Registers include:

- The replication of number-in-year between vessels, where two different vessels are ascribed the same numbered register for the same year;
- The lack of recorded official number (generally before 1854, but also left out on some later registers), and;
- Out of sequence registration pages, causing problems in the location of the documents, especially when microfilmed (Eliason 1992a: 1).

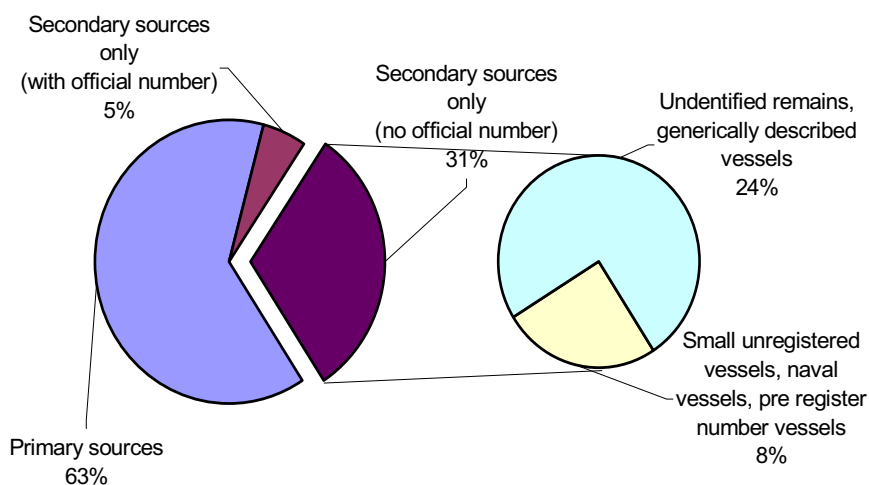
Other problems noted by Farr (1969: 14) are that such records often contain a large number of errors, such as mismatched rigs to masts and types of vessels, confusing the accepted nomenclature.<sup>7</sup> Where possible every separate register for each vessel was sighted to achieve some understanding of the evolution of that vessel over time.

Nevertheless, besides annotations regarding the fate of the vessel, modifications to the vessel, ownership details and changes, Customs House Registers provide details on the last date of registration, which can be a guide for the date of abandonment of a vessel. Although the abandonment or demolition date of the vessel is often explicitly stated in these documents, frequently a registration may be cancelled upon the vessel being hulked (in which case it may still be used for many years), or the register can be cancelled decades after the disappearance of the vessel from trade. This may be due to a late notification of a withdrawal, or the product of a specific investigation into a vessel not renewed for many years.

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<sup>7</sup> One Customs House Register of *Jackal* (Sydney: 88/1855) for instance lists the vessel as a one masted barque. For this entry details pertaining to rig were ignored due to an obvious error in recording the details of the vessel. Another vessel, *Why Not* is listed as a sail vessel, but is also recorded as having no masts, and is listed as a barge (Sydney: 4/1880).

About 63% (978 vessels out of 1542) of watercraft in the ANAVD had primary source documentation located during the period of data collection. Of the remaining 564 vessels only 14% (79 vessels or 5.1% of total) had official numbers and therefore should have had locatable Customs House Registers (official numbers on these records were only used uniformly after 1854). Of the 485 vessels (approximately 31.4% of total) without known official numbers (either without official numbers or unknown official numbers) at least 25.2% (122 vessels or approx. 7.9% of total) were either unidentified (often found during the fieldwork for this study), or were generically described vessels (for instance unnamed barges) where there was very little chance of locating primary source documentation. The 363 vessels left over (74.8% of vessels without official numbers or 23.5% of total) tended to be small vessels, not normally registered, early vessels operating before the Customs House Registration system or naval vessels (not registered in the same way as merchant vessels) that were abandoned upon decommissioning and not sold into merchant service.<sup>8</sup> These statistics are represented in Figure 5.1.



**Figure 5.1** Synopsis of types of documentary evidence used as aggregate data in the ANAVD (percentages rounded to nearest whole percent)

<sup>8</sup> Parsons (1991a: 265) also notes in the case of the vessel *Sir William Molesworth* that, “No official number [was] issued, which suggests the vessel was used as a hulk from its first register in Melbourne”.

With the exception of the obviously abandoned vessels found during the study and currently without historical documentation - all vessels in the ANAVD had between one and forty-three references, each entered separately into the bibliographic field in the Harvard system with a corresponding code (i.e. the reference "Loney 1991" might have a "\*1" accompanying the reference). This code would then correspond with the information from that source entered into the record of a particular vessel. In this way complementary, contradictory and absent information could be tracked in relation to all references for a particular vessel showing matching historical information between sources, and illustrating how the gaps in this information were filled in. This system was adopted from one pioneered by the Victoria Archaeological Survey (VAS) in the 1980s (see for instance Foster 1987b, 1988, 1989b, 1990; Jordan 1995).

### **Institutions Visited**

During periods of fieldwork a number of research institutions were visited. In some cases states were visited more than once in order to take advantage of opportunities not directly associated with this study, or to exploit funding that was obtained at a later date. In order to plan and make the most effective use of time during fieldwork, regions of activities were defined before each research phase, and amended according to subsequent data obtained in the field. Over 140 separate abandoned watercraft sites were visited and inspected. The degree of detail in recording that was carried out varied due to the time allocated to travel throughout a given state, the number of sites to visit in each state, and other research priorities. In many cases the locations of sites were already known through information provided by various heritage agencies and avocational societies. In some cases areas suspected of having vessel remains were searched, and under other circumstances searches for unlocated sites were undertaken.

As part of this research a range of research institutions throughout all states of Australia and the Northern Territory were visited. These institutions were visited primarily in an attempt to compile a more accurate and extensive understanding of the construction, fate and technical details of the abandoned watercraft. While this was done primarily through the appraisal of primary and secondary historical sources, it was corroborated with information from museum interpretation.

Below is a state-by-state synopsis of the research institutions visited. Outlined are the useful resources, as well as those found to be of no use so as to provide transparency regarding the amount of research undertaken, and to assist future researchers. The individuals and organizations that helped facilitate this research have already been noted in the acknowledgements.

#### *Northern Territory*

In the Northern Territory six institutions were visited. The first location was the archives of the Maritime Heritage Section of the Museum and Art Gallery of the Northern Territory (MAGNT) and their library. This allowed for the augmentation of the study data with more thoroughly researched information and the expansion of Museum archives with possible historical candidates for future archaeological finds. The Library of the Northern Territory University (NTU) was found to be the best source for material on general Northern Territory History, and the extensive Archives of the NT branch of the National Trust was useful because of its regional and specific site histories, especially in relation to the history of Doctor's Gully (File Number 6/0368) and numerous sites in the East Arm of Darwin harbour (File Numbers 6/0319, 7/016, 6/0310, 9/113). The NT archives were consulted, but were found to only have oral history transcripts concerning the arrival of refugee boats and "boat people" (Transcript Nos 598, 666 and 907). The NT Heritage Branch was also consulted but was not of any assistance. In light of the

general lack of published and unpublished literature specifically relating to deliberate vessel abandonment in this region, the NT Library was used mainly for its extensive photographic database, which revealed new areas of ship breaking. The library was also useful for its material on Darwin's artificial reef programmes.

### *South Australia*

As South Australia is the location of the author's previous studies on ship abandonment, and home state, easy access to collections over a longer period of time allowed for a comprehensive picture of deliberate ship abandonment in this state more than any other. The research institutions visited numerous times during the study were the State Library of SA (specifically the Mortlock Library of South Australiana), the State Records Office, and the SA branch of the National Archives of Australia. These institutions held the main sources of historical data for the national study, especially in relation to the collection of *Lloyds' Register of Shipping* and the *British Register of Australian Shipping*.

There were two sources of existing archaeological data pertaining to the abandoned vessel resource in South Australia. In particular, previous work carried out by the Department of Archaeology at Flinders University was pivotal in the commencement of the study. Another resource accessed early was the archives of the Maritime Heritage Unit of the government heritage agency, Heritage South Australia. Additional archival information was also obtained from work carried out by the Port Adelaide Historical Society and the archives of the Society for Underwater Historical Research (SUHR). Many museums, including the Morgan Museum (Morgan), Penneshaw Maritime and Folk Museum (Penneshaw, Kangaroo Island), and the Kingscote Museum (Kingscote, Kangaroo Island) either allowed access to their research collections, provided leads regarding other locations and sources of archival information, or local experts.

### *Tasmania*

Research in Tasmania was concentrated in the archives of the Tasmanian Parks and Wildlife Service, which held an extensive collection of information on many vessels in the ANAVD, and also held a referenced photographic collection. Another major source of research were the images and archives held in the Maritime Museum of Tasmania, Hobart. Of special note was an index (cited for the purposes of this thesis as the *Broxam Index*) researched by historian Graeme Broxam comprising of vessel specifications. Information was also sought from the Archives Office of Tasmania, the Hobart Office of the National Archives of Australia, and the Tasmanian Museum and Art Gallery.

### *Queensland*

Queensland was noted for its general lack of easily accessible archival material. The Fryer Library, in the University of Queensland Library was found to have no relevant historical records relating to the vessels listed as being abandoned in Queensland. This was also the case for the State Reference Library (part of the State Library of Queensland). In a few cases tourism literature was found to be of use.

In Southern Queensland, the Queensland Maritime Museum was visited in order to examine materials held by them that were once a part of some of the abandoned vessels in the region. Its library was not available due to funding and staffing constraints at the time of the visit.

Access to material by the Maritime Archaeological Association of Queensland (MAAQ) was made via three separate avenues. Material was made available at the archives of the Maritime Heritage Unit in the Queensland Museum in

Brisbane (now at the Museum of Tropical Queensland in Townsville), and through the collection of newsletters and correspondence of the society held at the John Oxley Library of Queensland History (in the State Library of Queensland). MAAQ member David Bell also provided research on the Bishop Island Ships' Graveyard.

In Northern Queensland, due to the almost complete absence of substantial or reliable historical sources, wider queries were made. Enquiries made to the Cairns Port Authority, however were of no assistance due to the authority's resistance to the publishing of information about vessels that had been dumped in the Grafton passage. Investigations made with the assistance of Cairns Historical Society at the Cairns Museum illuminated a few new candidates for dumping and supported evidence of the Grafton passage as the main and current dumping area.

In Townsville the Museum of Tropical North Queensland granted assistance by allowing access to the Queensland Shipwreck Database. The Townsville Maritime Museum was undergoing a major redevelopment during this visit and was not available for research. The History Department of James Cook University (JCU) had a major collection of historical photographs available for public viewing, including photographs of abandoned vessels (mainly those on Magnetic Island) (Photo ID 4064, 4065, 3786, 3877, 3638, 4203). Access was also gained to reports produced at the JCU maritime archaeology field school, which used abandoned watercraft around Magnetic Island as the subject of investigations.

#### *New South Wales*

In Sydney the research was gained mainly from the Vaughan Evans Memorial Library at the Australian National Maritime Museum (ANMM). The archives of the Maritime Heritage Unit of the New South Wales Heritage Office, and

the archives of consultant archaeologist Cosmos Coroneos, and steamship expert John Riley were also major repositories of information pertinent to this study.

North of Sydney, the only research institutions visited that proved of value were the archives of the Newcastle Regional Maritime Museum at Fort Scratchley and the Newcastle Regional Library. Both of these institutions were particularly informative on ships' graveyards and individual sites in their region, while also having much information pertaining to other maritime archaeological sites around New South Wales.

#### *Western Australia*

Due to the small amount of time spent in Western Australia, the only research institution accessed for this research was the library of the WAMM and the archives of the Department of Archaeology at the same institution. This was not, however, a problem due to the large resource possessed by the Museum. Special reference must be made to research files (files 12/92/1, 12/93/2, 12/93/3) much of which contained the extensive, and extremely detailed notes of the late Richard McKenna (files 193/79/1, 194/79/1, and 194/79/2).

#### *Victoria*

In Victoria a range of maritime museums were visited at Queenscliffe, Geelong, Port Albert, Portland and Warrnambool. The only maritime museum that was visited that had documentary material relevant to the study, however, was the Polly Woodside Museum (Maritime Museum of Melbourne), which holds extensive collections of published materials relating to the Port of Melbourne. Additionally, Heritage Victoria held information on suspected abandoned vessels, such as the Pier 35 wreck, which had not been widely publicised. No information pertaining to the vessels recorded as



located in the vicinity of towns along the Victorian side of the River Murray were held by Heritage Victoria due to the fact that Heritage New South Wales has jurisdiction over shipwrecks and related cultural heritage remains associated with the river.

By and large, the most extensive and useful collections of material came in the form of archival material on abandoned vessels in Victoria (especially the Barwon Heads Ships' Graveyard) held by the Maritime Archaeological Association of Victoria (MAAV). Of special note are the collections held by MAAV members Peter Taylor and Malcolm Venturoni.

### **Problems with the Historical Record**

#### *Absence of Candidates in the Historical Record*

By far the biggest problem in dealing with the historical record for a comparative study of this kind was the invisibility of abandoned vessels in the historical record. As Moore (1995b: 3) has commented:

Unlike the fanfare of their launch, the disposal of ships at the end of their working lives was often gradual and received little public attention. If not completely broken up, they were stripped of machinery, scuttled in deep water, whether alone or in marine graveyards. Invariably they faded from sight, their disappearance easily forgotten, unlike memorable shipwrecks.

This is further amplified with hulked vessels. As Bathgate (1979: 39) has commented in relation to watercraft abandonment locations and identification of abandoned watercraft remains in Western Australia, "Because of the large number of hulks used it was impossible to keep track of all of them more so as the names of the hulks often conflict with each other due to nicknames, mispronunciation or the complete lack of use of the original name". This has

an effect on analysis by reducing the numbers of vessels in the study. An additional problem is associated with gauging whether there is a variation in the visibility of vessels reported as dumped over time. It must be acknowledged that there is likely to be some variation for two reasons. Firstly, maritime historians have tended to concentrate more on certain periods of time; and secondly modern records are more likely to exist than older ones.

*Bias in the Definitions of Important Dates in Vessel Use-life*

Since the analysis of the vessel data was dependant on the notation of a time of abandonment within historical records, there was often a problem when trying to determine when a vessel was actually abandoned. This is a problem of the abandoned vessel resource, which distinguishes it from the shipwreck resource (as noted by Kenderdine 1994a: 176, 1994b: 22). Shipwrecks have a definite date of wrecking (whether known or not) while abandoned vessels may sit on shore for many years steadily being reduced.<sup>9</sup> They can also be dragged off for reuse or demolition.

Demolition is an additional problem. While it may be easy to define the time of abandonment when a vessel has been scuttled, it is particularly hard if we consider demolition as a form of abandonment because this process can take many years. Also, although some vessels are abandoned with the intention of never using them again, they may be resurrected. Likewise vessels may be laid up with the intention of using them in the future, but instead rot away.

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<sup>9</sup> To some degree this is also a problem in relation to the date of build of a vessel. Often historical records note a date of build as the day of the laying of the keel, and others note it as the day of launching. This difference of time may constitute years, or cross into subsequent years, and often it is not explicit which date is being used. This has ramifications for any analysis of vessel use-life or any analysis using dates as their main source.

The situation can become further confused if a vessel is abandoned in a floating condition, but eventually sinks, and is later broken up (see for instance Dundon 1997: 175). Whether the vessel is reused or deteriorates may not make a difference to the interpretation of the cause of abandonment. This could lead to the conclusion that the archaeological remains are only useful in ensuring that the historical record is correct and does not need to be consulted for any other purpose.

The definition used in this thesis defines the date of abandonment as the first day of cessation of its final use as a functional vessel. In this way, a vessel that is placed on a slip for demolition is abandoned from the date that it is slipped. Here the onus is firmly placed on the intention of the ship's owner, and clearly where demolition is concerned, the abandonment of use is one of the primary intentions of the shipowner.

The largest problem in the definition of abandonment is in the case of derelict vessels or moored lighters. With such vessels there is often time to carry out repairs (although there may not be the incentive), and they are often beached simply to stop them sinking where they could pose a hazard (see for instance Lellman 1933: 271). In such cases there is a twofold problem. If the vessel is effectively laid up and ceases to function in its normal sense, and then some years later is beached and stripped, when is the date of abandonment? How is this different from the vessel being laid up, and then returned into service some years later? In this sense, the laying up of the vessels is even more significant than the eventual abandonment or destruction of the vessel. As such, the problem can only possibly be remedied by in-depth investigation of each individual vessel, something not possible given the period set aside for this study, and the large size of the dataset.

*Ambiguous Language Concerning Vessel Fate*

The filtering of candidates for analysis required that vessels correspond to a checklist of requirements confirming that they were abandoned rather than wrecked. The biggest problem with this was the ambiguous language used by maritime historians and writers in reporting a vessel's fate and the method of disposal. While problems with the misrepresentation of vessels as being dumped when they were indeed wrecked would skew subsequent analysis, the absence of an abandoned vessel would likewise diminish the comparative accuracy of any discussion of trends in the data. This was largely remedied by having an understanding of the style of a particular author in how they went about describing the historical circumstances of a vessel's fate. For instance, Mike Richards' (1997b) interpretation of abandonment seems to include vessels that were left after a catastrophic occurrence or accident where the vessel was not submerged, but remained visible at a later date. Such a description undoubtedly fell under the category of a "consequential abandonment" (see Chapter 1) and could therefore be excluded easily. In other cases the story was not so easy to decipher and sometimes the reported fate in Customs House Registers was simply wrong. For example, even though the final Customs House Register for the vessel *Westralian* (Hobart 4/1923) cites the vessel as "no longer in existence (wrecked)" the remains of this vessel are however, attested to being in the Otago Bay Ships' Graveyard in many other sources, a story confirmed with measurements taken of the reputed vessel by the author during fieldwork in Tasmania for this thesis.

Many of the problems associated with the determination of whether a vessel from maritime historical literature was indeed abandoned is the language involved in reporting the fate of a vessel. Vessels noted as "abandoned as a wreck" had to be disregarded due to possible catastrophic implications in their fate (see for instance Parsons 1982b). Other more difficult notations were, "burned at sea". While this may be due to an accident or mishap at sea

that constituted the catastrophic loss of the vessel, it could equally be construed as the deliberate burning of the vessel at sea. Such language is common, and it is difficult to understand the intention of such phrasing, being based on assumptions of a particular author's predilection to use the word "accidentally" or "deliberately".

A good example of this can be seen in some of Jack Loney's publications, but particularly in volume three of his *Australian Shipwrecks* series (1982) where there are constant references to, "Some vessels Abandoned or Believed wrecked beyond repair, subsequently salvaged". The use of such language makes it impossible to determine from such secondary sources whether they fit the criteria for entry into the ANAVD. For this reason the entries listed there have been ignored, due to the lack of information contained in the entries and the lack of credibility in relation to deliberate abandonment.

Even more complex are notations that a vessel was "allowed to sink" because of the implications this has for the notion of time (see for instance Richards, M. 1996: 54). An obvious question where this is present may be, "is the abandonment date the date of sinking or the date from which it was allowed to sink"?

#### *Ambiguous Method of Disposal*

There was a clear ambiguity about how vessels filtered as abandoned for the inclusion in the ANAVD were discarded. This had marked effects in determining the possibility of there being *in situ* archaeological remains in the present day worthy of investigation, and therefore influenced the sites that were sought out for inspection. The use of terms such as "demolished", "dismantled", or "broken up" in the historical record although implying that a vessel was so extensively salvaged that there were no remains left, is deceiving. There are some cases where vessels fitting this description have

been identified as still existing in the archaeological record, often with a high degree of structural integrity. Mike Richards (1997b: section 13), for instance, noted that “broken up” actually means that all useful equipment was removed and also maintained that in 1907 it was not possible to “cut up an iron hull”. Others have made reference to inconsistencies where the word “dismantled” is concerned. Nutley and Smith (1999: 20) noted that the vessel *Myall River* (built 1912), according to oral history, was burnt by youths, even though it was cited in its final Customs House Register as having been dismantled and broken up. Vagueness in relation to the method of disposal can also appear to indicate deliberate abandonment, but in the absence of other corroborating evidence can equally be describing the aftermath of shipwreck (see Dundon 1997: 239). While the admission of the dismantling and abandonment may appear to be an indication of deliberate abandonment, the notation of it “ashore” can equally be seen as an indication of a catastrophic or wrecking event.

One major problem encountered in the research was references to vessels abandoned on the River Murray. Many of these vessels like *Alexander Arbuthnot* had been abandoned, but have since been raised and restored due to a recent trend to incorporate historic vessel remains into new tourist vessels (Phillips 1974: 128). Similarly preserved vessels pose a problem. While they have been abandoned from the context of use, the possibility of future restoration and remains.<sup>10</sup>

### Archaeological Research

The archaeological component of this research concentrated on two areas, the location of ships’ graveyards and vessel dumping sites, and the investigation of the logistics of the abandonment act and salvage. To a lesser degree there

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<sup>10</sup> For this reason vessels such as *Richmond* and *Florrie* that have been mentioned in other works (see Richards, M. 1997b: 35) are excluded from this study.

was an attempt to see sites as a component of the landscape in order to understand the evolution and use of places as abandonment areas, and to compare their location with associated infrastructure and other abandonment areas (expanded in Chapter 7). On this last point, walking the ground and understanding the current nature of the sites was pivotal to understanding their place in the landscape. The position of a vessel in relation to other aspects of its setting, such as navigable waterways and adjacent industry or land use shed light on the reasons for the formation of ships' graveyards.

The focus of the investigation was to visit as many sites as possible, while at the same time visiting sites that reflected the different types of abandoned vessels uncovered by the historical research. In this way it was hoped to visit ships' graveyards and individual abandonment sites, as well as investigate sites that reflected distinctive post-abandonment uses. Likewise a wide variety of environmental conditions were experienced, ranging from deep water to intertidal sites. Due to issues of access, the majority of sites visited were in this latter category.

Site inspections were carried out in conjunction with archival research and consultation with state cultural heritage management agencies. In some instances vessel remains were found that had not been previously discovered in the historical record (as indicated in the previous chapter). While these instances were few, attempts were made to then either extract this information from ANAVD entries that had not been married to archaeological remains, or seek supplementary sources to the database in order to confirm the archaeological remains as an example of a deliberately abandoned watercraft, and integrate the vessel into the ANAVD for subsequent analysis.

The finding of such remains also indicates the incompleteness of the historical record, and the absence of a comprehensive history of many of the vessels. In

the latter case it was found that some vessels that would have been excluded because of a lack of information regarding their fate needed to be added to the ANAVD, and a proportion of vessels excluded during the first stage of historical filtering actually belonged in the study.

Where sites were inspected a range of sources, relating to a variety of methods of construction and type of vessel were used in the appraisal of the archaeological remains.

- Paasch's *Illustrated Marine Dictionary* (1997) [1885], and *From Keel to Truck* (1978) [1901];
- Thearle's *The Modern Practice of Shipbuilding in Iron and Steel, Volumes 1 and 2* (1891; 1902);
- Chapelle's *Boatbuilding: A Complete Handbook of Wooden Boat Construction* (1941);
- Pursey's *Merchant Ship Construction: Especially Written for the Merchant Navy* (1942 and 1959);
- Walton and Baird's *Steel Ships, Their Construction and Maintenance: A Manual for Shipbuilders, Ship Superintendents, Students, and Marine Engineers* (1950);
- Stokoe's *Reed's Ship Construction for Marine Engineers* (1968);
- Eyre's *Ship Construction* (1980) and;
- Barabanov's *Structural Design of Sea-going Ships* (n.d.).

Despite discrepancies between texts, they facilitated the creation of a comprehensive understanding of marine nomenclature for the purposes of classification in the study, as well as an understanding of the history and reasons for changes in the technology of shipping and shipbuilding.




Site inspections were made by either diving on the archaeological remnants of watercraft, or by accessing them at convenient tides if in an intertidal situation. In the case of beached vessels work was often carried out by a combination of wading, snorkelling, and diving, depending on logistical factors. In both situations recording was predominantly made through diarised observations and photographs, or by site measurement and detailed site description. Detailed site inspections recorded many separate attributes of the archaeological remains, including:

- Spatial co-ordinates;
- Environment description;
- Dimensions;
- Evidence of propulsion;
- Construction details;
- Scantling dimensions;
- Exposure at tides;
- Orientation;
- Signatures of discard;
- Description of salvage activities, and;
- Intactness.

All details were entered onto a two page standardised form (see Figures 5.2 and 5.3) in a similar manner to that employed by Milne *et al.* (1998) for recording abandoned watercraft on the Medway River, United Kingdom. At the conclusion of the site inspection phase of research, over 120 separate beached and submerged abandoned watercraft had been visited (true numbers are hard to determine due to the disarticulated nature of some remains).



<b>VISIBLE REMAINS</b>	Date: _____	Orientation:									
Site: _____											
Recorded By: _____											
** mark features, sampling locations, signature locations and photo shots **											
Approximate Scale:											
<b>LEGEND:</b>											
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**Figure 5.3** Back (page 2) of the *Hulk Record form* used to record the archaeological remains of abandoned vessels during site inspection

## Analysis

Once the candidates were chosen (and excluded) for inclusion in the study (see Chapter 1 and exclusion criteria above) all historical and archaeological information was merged into a relational database, the major tool in the investigation of deliberate abandonment for this research. From this database, a range of quantitative monochronic and diachronic analyses based on vessel use-life and watercraft construction details and a number of qualitative abstractions were made. These deductions form the discussions and conclusions of this thesis (see Chapters 6 – 10). The relational database used for this study was *Microsoft Access 2000*. While the relatively inexpensive cost of the software was a major reason for its use, it was also chosen due to previous experience, the relatively easy nature of Sequence Query Language (SQL) programming, and the compatibility of SQL based databases with other Microsoft applications, and *ESRI Arcview* GIS. A database was chosen as the major tool for analysis in this study due to its facility as a tool for classification, and a means of compiling historical and archaeological findings in such a way as to create complex and extensively cross-referenced queries. Databases for the management and recording of archaeological or historical data have come a long way from the days of using *Minark* software. The use of databases has mainly been used for the compilation of the historical resume of a vessel, and not for the analysis of comparative data. Databases have, however, also played an increasingly major role in comparative studies, with examples from Australia (see for instance Foster 1987b, 1988, 1989b, 1990; Jeffery 1989, 1992; Coroneos 1991; O'Reilly 1999, and Doyle 2000), and overseas (see Corbin 2000).

A relational database, rather than a simple spreadsheet of tabulated data, was established due to the power of their cross-referencing and detailed query functions. Additionally it provided a way of allowing marine nomenclature to become aspects of tables, and turn terms and definitions into categories

that can be used for analysis. By pre-defining variables the number of keystrokes is also substantially reduced and mistyped terminology cannot be integrated into the subsequent examination of the data.

The creation of this database and appropriate fields is justified on the following basis. McGrail (1998: 5) has described how attributes or structural elements of watercraft reflect cultural differences, and therefore have cultural significance, and that in order to assess these differences an analytical scheme as a form of systematic classification needs to be established. Such a system allows for a perception of the remains of a watercraft as a three-dimensional object, while outlining choices in raw materials and manufacturing technique. From these statistics it is then possible to draw certain conclusions about the culture that created them. Although McGrail's study concerned ancient boats in North-West Europe dating before 1500 AD, and dealt exclusively with archaeological remains, it is the same premise that has been applied in this study, albeit concentrating more closely on the accumulation of a database extracted mainly from historical sources. In this research the compilation of a database was seen as the main way of compiling a useful schema for classification.

The compilation of this database basically started from scratch. Previous work done in the compilation of data dictionaries used in conjunction with shipwreck databases is not widely published, and those that were available were inadequate for describing abandoned watercraft, and separating them into meaningful analytical categories. Examples such as that published by Lorimer (1988a) (the "Lorimer Variables") do not reflect a system that can be easily adapted for the useful quantitative analysis of vessel related data, irrespective of whether it represents wrecked or deliberately abandoned vessels. This is due to issues concerning how appropriate and relevant

variables for analysis are determined (as commented by Green & Vosmer 1993: 33; Edmonds *et al.* 1995: 78-86).

For purposes of analysis, the ANAVD was separated into “thematic sections” with fields pertaining to a particular aspect of historical background, abandonment phenomena, or focus of research enquiry. The fields within the database are listed and described in Appendix 2.

### **Problems with Analysis**

A number of problems were encountered in the analysis of the ANAVD data. In most cases this was due to the changing nature of the documentary sources consulted. These problems can be separated into four main types. The first concerns the nature of the dataset, and its temporal distribution (and representativeness). The second concerns the discrepancy between how values attached to ship design, such as dimension and tonnage over time and between nations has been deduced, and how these differences can be integrated into databases. The third concerns the imperfect nature of marine nomenclature itself, and the fourth concerns the nature of databases, and their limitations in the analysis of temporal objects, such as watercraft.

Another minor problem was that some geographical changes had ramifications for categorisation. For instance Portland, which is now a part of Victoria was established before Victoria as a state was set-up and was a part of New South Wales. For this reason watercraft abandoned in Portland before the establishment of Victoria should conceivably be included in an analysis of New South Wales abandonment trends. However, the decision was made that this should be included in Victoria data due to the importance of spatial aspects in watercraft abandonment.

### *Distribution of Dataset*

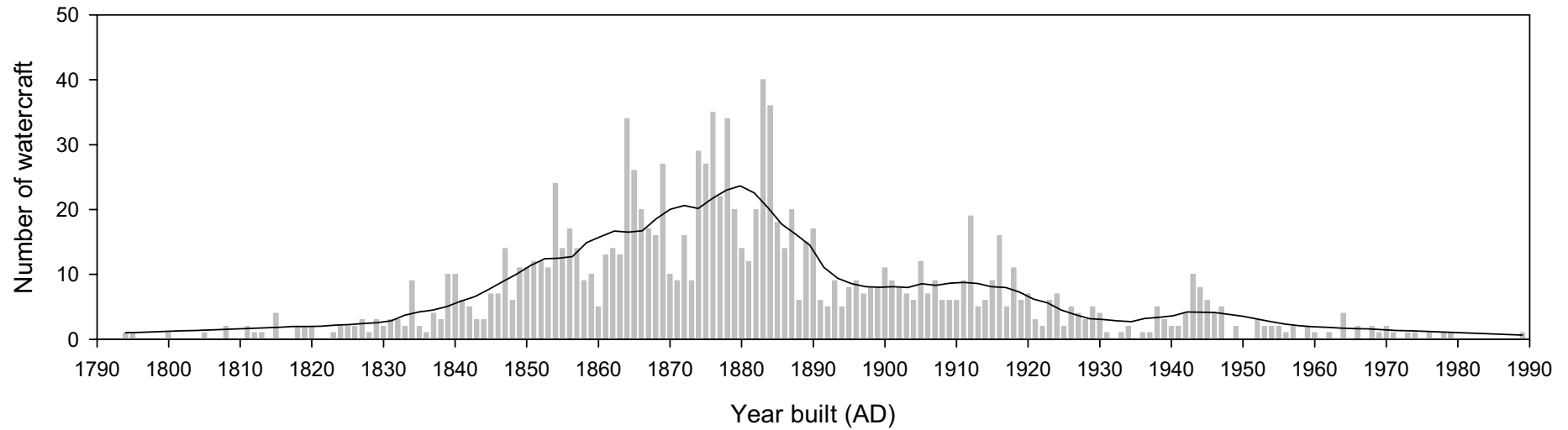
Figure 5.4 clearly shows that the temporal distribution of the dataset is extremely uneven. This is especially obvious in the early, and in the later part of the dataset. This is because early references to abandonment may not have been recorded in historical literature, or may not have been as copious in both of these periods. Which case applies to which particular time, could not be determined, although it is suspected that a lack of reporting can be cited in the case of early abandonment activity, and a lack of candidates may be accountable for the lack of reported cases in the later part of the dataset.

### *The Definition of Numeric Values*

Changes in the methods used in vessel classification are a substantial problem of a complex nature. This is especially relevant in relation to the size and burden specifications of a vessel over time and between nations. Although tonnage is supposed to be a measurement of cargo capacity, the calculation of tonnage is not a simple one, and has its own history and as Jones (n.d.: xiv) has commented on tonnage values:

This figure is not reliable. It was based on involved and changing calculations, reviewed from time to time. The Registers and the certificates of registration may differ for no good reason. Tonnage would change if a ship was altered, re-built or re-surveyed.

Methods for tonnage deduction have changed and evolved considerable over time according to a diverse array of formulae. The history of these changes and the range of formulae used in tonnage deduction will not be discussed here at length (see Appendix 3).



**Figure 5.4** Temporal distribution of abandoned watercraft in ANAVD by year of build (1790 - 1990) (n=1254)



Variations in such systems are however important to note, because a particular formula used at a certain time and by a particular nation or port, and cited in a particular shipping list or register may be quite different from the same vessel registered somewhere else at a different time. Not understanding the complexities of how tonnage is deduced has other consequences. This is obvious when relying upon maritime or economic histories discussing long periods of time and relying upon shipping tonnage data for analysis.

Historians such as Ville (1989, 1992: 62-63) have commented upon these difficulties in relation to the earning ability of shipping dependent industries during the late eighteenth and early nineteenth centuries. While this is given, the job of deducing the method for the obtaining the tonnage of all 1542 vessels contained within the ANAVD would have been an awesome task.

It should also be said that the deduction of true “cargo capacity”, often considered as distinct from registered rates of tonnage is nearly impossible for a database of this size. For this reason, the basic assumptions have been made, which pertain to the normal way the majority of the vessels registered (mainly through Lloyd’s register) had their tonnage values deduced. As a quantitative analysis needed to be undertaken, and the fields to be compared had to contain consistent data, it was taken for granted that the tonnage recorded in the gross and net tonnage fields would at least be an *approximate* indication and fairly accurate indication of tonnage which would be meaningful for analysis. For the purposes of the analysis of tonnage across time, and in dealing with such a large dataset, attention to the tonnage of individual vessels will make little difference to reaching conclusions about trends in shipping and abandonment.

The value of approximate measurements is also the case with the other dimensions of vessels, especially in relation to breadth and depth (see

Appendix 3). This is due to the possibility that moulded dimensions (measurement of the inside curvature of a vessel) has been used instead of an “extreme” measurement. In such cases, an artificial increase in a particular vessel dimension is produced. While depending on historically communicated vessel dimensions are admittedly fraught with error, for the purposes of analysis, all three main dimensional measurements cited in the ANAVD were treated as the greatest dimensions of “Length Overall” (L.O.A.), “Breadth Extreme” (B. Ext) and “Depth Extreme” (D. Ext). This system was consistent with modern methods of analysis (see Stokoe 1968: 9-10). This is not in line with the system of deducing vessel dimension in Australian Customs House Registers (Sexton n.d.: 6-7).

Approximate vessel dimensions were found to be meaningful for the purposes of analysis. Aspects of vessel nomenclature, however, did create challenges when attempting to determine field names for the purposes of quantitative analysis.

A more minor problem with using numeric data for comparative analysis comes from the tendency of authors of secondary sources to round tonnage values up or down to the nearest whole numbers. With a large dataset, the inevitable effect is a slight distortion of values across time. When tonnages from primary sources were entered into the ANAVD, they were treated as complementary with the secondary source tonnage notations if they were within the range of the rounded number (i.e. a variation of up to one unit).

#### *Inconsistencies in Nomenclature*

Often it was difficult to reflect the changing nomenclature of a vessel in the relational database so as to facilitate meaningful comparative study. There are certain instances where a particular type of design, noted on some historical records, may indicate a unique design, or one including another

design. For instance, in an analysis of the head type of a vessel it appears as if there are substantial inconsistencies in descriptions. While it may be possible that a vessel may have a clipper bow, with a figure head, some sources such as Australian Customs House Registers will traditionally only use one descriptive term. When a statistical analysis is done, “clipper bow” is understood as distinct from “figure head” and is analysed as such. Some of this problem is that where an item such as “figure head” is included, the vessel’s head type accompanying the figurehead is not noted in the historical record. Another example, such as the build and description of river vessels, is problematic, as although they are sometimes described via normal maritime-related descriptive terms, they are more often classified by a system outside of those used in categorising vessels. Often this means that only the broadest aspects of their design can be compared with ocean-going vessels.

#### *Databases and Changes in Ship Design*

While databases are a powerful tool for the compilation and analysis of historical data, they have problems in relation to the comparison of historical data across time. This is because the main sources of information exist as a “snapshot” of the details of a particular vessel at any particular time. While it is possible to make databases more temporally flexible by the inclusion of multiple fields for each aspect of a ships’ design, this is often not practical. This is sometimes due to the often diverse, and changing nature of individual ships and their environment, and inconsistencies in the historical record - especially when comparison of vessels is attempted.

## CHAPTER 6

### Watercraft Abandonment in Australia: National Perspectives

*The ships have gone, their age is past. The sea has taken most of them herself. In some quiet by-way of the sea's waters we may find a hulk careened on a bank by the tide which has deserted her, and find, despite all infirmity of age, a beauty of form and line that holds us and constrains us to search, to spell at last from letters nigh effaced by tide and by wind, and by the relentless erosion of time, a name once famous in a hundred ports (Cunningham 1988: 8-9)*

## CHAPTER 6

### WATERCRAFT ABANDONMENT IN AUSTRALIA: NATIONAL PERSPECTIVES

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#### Introduction

This chapter is concerned with the nature of watercraft abandonment in Australia from a national perspective. The discussion that follows is a synopsis of the research from the broadest geographical and temporal perspectives. To begin with this chapter will describe some of the forms of cultural constraint, in the forms of legislative and other regulatory frameworks that relate to the formation of watercraft abandonment sites and ships' graveyards. These frameworks can be understood as the bureaucratic background to ship discard behaviour. In particular attention is focussed on the role of cultural constraints arising through bureaucracy on the types of vessels that end up in ships' graveyards and the location of these dumping areas. Generally these systems can be seen as both passive and active, by either directly affecting ship abandonment or indirectly having an influence on the formation of sites. While technological changes must also be acknowledged as playing a role in general societal change (as well as discard trends), they have not been included here because of the inability to estimate general rates of technological change (see Chapter 2). Accordingly the influence of technological change is not reducible to a form appropriate for quantitative analysis – and an attempt at this is seen to be substantial enough to constitute a thesis-length discussion of its own.

Hence this chapter concentrates its analysis onto the degree of correlation between nationally significant economic and historical events and trends in

watercraft abandonment. All too often statements such as, "At selected points outside both Sydney and Port Phillip Heads lie scores of ships which outlived their economic lives or were replaced by more modern vessels" (Loney 1980: 86) are made concerning the reasons for the abandonment of watercraft. This illustrates the tendency in the archaeological and historical literature to examine deliberate watercraft abandonment simplistically. Normally it is expected that the main reason why a vessel is abandoned is because it has become either "nail sick" (worn out), economically redundant or technologically obsolete. Often the assertion that a vessel is abandoned for any one of these reasons seems sufficient cause not to warrant further investigation into the cause of its discard. Commonly vessels are said to end up in ships' graveyards because they had outlived their economic life, were not worth repairing, or were being replaced by more modern vessels (see for instance Loney 1991: 138). While all of these reasons are true, they do not tell us the full story; what were the factors that led to the decisions that these vessels were no longer needed?

### **The Bureaucratic Background to Abandonment in Australia**

At any given time a vessel can be seen as existing within a number of passive and active systems of cultural control and constraint. These systems can be seen in relation to the historical development and the existence of certain bureaucratic and administrative agencies and committees. To some degree the historical development and transformation of these organizations are also a part of the changes to the history of ship abandonment. These agencies can be fundamentally broken into two groups: government/quasi-governmental, and international regulatory. The first category is mainly represented by government ports/harbour and marine agencies. The second category is marine underwriters, whose function is linked with marine insurance underwriting. Both kinds of control exhibited by these organizations are

similar, however, and are predominantly concerned with dictating standards in marine construction and engineering. Historically there has been a high level of cooperation between such agencies. This is because their requirements are often based upon the same fundamental principles of engineering and shipping safety (Wilson 1974: 195).

### **Passive Controls and Vessel Abandonment**

Passive or indirect forms of cultural constraint are generally not directly connected with the processes of vessel abandonment. Instead they are the systems that have pre-defined many of the features of watercraft abandonment sites. By and large they can be viewed as political and economic frameworks concerned with the appropriate design and use of watercraft that have ramifications for how the archaeological sites have formed. These systems in an archaeological context are exceedingly important to understand as they pre-define the types of vessels that end up being abandoned. In this manner passive aspects of control are purely pre-depositional. Passive forms of cultural constraint are many, and vary greatly from nation to nation, region to region. While there are some international systems that can be seen to have had an impact on the abandonment of watercraft, the effect, or the degree to which they affect such behaviours varies from nation to nation. These passive forms of constraint can be seen to have an effect on the *disposal* of vessels simply due to the fact that they have an effect on the *use* of vessels. Indeed, the purpose of such regulation, it can be surmised is primarily for the use of vessels.

#### *Legislative and Regulatory Passive Controls*

Passive controls tend to be legislative and regulatory. There are many forms of bureaucratic and legislative cultural constraints that have affected the process of ship abandonment in Australia, and this section will not provide an

exhaustive list. As will be noted in the following chapter, every change in policy, with its associated economic ramifications will flow onto the abandonment trend. Various legislative controls, some that emerged from within Australia, and others that were imposed because of the Australian association with the political and economic clout of the British Commonwealth (as well as other external powers) are worth noting.

#### *Examples of Internal Passive Control*

Internal passive controls are numerous, and are often highly regionally specific, so only a few examples will be cited here. Orders by Governor Hunter from New South Wales in the 1820s forbidding the building of boats for private purposes and the ordering of all existing boats to be registered (Bach 1976: 71-72), for instance can be seen as restricting the types of vessels built. This had an effect on the types of vessels operating, and therefore those eventually needing to be abandoned. Another example of was an amendment to the Tasmanian *Marine Boards Act* in 1874, which saw half-yearly inspections of all steam vessels operating in Tasmania enforced (with a certification cost of one guinea per inspection). Standards, such as mandatory safety valves on boilers were brought in, and operators forced to comply. By 1878, compliance with these orders was starting to cut into the profitability of the running of the vessels (Hudspeth & Scripps 2000: 48). The first series of mandatory barge inspections in Tasmania as defined by classification procedures and enshrined in regulation was in 1926. These vessels needed to be slipped every twelve months and fitted with life buoys and compasses.

The introduction of all of these regulations would have a major impact upon the trade in their respective regions, and undoubtedly brought about increased costs to ship operators. Such events ultimately would have caused an increase in the identification of unseaworthy vessels, and also would have



limited the volume of shipping in a region. The economic effect of such small changes may have ended in the increase in the abandonment of vessels coming under survey requirements after this date.

#### *Examples of External Passive Control*

External controls have had a much more marked effect on abandonment trends in Australia. British legislation, in particular, had major ramifications on the type of commercial activities that could be carried out in the Australian colonies. The earliest and most obvious non-Australian legislative arrangements to have an effect on abandonment are the British Navigation Acts. The early Navigation Acts were important because they established a monopoly on eastern trade for the East India Company, which in practice meant that no Australian colony could build sea-going vessels until 1819. While this monopoly was limited in 1813 and concluded in 1833 it was not until 1 January 1850 that the British Navigation Acts cease to function (Bach 1973: 6). Before this time the British Empire reserved all internal routes within its boundaries, including the Australian coastline (Broeze 1975: 583). The repealing of the Act brought about commercial advantages for the Australian colonies by abolishing the East India Company's monopoly on trade once and for all, and opening up (in 1854) the coaling trade of Britain to foreign shipping (Bach 1976: 58, 133). Blainey's comments on the effect of the Navigation Acts show just what effect they had on Australian trade and abandonment. In particular he refers to the restrictions placed on Australian shipowners in relation to the salvage of foreign shipwrecks. For this reason, when Benjamin Boyd bought the dismantled French whaler *Bourbon* (around 1847), his options were limited to selling the vessel in an Indo-Chinese or Arabian port. Because of the distance, the vessel was instead employed as a coal hulk (Blainey 1974: 176).

A number of other legislative arrangements have instituted limitations and restrictions on the pursuit of commerce on the seas, and the vessels that can be used in Australia. Definitions and guidelines within the British Shipping Acts, of which there are at least thirty since the introduction of the first *Merchant Shipping Act* in 1894 (Cockcroft 1983: 328) have controlled, and to some degree shaped commerce on the sea, and therefore have had some input into the formation of vessel related archaeological sites. The British *Merchant Shipping Act* of 1892 in particular was a constraint on the powers of the Australian states until 1986 (Castles & Harris 1986: 151). British legislation was pivotal to the nature, structure and profitability of Australian maritime trade. It can therefore be seen as an important factor in dictating trade volume and trade partners, as well as influencing shipbuilding, and ship owning in that period. Subsequently, it is implicit that these regulatory frameworks had ramifications on the nationalities of vessels operating in Australian waters and upon what trades were profitable, and therefore would have played a role in the types of watercraft that were eventually abandoned in Australia (expanded below).

Even into the twentieth century we can see that international trade agreements and legislative developments caused substantial shifts in the economic status quo. Other British legislation such as the *Merchant Marine Act* 1928 had major financial implications by alleviating economic stagnation, introducing ten year contract mail subsidy construction loans of up to 75% and therefore creating a scramble to buy laid up post-war vessels (Hutchins 1974: 56). Also of note was the 1932 Ottawa Agreement. This agreement had economic effects on Fremantle by diverting goods from Japan and the USA towards Britain. The Australian government's ratification of the agreement meant that preference was given to imports from Britain. While Fremantle traded little with Japan, the main impact was that it halved the imports arriving from America (Clark 1980b: 229; Tull 1992: 38, 1997: 61). The affect

such an agreement had on trade may be seen at some stage in the nationality of the vessels abandoned after that time in Australia.

Marine insurance and ship classification are by far the two most prominent forms of passive control that guided trade, and the Australian abandonment trend as well as the international abandonment trends. The reasons that vessels, still in floating condition, were placed in a position whereby they come to be abandoned was a direct consequence of marine insurance. Marine insurance, and systems of classification used to determine hull condition and vessel seaworthiness have meant that vessels that posed a risk to life, limb and cargo could be removed. For this reason marine insurance has been described as “the grease that allows the wheels of international commerce to move” (Countersunk 1989: 7), and its importance to the growth of an international shipping system is well established (see Mansfield in Senior 1952: 261; Jackson 1971: 307).

In this way, we can see marine law and insurance as enforcing certain standardised behaviours upon the use and discard of watercraft. Generally, marine insurance can be seen as a system by which the relative qualities of vessels could be determined (Walton & Baird 1950: 64). For this reason they became the standard for the calculation of seaworthiness, and therefore prescribed in a scientific way the use-by date of watercraft. In essence marine insurance companies can be seen as a consumer watchdog, an indication of cultural conservatism in shipbuilding, and a measure of technological innovations and diffusion.

Marine insurance has a long history, but British systems of insurance have had the most effect on world maritime underwriting (see Gow 1914: 2; Lloyd’s of London 1938: 777, 1965: 652, 1973: 417; Senigallia 1940: 8, 11-12; Dick 1946: 1; Stevens 1947: 56; Senior 1952: 263). In Australia as well, a British system of marine insurance was adopted, and Lloyd’s of London was by far the largest

marine underwriter. In many respects this was due mainly to the weakness of the Australian maritime industry (Dick 1946: 1-2, 4-5; Countersunk 1989: 7). Lloyd's dominance grew for two reasons, because of the services it provided, and also the networks it formed and associated with. Of most importance was the *Lloyd's Register of Shipping* (founded in 1760 and reconstituted in 1834) which undertook the physical survey and publication of minimum standards in ship construction, and co-operated with such organizations as the British Corporation (formed in 1890), whose responsibility it was to undertake the administrative duties of assessing vessels under the British *Load Line Act* (Dick 1946: 11; Walton & Baird 1950: 66, 67).

For Australia, one of the by-products of having a foreign power as the main force in insuring vessels was that insurance could not be obtained, or at least was very hard to obtain because of certain prejudices.<sup>1</sup> Orme (1988: 31) wrote that:

In the early days of Tasmanian shipbuilding, the craft were believed to be of an inferior quality and it was difficult for the owners to obtain an insurance classification with Lloyd's. This was slowly changed as more locally built vessels began to trade overseas, particularly with England. The advantages of local wood used in the Tasmanian built vessels were then acknowledged.

Furthermore, other Tasmanian research shows that the seaworthiness of vessels, and the procurement of marine insurance was a major concern among members of the shipping fraternity. This is seen in a series of attacks on the shipowner John Charles Taylor made in the form of anonymous letters to the editor of the Launceston paper *Examiner* (7 July 1882 and 19 July 1882) outlining worries concerning the vessel *Jules Marie*. These letters suggest that

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<sup>1</sup> This was despite the fact that there were agencies, such as the Derwent and Tamar Insurance company, which is cited as specialising in marine insurance operating in Tasmania from at least the 1860s (Hudspeth & Scripps 2000: 37).

there was “agitation for better safeguards against unseaworthy ships being allowed to go to sea” (*Launceston Examiner* 7/07/1882 cited in Taylor 1998: 29-30). Despite the fact that this article related to an event concerning the vessel *Jules Marie* in particular, and may indicate a jealous individual who lost out on a lucrative salvage operation for the grounded vessel, or may simply indicate a level of favouritism between owner and surveyor, it would have caused repercussions for those engaged in Launceston trade. Likewise, it may have caused a change to the running of business, at least temporarily.

In maritime archaeology, marine insurance is a key factor in the consideration of cultural site formation processes. It is especially important in relation to Murphy’s “one more voyage hypothesis”. A brief synopsis of Murphy’s hypothesis is that:

Many shipowners today tend to extend the life of their ships beyond safe limits, as is amply demonstrated by recent hazards posed by ageing supertankers. Murphy’s hypothesis is that shipowners may always have been tempted to use their vessels beyond their normal, safe use lives (Gould 1983: 10).

Since Murphy published his “one more voyage hypothesis” in 1983, its applicability to maritime archaeological sites in the United States, and other nations has been investigated (see for instance McCarthy 1996: 354-356). In relation to Australia, McCarthy has highlighted one major problem with applying this hypothesis to Australian sites – the availability of insurance.

Murphy’s hypothesis rests upon conditions, which were a part of the post-revolutionary American experience in maritime affairs, that meant the availability, and legislative necessity to hold marine insurance in order to engage in trade was not enshrined until comparatively late. Australia, as a British colony was different. Following the abolition of the British Navigation

Acts, and the growth of the Australian shipbuilding industry, shipowners were almost instantly tied to the British systems of insurance and classification, which like their British counterparts saw that insurance was a prerequisite for carrying out trade. While this needs to be more thoroughly tested in relation to the Australian shipwreck resource (that, is whether vessels were kept longer and pushed harder), it appears that the historical evidence which often cites poor condition and lack of insurance as the cause for disposal does not support a “one more voyage hypothesis” in an Australian context. Furthermore, this is supported by the large size of the deliberately abandoned ship resource. Indeed the “one more voyage hypothesis” could only conceivably occur where the shipowner is the same person as the party wishing to ship goods (as in the case of Charles Broadhurst and *Xantho*). In the Australian case then, “high-risk” activities seem to be related to the activities of captains during voyages, not “high-risk” activities of ship owners and operators in deciding whether to send a particular vessel out on another voyage.

What also makes marine insurance interesting is that as a system of trust it is prone to fraud and rorts. The implications of a system of insurance being in place is that vessels said to have been wrecked and subsequently paid out for insurance purposes, may have indeed been abandoned in a way akin to wrecking so as to obtain such a pay out. This may mean that accounts are fabricated and that wrecking events are not catastrophic, but are instead behaviourally driven, due to forces affecting economic conditions. In this way we can understand that marine insurance, and in particular the specifics of individual policies can be seen as an important pre-depositional aspect in the formation in the abandonment site.

Another interesting trend appears to be that peaks in marine insurance related fraud could arguably be seen as coinciding with periods of increased

watercraft abandonment caused by particular historical events or economic conditions (and reflected in the analyses below and in Chapter 7). Maritime fraud, known as barratry, can be defined as any illegal, non-sanctioned action by a Captain, and can be levelled upon an individual for trading with an enemy without appropriate sanction (Hamilton 1903: 112-113). More clearly in relation to marine insurance it can be categorised as:

Any wilful act causing loss or seizure of or damage to a ship on the part of the Master with a criminal intent. It is essential that there should be knowledge that the act would prejudice his owners. To constitute barratry the act done must have relation to the ship herself and a loss arising from mere ignorance or incompetence of a Master through mistake is not sufficient; it must be shown that a Master had acted against his own better judgement (Holman 1953: 45-46, see also Lloyds of London 1973: 424, 1981: 489, 1991: 371).

Maritime fraud, as seen in passing off deliberately abandoned vessels as shipwrecks appears to be as old as any system of marine insurance, and cases of marine insurance fraud are well documented in the maritime historical literature (see for instance Jackson 1971: 308-310, 314-322; Chowdharay-Best 1976: 89; Howe & Matthews 1986: 549, 571; Matthews 1987b: 206-207; Harlaftis 1997: 79-81). Some of the best examples come from this study period. After the conclusion of the Second World War there were many cases of well-known shipping lines and shipowners engaging in, and getting away with maritime fraud. In these cases crews of “wrecked”, or “sinking” ships were often found in “well maintained lifeboats, fully dressed and with bags packed” (Countersunk 1989: 7). The Second World War was a time of increased shipping tonnage due to war-time shipbuilding, which was surplus to demand at its conclusion, leading to the mass unemployment of ships and an increase in abandonment (as discussed later). It would not be too much of a leap of faith to suggest that this behaviour would have been repeated

previously, for instance during the Great Depression of the 1930s and will continue to be part of the inherent nature of insurance of all types.

Some reference to maritime insurance fraud can be found in Australian maritime historical literature. One such case is that of the vessel *Croydon* (Broxam 1993: 192-3). In other cases such as that reported concerning the vessel *Croydon Lass*, which burnt in May 1877, the assertion that it was “deliberately lit” does not go far enough to explain whether insurance fraud, sabotage or vandalism was the actual cause (Taylor 1998: 15). Another case was the apparent wrecking of the vessel *Nestor* at Portland, Victoria in 1854 where divers found holes that had been deliberately bored through the hull beneath the Captain’s cabin (Loney 1971: 115).

### **Active Controls and Vessel Abandonment**

Active, or direct forms of cultural constraint are fewer than passive forms, but have had the greatest impact on the formation of abandonment sites. This is because they relate primarily to watercraft abandonment, and it is their main function to control the disposal of watercraft. Often these controls are legislative or regulatory by nature. One example of this are the permit applications and “rules of salvage” outlined in the *American Rivers and Harbors Act* 1915 and dictated to the Western Marine and Salvage Company of Alexandria, Virginia by the United States War Department for the breaking up of the “Emergency Fleet” (mentioned in Chapter 3) (Shomette 1996: 239, 251).

From an archaeological perspective such constraints can be seen as having relevance to both pre- and post-depositional aspects of ship disposal. This is because they are concerned with the location of abandonment areas, and the treatment of remains before reaching that location (pre-depositional) as well



as dictating the appropriate treatment of structural remains after abandonment (post-depositional) (mentioned in Chapter 9). They are intimately tied in with controlling salvage and ownership rights and responsibilities.

#### *Active Legislative Controls*

The first national legislation to control the dumping of watercraft in Australian waters was the Commonwealth *Beaches, Fishing Ground and Sea routes Protection Act 1932* (McCarthy 1979b: 85, 1983b: 335). The act (No. 73 of 1932) is described as, “An Act relating to the Protection of Beaches, Sea Fishing Grounds and Routes used by Vessels engaged in Trade and Commerce with other Countries and among the States”, and is mainly concerned with quarantine issues, the protection of fishing grounds and safe navigation. For this reason it aimed to regulate and control, “the sinking at sea, for the purposes of their disposal, of vessels and hulks”.<sup>2</sup> The Act clearly cites the obligations associated with the deliberate abandonment of a vessel under section 4. Within section 4 paragraph 2 it reads that that, “Any person who, without permission in writing of the Director first obtained, sends or takes to sea, from any port or place in Australia, any vessel, for the purpose of sinking the vessel at sea, or wilfully sinks any vessel at sea or who enters any port or place in Australia after having wilfully sunk any vessel without such permission, or otherwise than in accordance with such permission, shall be guilty of an offence”. The penalty for such an offence was £100. Paragraphs 4 and 5 outline the role of the Director (Director of Navigation or the Deputy Director of Navigation) in the determination of the location for abandonment. The Director has control over the abandonment of the vessel in the “prescribed” area, or outside of it and has to take into consideration potential danger to shipping if the disposal location is within territorial limits, and

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<sup>2</sup> According to the act a “vessel” is defined as “any hull of a vessel, hulk or floating construction of any description”.

potential danger to trawling if the disposal location is outside of Australian territorial limits.

While the Commonwealth act controls the dumping of vessels at sea, a range of other legislation covering and within state waters and state controlled shores regulated the dumping of vessels under state jurisdiction. In South Australia, for instance there were some controls put into place through the creation of the South Australian *Harbors Act* 1913. Specifically Division VI of the act entitled “Wrecks, Obstructions, and Damage” (and particularly item 80) covered the arrangements regarding responsibilities for the abandonment of vessels. This is further backed up with Division X of the Act entitled “Offences”, which outlines the penalties for non-compliance, including non-compliance with the rules for the demolition and/or dumping of unwanted vessels.

There are cases where the Federal government have changed state-plans for dumping. In the case of *Premier*, the Federal Government insisted that the vessel be scuttled in the designated graveyard area off of Rottnest Island despite State plans to dispose of the vessel on Straggler Reef, between the Rottnest and Carnac Islands (*West Australian* 09/03/1938: 18a, 30/03/1938: 16a).

### **Economic Correlates**

We can define Australian abandonment trends from a range of angles. The following discussion represents one such point of view - it outlines an examination of economic and historical events and their effect on the tendency to abandon watercraft in Australia. The decision as to what historical events to analyse in relation to abandonment is difficult. While it would have been easier to seek out events in relation to the data, this was not

considered an appropriate means of testing the data. Here a number of “national” economic events (those spanning the Australian continent and Tasmania) have been extracted to show their relationship to trends in ship abandonment. It is acknowledged that separate colonies and states have had different experiences of these same events. These diverse experiences will be addressed in certain cases in this chapter, with a more in-depth analysis of localised regional economic events undertaken in the following chapter.

This argument concerning abandonment and economic correlation begins with a discussion of changes in the vessel resource through time, facilitated by outlining major national historical events and comparing such information with trends in the abandonment of watercraft on a national basis. The ANAVD shows that there are at least 1542 deliberately abandoned vessels. These vessels are historically documented as being discarded in Australian waters in the two hundred year period between 1806 and 2001. However, not all of these vessels can be incorporated into economic analyses because they either did not have a date of abandonment recorded, or their tonnage value was not found. Figures 6.1 and 6.2 represent the abandonment of watercraft in Australia between 1802 and 2001. Figure 6.1 depicts the number of vessels abandoned each year (1246 vessels) and Figure 6.2 shows the accumulated gross tonnage of vessels abandoned each year (1235 vessels representing 413,950.1 gross registered tons). Both graphs have had periods of economic depression and boom superimposed upon them to illustrate the degree of correlation between abandonment trends and nationally significant economic conditions (expanded below). These figures are based on all vessels in the ANAVD irrespective of location (vessels of unknown location are included). Abandoned vessels of unknown year of abandonment could not be included in either figure. These two figures will be referred to often in this chapter.

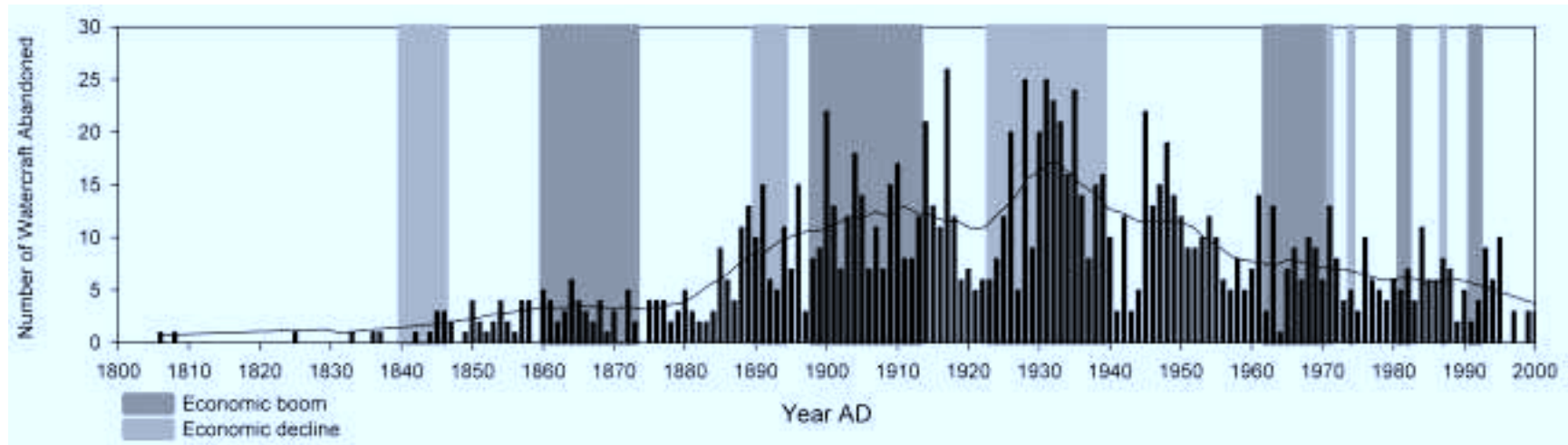


Figure 6.1 Watercraft abandoned in Australia (1800-2000) by number of watercraft (n=1246 watercraft)

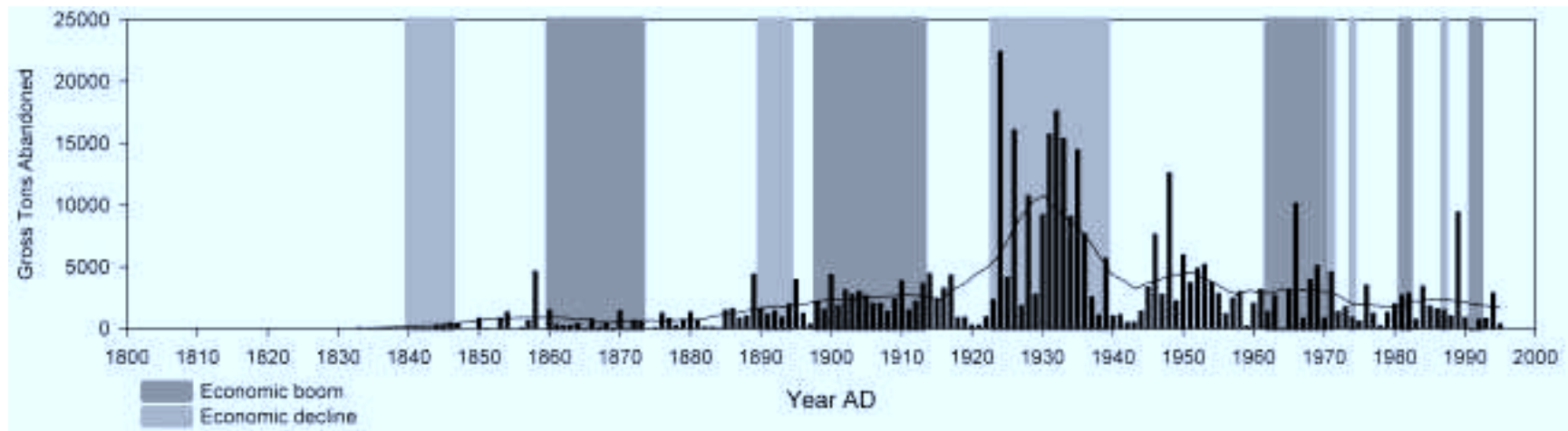


Figure 6.2 Watercraft abandoned in Australia (1800-2000) by gross tonnage (n=1235 watercraft, 413,950.1 grt)

## Economic Aspects of Ship Abandonment

The examination of the period of Australian history covered by this research illustrates that there are only a small number of events that have had discernible influence on ship abandonment. They can be broadly grouped into four categories:

- Periods of economic expansion;
- Periods of economic decline (recession, depression);
- War and;
- The aftermath of war (the transition to peacetime economy and economic reconstruction).

All of these events, as outlined and described in this chapter will not concentrate on the character of economic development itself due to its complex nature. Warfare is singled out here for a particular reason. Wars are well attested to as being events that bring about drastic technological change (as mentioned in Chapter 2). Rapid technological changes, while having long-term benefits, are normally associated with a range of problems concerning the process of transition from the old technology to the new (see Blainey 1973: 139; Rosenberg & Sumida 1995: 35). In this way, warfare, plus the technological repercussions of war, can be perceived not only as a catalyst for social, and economic growth, decline and change, but also as an important phase in the development of new technologies, which have later economic ramifications of their own. Indeed, Davies (1998: 97) suggests that there were four major economic events between the 1840s and the 1870s of which three were wars; the Australian Gold rushes of the 1850s, the Crimean War (1854 – 1856), the Indian Mutiny (1857 – 1858) and the 2<sup>nd</sup> China War (1856 – 1860).

There are many possible scenarios when we consider the economic perspectives of watercraft abandonment. For instance, the abandonment of

watercraft on one level could simply be a consequence of business bankruptcy. Behind such an event, however, is the likelihood that the bankruptcy was the consequence of some aspect of the economic climate of the time. This may be due to a depression within a particular trade or business enterprise, or may also be caused by an endemic recession or depression that has taken a hold of an entire nation.

There have been a number of economic events that have had direct influences on the predisposition of shipowners to abandon their watercraft. As Broxam (1998: ix) has noted, Australia has experienced recessions and depressions approximately every forty to fifty years beginning in the 1840s, and present in the early 1890s, early 1930s and early 1990s, with all these periods coming after a period of marked economic growth. Likewise other events, such as “rushes” and wars, although more often seen for their social or political aspects, can also be viewed as economic events of a major magnitude. It is against this background that this chapter is set, because it is against this undulating economic climate that abandonment may be seen to make most sense.

Gregory (1988: 1) outlines that the three primary indexes against which the effects of depression in individual nations can be analysed are unemployment, employment and output. In some respects we can ask whether the archaeological and historical data attached to the abandonment of watercraft may also be an index for such appraisals. For this reason it may be possible to check information from the abandonment resource against other economic indices, or indeed use data pertaining to the abandonment of watercraft as an economic index itself. But against what can we compare abandonment data?

Broxam (1998: ix) suggests that the tonnage of vessels coming into a port may be an indication of that port’s prosperity. He also claims:

Another indicator of the colony's maritime prosperity can be seen in the number of tonnage of ships built during the period 1843-1850. It will be seen that after a mini-boom in the late 1830s, it dwindled away to next to nothing by 1845, this is largely due to the 'lag-time' between ordering new vessels at the height of the depression (1842-3) and their completion. However, the recovery was swift and the resultant boom of the late 1840s was not repeated in Tasmania for nearly a century.

An apparent 'dip' of some magnitude in 1849 was apparently the result of several large vessels ordered in 1847/48 which were not completed until 1850. The massive influx of overseas ships on the market as a result of the Gold Rushes saw the almost collapse of the industry which was not revived again to any appreciable extent until the 1860s (Broxam 1998: ix).

It is important to factor in "lag-times". For example, a so-called "mini-boom" in shipbuilding in Tasmania in the 1830s had dwindled away by 1845 due to "the ordering of vessels at the height of the depression (1842/3) and their completion" (Broxam 1998: ix). If this is the case, then trends in abandonment may also be subject to lag-times. Outlined below a number of historical events, grouped according to the categories already outlined that the abandonment data can be tested against.

#### *Periods of General Economic Boom*

Periods of economic boom are much less well documented than periods of economic decline, mainly due to the general lack of major (and often drastic) social upheaval. Australian economic health, stability and progress have to some degree been dependant upon influences and developments in international commerce. Furthermore, Australian overseas shipping has

been almost totally foreign owned (Bach 1976: 187).<sup>3</sup> In particular Australian trade, shipbuilding and ship buying trends have been most influenced by British maritime supremacy, which had been in force since Waterloo (1815). From the early days of the Australian colonies imports and exports were dominated by the British control of global trade (Bach 1976: 56). This was reinforced by the lack of competition from other nations, and by the 1850s Britain was “the workshop of the world” (Thomson 1978: 138; Pollard & Robertson 1979: 9). In the period before 1850 Australian maritime trade was plagued with problems arising through the inability of Australian exports to fill the ships arriving from Britain. As a consequence many ships sought freight elsewhere and in doing so established trade links with China and India (Broeze 1975: 583). After the 1850s the Australian colonies experienced an increase in economic activity, particularly in the ports of the south-eastern colonies which sparked further development (Bach 1976: 117).

Table 6.1 shows the distribution of the 1542 vessels in the ANAVD by their nation of build. These watercraft predominantly belong to three categories, Australian built, British built and unknown location of build (88.27% of ANAVD). If we exclude watercraft in the “unknown” category we can see that vessels were predominantly Australian, British and from the United States and Canada (92.57% of vessels of known origin). Vessels built in other nations account for only about 7% of vessels of known origin, or approximately 6% of the entire database.

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<sup>3</sup> Likewise the Australian shipbuilding industry has always been small by world standards. Although vessels of 85,000 deadweight tons were being produced in Australia from 1976, the industry still only accounts for less than one percent of world output (COIITC 1980b: 350).



Nation	No. watercraft	% total	% known
Australia	694	45.01%	54.82%
United Kingdom	391	25.36%	30.88%
Unknown	276	17.90%	N/A
United States	48	3.11%	3.79%
Canada	39	2.53%	3.08%
Netherlands	15	0.97%	1.18%
Indonesia	14	0.91%	1.11%
New Zealand	14	0.91%	1.11%
Germany	8	0.52%	0.63%
Vietnam	8	0.52%	0.63%
Norway	6	0.39%	0.47%
France	5	0.32%	0.39%
India	5	0.32%	0.39%
China	4	0.26%	0.32%
Sweden	3	0.19%	0.24%
Ireland	2	0.13%	0.16%
Hong Kong	1	0.06%	0.08%
Seychelles	1	0.06%	0.08%
Spain	1	0.06%	0.08%
Finland	1	0.06%	0.08%
Denmark	1	0.06%	0.08%
Taiwan	1	0.06%	0.08%
Thailand	1	0.06%	0.08%
Burma/Myanmar	1	0.06%	0.08%
Austria	1	0.06%	0.08%
Italy	1	0.06%	0.08%
<b>TOTAL</b>	<b>1542</b>	<b>100.00%</b>	<b>100.00%</b>

**Table 6.1** Distribution of abandoned watercraft by nationality of build showing number, proportion of total ANAVD and proportion of vessels of known origin.

Figures 6.3 to 6.6 show the proportion of British, Australian, North American (the United States and Canada combined) and “other” built vessels (all other nations) in the abandoned watercraft record by year of build. Figures 6.7 to 6.10 show the proportion of British, Australian, North American (the United States and Canada combined) and “other” built vessels (all other nations) in the abandoned watercraft record by year of abandonment. These analyses illustrate much about changing economic circumstances in Australia between the 1790s and the 1990s.

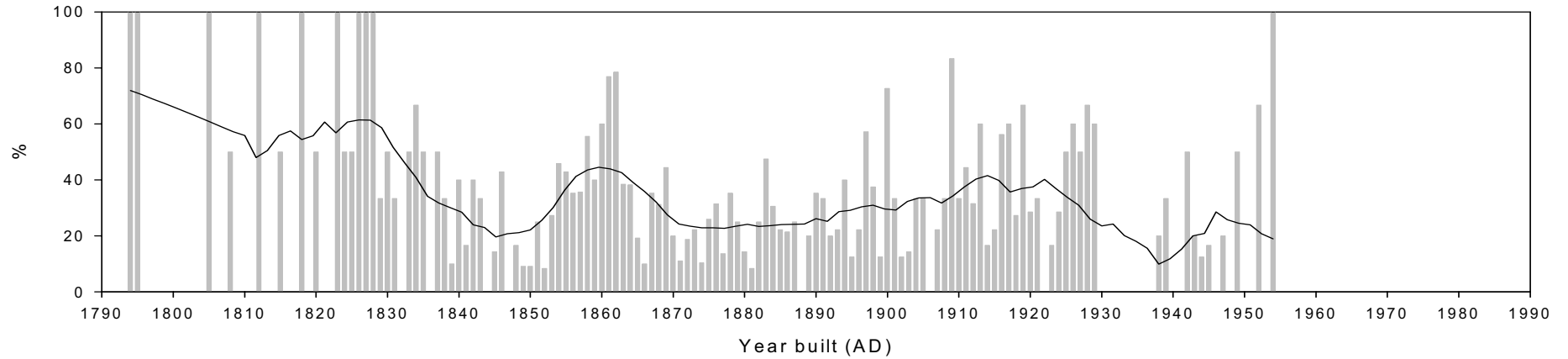


Figure 6.3 Percentage of British built vessels by year of build (1790-1990)(n=387 watercraft)

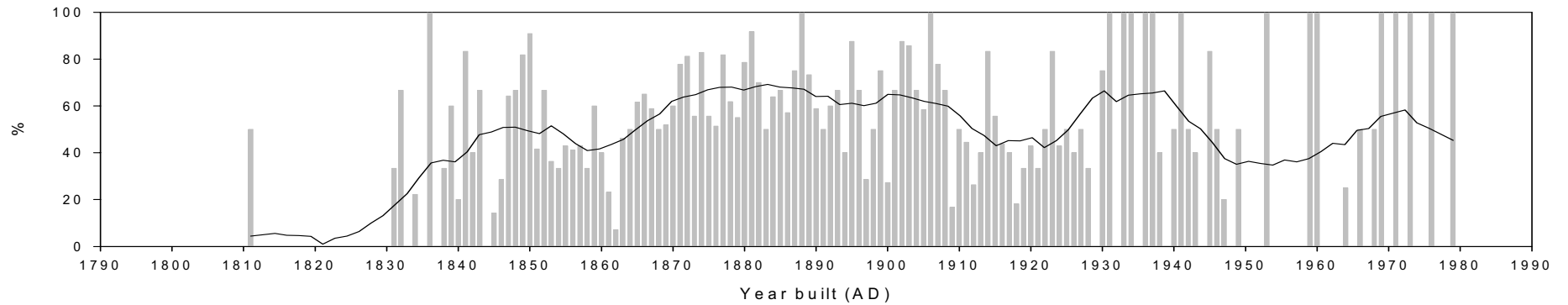
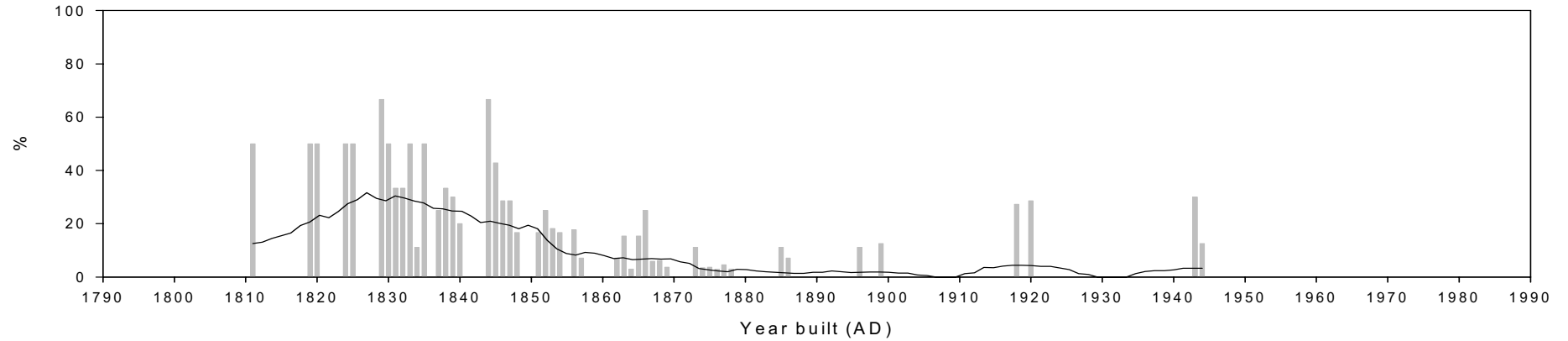
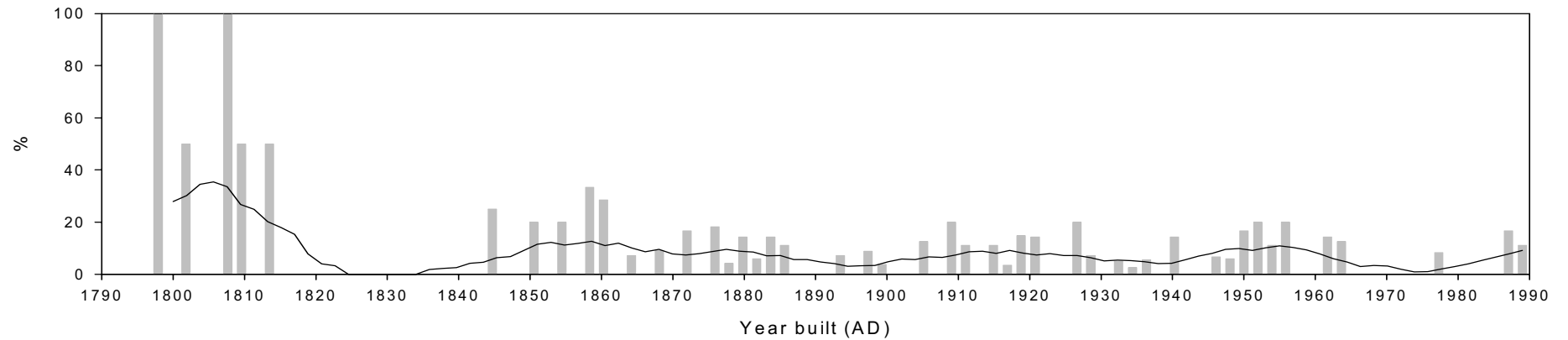


Figure 6.4 Percentage of Australian built vessels by year of build (1790-1990) (n=671 watercraft)



**Figure 6.5** Percentage of North American built vessels by year of build (1790-1990) (n=83 watercraft)



**Figure 6.6** Percentage of non-Australian, British or North American vessels by year of build (1790-1990) (n=123 watercraft)

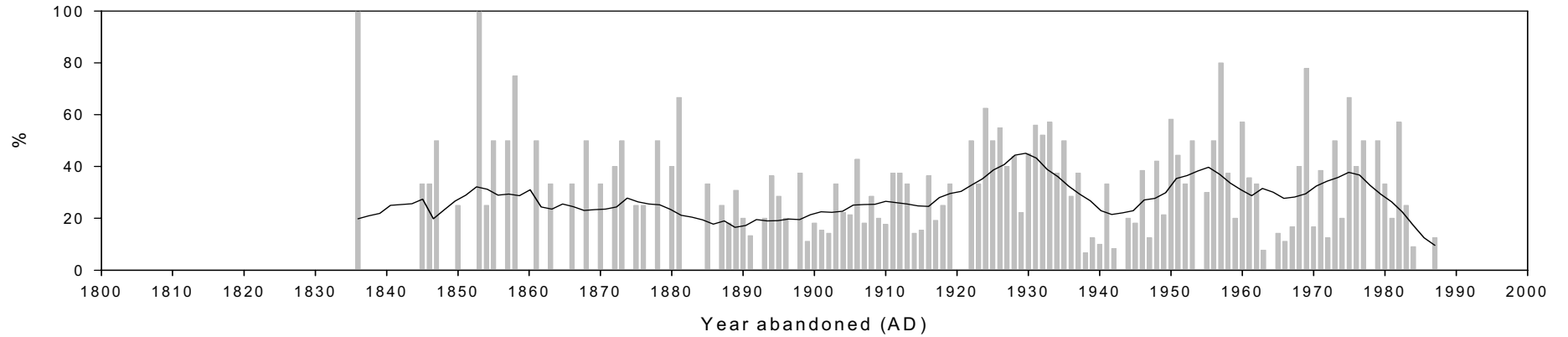


Figure 6.7 Percentage of British built vessels by year of abandonment (1800-2000)(n=351 watercraft)

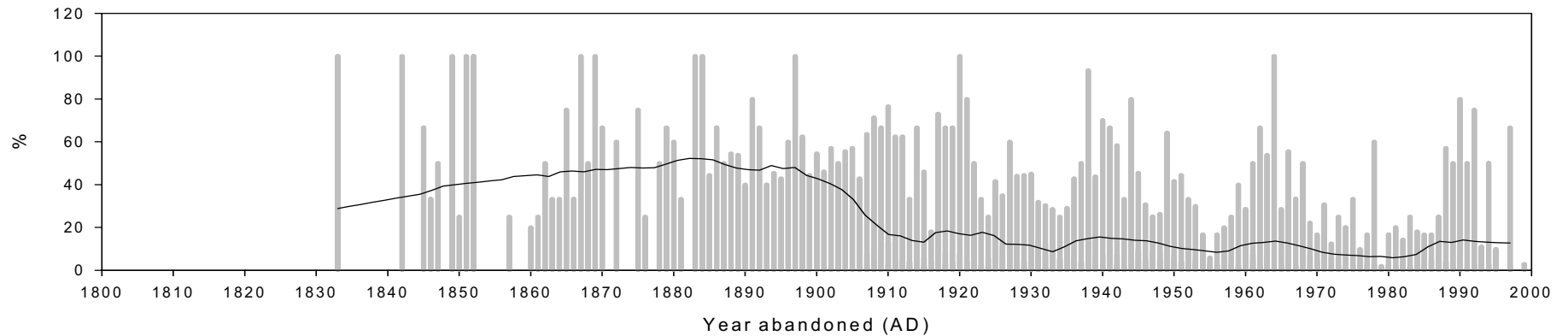
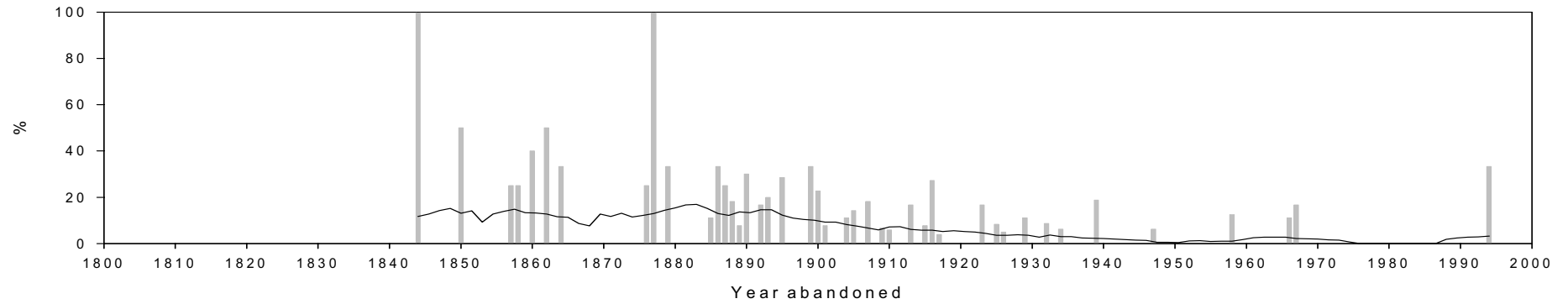
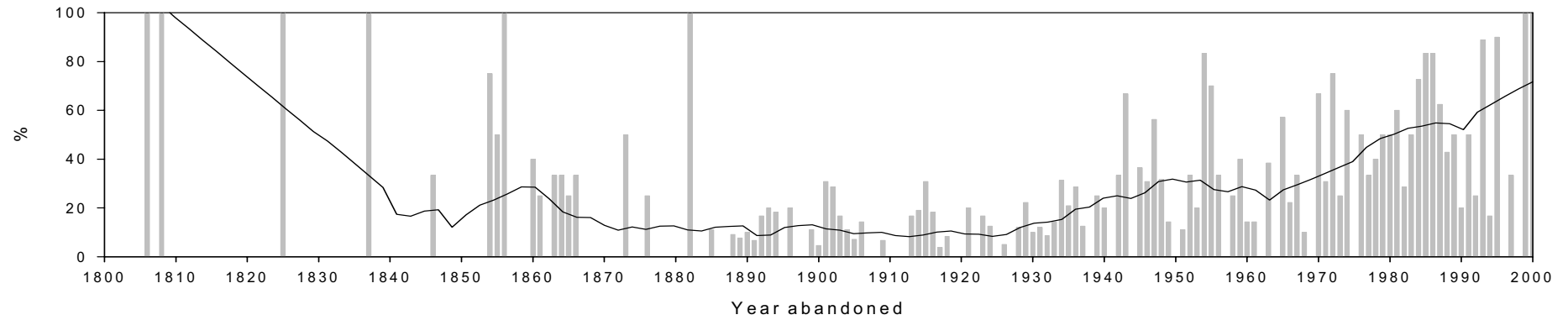


Figure 6.8 Percentage of Australian built vessels by year of abandonment (1800-2000) (n=548 watercraft)



**Figure 6.9** Percentage of North American built vessels by year of abandonment (1800-2000) (n=70 watercraft)



**Figure 6.10** Percentage of non-Australian, British or North American vessels by year of abandonment (1800-2000) (n=278 watercraft)

In particular Figure 6.3 is interesting because it illustrates that Australia was part of the world economic maritime mercantile system that was subject to the economic hegemony of British domination (which Kennedy 1994: 66 notes was itself dependant on the power of its merchant marine).

Over the period 1860 to 1914 British trade (upon which the Australian colonies depended) went through a period of growth and supremacy, partially facilitated through the opening of the Suez Canal in 1869 (Pollard 1952: 98; Thomson 1978: 142). This was interspersed with two major boom periods; 1860 - 1873 (known as "the age of affluence") and 1898 - 1913 with the period 1873 - 1898 being a period of stagnation, and in some regions depression (to be discussed).<sup>4</sup> This period is also important because of the dramatic increase in the British share in world shipping from its major share of 26.3% in 1860, to 60.2% in 1890, and its decline to 41.1% in 1914 (Bach 1976: 134, 139).<sup>5</sup> Such figures were also reflected in British shipbuilding with Britain building and launching more than 50% of the world's ocean going tonnage by 1851, an estimated 75% by 1880, on average 60% before the First World War, 41% between the wars, one third between 1935 and 1939, and 20% by 1958 (Parkinson 1960: 3; Thomson 1978: 142; Slaven 1982: 37-38). While these values do not coincide exactly with the figures depicted in Figure 6.2 there was a notable dependence on British ships throughout the major period covered.

It can be understood why these figures are not as high as those cited in trade and shipbuilding figures above by examining Figure 6.4. This depicts the Australian percentage of ships in the abandonment record and illustrates that the development of the Australian shipbuilding industry played a large role

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<sup>4</sup> McGhee (1967: 170) cites that the years 1860-1890 was "the long boom" due to increased investment in Australia.

<sup>5</sup> Values for the British percentage of world trade vary from author to author. Other authors cite that the British Merchant Marine constituted one-third of the world's ocean-going tonnage after 1865, and forty percent by 1914 (with an even larger percent of world steam vessel tonnage) (see for instance Harley 1973: 372; Jones 1990: 152).

in Australian economic development, especially around the 1880s when Australian built ships are reputed to have been at the peak of their importance (ANMA 1989: 100). Also reflected is the effect of the development of naval construction during the two world wars, which stimulated the Australian shipbuilding industry after the conflict (Varns 1969: 4). The dip in Australian built ships, and increase in British and American vessels around the First World War is also probably a reflection of the purchasing trends of the Hughes Government for the Commonwealth Government Line of Steamers from 1916 due to an “an acute shortage of tonnage space and power” (noted by Broeze 1992: 20). The abrupt end to the decline in Australian built ships in the late 1940s could arguably be attributed to the re-institution of the bounty system (after its introduction in 1940 and removal in 1943) (Commonwealth Government 1992: 15; Broeze 1998: 103).

Figures 6.5 and 6.6 illustrate the relatively insignificant reflection of vessels built in all other nations. Figure 6.5 is also interesting because it clearly correlates with historical literature pertaining to the challenge to British shipbuilding by the North American industry before the American Civil War (and its considerable decline thereafter), and also shows two slight increases in North American ships around the time of the First and Second World Wars (Pollard & Robertson 1979: 9, 12-13; Cage 1995: 3). This increase in North American ships around the Great Wars is supported in the historical record. The American shipbuilding industry is credited with being at its highest capacity during times of war, and World War One has been cited as being favourable to American owners (Culliton 1974: 8, 12; Hutchins 1974: 56). During the Second World War the American percentage of the world’s shipping rose from 16% to 62% (Culliton 1974: 9), and in light of this it is surprising that there wasn’t an even larger percentage in the Australian abandonment record.

Another problematic factor with the assessment of economic boom times is that they often coincide with the periods leading up to and following major wars. This could generally be said to be much of the story of the twentieth century, and will therefore be assessed separately below. This is best summed up with statistics from Bach (1976: 352) who cites that during the period of the Second World War trade operated at 75% of the level it had in 1939. By 1948 this level was at 94% of the pre war figure, in 1960 it was at 200% and by 1973 it was at 250% (with a boom period between 1967 and 1970). A boom in 1951 and 1952 is also associated with the Korean War (to be discussed).

The 1960s saw an agricultural boom commence in 1962, which ran into the next decade (and became a rural crisis in 1971) (Shaw 1975: 278-279). The 1980s and the 1990s however, were devoid of major international military skirmishes and different states of Australia went through boom periods. Such was the case in most of Australia (but mainly Western Australia, Queensland and the Northern Territory) in 1981 - 1982, and 1991 - 1992 (Tull 1997: 70). These occurred for a variety of reasons, with Tull (1997: 71) suggesting that the economic growth in Western Australia at these times was attributable to population increases and the expansion of agricultural and mining exports.

We must however, factor in that some regional economic booms were actually detrimental to the shipping of the region in question and to the shipping of other regions. The Victorian Gold Rushes of the 1850s, for instance greatly influenced the economies of the Australian colonies. While not the first discovery of gold, the finds in Bendigo and Ballarat in 1851 were the first to develop into a "rush" (Jose 1913: 114-117; Cotter 1967a: 113; Fitzpatrick 1969: 80; Palmer 1971: 38; Clark 1978b: 5). It can also be seen as one of the first historic events to have truly national economic ramifications. Indeed its implications were so varied that it has been held responsible for many of the transitions in the Australian economy after 1850 (see Fitzpatrick 1969: 121;



Ward, J. 1966: 4, 31, 110; Ward, R. 1969: 75, 78; Shann 1967: 185; Palmer 1971: 38, Bach 1976: 96; Clark 1978b: 8; Broeze 1992: 14).

The effects of rushes, however, are different for particular regions. Cotter (1967a: 125), for example suggests that the effect of the Californian and Australian gold rushes were much wider than their respective regions, and in particular had a substantial impact on the economies of Great Britain and Europe. This was mainly due to the timing of the rushes during a period when there was a general world depression. In the context of the Victorian gold rush, the influence on Victoria itself was not surprisingly one of a major phase of development, and the primary cause for the drastic expansion of trade (Fitchett 1975: 1). As Clark (1978b: 23) has intimated, "Gold would attract so much of the commerce of the world to Australian shores, that the world would witness a change in the system of maritime commerce greater than that effected by the voyages of Columbus and Vasco da Gama".

Indeed, Clark (1980b: 135) credits the rushes for establishing Victoria. This economic boom however cannot be seen as a definite indication of an expected drastic decrease in the deliberate abandonment of watercraft in Victoria. Surprisingly the reality seems to be quite the opposite with many more vessels being destroyed under suspicious circumstances. This has been described by Loney (1980: 50):

The history of the Port of Melbourne contains many accounts of fires on ships ... Most of the early fires could have been started by seamen determined their ship would not set sail again and deprive them of an opportunity to join the thousands streaming to the Victorian goldfields.

It appears that the early 1850s was a time of decreased or steady abandonment in all states of Australia, with the exception of Victoria where two vessels in 1853 and four vessels in 1854 were discarded. Indeed, 1854 was the year that saw the fourth highest peak in abandonment throughout

Victorian history, and the six vessels discarded from 1853 were the first to ever be abandoned in that state (these statistics are addressed in more detail in the following chapter). Taking into consideration that many acts of marine insurance fraud and barratry could not be proven, it can reasonably be inferred that these are the minimum number of vessels abandoned or deliberately sunk during the rushes, and that the real numbers were considerably larger.

The impact of these rushes on other colonies, and other industries in Victoria however, can be best described in terms of the negative effects of the drain in labour. This drain was similar to what occurred in 1848 because of the great Californian rush, which had already had a marked effect on the Australian economy (Cotter 1967a: 113). Before 1851 the main basis of Australian wealth lay in the pastoral industry. While the Victorian gold discoveries initially stimulated this industry, it eventually inflicted severe damage due to the migration of labour from this already understaffed sector (Ward 1966: 23, 30). Indeed, this migration was so great that New South Wales is credited with losing a quarter of its population, Tasmania a third, and one hundred workers a day in South Australia (Jose 1913: 128, see also Parsons 1986b: 51). From a reading of different sources on the effects of the Victorian gold rush on the colony of South Australia there are many perspectives that come to light. Whereas Castles and Harris (1987: 95) along with Clark (1980b: 135-136) credit the rush with debilitating the colony, Roberts (1968: 228) cites that in relation to squatting, “the gold discoveries ... caused a boom which lasted for eighteen years”. What is clear is that the effect on the South Australian maritime industry may not have been as pronounced as in Tasmania, with the option for land transportation available to people wishing to make their way to the goldfields.

Indeed, the Victorian gold rushes had as much of a negative effect on Tasmania, as it did a positive effect on Victoria (Kok n.d.: 19). In 1850 Broxam (1998: ix) notes that Van Dieman’s Land was seemingly on the verge of

“unprecedented prosperity” but was disrupted by the commencement of gold fever on the Victorian gold fields in 1851 (this is supported by Clark 1980b: 135-136). This not only sealed the colony’s fate as somewhat of an economic backwater for the ensuing decades, but was also an event from which it is reputed to have never fully recovered. This was due mainly to the cessation of the transportation era, an associated increase in labour costs, and increased migration to the mainland.

The analysis of ANAVD data shows that this instance of a regional economic development is significantly different than the global ones that will be discussed. The rush in Victoria appears to have caused no increase whatsoever in ship abandonment in Tasmania, probably due to those ships travelling to Victoria for the rushes. Indeed, the phenomenon of ship desertion by crew appears to have only occurred in Victoria (see also Clark 1980b: 120). The analysis of the types of vessel, and ownership of the vessels that has been seen to correspond with the duration and aftermath of the Victorian gold rush may indicate that some of the vessels operating in Tasmania were eventually abandoned in Victoria. In this way a regional economic boom that coincides with the transportation of people to that region appears to coincide with a decrease in abandonment in the state hit by the detrimental aspects of en masse migration, and is married with an increase in the abandonment of vessels at the place of economic boom. This appears to be the only instance of such a reversal. Shipowners, having no crews due to desertion, may have been the losers in this situation.

#### *Periods of General Economic Downturn*

There have been many economic recessions and depressions throughout Australian history, and shipping in Australia has also been effected by wage issues and union strikes, all of which have had a marked effect on the prosperity and material wealth of the nation (Bach 1973: 7). Many of these

periods of economic decline can be seen as reflected in the discard trend outlined in Figures 6.1 and 6.2. A financial depression occurred in the four-year period between 1840 and 1844 which caused the drastic decline of prices across the board and major increases in unemployment and destitution (Clark 1978a: 188, 190, 197, 293-5, 359, 1980a: 292, 1980b: 103). The years of 1841 – 1846 have also been described as a time of “administrative and economic chaos” (Clark 1980b: 110). The blame for the depression (which was mainly focussed in commercial and agricultural sectors) was blamed on many things; the behaviour of the banks, the cessation of transportation, drought, the price of land, and a decline in the demand for Australian wool (particularly in New South Wales) by English woollen product manufacturers (Clark 1978a: 295). Although the period from the mid-1840s does coincide with an apparent increase in the regularity of abandonment events in Australia, the discard trends cannot be seen to correlate well with the economic declines of this period of Australian history. This may be due to the economic immaturity of the relatively new colonies of South Australia, Victoria and Western Australia. Hence the early national trend may be understood better as a composite of trends in New South Wales and Tasmania (see Chapter 7).

The period after 1870 is more interesting, because the degree of correlation is better defined. Bach (1976: 142) has written that, “between 1870 and 1914 the bad years are said to have outnumbered the good years two to one”. He further notes that the period between 1873 and 1898 were depressed in that there was an extremely low rate of expansion within Australia, Britain and the world. This is the period known generally as the first “great depression” (Bach 1976: 134, 142; cf. Rostow (1938: 136), and Aldcroft (1965: 14) who cite this period as 1873 – 1896). The 1890s were an important watershed in Australian history, defined by debilitating economic depression, collapsing financial institutions, large strikes, increased unemployment and amplified social tension and division throughout the colonies (Ward 1969: 108-109; Bach 1976: 201; Clark 1981: 56, 85, 111; Castles & Harris 1987: 232). The depressions

and strikes of the 1890s are also cited as impairing the low-profit Australian shipbuilding industry (ANMA 1989: 101). The economic crisis can be traced to a financial crash in Argentina around August 1890, was followed by the failure of Barings in London, and is noted as being at its worst between 1890 and 1893 (1893 is known as the year of the Australian “Bank Smash”) before the first signs of recovery around 1894 (Shann 1967: 328; Clark 1980b: 169, 171).

The British shipping industry, which was depressed in 1894 (Cage 1995: 7), and the recovery that would come later was not long lived. Bach (1976: 143) has noted that, “The sufferings of the industry after 1900 seem to have been self-inflicted rather than as a result of depressed world trade; the great 45 percent increase in world tonnage between 1900 and 1910 was made more dangerous by the technological improvements that permitted greater carrying power for a given tonnage”. By 1902, 80% of British shipping is reputed to have been running at a loss, and by 1908, “shipping of every nationality was being laid up, there being nearly 2 million gross tons lying idle at the end of 1908, of which half was British” (Bach 1976: 143). An examination of the discard trend, with particular reference to the number of watercraft discarded between 1873 and 1908 (Figure 6.1) can be seen in stark contrast with earlier periods. During this time abandonment events became more common with vessels being discarded in substantially larger numbers than before.

Very little has been written with regard to the interwar period, the Great Depression of the 1930s and the decline in shipping. As Louis and Turner (1974: 1) have noted, “Although the depression was – along with the crisis of the 1890s and the two world wars – one of the great traumatic experiences of Australian history, it has as yet attracted little attention from Australian historians”. Even less has been written on the effects of the Great Depression on maritime transport even though writers such as Gazeley and Rice (1996: 298) have commented, “Shipbuilding epitomises the chronically depressed

industry of the 1930s". General accounts of this Great Depression from international and national perspectives neglect to mention its impact on maritime trades, despite the fact that overseas and interstate shipping was the dominant mode of transport, and possibly even an important indicator of the true impact of the event.

The Great Depression of the 1930s was arguably one of the most pivotal turning points in the history of the twentieth century. The effects it had were many and varied. Between 1929 and 1933, world trade plummeted by twenty percent, freight prices dropped to pre-war levels, one in five of the world's fleet was laid up and out of use, and between 1929 and 1931 the volume of world exports fell by thirty percent (Dyos & Aldcroft 1969: 320-321; Gazeley & Rice 1996: 296). In response to such economic failings most nations worsened the conditions by instituting prohibitions and increasing tariffs on imports, thereby inadvertently crippling their export trade at the same time, and overall requiring less need for the shipping of goods (Southgate 1965: 268-269). In relation to global maritime trade, it was particularly important because of the changes it brought about to the commercial conditions of the time, particularly in relation to the position and power of the United Kingdom.

Britain is said to have been on shaky economic foundations before 1914 due to its industrial dominance and competitive advantages in a limited number of industries such as coal, iron, steel, and machinery, vehicle, ship and textile manufacturing (Dyos & Aldcroft 1969: 301). Likewise, the British shipping industry was noted to be in decline well before the crash of 1929, and Hutchins (1974: 56) cites that there was a general depression in shipbuilding between 1922 and 1928.<sup>6</sup> To some degree, the economic problems of Britain were the same ones that were felt the world over in shipping in the 1930s, and

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<sup>6</sup> Other events, such as the British Seamen's Strike of 1925, brought on by a wage cut due to the perception of this decline in the shipbuilding industry can also be seen as evidence of this (Gifford 1992: 73).

they were as much about the aftermath of the First World War, as they were about the Great Depression. The post-war boom (called by Shaw (1975: 233) an “unhealthy boom”) was coupled with a reduction in the need for ships. This was due to the artificially heightened demand for ships that had been needed during the period of conflict (already discussed). Also a factor was an over-supply of tonnage, with many vessels not needed, and the ones that were being used were the larger, newer and more-economical ones (Southgate 1965: 268-269). Dyos and Aldcroft (1969: 320-321) however claim that after 1934 this over-tonnaging crisis was increasingly stabilized and by 1937 was in a fairly balanced state. The ships of this new era were, however, the harbingers of the new technological environment, being technically superior in efficiency (being mainly oil-fired or diesel propelled), and design while also being larger and faster (Dyos & Aldcroft 1969: 320-321; Hudspeth & Scripps 2000: 194).

The disposal of these obsolete vessels were initially done at high prices, but eventually moved into the en masse asset disposal of infrastructure within many industries. It could also be said that where assets were not disposed of, or could not be disposed of, disuse and dereliction were the only other alternatives. The aftermath of the Great Depression stretched well beyond the early 1930s. In the early 1940s (1941 or 1942) *Star 4* and *Star 5*, two whalechasers once operating out of Kaipipi were demolished on the Bluff waterfront in New Zealand (Watt 1989: 215, 220). This same process occurred in Australia, with the first laying up of vessels occurring from the initial trade decline around 1928 that reached 58% of Australian vessels by 1930 and was still at 40% in 1932. The winners by far were the new generation motor vessels, whose economic advantages made all the more obvious by the financial crisis (expanded in Chapter 7). A new technological status quo had been born (Bach 1976: 317- 319).

What made this situation worse, for nations like the United Kingdom, were that these new vessels increasingly tended to be foreign built and owned, and their pre-war maritime hegemony had been seriously eroded. Partially, this new technological circumstance had come about because of the propensity for non-British, and particularly northern European nations to adopt the diesel engine, turbo-electric drive and new generation of geared steam turbine engine in their new vessels (Hutchins 1974: 55). Another factor was that by 1926, well before the onset of the depression, German vessels were 28% cheaper than their British counterparts, and by 1938, after the depression Swedish vessels were 20-25% cheaper (Scandinavian countries together in 1938 were 17.5% cheaper than Britain). With specific reference to the British shipbuilding industry similar devastation occurred, with the British market share falling from supplying 25-30% of this market before the First World War to around 7.4% of the market by 1934. At the peak of the problem, between 1930 and 1935, 80% of the nation's shipbuilding berths lay idle, and a sterilisation scheme was enacted that saw the destruction of 1.4 million tons of shipping capacity. While this was partially due to the weakened demand for naval construction, it is also attributable to the weakening demand from all prospective ship buyers the world over (including Britain) for British built ships (Slaven 1982: 38-39).

All of these factors, coupled with Britain's dependence on, and over-achievement in export industries culminated in the decrease in the use of British vessels to the tune of 25% between 1913 and 1937. Subsequently Britain lost major portions of its total market share (Dyos & Aldcroft 1969: 320-321). Through such economic devastation, Britain would never again regain its dominant position in global trade. From the viewpoint of the effect of the depression of the 1930s on Australia, all of these factors are important, because from the perspectives of trade partnerships, and ship buying behaviour, Australia was inextricably linked with the economic fortunes of the United Kingdom.



As has already been shown, the Great Depression of the 1930s was not the first economic depression that Australia had known, yet it was to be the worst it was to know in its history, and would become an important turning point in its economic and technological evolution. During this period a range of factors were to cause major economic disruption and social hardship. The depression hit every sector of the Australian economy, causing a rise in unemployment to unsurpassed levels, the cessation of development, and the decline in prices of staple goods (especially wool and wheat). Increased foreign competition and the almost overnight decline in primary industry were all to have dramatic effects (Clark 1980b: 224, 1987: 308). Ships ordered before the depression hit soon found that they had insufficient freight once built (Harvey 2000: 19).

The Australian heavy industrial sector however is reputed to have fared differently. Although steel production for instance was one of the first, and hardest hit internationally, Horne (1971: 193) claims that, “from the beginning of the First World War to the Depression manufacturing production went up by 70 per cent; and in the Thirties, despite the Depression, it more than doubled” (Horne 1971: 193). Additionally, Australia is acknowledged to have suffered earlier and more severely than many other nations, due to its dependence on exporting primary produce and the falling price of this commodity from the mid-1920s which compounded the effects of this period (Ward 1969: 139; Moss 1985: 296).

The Great Depression of the 1930s was similarly the single most important event in the history of the abandonment of vessels in Australia. The experience of each Australian state was to some degree special (discussed in Chapter 7), and the analysis of abandoned vessel data may indeed allow us for the redefinition of this event from an Australian perspective that clearly shows that Australia was already in a significant economic depression before

29 October 1929 (as described by Clark 1987: 322). Indeed, much of the problem with Australian perspectives on the Great Depression is that there has been a tendency to analyse the event from the date of the New York Stock Market Crash. The inclination of many works on the Great Depression of the 1930s (even in Australia) is to consider 1929 as the year the depression commenced, and 1932 its nadir (see Broadus 1964: 3-24; Louis & Turner 1974: 1). As one commentator has asserted:

The 1930s take much of their character from the great depression. Unlike a war, a depression is a catastrophe of which beginning and end can never be pinpointed to the day nor, perhaps, even the year (Crowley 1980: 416).

Indeed there has been some commentary concerning the actual time that defines the Great Depression of the 1930s (Cotter 1967b: 262; Dyos & Aldroft 1969: 299-301; Dickey 1986: 174; Louis & Turner 1974: 1). In an Australian context the Great Depression of the 1930s was preceded by major downturns in trade not dictated by the stock market crash of 1929. Morris (1999: 109) has quoted much data pertaining to the pre-depression economy in Australia. He cites that by the mid 1920s wool was in decline, dropping 11% from 1925-1926, tonnage levels coming into Australian ports were in serious decline, and some notable Australian shipping companies had begun to show substantial losses by 1928 (the Adelaide Steamship Company, for instance posting a 10% decline). An examination of the discard trend (as seen in Figures 6.1 and 6.2) may even suggest that the depression in Australian maritime trades may have started to emerge as early as 1923 and continue until around 1939.

In a previous study Foster (1987b: 15) notes, in the case of the number of shipwrecks in Port Phillip that “Gradually the numbers dropped until the period 1921-1940, when six of the nine vessels wrecked during the period were *deliberately* beached, sunk or dismantled”. While it is not clear whether *deliberately* beached refers to deliberate abandonment or abandonment

arising through crisis, this supports national data showing that deliberate abandonment increases dramatically in the 1920s. In her subsequent analysis (in Foster 1988: 28, 1989: 21, 41, 1990: 28) she rightly omits scuttled data to analyse the trend of shipwrecks throughout the period 1839-1985.

Over the period of the economic depression many economic factors came into play that did not only affect the economic health of the nation, but also redefined the nature of trade, and the technologies used to engage in that trade. Kerr (1998: 21, 105), for instance has commented that the Great Depression was the single most important factor contributing to the cessation of the building of, and use of sail vessels engaged in various carting trades (especially the “barge trade”). It could be reasonably said then that the building and abandonment of sailing vessels may be a good litmus test for the economic health of regions across time.

In many cases the Great Depression simply brought on a period when any expenses that had to be met concerning the carrying out of trade could not be met. One such example was the four-masted, steel-hulled barque *Hougomont* of 2378 gross tons built by the Scott Shipbuilding and Engineering Company of Greenock in 1897. In April 1932 the vessel was 530 miles west-south-west of Kangaroo Island bound to Port Lincoln from London when a gale took most of its masts and rigging. After reaching Port Adelaide the owners decided that they could not afford the expenses of £2,500 to fix a vessel valued at only £1,000, and they opted to dispose of the barque. The vessel was stripped of its fittings and taken to Stenhouse Bay, South Australia, where on 8 January 1933 it was positioned, southwest of the jetty and sunk with explosives to provide a breakwater for vessels loading gypsum (Christopher 1990: 78; Loney 1987: 141, 1993a: 132-133; Parsons & Plunkett 1995: 43; Arnott 1996: 18-20).

As for other detrimental economic events in the later twentieth century, the Middle East oil crisis of 1974, and the stock market crash of 1987 does seem to also coincide with a marked increase in ship abandonment in the mid 1970s and late 1980s for most states. Another reason for the overall increase in ship abandonment around this time can be attributed to the to the dramatic rise in refugee vessels and illegal fishing boats entering the Northern Territory, as well as the steady rise in the formation of artificial reefs.

### *The Effect of War*

Conflict is a special economic case study when referring to watercraft discard trends. This is because, although wars may be perceived as occurring for a range of non-economical reasons, they are, at least in part caused through economic circumstances. This is because war often has economic origins and to a large degree, the causes of war lie in economic conditions borne in times of peace, or economic damage done in previous wars (see Blainey 1973). To define these periods as mutually exclusive events is short sighted and denies the true causes of such periods.

Australia as a nation, and the individual colonies before Federation have been involved in many conflicts (see Ward 1969: 28, 127; Buxton 1980: 200; Crowley 1980: 270-271; de Garis 1980: 254; Robertson 1980: 452). Wars before Federation, such as the Crimean War (1854 - 1856) have been reputed as having a substantial economic effect on the colonies because of their effects on world trade. Despite Clark's assertion that, "the war in the Crimea threatened to upset those conditions of peace deemed essential for world commerce" (Clark 1978b: 84) the war is said to have had, "an immediate effect" on the world's shipbuilding by increasing demand, with British shipping growing 70% between 1850 and 1860, and great profits being reaped (Bach 1976: 95, 103). Under these circumstances no increase in the abandonment of watercraft should be expected, and the abandonment trend, as reflected in

Figures 6.1 and 6.2 show that there was indeed, no appreciable increase. However, Australia as a nation was not actively engaged in this conflict, and the economic effects of other conflicts where Australians were active combatants have not been well documented (the Sudan War, Boer War and Boxer Rebellion). The comparison of the years of these events (1885, 1899-1902, and 1901 respectively) does not however seem to coincide with any marked increase or decrease in ship abandonment. Generally speaking, the first conflicts to have effects on the Australian economy and on watercraft abandonment began from 1914 with the commencement of the First World War.

The effect of the First World War does not appear to have been as drastic as later wars, and it is credited for speeding up the economic development of many western nations such as the USA and Australia, and for being the catalyst for the production of many new industries (see Chapter 7 for discussion of state differences) (Hutchins 1974: 52; Clark 1980b: 208). The Second World War, however, was a time of massive upheavals in the maritime world. In the north of Australia, for instance the duration of the war saw the forced seizure and destruction of an unknown number of vessels to avoid their capture by Japanese invaders (Henderson in Sledge 1978: 30; Sledge 1978: 30).

Tull (1997: 63) cites that the conditions during both great wars were significantly different. He declares that the Australian economy stagnated during the first war, but in the second war expanded, and experienced accelerated growth in the industrial sector (similarly noted by Hughes 1964: 132, and in the USA by Hutchins 1974: 15). He also points out that while there was a national boom, it was concentrated in the eastern states, and other states, such as Western Australia had an economy which, like it had in the previous war, stagnated. This was also reflected in a marked drop in exports

from Fremantle. The economic boom in the post World War Two period is said to have lasted to the 1970s.

The effects of subsequent conflicts, such as the Malayan Emergency (1950 – 1960), Indonesian Confrontation (1964 – 1966) and the Vietnam War (1962 – 1972) are less certain. The Korean War (1950 – 1953) differs from any other conflict discussed here because it is well documented that it caused an economic boom brought about by an increased demand for Australian primary produce (Hughes 1964: 15; Shaw 1975: 271, 278; Bolton 1980: 488; Clark 1980b: 256; Hudson 1980: 522, 527, 533).

### *Target Ships*

As noted in Chapter 3, the use of target ships is also related to warfare. At least twenty-nine vessels (about 2% of the ANAVD) are listed as having been used in military related manoeuvres that saw them scuttled with military ordinance between 1887 and 1994 (see Figure 6.11). Of these, twenty-five vessels were sunk in strafing exercises, and four were sunk in bombing practice.

One vessel, the steel steamer *Psyche* (built 1900), sunk in Salamander Bay, Port Stephens, New South Wales sometime during World War Two is listed as having been both bombed and strafed during the scuttling process (see Chapter 9). To this number we can add the destruction of the HMAS *Torrens* off of the Western Australian coast in 2001. Additionally the vessel HMAS *Adroit* was sunk in an unspecified “naval exercise” in 1994. In some cases, such as in the case study of *Moltke* (1870 – 1913) vessels were used for target practice at a time substantially after initial scuttling. This is a well-established behaviour with many examples of wrecks being strafed by the Royal Australian Air Force after they were wrecked in Victoria.

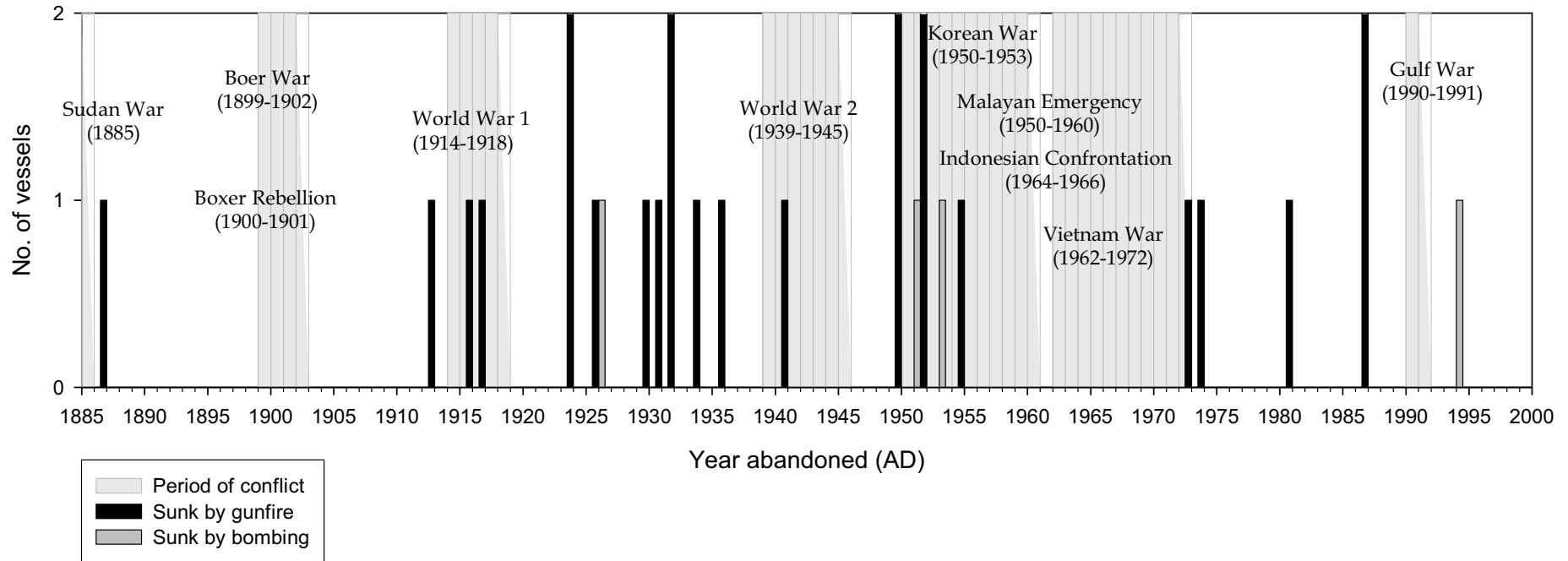


Figure 6.11 Watercraft abandoned or sunk in military manoeuvres in Australia 1885-2000 (n=28 events)

Examples of this are the wrecks of *Riverina* and *Orungal*. Also drying reefs at sea have been used as targets (pers comms Ross Anderson 22/02/2002). This activity has occurred in all of the states and territories of Australia except Tasmania (see Table 6.2). By and large the majority of vessels were destroyed in the Sydney Heads ship disposal area. Also, surprisingly only two thirds of the vessels had at some stage been owned by an Australian defence agency (in most cases the Royal Australian Navy or the Royal Australian Air Force, but in one case the Victorian Colonial Navy). The additional third of vessels were apparently seized as opportunities to carry out military manoeuvres and could possibly reflect some degree of urgency in the need to test new weaponry.

Name	Built	Scuttled	State
<i>George R. Crowe</i>	1885	1887	Queensland
<i>Moltke</i>	1870	1913	Queensland
<i>J.L. Hall</i>	1859	1916	Western Australia
<i>Lalla</i>	1874	1917	Western Australia
<i>Barcoo</i>	1885	1924	New South Wales
HMAS <i>Australia</i>	1913	1924	New South Wales
<i>Loch Ness</i>	1869	1926	Western Australia
J5 submarine	1916	1926	Victoria
<i>Torrens</i>	1916	1930	New South Wales
<i>Huon</i>	1915	1931	New South Wales
HMAS <i>Encounter (ex Penguin)</i>	1905	1932	New South Wales
<i>Hankow (ex City of Hankow)</i>	1869	1932	Northern Territory
<i>Pam (ex Lady Palmerston)</i>	1864	1934	South Australia
HMAS <i>Anzac</i>	1917	1936	New South Wales
<i>Psyche</i>	1900	1940	New South Wales
HMAS <i>Success</i>	1918	1941	New South Wales
<i>Bankfields (ex James Beazley)</i>	1876	1950	Western Australia
<i>Quorna (ex Warrener)</i>	1912	1950	South Australia
<i>Kyogle</i>	1901	1951	Queensland
<i>Marjorie</i>	1898	1952	New South Wales
<i>Colonna (ex Sierra Colonna)</i>	1878	1952	Western Australia
HMAS <i>Kuramia</i>	1914	1953	New South Wales
<i>Governor</i>	1898	1955	Western Australia
<i>Kara Kara</i>	1926	1973	New South Wales
<i>Karoola</i>	1947	1974	New South Wales
<i>Trinity Bay</i>	1912	1981	Queensland
<i>Colac</i>	1941	1987	New South Wales
Oil Fuel Lighter 1208 (ex Karpont)	1945	1987	New South Wales
HMAS <i>Adroit</i>	1968	1994	Western Australia

**Table 6.2** List of vessels scuttled as target ships in Australian waters (by state)



What is interesting about the times of the destruction of these target vessels is that only nine out of the twenty-four vessels (33%) listed as sunk by gunfire and two out of the four vessels (50%) listed as sunk in bombing practice were done so during actual periods of conflict (approximately 36% overall). Vessels were only used as target ships at the middle of the First World War, the beginning of the Second World War and during the Korean War/Malayan Emergency.

The rest of these vessels can be seen to directly follow or immediately proceed conflicts (this is especially true for the period between the two world wars). This may indicate two behaviours, the testing of weaponry as a show of power in the prelude or aftermath of war, or the testing of weaponry in preparation for war. It is highly likely that both behaviours are represented here. The commencement of target ship testing in 1887 is more likely related to the “Russian Scares” around the middle of the 1880s more so than the aftermath of the Sudan War, which was not a major conflict from the Australian perspective and never involved naval forces.

Foster (1989a: 22) mentions proposals during the “Russian Scares” of 1885 to scuttle hulks in the West Channel of Port Phillip, Victoria to prevent enemy vessels from using it. The plan was eventually stopped because of publicity concerning the prices paid by the government for the vessels to be sunk. This second behaviour can arguably be seen in three separate clusters of vessels sunk in this way. It may be seen in the large amounts of craft sunk as target vessels in the lead up to the Second World War, and in the period after the Vietnam War. Of more interest is the period in the 1950s. If we factor in the distance, and previously noted positive economic effects of the Korean War, and the status of the Malayan Emergency as a minor conflict, these sinkings could be seen as pre-empting further conflicts in South-east Asia, as represented by the war in Vietnam.

### *The Aftermath of War*

The problem with the aftermath of war is the abrupt transition from wartime to peacetime economy, which is often associated with a brief depression. An example of this can be seen in the aftermath of the Crimean War, where freight rates reflected, “the state of the depression that began after the war” (Bach 1976: 103). Likewise, changes in freight rates associated with a number of other conflicts, such as the Korean War (1950), Suez Crisis (1956) and Six Day War (1967) (noted by Tull 1992: 46), would have brought about substantial parallel changes to Australian economic health, and discard behaviour. More often the aftermath of war coexists with an “over tonnage crisis” due to increased shipbuilding during wartime and a reduced demand after the conflict (Culliton 1974: 12). This has been previously mentioned by Davies (1998: 97) who noted, “wars created shipping shortages and conversely a glut when the wars ended”, and Culliton (1974: 9) who has said nations could build ships faster than they could sink them by the Second World War. Culliton (1974: 11) also explains:

The products of shipyards tend to pile up in time of war. They also tend to be mass-produced and lacking the custom-built features that prospective shipowners desire. This is especially in relation to combination cargo and passenger vessels.

Furthermore, ships after the war were exceptionally cheap, and when bought eventually lead to the discard of older vessels:

Although soon made obsolete by technical development, the war built ship could still earn money if purchased at the right price. The vessels were accordingly sold slowly by government at prices which started at \$200 per deadweight ton, but rapidly declined to near scrap value in the early thirties (Hutchins 1974: 55)

Crises borne out of surplus tonnage do not always coincide with post-war situations, and may for instance simply be a product of uncontrolled shipbuilding, but nearly always coincides with depressions in the shipping industry (as evidenced by Bach (1976: 57) who cites similar conditions from the mid 1820s until the 1840s). Such crises are, however, made worse by the economic depression often associated with the financial conditions immediately following protracted conflict (as in the case of the First World War), and appear to be one of the major catalysts for increases in ship abandonment. Another contributing factor are the costs of laying up these unused vessels for prolonged periods of time (Bach 1976: 288, 289).

The aftermath of the First World War had more of an impact on the predisposition to deliberately abandon vessels than the period of the actual conflict. While this is partly due to the passenger depression of the 1920s, it is more attributable to the surplus of shipping upon the commencement of peace and the fall in freight rates that accompanied it (Bach 1976: 286, 315; Tull 1992: 45-46). This sooner or later meant that a large portion of the world's mercantile fleet could not obtain business, and were selected for dismantling and discard. This surplus was due to what Bach (1976: 286) calls, "the legacy of emergency wartime building", and due to continued shipbuilding after the war, which was "in excess of the requirements of trade" (Southgate 1965: 268-269; Kennedy 1994: 67). Consequently 2.5 to 3 million tons of shipping was laid up in British ports, and 20% (10 million tons) of the world's merchant ships were idle by 1922 (Kennedy 1994: 68). This is in direct contrast to behaviours in ship owning during the war with vessels such as the American barque *St. James*, for instance, which was converted into a barge in 1909, being subsequently refitted as a barquentine due to the shortage of available tonnage due to the conflict (Matthews 1987a: 275-276).

However, the aftermath of the First World War also coincided with technological changes outside of shipping that were to have dramatic

consequences on a range of maritime industries, as it is generally acknowledged as the period after which road infrastructure began to grow at unprecedented levels (see Chapter 7). While this did not affect international vessels, it had a drastic negative effect on coastal watercraft (Graeme-Evans & Wilson 1996: 81). The innovation and increased use of the motor engines coming out of the ashes of the war had other effects. While the war had little effect on the South Australian mosquito fleet during its duration, the increased introduction of the auxiliary engine in that trade (and increased competition) following the conflict (and borne out of other technological developments in other trades) made a huge difference to the future of that business (Bach 1976: 249). This is reflected in the ANAVD in the conversion of vessels to engine assisted types (see Chapter 8).

The aftermath of World War Two had many effects on maritime trade. The peace that ensued with the conclusion of the Second World War was for most of Australia a time of a marked economic boom, which had a huge effect on both the pre-war trades and the new ones that had been created from the necessity of wartime. This was the case with many areas that are the focus of this thesis, such as at Strahan, Tasmania (Kerr and McDermott 1999: 97). For many nations, but particularly for Australian coastal trades, the first post-war decade was one of steady decline. This was due to the cessation of certain trades, industrial unrest, changes in cargo handling methods, a fall in the demand for passenger services, increased competition from land transport, and astronomical costs associated with building new vessels (Pemberton 1975: 169; Bach 1976: 351, 370 see also Barsness 1974: 169). The aftermath of World War Two also saw a dramatic shift in the emphasis of design of vessels made locally in Tasmania, to being that purely of fishing and recreational vessel (Graeme-Evans & Wilson 1996: 81). These changes in the design of vessels was a response to new for them, and was also cited by Milne (*et al.* 1998: 8) in a case study from the United Kingdom for the conversion or motorisation of war barges for other purposes.

The aftermath of the Second World War is a major feature in the history of abandonment due to the en masse scrapping of merchant vessels used during the war (as noted by Paine (2000: 150) in relation to the United States) and can also be seen in Australia. As Fassett (1948a: vii-viii) has stated:

The mass production of ships of all types during World War II has resulted in a large surplus tonnage for peacetime commerce. The reduction in the number of shipyards today under way to contract operations to a peacetime basis is one of the most drastic industrial shrinkages and one of the gravest economic problems to be met in passing from war to peace.

The effect of the aftermath of war on watercraft abandonment can be summed up in three areas; surplus tonnage, short-term post-war depression and what Bach terms the “rude challenge” of technological innovation in relation to ship design, technology and shipping techniques (such as cargo handling and berth design) (Bach 1976: 346, 351).

### **Conclusions**

Cultural systems of constraint are important because they are factors that prescribe what activities may occur, and do occur in relation to discard activities. A major aspect of ship discard focuses on the economics of traversing distance. As will be shown in Chapter 7, ship breaking and discard locations are structured due to the economic issues associated with travelling the distances to carry out discard activities. Active and passive controls on watercraft abandonment are also more broadly important to maritime archaeology because they have the potential to re-assess maritime histories in a way that is significant to the interpretation of the shipwreck resource. If the abandonment trend illustrated here, and in the following chapter can be seen as an indication of changes within economic and technological circumstances, then changes in the abandonment trend may also be a tool for the assessment

of the likelihood of maritime fraud. This may itself bring about the reappraisal of the history of some shipwrecks, which may turn out have been deliberately disposed of.

The distinct economic processes of boom, depression, conflict, and the repercussions of war can be seen as important factors behind the abandonment of watercraft in Australia. While these processes have been documented, and provide important historical contexts against which watercraft discard trends can be assessed, the number, type and configuration of the vessels discarded can also be seen as a tool for the assessment of these events upon maritime trades, and general economic health.

It is not really a surprise that the tools of economic development are also the most sensitive to changes in the economic environment. The abandoned watercraft record is more attuned to illustrate these processes because the vessels that were engaged in trade were so until they were no longer required, and their lives were not artificially shortened through catastrophic loss. In effect their use life is a representation of the life, success, and health of the trade it was engaged in.

This chapter has shown that there is a close correlation between well-documented economic trends of national importance and trends in the discard of watercraft. It has also shown that these discard behaviours exist because of drawn out decision-making processes that emerge throughout the life of a vessel, but are redefined by the consequences of economic change. Moreover, this change can be seen in the analysis of the number of vessels abandoned throughout Australian history. This shows that the discard of watercraft is an economic indicator, and can be used in the assessment of the social consequences of economic events caused by cycles of boom and bust and interrupted by conflict.

## CHAPTER 7

### **Watercraft Abandonment in Australia: Environmental and Regional Perspectives**

*And in any port that had a 'rotten row' where vessels were laid up – either temporarily or out of commission for good – they swarmed aboard the steamers and barges. Each lad who could grab a wheel would stand at it, pretending to steer, imagining himself already a skipper (Mudie 1965: 146)*

## **CHAPTER 7**

### **WATERCRAFT ABANDONMENT IN AUSTRALIA ENVIRONMENTAL AND REGIONAL PERSPECTIVES**

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#### **Introduction**

This chapter is an outline of watercraft abandonment focussing on the distribution of abandonment areas, and the environmental, economic and historical events that have contributed to the formation of vessel discard sites in particular regions. On a regional level, some historical events can be seen to be the direct causes of changes in discard trends, while other tangential events serve as multiplying these effects. Additionally this chapter discusses role that environmental factors have on discard trends. This chapter is a discussion of the trends evident in the comparison of ship abandonment sites and is not a comprehensive gazetteer of sites documented or visited during the fieldwork associated with this research. The analyses in this chapter also illustrate that discard trends on national and statewide levels are substantially different, but nonetheless still relate to the fluctuating economic and technological conditions in nations and regions.

#### **The Landscape of Abandonment**

Understanding landscape is pivotal in the understanding of discard behaviour. This is linked to a number of points made by Kenderdine (1992: 2):



Landscape symbolically expresses the actions of groups and individuals conditioned by particular cultural values over a period of time. The landscape is a code that when deciphered reveals the meaning of the cultural and social significance of common but diagnostic features ... The natural landscape underwrites the subsequent interactions of humans and the environment, it precludes and dictates the activities that can be sustained within (and across) geographic regions.

The abandonment of watercraft revolves around a singular, and fundamentally important point: an abandoned vessel should never be a navigation hazard. This is something noted at other ship discard locations around the world, such as at Mallows Bay site (see Chapter 3). The discard of watercraft in a location that will cause harm to other watercraft is unacceptable. We can also understand this by examining what happens when ships are wrecked in navigable sections of water – they are either destroyed, or substantially dismantled (see Parsons 1982b: 8-9, 11, 44, 51; Christopher 1988: 11-12 for examples). To a large extent the location of ship dumping areas occurs because of a socially organised use of space that is comparable to many other archaeological studies (see for instance Portnoy 1981: 213; Hohman 1975 in Rathje 1981: 52). This major premise behind discard psychology is also supported by findings in archaeological research. During an unsuccessful search for the vessel *Ellen* by the Underwater Explorers Club (Western Australia) the shipwreck of the *James Matthews* (1841) was revealed. This discovery, however, served to suggest possible reasons for decisions to choose locations for the abandonment of unwanted watercraft, as noted by McCarthy (1983b: 354 see also McCarthy 1979b: 20):

It is thought unlikely ... that the Harbour master would have allowed a vessel [*Ellen*] to be deliberately scuttled on the northern shore of Woodman Point as she would be a danger to vessels blown ashore from the Owen Anchorage area immediately to the north ... The wreck,

therefore, is presumed to lie to the south of Woodman Point, in Jervoise Bay.

On a broad level, we can understand that ships' graveyards occur at places where there is a concentration of watercraft based commercial activities and the volume of trade and traffic in a particular port (as illustrated in Chapter 3 at Port Stanley).

In inner harbour environs, ships' graveyards generally occur in disused or "abandoned" stretches of waterway. In Tasmania, for instance there is a correlation between areas used as gunpowder hulk mooring areas, and eventual abandonment regions (Hudspeth & Scripps 2000: 128). This may be due to the perception of such places as unimportant and under-utilised. A place fit to moor a dangerous object, such as a gunpowder hulk, which may detonate and do damage would equally be suitable as the last resting place of marine rubbish. When changes to the use of such spaces occurs and these areas are then targeted for other uses, the consequences are that these sites come under increased pressure, usually in the form of increased salvage activities. This also supports an assertion in Chapter 2, that concentrations of refuse tend to occur where there have been previous discard activities.

### **Australian Abandonment: Site Location Factors**

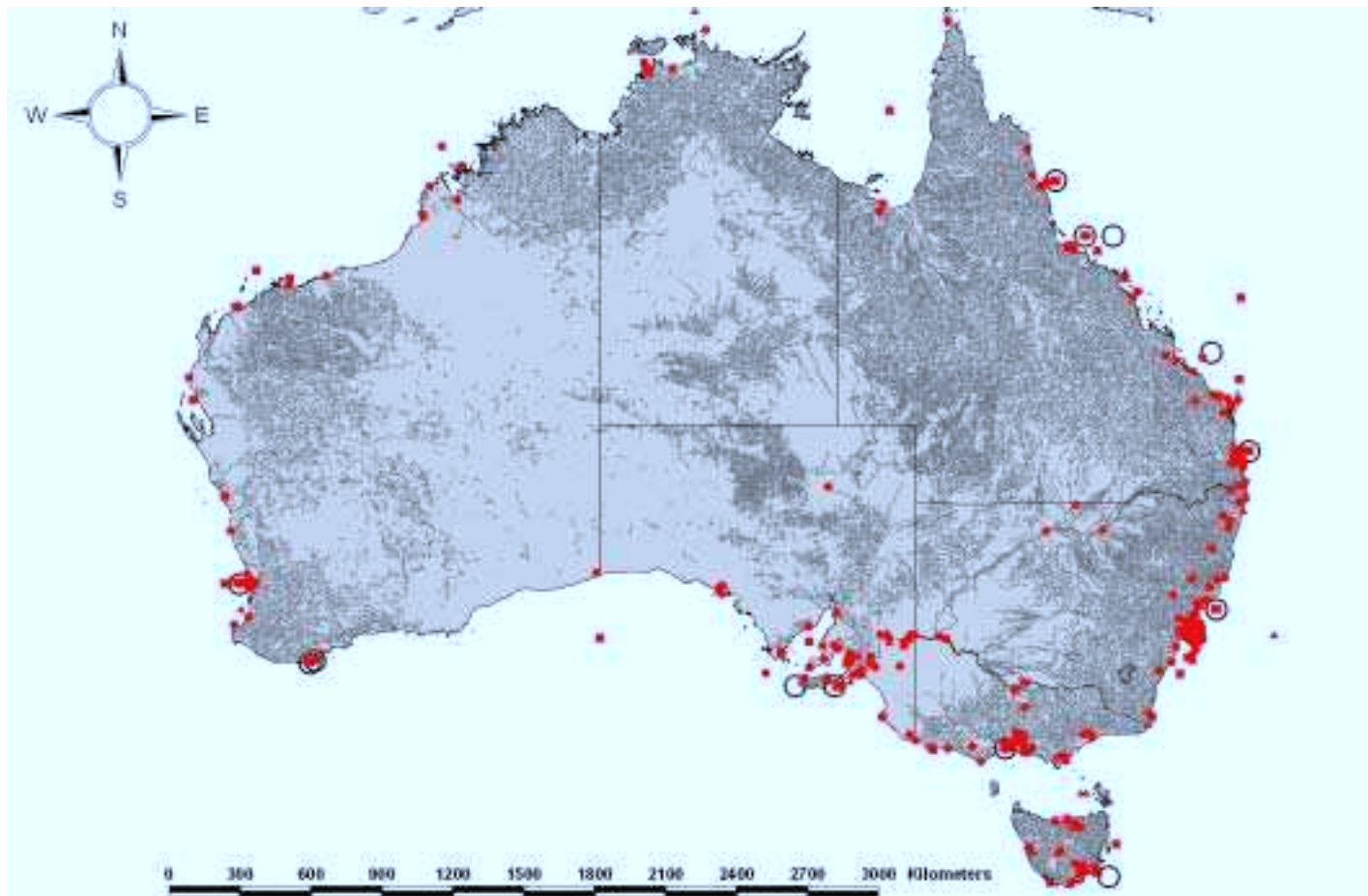
On the broadest level, the location of these sites is obviously associated with the establishment of the Australian states, and the location of their capital cities and port areas. The distribution of abandoned watercraft sites can be seen in Map 7.1. This map does not simply illustrate the dispersal of these vessels, but also enables us to understand some of the site location factors that are evident when investigating the spatial aspects of ship abandonment areas. Overwhelmingly, the distribution of abandoned watercraft corresponds with Australia's ports, and almost every major port has at least one watercraft

disposal region. This is further illustrated in Maps 7.2 – 7.7 which show the location of the main watercraft discard and demolition areas adjacent to the main ports of each state.<sup>1</sup> This is because the function of centres of maritime commerce is directly related to the creation of watercraft abandonment areas. Furthermore, such areas tend to be within close proximity of ports because of the concentration of vessel building, repair, salvage and condition assessment processes that occur there.

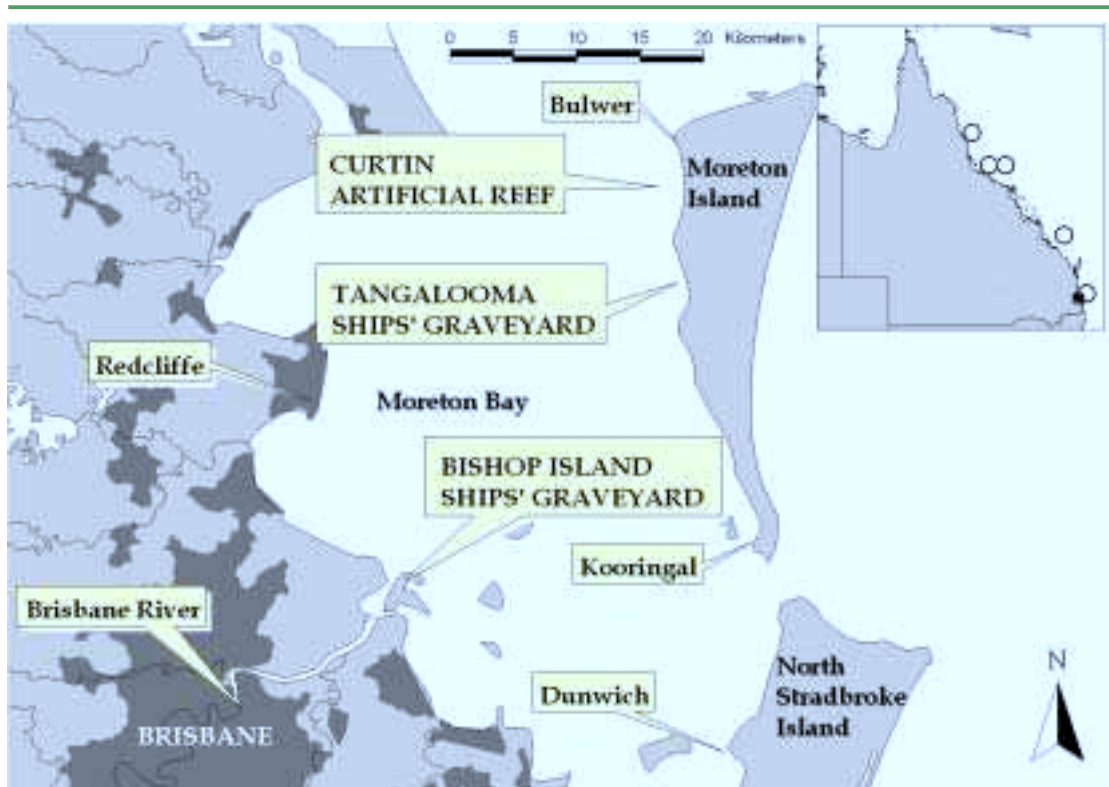
In 1969 the Australian Bureau of Statistics noted that Australia had sixty-one principal ports, twenty-five to thirty of which were of “statistical significance” due to their volume of trade. Of these, only six could be considered major ports (Bird 1968: 3; Bach 1976: 25). By and large it is clear that the vast majority of watercraft abandonment in Australia has occurred in these six premier ports. The location of these six ports tells us much about the reasons for the location of major centralised ship abandonment areas in close proximity to areas of port activity. Australian ports, due to their distance from each other do not compete to the same degree as European ports, and therefore the most important aspect of Australian port activity is wrapped up in the proximity and size of their hinterland (Tull 1997: 73). For this reason the distribution of major watercraft discard areas tends to be equally far apart.

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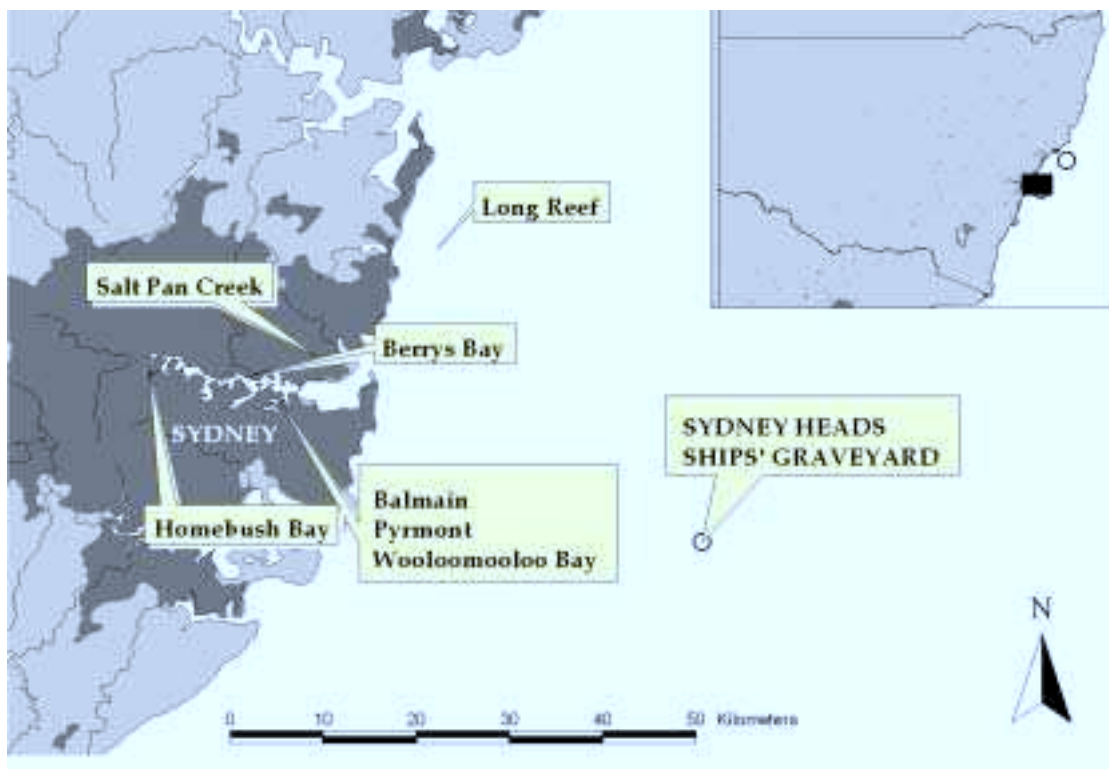
<sup>1</sup> Actual locations of watercraft are not shown in these illustrations due to site protection issues.



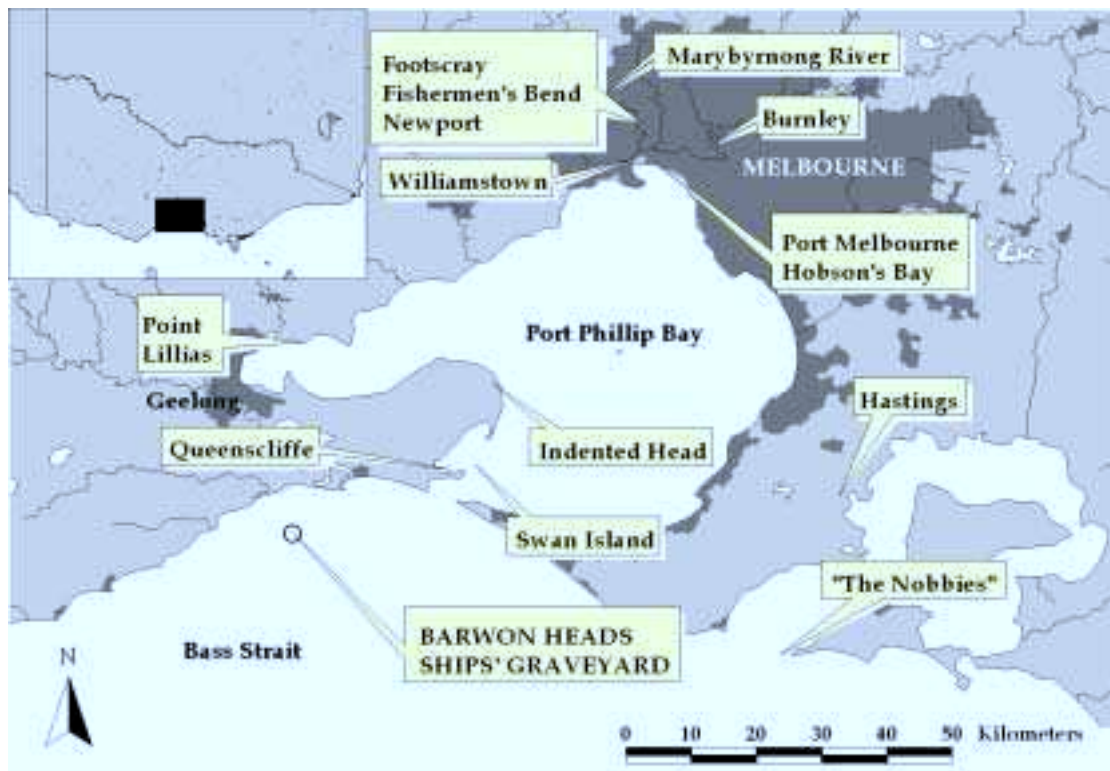
**Map 7.1** Map showing the distribution of abandoned watercraft in association with the Australian coastline and river systems. Circles denote locations of official Commonwealth dumping areas defined under the *Beaches, Fishing Ground and Sea Routes Protection Act, 1932*. Spatial data is from a variety of sources; GPS locations from archaeological inspection, official nomenclature lists of place names, and scuttling locations known by Environment Australia



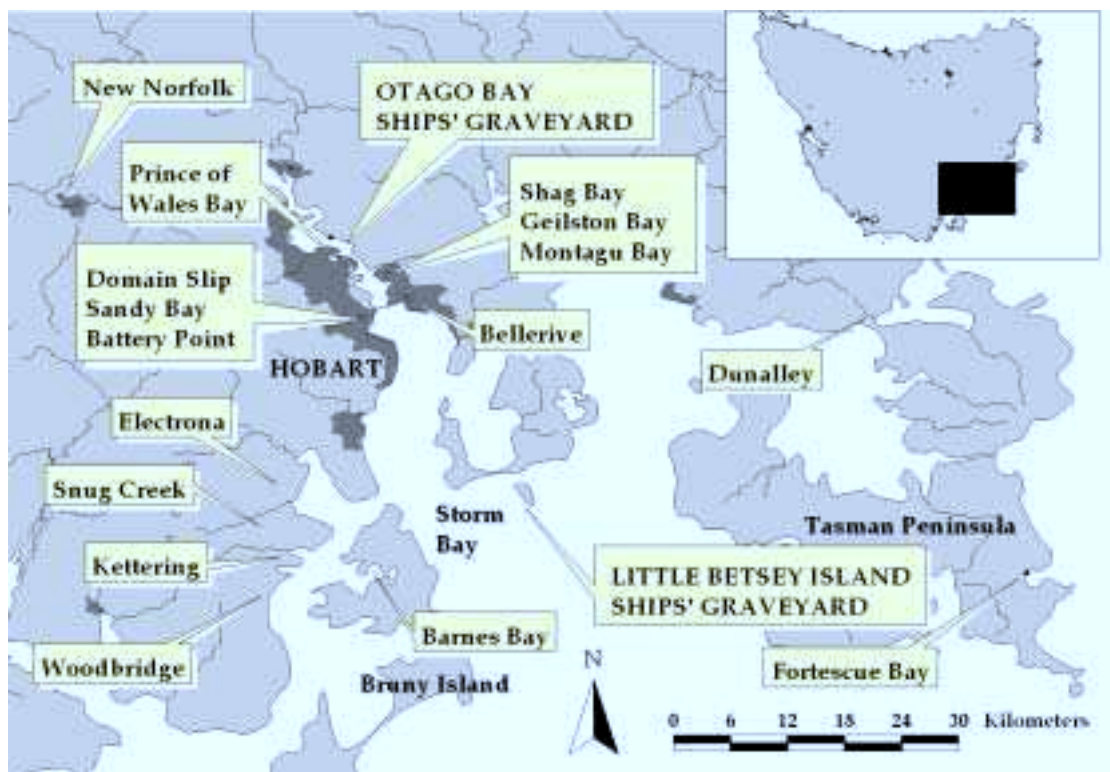
Map 7.2 Abandonment areas noted in the vicinity of Brisbane (major accumulations capitalised)



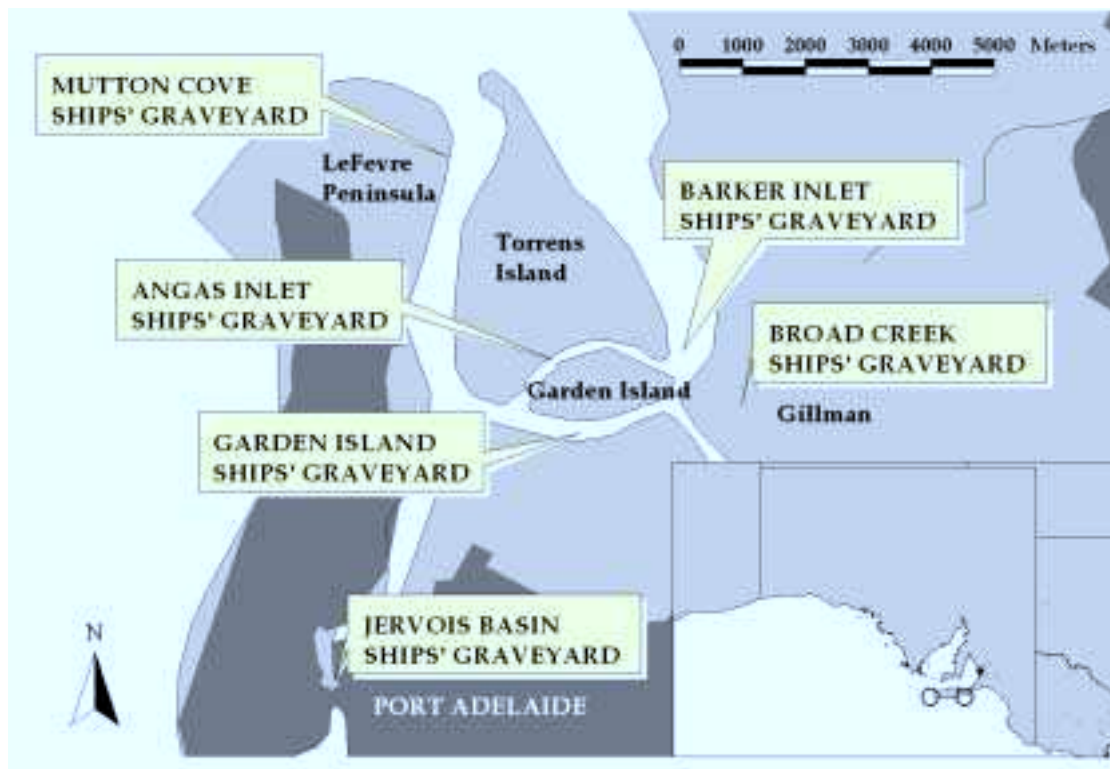
Map 7.3 Abandonment areas noted in the vicinity of Sydney (major accumulations capitalised)



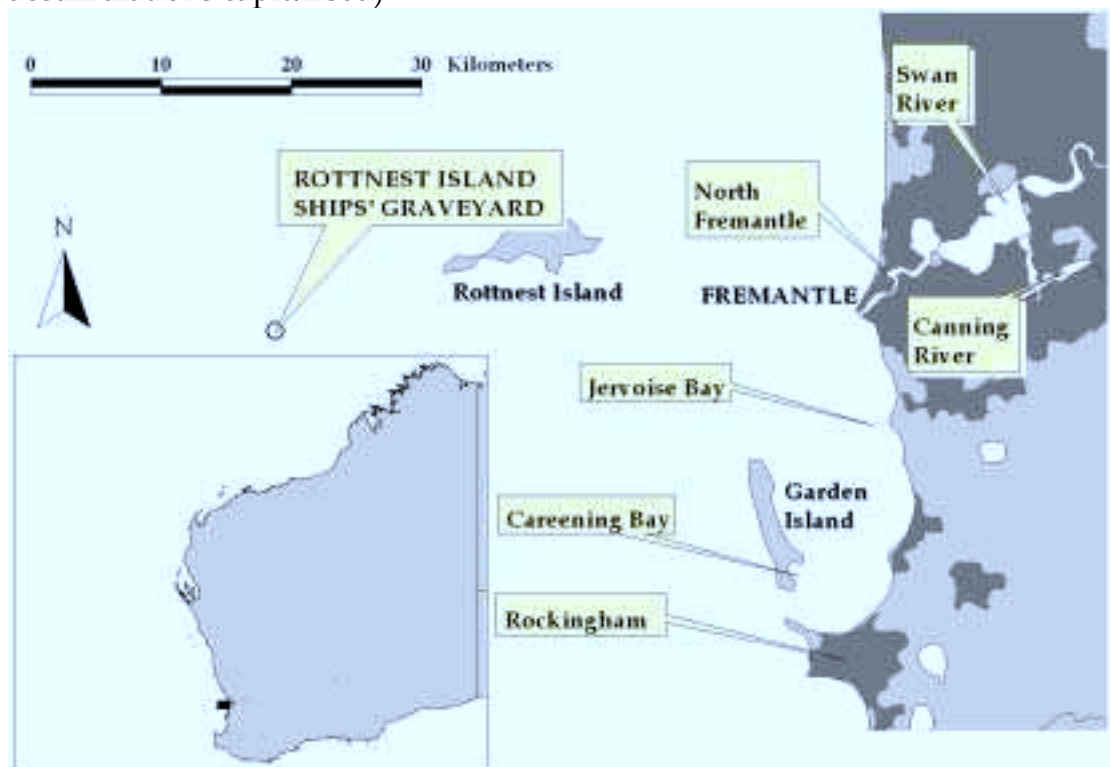
Map 7.4 Abandonment areas noted in the vicinity of Melbourne (major accumulations capitalised)



Map 7.5 Abandonment areas noted in the vicinity of Hobart (major accumulations capitalised)



Map 7.6 Abandonment areas noted in the vicinity of Port Adelaide (major accumulations capitalised)



Map 7.7 Abandonment areas noted in the vicinity of Fremantle (major accumulations capitalised)

This can also be seen in the tendency of major ports to be close to, or have within them at least one ships' graveyard, and secondary ports to often have isolated abandonment sites within close proximity. Furthermore, it seems that where secondary ports undergo major development that sees them become major centres of maritime activity, ships' graveyards of some type eventually follow.

### *Trade, Technology and Distance*

As Tull (1997: 1) has stated the, "The basic function of a port is to provide a link between land and sea transport and to furnish means by which transfers of freight and passengers between the two systems can be made efficiently". Ports, in many respects, are the microcosm of trade. While they do not represent the journey of a vessel; they represent the causes, commencement and conclusion of mercantile behaviour. They are the locations of the successes and the failures of technology and economics. For this reason it is of no real surprise that watercraft abandonment sites occur close to ports. These are the places where trades change, technologies are introduced, tried and tested, and where unwanted, unused or unsuitable vessels are laid up. The reason for their being laid up at these locations rather than other places is due to the concentration of obtainable trade at major ports and the fact that major ports were often more likely to have remnant trade opportunities in times of economic depression or recession.

Here the location of abandonment takes on a level of technological dependence. Without a powered vessel to tow an unwanted ship to a deep-water scuttling location it would have to travel under its own power (whether wind-driven or engine-propelled) - it is easy to see that this would not be practical due to adverse logistical circumstances, such as ensuring crew



safety. Additionally, if the vessel was to be taken out under its own power, it would have to be scuttled with many of its expensive propulsion related components (masts, sails, rigging) unsalvaged, and the dismantling of these sections would not have been practicable at sea. If sailing ships were instead used to tow unwanted vessels, there would have been similar problems due to problems with manoeuvrability. In the age of steam many of these issues would have been remedied, but there would have still been high costs associated with the use of steam tugs for moving vessels out to sea for scuttling. It is also the case that many of the early steam vessels, which served as tugs in this function (which were slow and unreliable) were limited in the distance they could travel due to inefficient engines (see Broeze 1992: 14; Tull 1992: 47; Riley 1999: 28). In this light we can see that the dangers, and costs associated with the abandonment of a vessel at sea would increase with distance. All of these factors meant that there is a predicability in the location of abandonment areas in relation to major ports, defined by the technology available to tow the vessels, and more importantly the perceived cost in the towing of the vessels to their final resting place.

### *Inner Harbour Functions and Abandonment*

Abandonment areas can also be understood to correspond with certain inner harbour functions. It seems evident from examples in the historical literature that there is a link between areas of ship breaking (in itself corresponding with dumping areas) and shipbuilding (as mentioned in Chapter 9).

In most areas of Australia shipbuilding places were initially determined due to their close proximity to suitable resources of shipbuilding timber, and in the early days of settlement shipbuilding occurred all along the Australian coastline. As the reserves for solid timber dried up, "batten built" vessels, or those built with steam bent knees had to be increasingly used (Kerr 1999: 35,

37, 125). By this time shipbuilding, and the location of shipyards ceased to depend on close proximity to their own timber reserves and their supply of timber was more often provided by a steady stream of bought timber arriving by cart, horse or punt. A consequence of this was that there was an increasing tendency towards the movement and centralisation of shipbuilding activities in ports where materials could be procured easily.

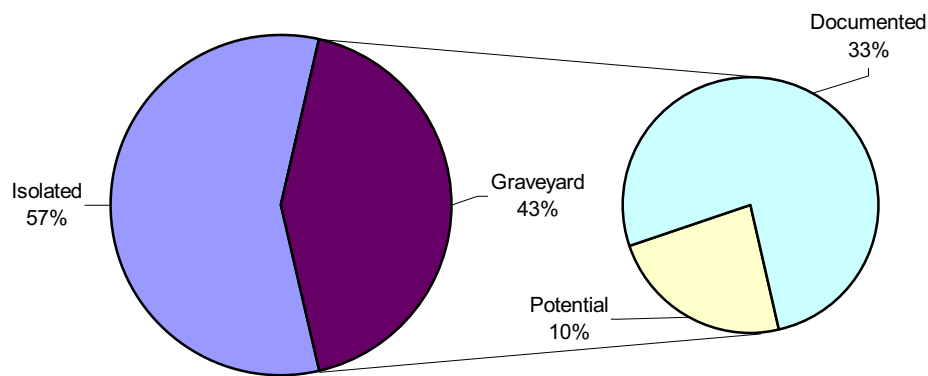
The procurement of timber played a pivotal part shipbuilding businesses based in inner harbour contexts. Consequently it is clear that the salvage of timber for building new ships from salvaged materials sourced from old, outmoded or worn vessels was a major aspect of providing such supplies. Indeed there seems to be a strong correlation between the intertidal ships' graveyards in many inner harbour locations and ship breaking industries – possibly due to their dependence on the salvage of the unwanted vessels to supplement shipbuilding enterprises with additional materials.

Another indication of the relationship between shipbuilding, abandonment and salvage activities is the fact that many shipbuilding places were also locations where watercraft modification, conversion and repair was undertaken. In northern Tasmania, some shipbuilding yards (such as Harry Wood's yard at Devonport) are noted for undertaking repair and lengthening work on watercraft (Orme 1988: 31). In these cases, where vessels undergoing repair, conversion or modification were put back to sea and found not to be in floating condition, the yard soon became a demolition yard. Subsequently it was often necessary to designate a place close by that could become a suitable resting place or "ships' graveyard" for such vessels. This has particularly been noted in southern Tasmania, with some major shipbuilding locations along the Derwent River also being located within close proximity to major ship dumping locations.

### **Australian Abandonment: Site Types**

The Australian abandonment landscape can be seen from many perspectives. As noted in Chapter 3, abandoned vessels exist as isolated (solitary) sites or within large accumulations known as ships' graveyards. At least 507 out of 1542 vessels (approximately 33%) are dispersed across 42 known ships' graveyard sites nationally. Additionally there may be another unconfirmed thirty-seven ships' graveyards constituting a further 154 vessels (10%) taking the accumulated 661 vessels to about 43% of the total (Figure 7.1). It should however be noted, that there are some vessels that are currently unidentified within some of the documented ships' graveyards dispersed around Australia, and that some of these vessels may indeed be in the ANAVD but not currently attributed to any particular accumulation of watercraft.

While it is not likely that there are any other large ships' graveyards in Australia not identified in this thesis, there may be some vessels in small graveyard accumulations that have thus far not been given a designated graveyard description. This is due to the possibility that the vessels have been broken up and no longer exist. One notable case is the possibility of there being a ships' graveyard on Thursday Island in Northern Queensland where there has been some correspondence of vessel remains in the area – but mainly historical information pertaining to the seven vessels that have been dismantled there.



**Figure 7.1** Isolated/solitary abandonment sites v. watercraft accumulation/ships' graveyard sites (documented and potential) in Australia (n= 1542)

Ships graveyards in Australia are essentially of two types: designated/official and non-designated/unofficial. Designated graveyards are often enshrined within legislation and bureaucratic procedures. Non-designated graveyards often pre-date the designated type, or eventually become designated dumping areas.

The placement of all of these watercraft spatially peripheral to shipping routes are indicative of strategies in line with the desire to avoid navigation hazards that would substantially impede the carrying out of commercial activities. The graveyard sites can be seen as comprising of two main types; deep-sea scuttling areas and intertidal ships' graveyards found in inner harbour contexts. These sites are also peripheral to commercial activities, but in slightly different ways. Deep-sea scuttling areas tend to be a substantial distance from major centres of commercial trade routes. Ships' graveyards in harbour contexts are isolated from trade routes, as well as areas of commercial activity, although their location, being within a harbour are still accessible. These two types of site also correspond with legal definitions and political jurisdiction. Deep-sea scuttling areas tend to be "Commonwealth designated areas" defined under the *Beaches, Fishing and Sea Routes Protection Act 1932*,

whereas ships' graveyards within harbours are located within state waters or state controlled areas, and may be controlled by state harbours legislation and regulation.

#### *Commonwealth Areas*

The active controls that are dictated by the *Beaches, Fishing and Sea Routes Protection Act* are also relevant to the landscape of abandonment because the accompanying Statutory Rules for Commonwealth Acts (1933: 96-104) include maps of the areas where vessels can be dumped (See also Parliamentary Hansard 1932). There are 14 such areas outlined in this legislation, which correspond with certain Australian Ships' Graveyards (see Appendix 4). They include a number of details:

- Description of location;
- Depth of water at disposal area;
- Bearings to prominent shore based features, and;
- Distances from port.

Twelve of the areas are circular areas between three (in the case of area 3 – Melbourne and Geelong) and seven miles in diameter (in the case of area 7– Fremantle), with the two designated areas off Albany being adjacent to land. The depths vary from 25 fathoms in the case of area 3 (Melbourne and Geelong), to 100 fathoms in the cases of areas 1, 2, 4, 10, 11, and 14 (Sydney, Newcastle, Hobart, Brisbane, Rockhampton and Cairns) (the depth of area 7 (Fremantle) is not defined).

These areas link in with what has previously been said in relation to the nature of Australia's predominant ports, and their separation, and they are obvious indicators of the concentration of trade in certain ports. It is no accident that the designated areas correspond not only with major ports, but that where other ports, such as Fremantle have had to share and compete for

trade with other ports (such as Albany) (Tull 1997: 75) we can see that major abandonment areas are closer together (such as the small distance between Commonwealth designated area 7 in Fremantle and designated areas 8 and 9 in Albany). This is also supported by examining the correlation between major ports, designated areas and the length of the coastline of certain states. For instance, Queensland, more than any other state has the largest number separate abandonment locations, as well as the most Commonwealth designated areas. This is undoubtedly due to the combined factors of an exceptionally long coastline, numerous profitable and concurrently working ports and settlements, and dispersed population.

These locations give us some indication of the lengths to which regulatory bodies went to control watercraft abandonment. The analysis of the ANAVD however suggests that these designated areas were not a complete success with only around 15% of total abandonment being located within these areas. Only five noted watercraft accumulations, or ships' graveyards can be considered to correspond with these areas. The Sydney Heads Graveyard (area 1), Newcastle disposal area (area 2) Barwon Heads Graveyard (area 3), Rottnest Island Graveyard (area 7), the Albany Graveyards (areas 8 and 9) and accumulations off of Townsville and Cairns (areas 13 and 14) correspond well with designated areas. Other areas, such as one of the areas designated for Adelaide and Gulf Ports and for Brisbane (areas 5 and 10 respectively) do not contain enough vessels to be considered major accumulations, and areas 4, 11 and 12 (Hobart, Rockhampton and Bowen) appear to have never been used at all. In particular there is a well-documented relationship between area 4 (Hobart), which was not used at all, and a site known as the Little Betsey Ships' Graveyard, which was used extensively. Indeed, the statutes make a special note for Tasmania that, "The sinking area within the Hobart port limits is on the edge of the reef at the south end of Betsy Island situated to the eastward of the entrance to the Derwent River" (Statutory Rules, Commonwealth Acts 1933: 99).

In part we can see the lack of use of these designated areas as being related to the previously noted points on watercraft abandonment and distance from port. This is linked with what Broeze (1998: 6) has said about distance:

Distance, it should always be remembered, can be measured and perceived in many different ways: in length, time or cost, and according to class, occupation or ideology. What is far to some can be close to others.

While the distance of these Commonwealth areas from port are not large by normal mercantile standards, they are exceedingly large when the journey is certain to cost much, and have no return. Traversing large distances to dump a vessel would be a major disincentive for the use of particular dumping areas because such journeys were expensive. For this reason one may speculate that some of the vessels intended to end up in these deepwater designated ships' graveyards did not end up where they were supposed to, and were secretly dumped between their port of departure and the area designated for their dumping. To some degree this also explains why ships' graveyards like the Little Betsey Island Ships' Graveyard (located around 27 kilometres by sea from Hobart) were used instead of the Commonwealth designated area (located over 100 kilometres by sea from Hobart).

This also seems to be the case with other, under-utilised Commonwealth designated areas. Areas 5 and 6 for Adelaide are respectively located over 160 and around 250 kilometres from Port Adelaide, whereas the most densely packed discard areas in Port Adelaide are between 100 metres and six kilometres from major commercial areas. This is also the same situation in Brisbane where the major ships graveyard (Bishop Island) is in the mouth of the Brisbane River, as opposed to the designated area, which is around 80

kilometres away by sea. Contrasting this are the approximate distances of the successful designated areas from major commercial areas:

- Area 1                      36kms from Sydney
- Area 2                      64kms from Newcastle
- Area 3                      77kms from Melbourne; 75kms from Geelong
- Area 7                      37kms from Fremantle
- Areas 8 and 9            22 and 27kms from Albany

The majority of these areas are closer to ports than their unsuccessful counterparts. Clearly distance was a major part of the success of Commonwealth areas, and the shorter distances represented by the existence of non-Commonwealth graveyards of the illegal variety, or under the jurisdiction of State regulatory bodies were a major attraction for those wishing to dump unwanted vessels.

#### *State Jurisdiction*

Ships' graveyards within state jurisdiction tend to be of the variety where vessels are beached rather than scuttled in deep water. This is obviously because of Commonwealth jurisdiction over the most of Australian waters, and state jurisdiction over inland waterways. Additionally each state, and sometimes each port may have a number of separate abandonment areas. If the Commonwealth areas can be seen as indications of the concentration of trade, the predominance of abandoned watercraft adjacent to Australia's capital city ports can also be seen as the veritable monopoly on trade that each port has over its state (noted by Tull 1992: 49).

Port Adelaide in South Australia, for instance has a range of vessel abandonment areas (official and otherwise), scattered about the inner and outer Harbour (as seen in Map 7.6). The changes in the location of vessel disposal areas appears to be due to the changing use of the port and the



changing nature of salvage from the late 19<sup>th</sup> century. While it is well documented that there were certain locations where vessels were broken up and disposed of there were many isolated locations for the total dismantling of obsolete or unwanted vessels. The first vessel to be broken up at Port Adelaide was the wooden cutter *Mary Ann* in 1842 (built 1834) while the last four ketches to be broken up at Port Adelaide are cited as being *Endeavour* at MacFarlane's Slip, *Free Selector* at the Harbours Board Reach, *John Lewis* at the Central Slip and *Active* near the Fish Ramp in the mid 1960s (LeLeu 1977: 10-11; Ritter 1996: 45).

From these examples it can be understood that ships' graveyards within state areas are of two fundamental types; those predominantly representing ship discard activities, and those predominantly representing ship-breaking activities. In relation to site formation theory we can see ship discard sites as secondary refuse sites, because some degree of salvage has already occurred at a ship-breaking yard, which themselves can be defined "primary refuse sites" (see Chapter 2). Of this latter category there are very few sites that remain where vessels were broken up and still some have remnants of these watercraft. Predominantly ship-breaking areas were places that have been subsequently cleaned up, or where salvage entailed the complete dismantling and recycling of watercraft - and therefore are more representative of curate behaviours (Chapter 2). There are many places where vessels have been broken up but where there are no longer archaeological remains of those vessels. In some cases this is due to subsequent "clean up" activities, but in other cases this is due to efficient salvage. Such sites cannot be called "ships' graveyards" the same way that the other sites can. Examples of these sites are found at American River and Kingscote (South Australia), Balmain and Pyrmont (New South Wales), Battery Point and Prince of Wales Bay (Tasmania). Intertidal ship discard and ship breaking sites are important to distinguish from deep-sea scuttling areas, because they are occupied for the purposes of salvage and scavenging, not just ship disposal. These sites are

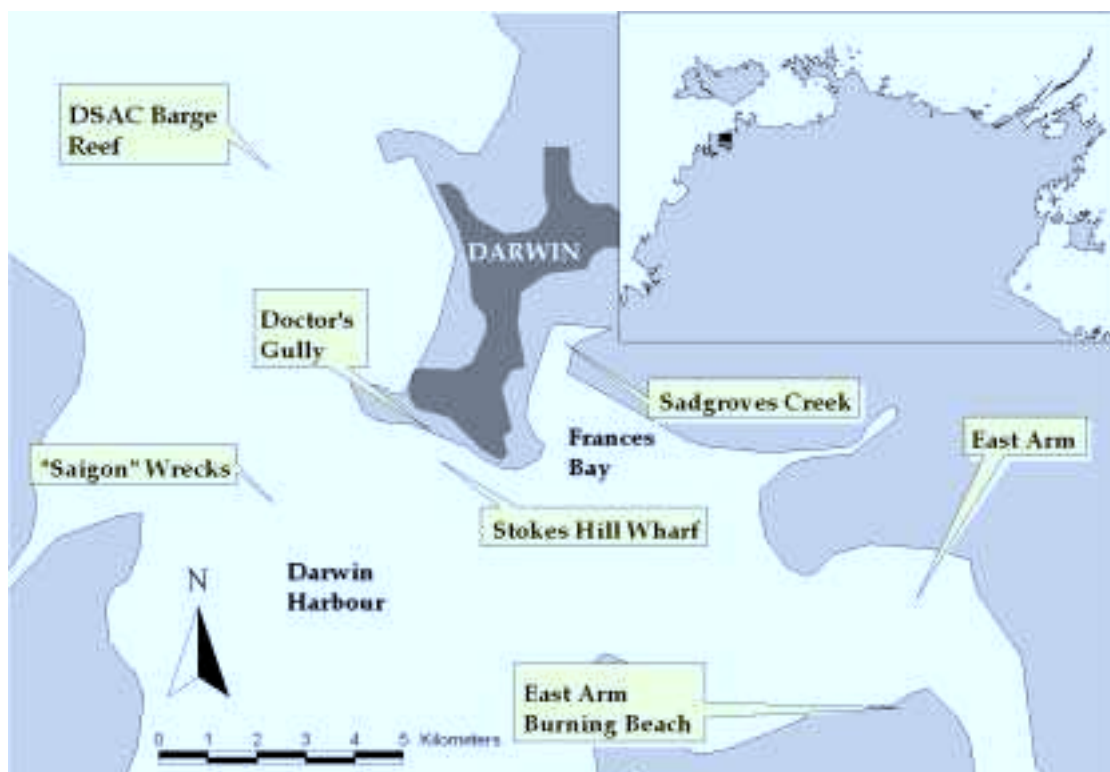
therefore more likely to accumulate the signatures of placement assurance, and hull reduction strategies (see Chapter 9) that may coincide with economic or technological trends (as defined in Chapter 6).

Surviving sites that represent ship breaking and ship discard together can be found at the Jervois Basin (Port Adelaide), Homebush Bay (Sydney), and Point Lillias (Corio Bay, Geelong). The ships' graveyards that were also ship-breaking areas are also special because while they often do still contain some abandoned watercraft, these are only a small proportion of the vessels that were actually abandoned and dismantled there. These sites, despite their relatively scarce material remains in relation to other vessel accumulations are important because they represent many more reuse, discard, abandonment, and reclamation processes. Such is the case with the Jervois Basin Ships' Graveyard with six vessels located in the area - but up to 49 other sites possibly there.

#### *Shared Jurisdiction: The Territories*

In most Australian states official ship abandonment can be seen in relation to the division between State and Commonwealth rights and responsibilities. In the case of the Northern Territory, however, the situation appears somewhat different. The Northern Territory at the time of the writing of the 1933 legislation did not have a major need for the control of the discard of watercraft. As a consequence the discard pattern there is much more scattered. There are only three distinct regions that are noted as being dumping areas in the Northern Territory. These three sites are distinct in that the first area can be loosely termed a ships' graveyard is found in Darwin Harbour (see Map 7.8) while the other two regions are considerable distances from Darwin around Ashmore Reef and the border of Australia's Exclusive Economic Zone (about 470 nautical miles west of Darwin) and New Year's Island (approximately 150 nautical miles northeast of Darwin). These last two

regions have been defined here because Ashmore Reef is a known site for an unknown number of abandonment sites and New Year Island is historically listed as being the dumping ground for a single vessel, the motor vessel *Miyo Maru* (the information of which has not been corroborated outside of the citations within the ANAVD). The majority of the abandoned vessels in the Northern Territory (around 98%) lie inside, or within close proximity to Darwin Harbour. Within this area, there are a number of locations, or clusters, which have served as focal points for vessel disposal.



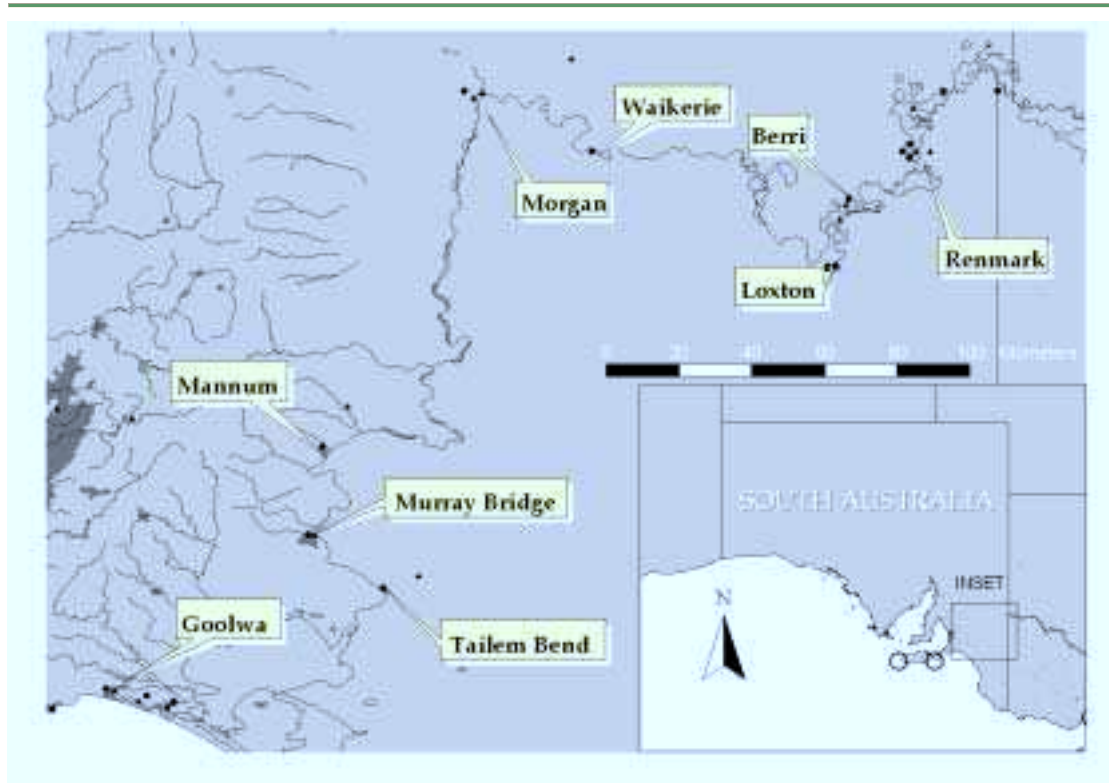
**Map 7.8** Abandonment areas noted in the vicinity in Darwin Harbour

*Special Case: Riverine Abandonment*

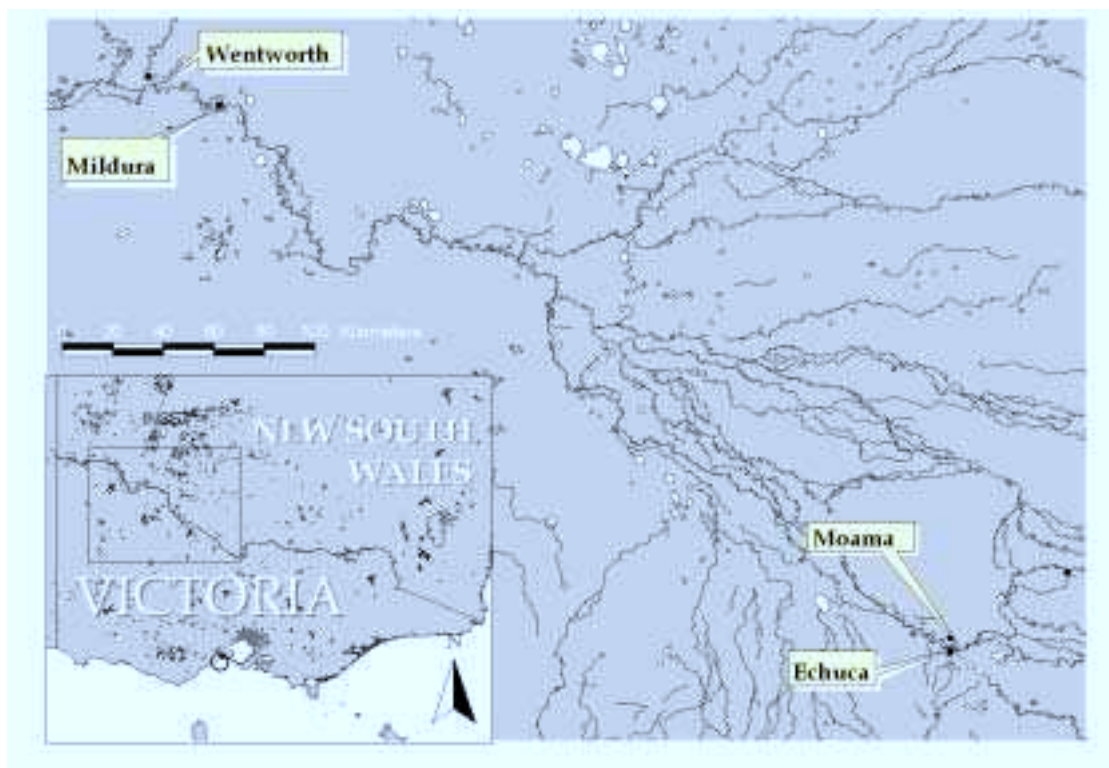
Kenderdine (1994a: 179-180, 1994b: 22-23) has also noticed spatial patterning in relation to the location of watercraft on the Murray River in South Australia, Victoria, and New South Wales. Of relevance to deliberate discard, she noted that:

- Sites are more common in the lower reaches of the river indicating that vessels moved down river as trade declined;
- Discard locations were predominantly in tributaries removed from the main river to ensure safe navigation;
- Sites cluster around saw milling operations in New South Wales and Victoria. Abandoned barges were often built for particular saw milling operations;
- Abandoned vessels can be found in tributaries of the river, which served as ships' graveyards;
- The growth of railway networks and the construction of bridges had ramifications on trade, and discard behaviour;
- More sites are found in the lower reaches the South Australian section of the river than any other. This may indicate that the normal response to trade decline was to deliver last services to downstream ports, and;
- Site cluster around major ports, these ports usually having a rotten row.

These findings were replicated in this study, and the major towns and settlements along the River were found to be focal points for discard activities (see Maps 7.9 and 7.10).



Map 7.9 Abandonment areas along the Murray River in South Australia

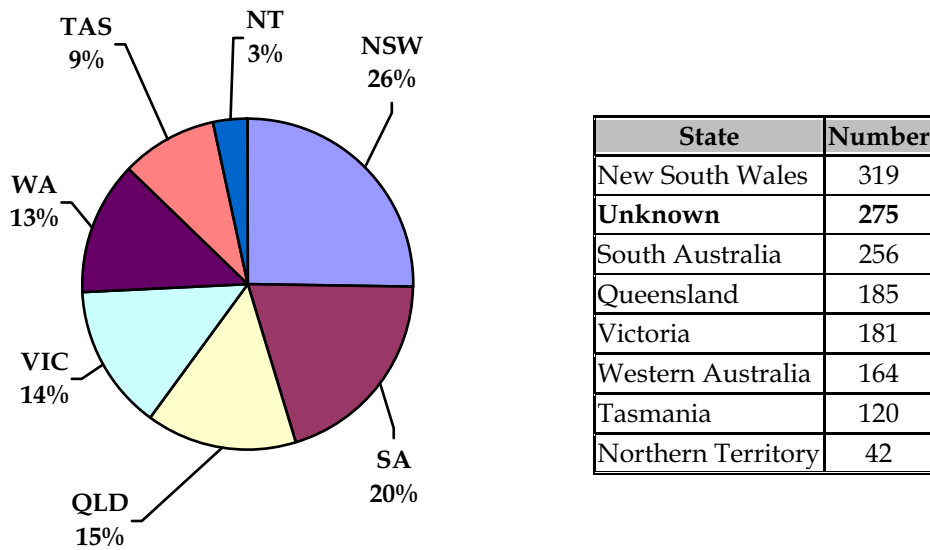


Map 7.10 Abandonment areas along the Murray River in New South Wales and Victoria

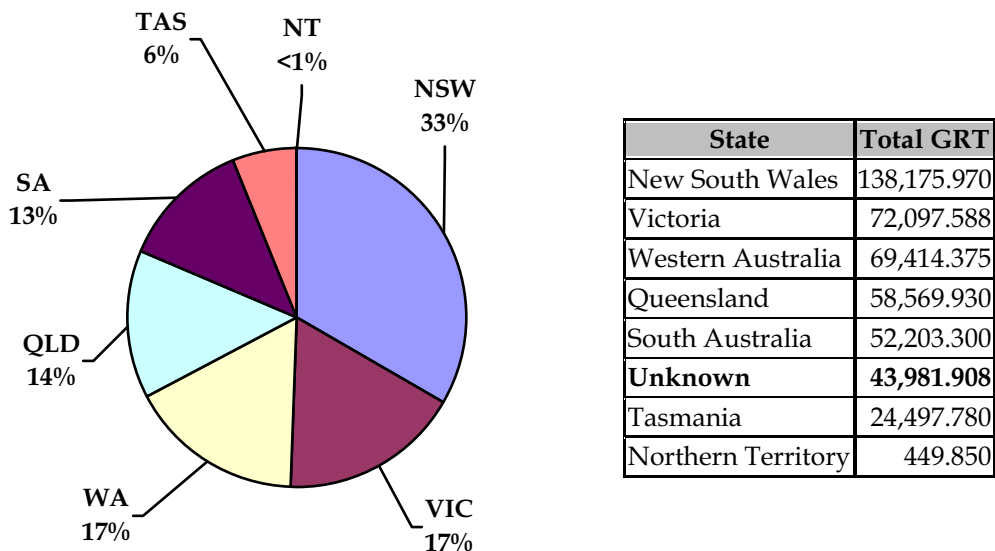
The spatial constraints of operating a vessel on a river (only being able to travel up river, and down river) also affect options in relation to where you may discard a vessel. Nevertheless, there are still major links between riverine and marine abandonment in the location of discard areas. These can be summarised as; trade will define working location, and perceived threats to navigation will abandonment location. These findings were also reflected in a similar study (Babits & Corbin-Kjorness 1995: 28, 76, 78) on the Pungo River system, North Carolina where secondary and tertiary streams were found to be the most likely places for watercraft disposal.

### **Site Distribution**

As indicated elsewhere there are 1542 separate abandoned watercraft sites in the dataset of this study. Of these sites 275 (approximately 17%, the second largest category in the study) were abandoned or dismantled in a state that is currently unknown, and have therefore had to be excluded from regional analysis. The remaining 1267 vessels that remain are dispersed as depicted Figures 7.2 and 7.3, according to number, and tonnage.



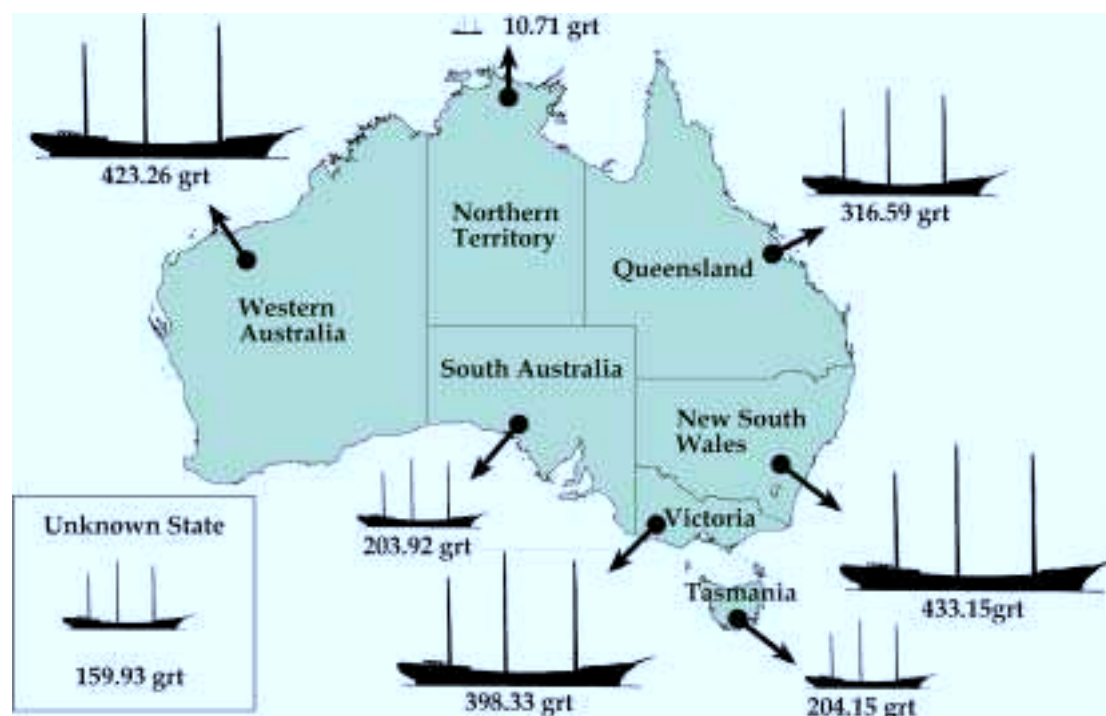
**Figure 7.2** Breakdown of state of abandonment by number of watercraft (with known date of build and abandonment), with “unknown state” excluded (n=1267) (bolded values excluded from chart)



**Figure 7.3** Breakdown of state of abandonment by gross tonnage of watercraft (with known date of build and abandonment) with “unknown state” excluded (459,390.7 gross tons in total) (bolded values excluded from chart)

As with the national analyses undertaken these values may vary with additional abandoned vessels that are not currently documented. Examples such as a number of unidentified barges along the Murray River identified by Kenderdine (1994a: 180-181), and “stout old” lighters, “cast aside” at Portland, Victoria (Learmouth 1960: 66) would undoubtedly increase the number of vessels, and total tonnage abandoned in each state. Similarly there are some vessels in the database without currently known tonnage values.

These figures illustrate the importance of gross tonnage as a value for the analysis in abandonment trends. A comparison of the number of watercraft, and the total gross tonnage of watercraft abandoned in each state and territory show that there are substantial changes to the ranking of the distribution according to each analysis. This also illustrates that while states like South Australia have had many vessels abandoned, their size on average was much smaller than in other states (see Figure 7.4).



**Figure 7.4** Average gross tonnage of watercraft abandoned in each state and territory (equals total gross tonnage abandoned divided by total number abandoned). Figures are rounded to two decimal places



This analysis also explains why there are so many watercraft of unknown location of disposal, with the breaking up of these smaller vessels being comparatively invisible in historical documentation. Additionally these values may also reflect the size of vessels working in the major ports of these regions, and over time, may illustrate the effect of developing port infrastructure, and the consequences of dredging operations (expanded below).

There is a large variation in the number of vessels abandoned in each state and territory of Australia. For instance, the watercraft abandoned in the Northern Territory account for only 3% of all abandoned vessels throughout time. Additionally, the entire ship abandonment resource of the Northern Territory equates to only forty-two vessels, roughly the equivalent to a single ships' graveyard in most other states. While this is not surprising considering that the numbers of abandoned vessels could be expected to be generally inversely proportional to the total amount of trade in a particular region across time, this has meant that some analyses are less reliable due to the considerably smaller sample size available for these areas. Due to the large differences in the number and total gross tonnage of watercraft discarded in each state no combined abandonment trend on a single graph can be adequately displayed, hence Figures 7.5 to 7.18 show the number of, and gross tonnage of watercraft abandoned in each region (arranged according to number of watercraft) between 1800 and 2000. Periods of major national and regional economic change, and drought years have been superimposed on the graphs to illustrate the degree of correlation between these occurrences and watercraft discard trends. These charts will be referred to continuously throughout this chapter.

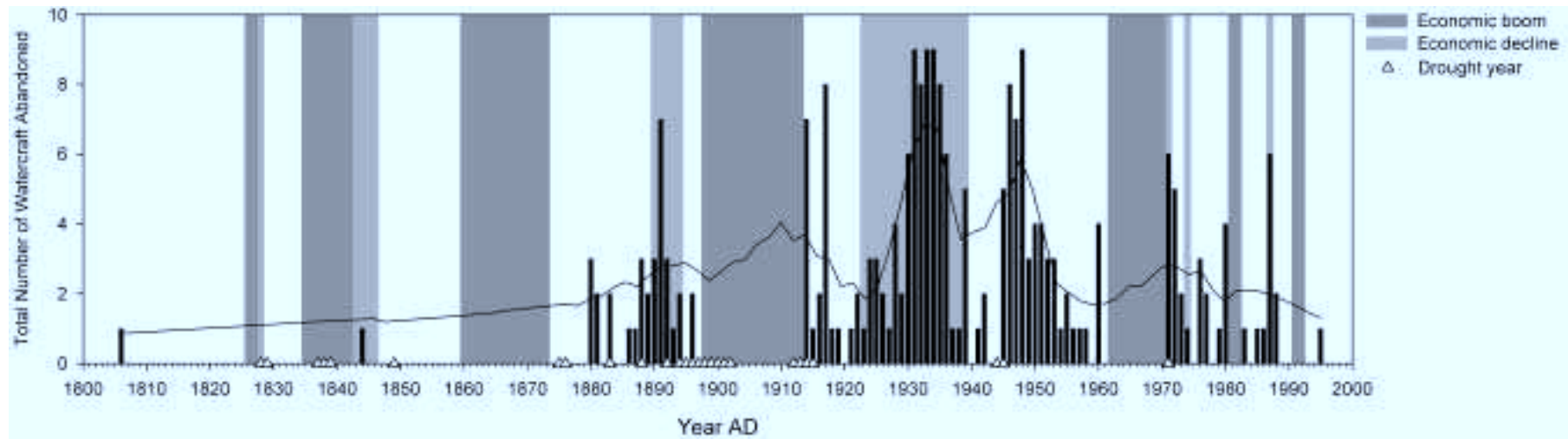


Figure 7.5 Watercraft abandoned in New South Wales (1800 - 2000) by number of watercraft (n=319 watercraft)

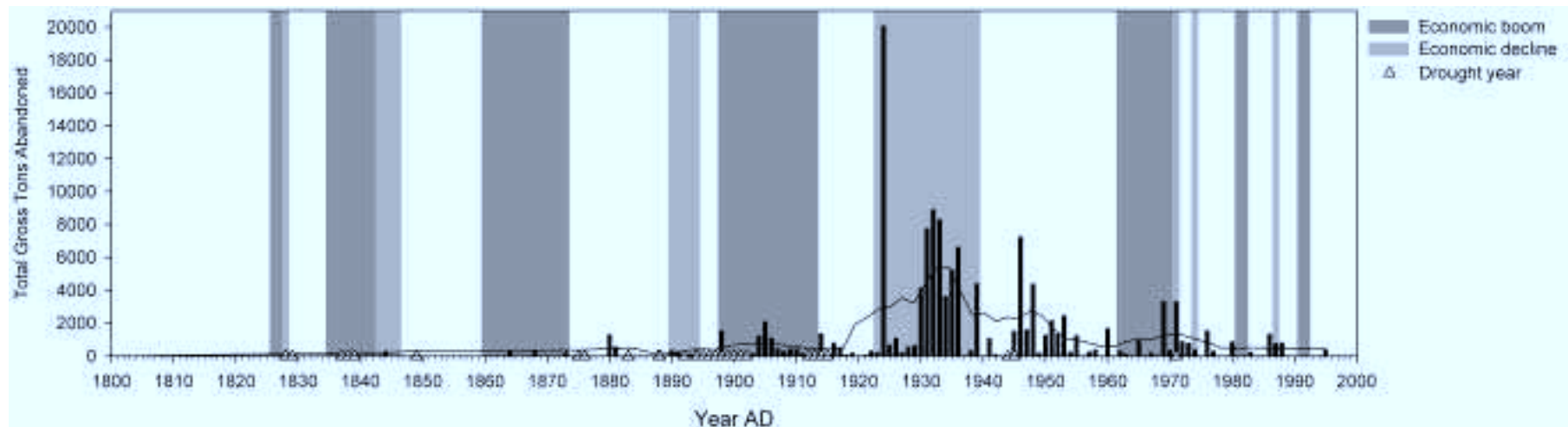


Figure 7.6 Watercraft abandoned in New South Wales (1800-2000) by gross tonnage (n=319 watercraft, 138,175.97 grt)

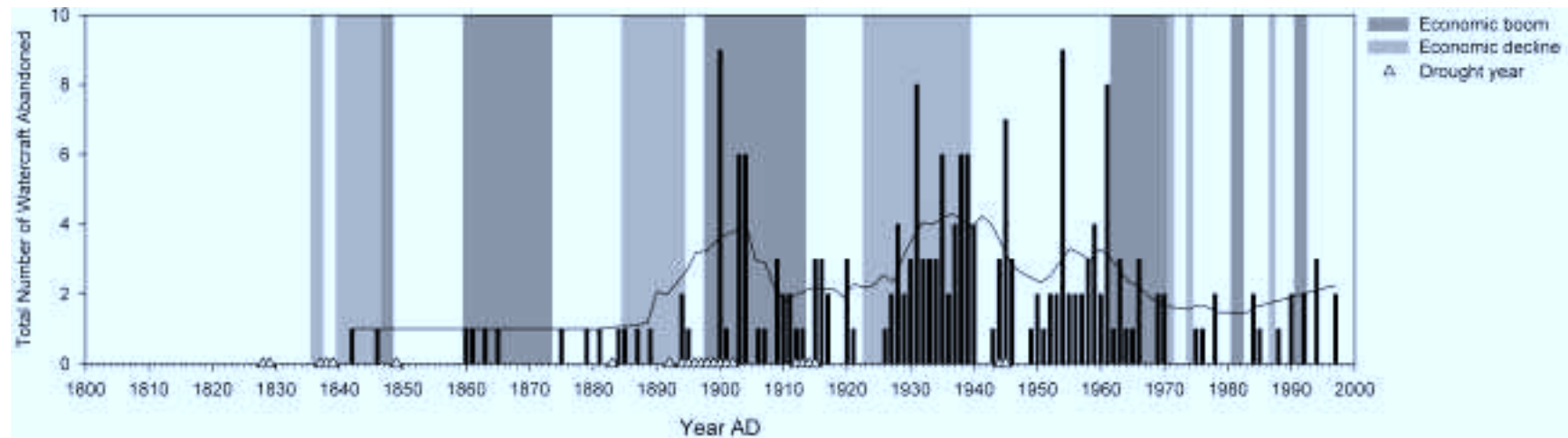


Figure 7.7 Watercraft abandoned in South Australia (1800-2000) by number of watercraft (n=256 watercraft)

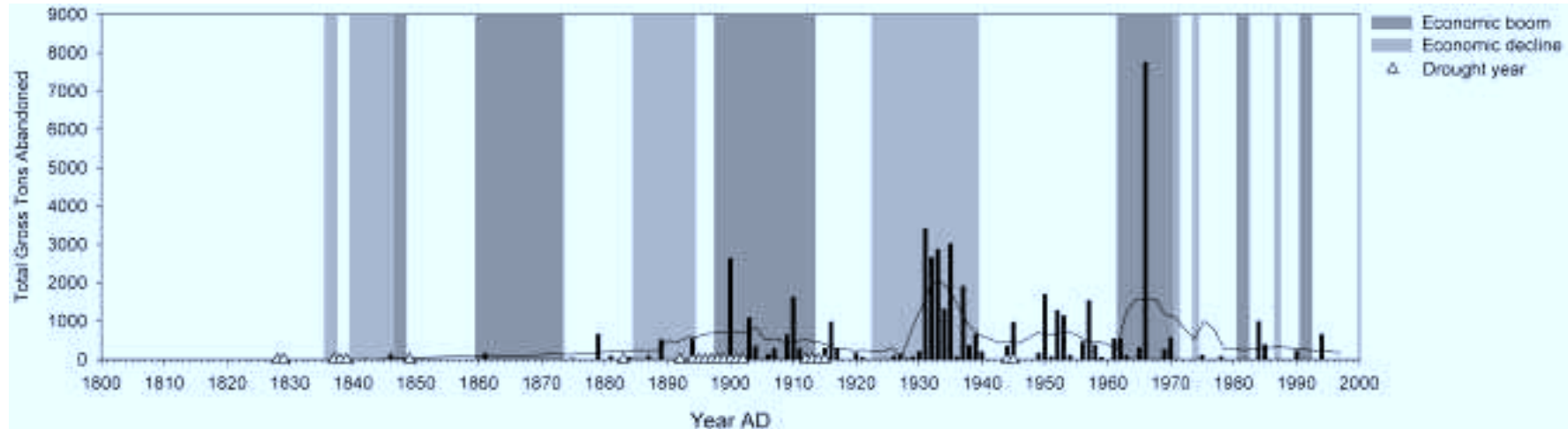


Figure 7.8 Watercraft abandoned in South Australia (1800-2000) by gross tonnage (n=256 watercraft, 52,203.3 grt)

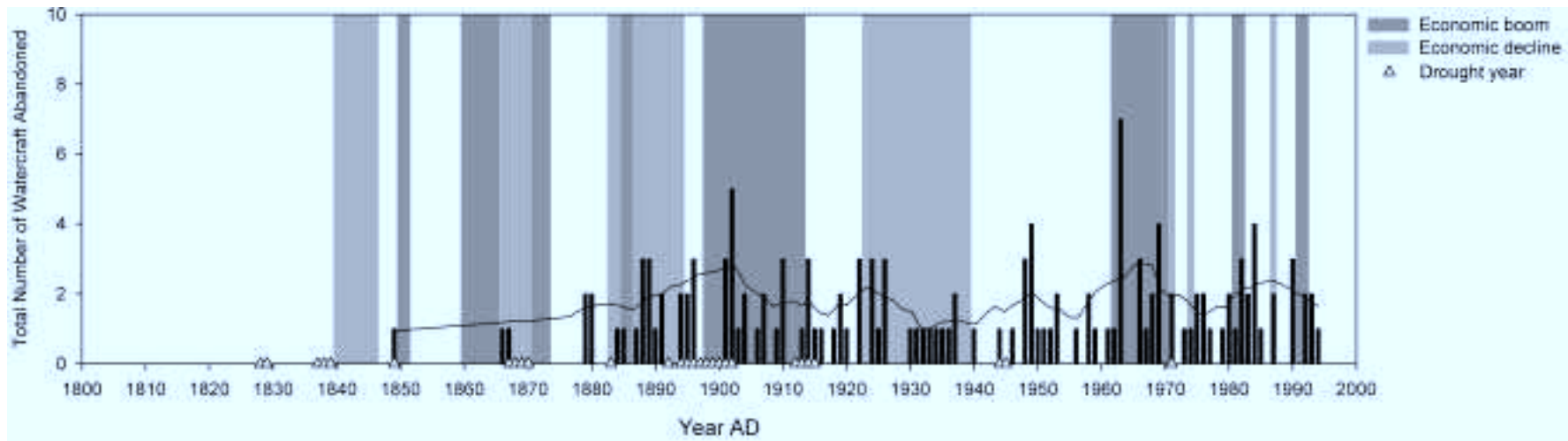


Figure 7.9 Watercraft abandoned in Queensland (1800-2000) by number of watercraft (n=185 watercraft)

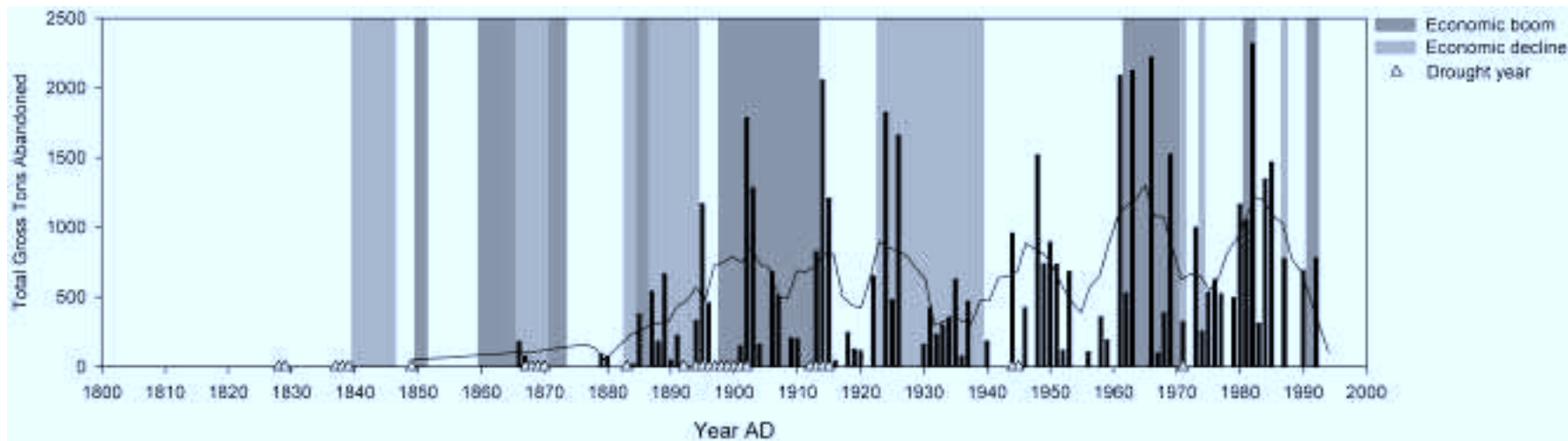


Figure 7.10 Watercraft abandoned in Queensland (1800-2000) by gross tonnage (n=185 watercraft, 58,569.93 grt)

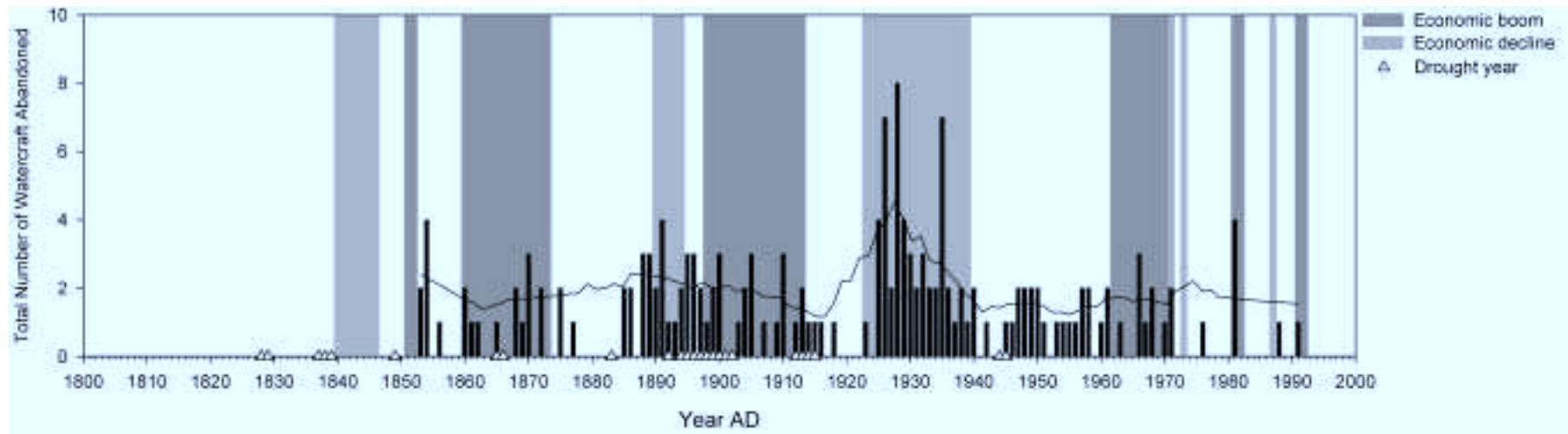


Figure 7.11 Watercraft abandoned in Victoria (1800-2000) by number of watercraft (n=181 watercraft)

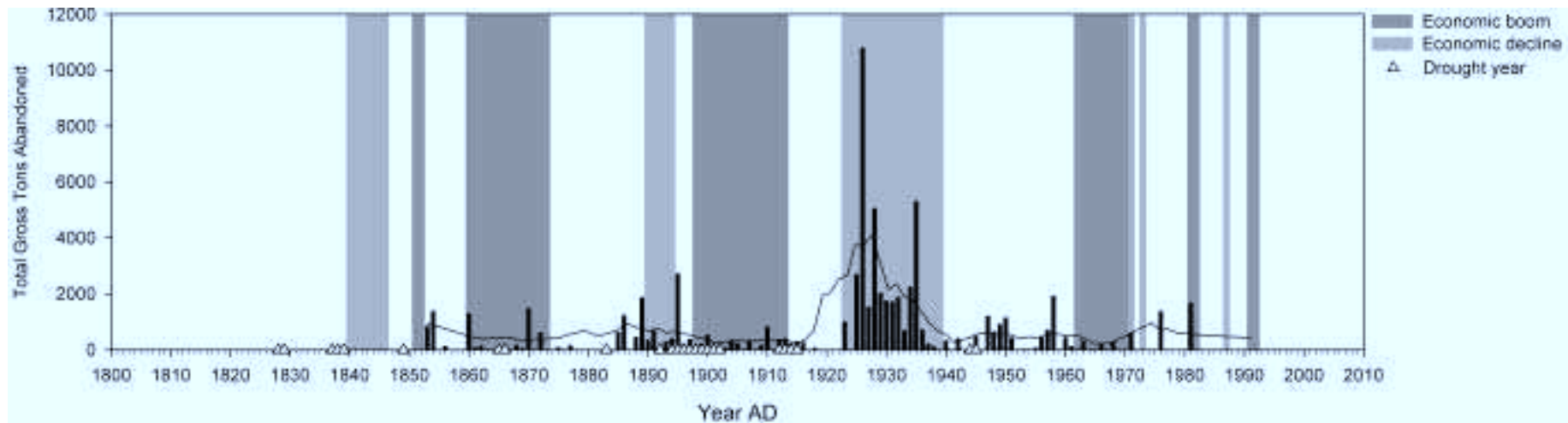


Figure 7.12 Watercraft abandoned in Victoria (1800-2000) by gross tonnage (n=181 watercraft, 72,097.588 grt)

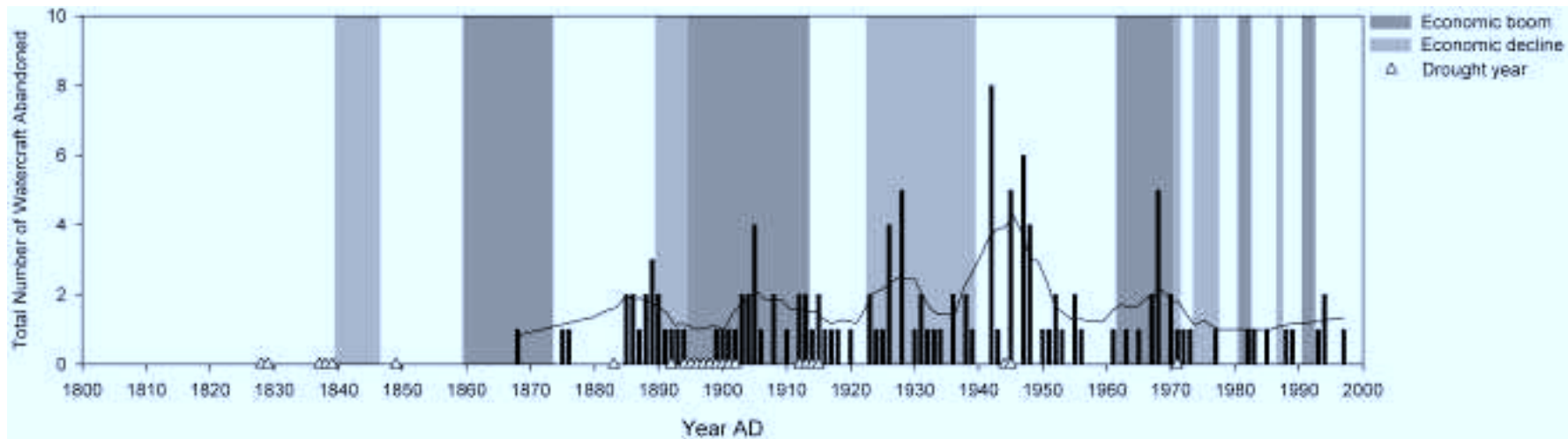


Figure 7.13 Watercraft abandoned in Western Australia (1800-2000) by number of watercraft (n=164 watercraft)

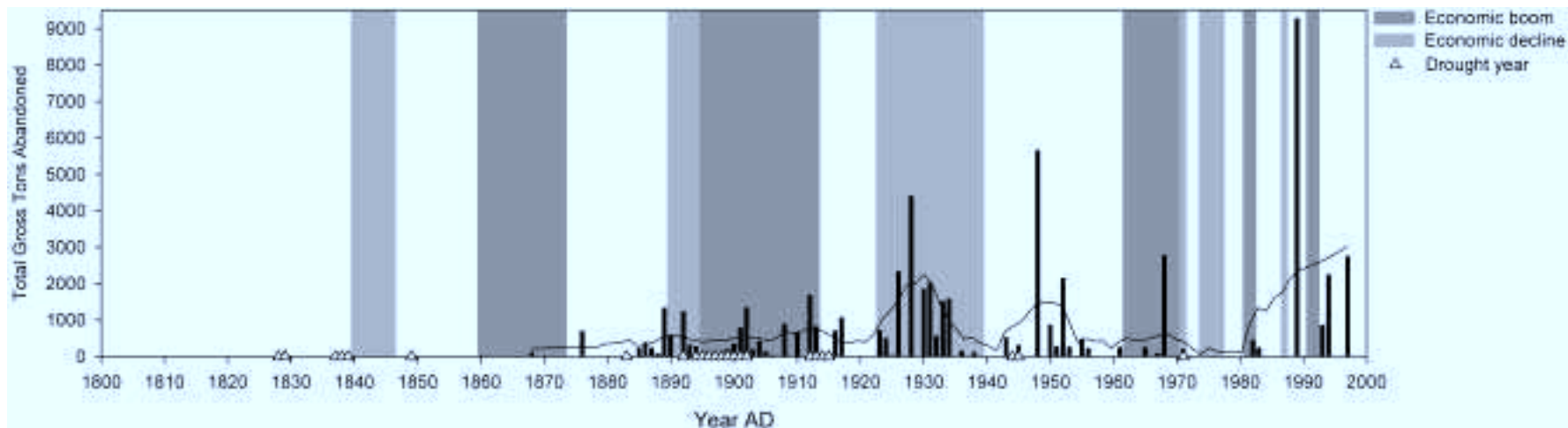


Figure 7.14 Watercraft abandoned in Western Australia (1800-2000) by gross tonnage (n=164 watercraft, 69,414.375 grt)

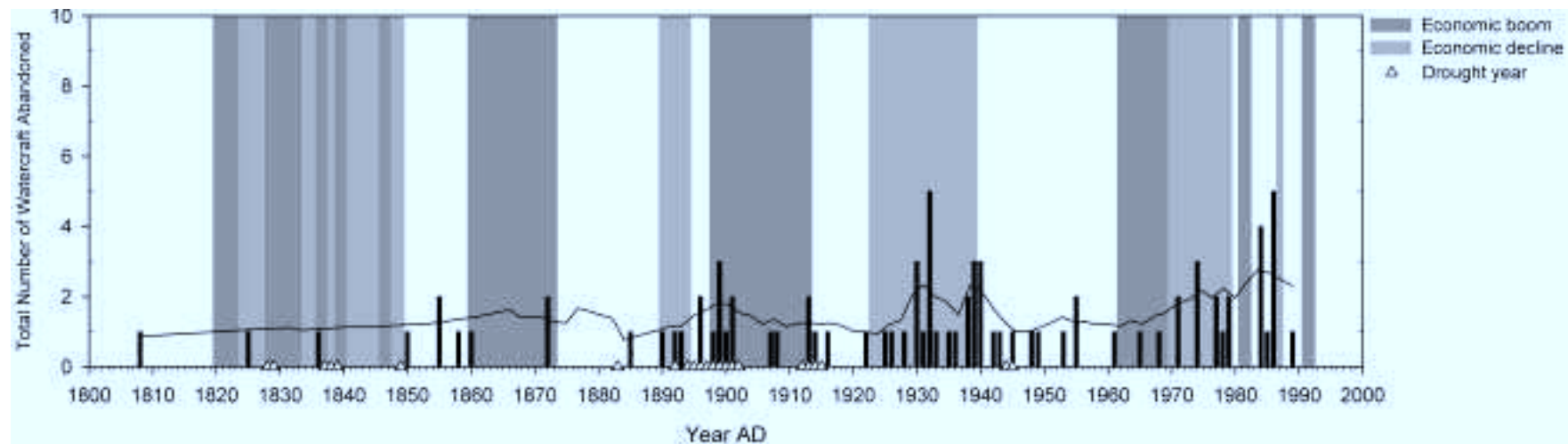


Figure 7.15 Watercraft abandoned in Tasmania (1800-2000) by number of watercraft (n=120 watercraft)

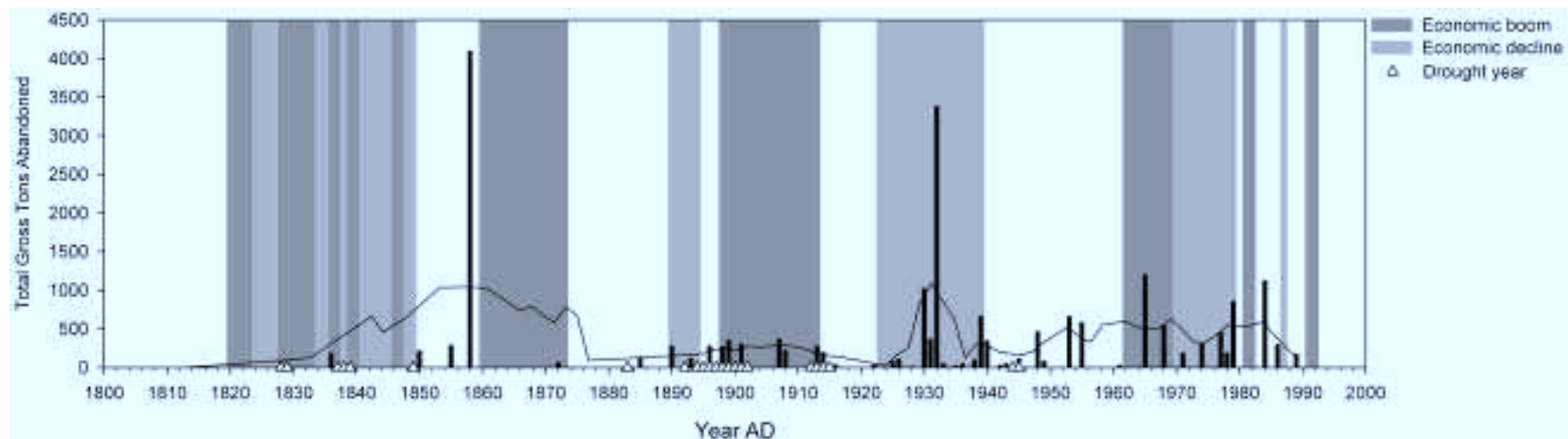


Figure 7.16 Watercraft abandoned in Tasmania (1800-2000) by gross tonnage (n=120 watercraft, 24,497.78 grt)

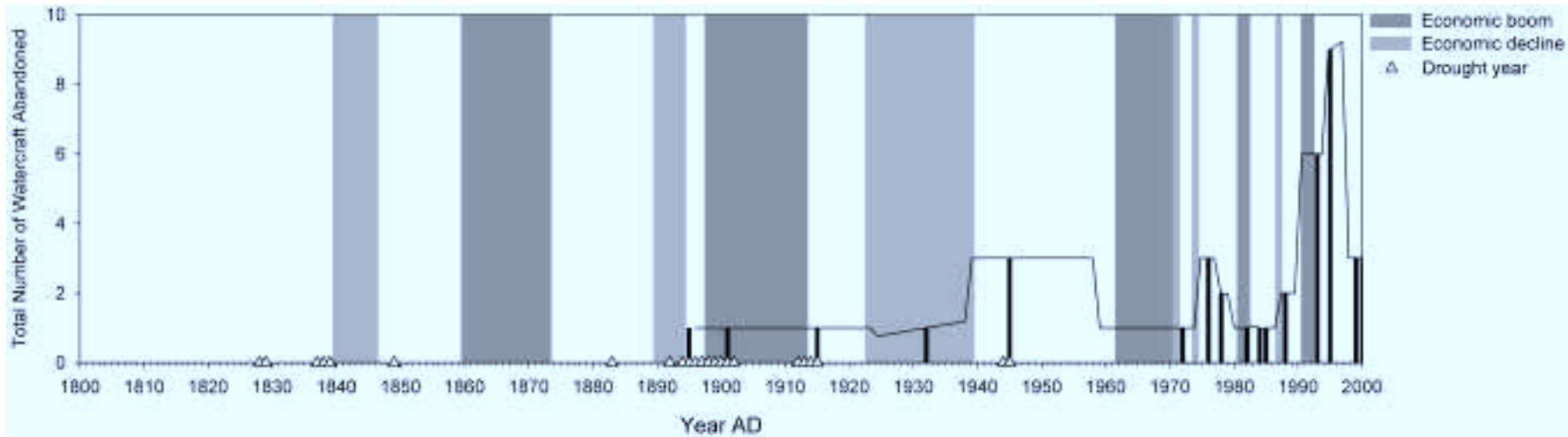


Figure 7.17 Watercraft abandoned in the Northern Territory (1800-2000) by number of watercraft (n=42 watercraft)

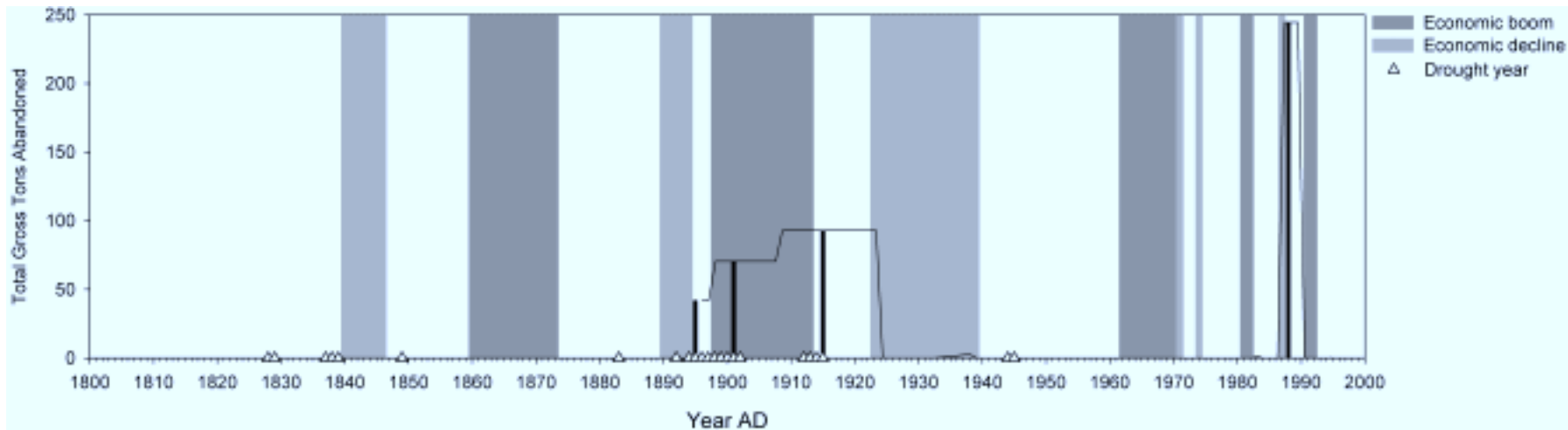


Figure 7.18 Watercraft abandoned in the Northern Territory (1800-2000) by gross tonnage (n=42 watercraft, 449.85 grt)



### **Environmental Aspects of Ship Abandonment**

While this thesis is concerned with the cultural site formation processes that create ship discard sites, the environment, and environmental change may also play an important role. The environmental aspects of ship discard are best analysed on a state level because such events are generally regional, and are most clearly seen in analyses specific to states or to regions. In this way, environmental events affecting regions along state boundaries can then be seen as reflected in the discard trends of individual states.

As discussed in Chapter 3 environmental damage is demonstrated as having played a role in the creation of ship discard areas. Such occurrences, however, are not evident in the Australian literature, and environmental damage appears to play no part in the process of abandoning vessels in Australia. This is probably because major developments along the inland waterways of Australia have only recently become major problems in relation to environmental damage and were generally constructed after the conclusion of the use of inland waterways as major transportation routes. Broadly speaking, environmental damage appears to only affect trades centred on riverine and lacustrine environments, and not marine ones. There are, however some links between environmental catastrophe and the tendency to abandon vessels. For instance, while droughts may result in the drying up of waterways and increase the possibility of stranding vessels – this does not seem to have been a major problem in Australia. However droughts have undeniable devastating effects on economic conditions in Australia, particularly through the effect of hot, dry climates on crops and vegetation. This in turn changes trade along rivers and ultimately alters the economic health of regions and states. As with other historical events that affect national economic health, this translates to an increase in the abandonment of vessels used in drought-affected regions.

There have been countless droughts reported throughout nineteenth century Australian history, and the ebb and flow of environmental extremes is a topic central to that history (see Clark 1978b: 409). The earliest mention of a devastating drought found was in 1828 – 1829, which caused a dramatic fall in the prices of the major staples of the Australian economy. Later, equally ruinous droughts (1837 – 1839) coincided with other detrimental economic events, such as the cessation of the use of convict labour in most states (commencing in New South Wales in 1840) (Shaw 1969: 30, 40, 48, 1975: 84; Clark 1978a: 143-150, 263, 1980a: 291). Similar effects were experienced in the droughts of 1849, 1883 and 1892 (Clark 1978b: 256, 1980a: 291, 1981: 96). Droughts in the early part of the twentieth century have also been cited as the cause of the abandonment of vessels. One such example is the paddle steamer *Melbourne*, which for the period 1902 – 1905 was laid-up and eventually abandoned at Mildura, Victoria. The vessel was deposited on the remains of the paddle steamer *Jane Eliza*, which had been abandoned in the order of twenty years previously after concluding duties as a pumping plant for the purposes of ensuring against underwater erosion alongside a wharf (Mudie 1965: 233-234). While it is important to acknowledge that there are cases where abandonment can be directly linked to environmental catastrophes, the discussion below indicates that they are statistically irrelevant from the perspective of comparative analysis.

Despite the fact that these environmental catastrophes are said to have had national economic consequences a perusal of Figures 6.1 and 6.2 (Chapter 6) depicting the number of vessels and the gross tonnage of vessels abandoned in those years does not reflect the increase in abandonment that would be expected, although there is a slight increase around 1850. The reason for this is probably because environmental events such as droughts can be considered to have their greatest influence on regions within, and across state boundaries. There are many historically documented droughts that have affected particular regions, and a reading of general Australian histories

indicates that different areas of different states were often affected at very different times. On a state level, for instance drought had a major effect on all of Victoria in the summer of 1865/1866, and drought, coupled with depressed cattle prices ravaged Queensland quite drastically between 1868 and 1870 (with Townsville in drought by 1867) (Clark 1978b: 190, 244, 312; Gibson-Wilde 1984: 114). Similarly New South Wales was suffering shortages of water throughout 1888 (Clark 1978b: 406-7). On a more regional level Wilcannia (New South Wales) was affected between 1875 and 1876, and Maitland (South Australia) was in the depths of a drought in January 1901 (Clark 1978b: 196, 1981: 184).

The “dry nineties” was a period of Australian history that refers to a veritable national drought. This period saw most states suffering from 1894 until the so-called “Sahara year” of 1902, and before this time there had been five years of abundant rainfall for many states (Shann 1975: 342, 386-388; Shaw 1969: 110, 1975: 208). Later periods of drought are also noted between 1912 and 1915, 1944 and 1945 and in Queensland, Western Australia and New South Wales in 1971 (Shann 1975: 389; Shaw 1969: 132, 1975: 261, 279, 300).

While vessels are documented as being abandoned in these years and the years directly following in the analysis of individual states, none of these years appear to be major periods of increased abandonment. Furthermore, where a drought coincides with a marked increase in ship abandonment the reasons seem to be better attributed to other economic developments. It seems from this reading that such events are relatively minor in comparison with other events in Australian history, and at best worsen pre-existing economic problems. Other environmental catastrophes are noted for their dramatic effects on certain sectors. A hurricane in 1870 is credited with ending the cotton and sugar industries in Townsville (Gibson-Wilde 1984: 103).

Fundamentally these environmental events can only be seen as a catalyst contributing to, and multiplying economic change. It is the view of the author that while there is some degree of environmental determinism in the abandonment resource of Australia it cannot be considered to be a primary factor in the disposal psychology behind the abandonment of watercraft. In an Australian context, the effect of the environment on abandonment trends is related almost entirely to the threat, perceived threat, or occurrence of widespread natural disaster and the subsequent economic problems caused by such events. From this perspective we can see that the catalysts for change in relation to the tendency to abandon watercraft are more or less economically derived.

### **Economic Aspects of Regional Abandonment**

The economic aspects of regional watercraft abandonment can be best understood in relation to the themes of economic boom, bust, war and the transition to peacetime economy as outlined in the previous chapter. Additionally, the more specific geographical limitations of a regional analysis mean that the effects of developments to port infrastructure and alternative transportation methods may be reflected in the abandonment trend.

Tull (1997: 1) has stated that shipping and trade is a barometer of a state's prosperity. If this is the case then trade is also a major factor in the abandonment of vessels, and at the peaks of economic prosperity, abandonment should theoretically decrease. However, this appears to be more complex on an intra-state level, with competing ports within the state having an effect on the predisposition to abandon watercraft at certain locations. The development of Cockburn Sound, and Albany in particular, for instance is cited as drawing trade away from Fremantle in the 1950s (Tull 1997: 3), and both of these areas are established, and extensive abandonment regions. But to what degree did the growth of Cockburn Sound contribute to

the growth of the abandoned vessels resource in Fremantle? Were the regions sufficiently linked to cause a negligible growth in abandonment for the larger region? Albany is cited as having competed with Fremantle, as Western Australia's premier port from the 1830s (Tull 1997: 12), and this is reflected in the spatial arrangement of official and unofficial ship discard areas in both locations, but properly understood in relation to the economic expansion, and growth of port infrastructure at both of these places. In this way it can be seen that other factors, such as the intra-state dynamics of trade, may be reflected in the changes in the utilisation of ship disposal areas in individual ports.

Of course, if abandonment is dependent upon trade, and regional trade is dependent upon the commodities and goods that may be unique to certain ports, it is then clear that the tendency to abandon certain kinds of vessels in certain ports is dependent on the health of certain industries. For this reason ship disposal areas have a local or regional context, which may be drawn out of the vessel histories. These issues will not be discussed here, but illustrate how the analysis of abandonment trends on state-wide, or even more local scales have much to contribute to understanding economic change in regions.

### **Economic Feast and Famine**

One problem when trying to understand regional economic boom and bust cycles is that regional histories are not often specific whether they are discussing economic depression in a local, regional or national sense. This is especially the case when they discuss early colonial and pre-Federation times. Charting the economic developments in every trade of every colony and state over time is impossible within this scope of this thesis. Every change in policy, raise in freight rates, increase in wharfage dues, new trade monopoly or conference on passenger shipping has a trickle down effect that directly influences and controls economic conditions and climates. Because of this,

some inevitable oversimplification is undeniably a part of what is described below. Additionally, it must be acknowledged that because of the broad overview, and the amount of data used in this analysis some of the links suggested appear tenuous and require future expansion in more detailed regional economic analyses beyond the scope of this dissertation.

An increase in abandonment can be seen to especially correlate with documented economic decline in:

- South Australia in the early 1840s (1841 – 1846), and two decades of depression commencing in the 1880s (around 1885), and joining with the national depression of the 1890s (Dickey 1986: 14; Parsons 1986b: 41; Castles & Harris 1987: 77) (see Figures 7.7 and 7.8);
- Queensland in the 1860s (1866 – 1870) due to the collapse of the banks that funded initial colonisation, and in the 1880s due competition from German sugar (1883 – 1889), and a slump in gold mining (1888/89) (Bolton 1972: 39, 78, 144, 192, 257) (see Figures 7.9 and 7.10);
- Western Australia from 1974 until 1977 due to downturns in the container trade (Tull 1997: 70) (see Figures 7.13 and 7.14), and;
- Tasmania in the 1970s due to the decimation of the fruit industry (Hudspeth & Scripps 2000: xvii) (see Figures 7.15 and 7.16).

While this illustrates that evidence of early regional depressions are reflected in the abandonment trend, they are not as distinct as in a national analysis. Increases in abandonment do not appear to correspond with the earliest economic depressions that gripped the colonies after their establishment. This may be due to a number of factors that define the early economic development of Australia, such as the rate of immigration, the system of land grants, land rents and government expenditure, but was more likely attributable to the relatively small size (and often experimental nature) of

trade in new colonies, as well as the options for vessels to trade in nearby colonies. There are many examples of this:

- New South Wales from the 1790s due to labour shortages, and in the late 1820s (1827 – 1829) due to English financial crises and a fall in wool prices (Shaw 1969: 13, 30, 49) (see Figures 7.5 and 7.6);
- South Australia in the 1830s despite economic hardships that date from the establishment of the colony in 1836 (see Figures 7.7 and 7.8);
- Tasmania from the 1840s due to the cessation of convict transportation (and hence cheap labour) and the mass exodus of people from this colony because of the Californian Gold rush (1849), the establishment of the new colonies of South Australia (1836), Victoria (1850), and Queensland (1859), and the New Zealand Gold Rushes (Graeme-Evans & Wilson 1996: 8; Hudspeth & Scripps 2000: xvii, 11, 32, 42) (see Figures 7.15 and 7.16), and;
- On a national level in the 1840s (1842 – 1844) (Shaw 1969: 49, 50; Dyster 1981: 104; Broeze 1992: 14) (see Figures 7.5 – 7.18).

In some cases this may be attributed to corresponding economic growth in other sectors. For example, in Tasmania, the economic expansion brought about by the development of timber and produce export industries (because of the rushes in California, New Zealand, Victoria and New South Wales from the 1850s), may have cancelled out much of the hardship. Indeed, the economic depressions in Tasmania, which are credited with lasting from the 1840s until the 1870s are very poorly represented, probably due to the drastic fall in shipping arrivals to Tasmania over this period. Certainly, Hudspeth and Scripps (2000: 41) cite that between 1857 and 1872 the tonnage of shipping plummeted from 105,000 to 50,000 tons, representing a drop from 547 yearly arrivals to 195.

The analysis of regional booms and busts in Australian colonies and states have tended to concentrate on trade cycles that have tended to be defined in relation to English trade cycles (see Hartwell 1954: 190; Morrissey 1967: 64). For example Hartwell cites that because Tasmania was a dependant colony it went through trade cycles that resembled English ones. Between 1820 and 1850 Van Diemen's Land was very depressed for the periods 1826 - 1827, 1834 - 1835, 1841 - 1845, had moderate depressions 1824 - 1825, 1838, 1848 - 1849 and experienced a boom in 1839 - 40. It had periods of mixed prosperity 1820 - 1823, 1828 - 1833, 1836 - 1837, 1846 - 1847. All of these are said to have coincided with the six cycles in British prosperity over the same period (Hartwell 1954: 187, 190). However, many of these cycles are often too short to expect a corresponding change in the abandonment trend, and a change would only be expected during protracted advantageous or adverse economic change. This can be noticed in any number of the cycles communicated by Hartwell in relation to Tasmania, and in the short lived economic depressions of particular ports (such as Townsville in 1876), as well as more modern recessions, such as in Western Australia in the 1950s (1952 - 1953) (Gibson-Wilde 1984: 113; Tull 1997: 66).

Another interesting observation is that not all states appear to have had the same response to the national economic depressions mentioned in the previous chapter. While the depression of the 1890s is clearly evident in the examination of trends in South Australia and Queensland, it is not nearly as marked in the Tasmanian trend despite its documented adverse effects (Hudspeth & Scripps 2000: 106-107). Likewise, despite the unfavourable influence of the depression of the 1930s on all states of Australia (Matthews 1998: 30) it is not as marked in the Tasmanian abandonment trend. This may be due to record produce crops and port arrivals in the early 1930s, the lifting of coastal clauses in the Navigation Act in 1932, the reduction of wharfage rates in the mid 1930s (both stimulated trade), and documented problems in gaining trade after the depression (due to increased competition in a number



of trades), which effectively “smoothed out” this trend. Another factor may be that Tasmania is generally credited with being in the midst of depression by the 1920s, which deepened in the 1930s (Hudspeth & Scripps 2000: 163-164, 171, 193-195, 199). Likewise other data suggest that South Australia was in the midst of economic depression by the 1920s, and the state’s economy was in very bad shape by the early 1930s (Broomhill 1973: 9; Clark 1980b: 224; Dickey 1986: 183; De Rooy 1987: 25; Probert 1990: 122; Tregenza 1991: 80, 83, 90; Walter 1999: 11). All of these events can be seen as reflected in regional abandonment trends. Similarly the effect of the Middle East oil crisis of 1974, and stock market crash of 1987 appears differently in separate trends.

A decrease in abandonment can be seen to correspond with documented economic expansion in:

- New South Wales in the 1820s through the expenditure of the British Government, and between 1835 and 1840 (Morrissey 1967: 65; Shann 1967: 104, 189; Shaw 1969: 29, 39, 48; Broeze 1992: 10) (see Figures 7.5 and 7.6);
- South Australia in the late 1840s (after 1846), and the 1870s (Dickey 1986: 14; Castles & Harris 1987: 77; O’Reilly 1999: 57) (see Figures 7.7 and 7.8);
- Queensland throughout the 1850s, due to the expanding pastoral industry and mineral booms, the 1860s, due to the American Civil War (which maimed the American cotton industry), subsequent mineral rushes, and the growth of wool exports, as well as in the mid 1880s due to the “sugar boom” and expansion of beche-de-mer fishing (Bolton 1972: 14, 21, 37, 44-45, 47-48, 91, 127, 139-140, 156, 278; Gibson-Wilde 1984: 80) (see Figures 7.9 and 7.10), and;
- Western Australia in the 1890s due to the expansion of gold mining and boosted population (Shaw 1969: 115; Tull 1992: 36, 1997: 14, 23, 56) (see Figures 7.13 and 7.14).

Early, short-lived economic growth periods are often hard to determine due to the low amount of trade at some ports. The economic boom periods that lasted from 1829 to 1832 and 1839 to 1840 in Tasmania (Roberts 1968: 291; Shaw 1969: 5), for instance are too short to expect a corresponding change in abandonment behaviour. This is also the case with booms in New South Wales around the late 1820s (1826 – 1827) and the late 1830s/early 1840s (1838 – 1840 and 1841 – 1842) (Shann 1967: 102, 104, 189; Shaw 1975: 94).

### **Warfare**

The economic effects of war are also reflected differently in separate state trends. The Boer War (1899 – 1902), and the Boxer Rebellion (1900), for instance was profitable to Queensland because of the demand for horses that they created, but was of little benefit to other states (Bolton 1972: 221). Similarly, the commencement of the two World Wars had special effects on different Australian settlements, and this is reflected in the abandonment trends.

For example, despite the fact that the First World War is credited with speeding up economic development in Australia (as noted in the previous chapter), this is not reflected in all states. In Tasmania its influence is reputed to have been negligible until 1917, when the effects of the decline in shipping (due to wartime adoption of merchant tonnage) began to have ramifications. Much later, when it was a source of major disruption to trade throughout Australia it still did not deter many states from expanding their port infrastructure. This would change later due to the prolonged nature and intensification of the conflict. June 1918 saw the prices of quayage and port dues rise substantially, despite general hardship in the state brought about by the shipping decline ensuing after the outbreak of hostilities in World War One. The changes in how these dues were determined, (a change from net

tonnage calculations to gross tonnage calculations) constituted a major financial drain on struggling merchants and shipowners. The cessation of hostilities in late 1918 did not see a major change, with high fees now coupled with a seaman's strike, causing a post-war continuation of hardship. When the big ships did return, it was soon found that they had indeed become bigger, mainly due to the establishment on new, more direct routes in international trade (London to Hobart), a problem for the port due to the depth of water (Hudspeth & Scripps 2000: 153-155, 158-159). Similarly, in North Queensland the outbreak of the First World War caused havoc to the mining industry due to fears of unpredictable foreign markets amongst buyers and shut down smelters, and in South Australia is credited for bringing about a depression (Bolton 1972: 296; Dickey 1986: 122; Castles & Harris 1997: 203).

Additionally, the Second World War brought about a slow turn around of shipping in Tasmania, and became a reason for vessels not to visit the port. This is turn meant that Hobart suffered from a lack of trade at this time, which was made worse by the requisitioning of vessels for use in the conflict. The level of shipping, which was at its highest in 1938, would not reach the same level until 1958 (Hudspeth & Scripps 2000: 242, 256).

### **The Growth of Alternative Modes of Transportation and Communication**

Alternative modes of transport and communication have been largely credited with creating competition that adversely affected many forms of maritime transportation in Australia and overseas (see Aldcroft 1963: 27, 29; Broeze 1992: 21; Devendra 1993: 22; Simmons 1996: 206). Despite the fact that most road networks were still unsealed in the 1950s, and air services did not really exist until the 1940s (Parsons 1986: 99), the growth of alternative forms of transportation was pivotal in the replacement of maritime trades. This occurred on many levels where the transportation of people, merchandise or

information was replaced by other methods. While the physical barriers broken by the growth of rail, road, and air networks mainly facilitated this, it was also the product of the expansion of telegraph, radio, and pipeline technologies (Barsness 1974: 170; Clark 1981: 29). The expansion of these developments, however, spread at different rates in different places, and can be seen to have had a direct impact upon the abandonment trend through the influence that it had on maritime trades. In some cases the growth of these networks was able to facilitate more commerce to ports, and in others it actively replaced trades. This has been noted in relation to North Queensland ports, and is especially true for the post Second World War world, where by the 1950s these modes had eroded many of the traditional markets of maritime trades (Dyos & Aldcroft 1969: 299; Bach 1976: 188-189; Bolton 1972: 162-163; Coroneos 1988: 6). As one author has noted, "Competition from railroads and road transport, and in more recent years, from airlines provoked the prophecies of doom that are inseparable from the shipping industry the world over" (Bach 1973: 7).

Transportation methods can be assessed according to a range of attributes such as comfort safety and efficiency, both in relation to passengers and cargoes. The major difference between water and land transport can be seen in relation to infrastructure. Part of the success of sea transport can be related to the concentration of infrastructure at the site of port development. Infrastructure in relation to both road and rail transportation, although still requiring centralised facilities such as warehouses, terminals and repair establishments is much more dispersed, requiring much more time, expense and effort to become established. Once established the costs of maintenance and use are much less in relation to sea transportation, providing major competition and therefore drastic change.

In particular intrastate shipping was impacted because of land alternatives:

Intrastate shipping is short-haul work, unable to maximise its time at sea with respect to time in port. The limited cargoes, the short runs, the physical problems of most of the ports, the time lost, owing to weather conditions at the bar entrances, would have been by themselves severe obstacles to the expansion and modernisation of services. When an alternative means of transport was freely available, the outcome was inevitable (Bach 1976: 386)

As commented by Kerr (1998: 105) steep, hilly and densely forested land by nature is poorly suited to land transportation. Hence the growth of land infrastructure is influenced by geographical features and topographic realities, which in turn played an important part in the growth, development and eventual decline of maritime trades and seagoing transportation. From the examination of the establishment of land based infrastructure related to both road and rail it is obvious that the spatial orientation of such works are the most important aspects when examining the growth or decline of maritime transportation and trade. The overriding formulae for this seems to suggest that land infrastructure parallel to the coast will cause a decline in maritime trades, except under exceptional circumstances related to economic conditions in adjoining regions that see en masse migration from the region in question.

There is also a relationship between economic conditions and the expansion of alternative modes of transportation. To some degree economic decline may have been beneficial for maritime trades. For instance, the depression of 1892, and drought conditions that concluded in 1902 are credited with stopping road development in Queensland (Bolton 1972: 162, 192, 263). Another ramification of the expansion of alternative transportation was technological changes within marine transport. Matthews (1998: 85), for instance has commented that the conversion of ketches in South Australia to motor vessels was undertaken because it allowed for greater competition between these watercraft and emerging road and rail systems.

### *Railway Transportation*

As with other nations (and noted in Chapter 3), the growth of rail networks in Australia can be linked with the decline in maritime trades. Some colonies, such as Victoria began building railways from the 1850s, and the linking of Adelaide to Brisbane by rail in 1888 is credited with “stealing” traffic from shipping (Clark 1981: 46; Parsons 1986b: 227). Other colonies, such as Western Australia had natural obstacles that inhibited the construction of railways, and therefore did not feel the effects of competition until much later (Bach 1976: 236). Indeed, on the upper North coast of New South Wales, the railroad only began to have an adverse influence on maritime trade around 1924, when it played a large role in the destruction of trades along the Hawkesbury River (Bach 1973: 7; Purtell 1995: 2-3). Nevertheless, the expansion of railway mileage in Australia from 800 miles in 1870 to 13,500 miles in 1900, and the opening of the Trans Pacific Railway in 1917 (Hughes 1964: 29; Tull 1997: 53-54) would not have been advantageous to marine trades. Likewise the development of railways to Perth, and between Sydney and Brisbane, and the towns of Queensland caused a major drop in passenger transport, causing the disposal of interstate passenger vessels (Parsons 1981a: 9). These events can be seen as a contributing factor to the increased abandonment of watercraft evident nationally, and in mainland states in the late 1910s, and 1920s. Importantly, this is not seen in the Tasmanian trend. This has also been the case in Australia more recently. The modernisation of newsprint production facilities, and namely the introduction of rail facilities at Boyer, Tasmania, was the direct cause of the abandonment of the barges that used to fulfil the role of newsprint transportation (the barges *ANM 3*, *ANM 4*, *ANM 6*, in 1984 and *ANM 5* in 1986) (Hudspeth and Scripps 2000: 333). However, as with other instances from around the world, some ports, such as Fremantle benefited from radial rail networks (Tull 1997: 78). Indeed

rail had the added affect of changing the role of regional ports and thereby influencing the balance of trade (Bach 1976: 252).

The growth of alternative methods of transportation was particularly important in the case of riverine trades. Mudie (1965: 124) cites that government attitudes towards riverine transport on the River Murray influenced policy and railway planning. In this case, the Australian colonial, and later Federal governments perceived the trades in the river as menacing and out of their control, and planned railways to travel to the rivers, in order to cause it to decline. This, and the development and use of motor-lorries was to have great ramifications on trade, finally culminating in the total drying up of commercial activity of a major nature on the river. Indeed, in the economic warfare between the colonies along the river, alternative transportation seems to have been the most effective and decisive weapon, with the South Australian control of the river (and hence trade) drying up as the Victorian and New South Wales governments extended their railways (Castles & Harris 1987: 227). Others have noted these changes. When Kenderdine (1994a: 1880) says "Wreck-site distribution tends to reflect the dynamics of the decline in the river economy and trade, the advent of the railways and the building of bridges, and the adaptation of alternative forms of technology that helped supersede the Murray steamer as a form of transport", she is actually referring to abandonment distribution. This relationship between economic decline and the spatial organization of abandonment areas along the River Murray has already been discussed.

#### *Road Transportation*

It has been commented that the economics of land transportation and the influence of the petrol engine was a major source in the decline of water-borne transportation methods quite early (Moore 1970: 238). Hunter (1993: 4) has also pointed that the quality of the road or the waterway is a variable that

is crucial to the viability of any mode of transport. This assertion illustrates the reasons for the initial unimportant nature of road transport in early times, and also the growing importance of road transport once costs associated with road construction and upkeep dropped in relation to the costs associated with dredging. Competition from road transportation has been cited as a cause of the death of many maritime industries around the world. This is especially the case in Australia. By 1932 there was one car for every twelve Australians, and Australia had become the fourth largest car-owning nation, and the fifth largest importer of petroleum (Tull 1997: 61). In 1932 the South Australian parliament had reported that:

... the use of motor transport has had an effect on reducing business at many of the ports on Yorke Peninsular. The commissioners recognise that whilst the public naturally seeks what it deems to be the cheapest means of transport, nevertheless where such an operation displaces forms of transport that efficiently and economically serve the public, and have been established at great cost, it inflicts a loss on the community as a whole. Should the territory hitherto using water carriage be served by other means of transport, it must be recognised that many ports will not pay, and it will be difficult to justify the maintenance of the shipping facilities now provided (SAPP 1932 No.24: 8).

But the changes to maritime trades through the expansion of road networks came earlier, as noted by Parsons (1986d: 6):

Changes of ketches to auxiliary power was forced upon owners after World War One through economic necessity. Road transport was cutting into their remaining trade and road delivery, although often more expensive was usually faster.

After World War Two, the development of road infrastructure was to be a major force in changing the barge trade in Tasmania, as well as causing a decline in the timber trade (Kerr 1998: 105; Hudspeth and Scripps 2000: 171,



193). Roads also played a large role in the destruction of maritime trade along the Hawkesbury River, north of Sydney, and the decline of the passenger trade along the Richmond River between 1920 and 1950 (Purtell 1995: 2-3; Curby 1997: 8, 23).

Road transport often followed railway expansion and compounded the detrimental effects of railways on river transportation corridors. Workman (in Belle 1977: 12), for instance has linked the decline of the use of ketches from the 1920s in Port Adelaide directly to the emergence of the motor truck and semi-trailer. Tregenza (1991: 133), also writing about South Australia cites that the main reason for the end of the interstate passenger and freight line trade, as represented by the disposal of such vessels as the *Manunda* and *Manoora* as being due to the direct influence of the “unreliability of the maritime work force and the competition of air and road transport”. This growth and steady improvement of road infrastructure was also reflected in a change in the transport spending of such businesses as Port Adelaide timber merchants Le Messurier, who had traditionally upgraded their ships, but by 1968 had in their possession six diesel fuelled semi-trailers operating between Adelaide and Melbourne (Tregenza 1991: 133). Citing evidence from Tasmania Kerr (1998: 126, 127) has noted that the direct impact of road transport from the 1920s (coupled with the effects of the Great Depression) was a drastic drop in available freights. This meant that vessel operators had few choices; convert vessels to fishing trades, sell vessels interstate or, lay vessels up. Road transportation is cited as the direct cause of the abandonment of vessels in Tasmania. When the Australian Newsprint Mills changed to road transportation the consequence of this was the scuttling of their fleet of barges in 1986 (Jacques 1997: 51). The use of semi-trailers for the transportation of grain in 1956 is cited as the main reason for the sale (due to fears of the vessel’s redundancy) and modification of the vessel *Leillateah* (Graeme-Evans & Wilson 1996: 46).

### *Air Transportation*

Besides Bach (1976: 352), who has noted that expanded aviation services replaced passenger trades, not much has been written on the competition between aviation and maritime transport. This is most probably because airborne trades were generally developed after land transportation had made substantial inroads into many marine trades. In the passenger trades, it has been commented that air transportation only began to have an influence on sea-borne trade of the same kind in the 1950s (Baty 1984: 9).

It has been said that:

Because of the different operating conditions, pattern of usage, technical requirements, state of development and other factors peculiar to each of the transport modes, the adoption of new technology within these modes has progressed at different rates and in different directions. A little cross-fertilisation of technology between modes has occurred, but each mode has remained essentially different and independent (COIITC 1980b: 318-319).

In the modern world, this situation is gradually changing with the creation of “transport systems” that facilitate intermodal (sea – road – rail – air) freight transfer through the efficient transfer of goods between different modes of transport (COIITC 1980b: 319-320). Such systems (such as containerisation), by reducing competition between modes of transport also decrease the likelihood of abandonment because of competition.

### **Changes to Port Infrastructure: The Symbiotic Nature of Ships and Ports**

The development of appropriate port infrastructure is central to port use, productivity, efficiency and success. In this way the development of port

infrastructure also influences the types of vessels operating at a port, and flows onto what vessels are abandoned at a particular port.

Infrastructure, such as the provision of marinas, boat sheds and moorings will effect the use life of vessels by not placing them under undue strain and wear. Such was the case in Tasmania in its depression of the 1850s where redundant water taxis were granted boat ways and a boat harbour so that the vessels did not have to be beached for prolonged periods while there was no work (Hudspeth & Scripps 2000: 45). From this we can understand that a deliberately beached and abandoned vessel does not only constitute the abandonment of the vessel, it also constitutes the abandonment of a mooring, and is therefore directly related to its no longer useful function.

These developments can have a number of influences on abandonment trends. On one hand the improvements to the usability, and safety of the port, can stimulate trade and create economic expansion. This growth should decrease watercraft abandonment. Such is the case with the port of Fremantle, which is presented as an unsafe harbour until the bar across the mouth of the Swan River was removed and the inner harbour constructed in the 1890s (Souter 2000: 2). These poor port facilities ensured that Albany remained Western Australia's principal port throughout most of the nineteenth century. The importance of the major port at Fremantle increased in the 1870s, reflecting a growing population and economy.

The other side of this economic expansion is that subsequent economic downturns will bring about a substantial increase in watercraft discard activity, due to the larger number of unused vessels in port. Likewise the cessation of the phase of port development and expansion will often see the abandonment of the vessels (many of which are often custom made for work on such jobs) that were used in the project. These activities may be seen as "multiplying factors" in the abandonment trend and is demonstrated by the

fact that construction work had concluded at Fremantle by 1903, and breakwater schemes were completed in Port Kembla in 1901 and at Adelaide and Newcastle in 1909 (Tull 1997: 21-22), all of which coincide with levels of high vessel abandonment.

Commercial vessels and ports operate in a delicate symbiotic relationship (Bach 1976: 404). A change in one often requires changes to the other. As one source notes: "Many technological changes in transport cannot be introduced, or all of the benefits may not be derived from their introduction, because of the inability of the physical infrastructure to support them properly" (COIITC 1980b: 325). Similarly Lenihan (1983: 54) has made reference to the relationship between changes in watercraft design and support infrastructure:

During the Industrial Age, what was an innovative design in one decade could be made obsolete in the next, as mass-produced support facilities became incompatible with vessel design

It could additionally be said that ports reflect world shipping. Bach (1976: 342) for instance notes that the projected depth of the Suez Canal meant that ports such as Fremantle and Melbourne had to increase their harbour depth if they wanted to have equivalent vessels in their port. It is also clear from the little work that has been done on port histories that the same forces, namely that of war, economic depression and labour stoppages, which have been the main factors in the growth and decline of ports the world over (Barsness 1974: 167), are the same pressures exhibited on shipowners in relation to the abandonment of watercraft. Undoubtedly, the nature the vessels found within the disposal areas of ports the world over are signifiers of the development and decline of these pivotal centres of commerce. Thus ports can be seen as a mirror of shipping, and vice versa. In early periods of a port's development, the changes to ships that most impinged upon the workable nature of a port were the size and number of ships. The technical

difficulties that this caused for ports were few and predicable. Where the numbers of ships grew, more space was required, and wharfage and harbour development needed to be sped up. Likewise the nature and size of the port, harbour and dock facilities that serviced these vessels limited the size of the vessels and the methods that could be employed in handling cargo (COIITC 1980b: 325; Tull 1997: 39). Where vessel size grew greater, time and energy needed to be invested into dredging and deepening activities.

Arguably the latest revolution in shipping is the advent of containerisation. Besides the revolution in ship design a concurrent revolution in waterfront work practices, centralisation policies and the transformation of ports themselves became manifest. As Bach (1976: 361) has noted “Unlike traditional technologies, containerisation could not be introduced gradually; the enormous implications and ramifications of the concept had to be considered in detail before the service was started”. This was not the first step in the revolution with technology such as larger containers, stern loading roll-on/roll-off vessels and Lighter Aboard Ship (LASH) technology being introduced from the 1970s. While some changes to ship design are not symbiotic to the same degree as other (for instance LASH ships can be utilised at many types of ports due to the ability to unload barges of goods), all of these technological changes illustrate the transition to highly specialised technologies in the design of ships (Bach 1976: 355, 404).

1965 is said to be the crucial year when shipping companies turned seriously to the container system. In Australia it was 1964 with the use of the *Kooringa* by Associated Steamships. LASH ships and container ships are a part of a process that, “extends ideally from factory floor to distributor’s store, involving a complex of land and sea movements and documentation that calls for all available experience and skill” (Bach 1976: 354). Some Tasmanian ports, however, did not begin to undergo the process of containerisation in earnest until the 1980s (Hudspeth & Scripps 2000: 291, 301).

Indeed, there is also a link between deepening activities, public works and abandonment because of the types of vessels that are discarded in an area. For instance, Hobart had very little dredging carried out, due to its suitability as a natural harbour, and hence there were very few dredges abandoned. This is in direct contrast with ports such as Adelaide, Brisbane, and even ports as close as Launceston, which requiring extensive and large amounts of modification to the harbours, had to employ dredges extensively. Dredging also has an effect on the design of watercraft, specifically in relation to the dimensions of a vessel. This is well cited in relation to the depth and width of the Suez and Panama Canals and the St. Lawrence seaway where limits on dimensions played a large part in altering the dimensions of watercraft (Eyres 1980: 4). Similarly the lack of port infrastructure in the Australian colonies in the early days is noted to have had a major influence on watercraft design (O'Reilly 1999: 35-36, 38-40).

A successful port was one that was informed of these changes, and moved with the times (Bach 1976: 256). This is another reason for the drastic effects of economic depression, as such events tend to stop, or inhibit wharf expansion. The depression of the 1930s, for instance laid up the development of wharfage in Melbourne (Bach 1976: 268).

Generally it could be said that the only aspect of ship design that was important to the design of early ports were the dimensions of a vessel, due the considerations of channel depth and width, and wharf length. A new hull design, or marine technology would have had minimal consequences in port design, expansion and utilisation. This could even be said during the transition of sail to steam, with the only changes being the need for bunkering facilities, and generally no other wholesale changes. Such was the case until comparatively recently. Bach (1976: 404) notes that there were three developments in modern maritime technology, which required changes to the

matching facilities ashore: bulk carriers, cellular container ships and roll-on/roll-off (ro-ro) vessels (Bach 1976: 404).

The relationship between ports and ships on a technological level is complex. For a change in the design of a ship to work, it must be compatible with the ports that it wishes to engage in trade with. Likewise, a major change to port infrastructure is useless, unless there are ships that can use it. In essence, both ships and ports have had to adapt to new technologies in trade, shipping and cargo (Tull 1997: 2). In many cases we can see the remnants of a certain portion of the abandoned watercraft resource as being representative of this inability to adapt, and the unveiling of shortcomings in design illuminated by such changes. A vessel that could not adapt to an innovation in cargo handling or other port-related activity was simply useless, and had to be replaced.

### **Other Factors**

Other factors that have influenced regional abandonment trends were the increased tendency to sink unwanted vessels as artificial reefs, and the destruction of “illegal” vessels (refugee and seized fishing boats). While both of these activities may be seen as skewing the abandonment trend, on a regional level they have very little effect because the tendency to sink vessels for post-abandonment uses such as fish aggregation devices and artificial reefs are as much about the economic health of a region as normal discard activities, and have only been pursued in earnest since the 1970s. Additionally the destruction of “illegal” vessels is a phenomenon more or less confined to the Northern Territory where it comprises the vast majority of abandoned watercraft for that region.

## **Conclusions**

The distribution of discard locations in Australia can be seen to reflect a number of things. From one perspective it reflects the active cultural constraints, such as the legislation that defined Commonwealth designated areas in the 1930s that sought to control the abandonment of watercraft. From another angle it illustrates the failure of these Commonwealth initiatives due to logistical and jurisdictional issues.

Indeed, part of the lack lustre utilisation of these Commonwealth areas can be attributed to their focus on harm minimisation issues at the expense of the economic issues associated with distance. For this reason discard sites tend to be associated with ports, and normally within close proximity with ship breaking areas. It is this distance between primary, and secondary refuse sites that is a major factor in the creation of accumulations of unwanted watercraft. Additionally, these Commonwealth areas appear to have only been used where issues associated with available space in ports (linked to port traffic, and itself an economic issue), or the coincidental cheapness of taking vessels to these locations for scuttling.

Additionally, the discard trend on a regional level can be seen as an economic index in the same way that it can on a national level. While the economic events that bring about changes to discard behaviours resemble those already mentioned in the national analyses undertaken in this research of boom, bust, war and the aftermath of war – an analysis of a smaller geographical area needs to take in a number of other processes that serve to multiply the advantageous, or detrimental economic effects these events.

These so-called “multipliers” may be found in the form of changes in the development of port infrastructure, the cessation of dredging and deepening, environment change, and the growth of alternative methods of transportation.



While these events have influences on discard behaviour, their effects seem to be varied, and are largely undiscernible in the abandonment trend, and are not as marked as better defined economic developments.

## CHAPTER 8

### Archaeological Signatures of Use

*... hulks, no matter how bedraggled, barnacle-encrusted or time-worn, provided they have some mark of connexion with an earlier glory, carry with them a proud and romantic dignity which their up-to-date sisters cannot claim (Glassford 1953: 218).*

## CHAPTER 8

### ARCHAEOLOGICAL SIGNATURES OF USE

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#### Introduction

The former uses of watercraft are often still evident in the archaeological signatures of abandoned vessels. These signatures can be seen as indicators of change in the behaviours of those who utilised the vessels. Generally we can distinguish site formation processes related to the use, modification and discard of watercraft. This chapter is concerned with the use and modification of watercraft before and after abandonment, while discard processes will be described in Chapter 9. Use and modification processes are important because they have direct influences on discard processes and can be seen to influence the time and nature of the transformation of a vessel from a systemic to an archaeological context.

In cases of deliberate abandonment “use” can be understood from a range of perspectives. In the first instance - the design and construction technique of a vessel can be seen as a signature of intended function as well as evidence of consumer choice in ship purchasing. It is therefore a representation of the adherence or resistance to technological norms. Next, indications of the modification or conversion of a vessel’s design or construction as seen in the archaeological remains of watercraft are indications of changing technological and economic situations, and the reuse processes that accompany them. In other cases the indications of functional post-abandonment use are evident. All of these stages in the evolution of an individual vessel’s life are significant because they can shed light on economic conditions of the time, as well as the

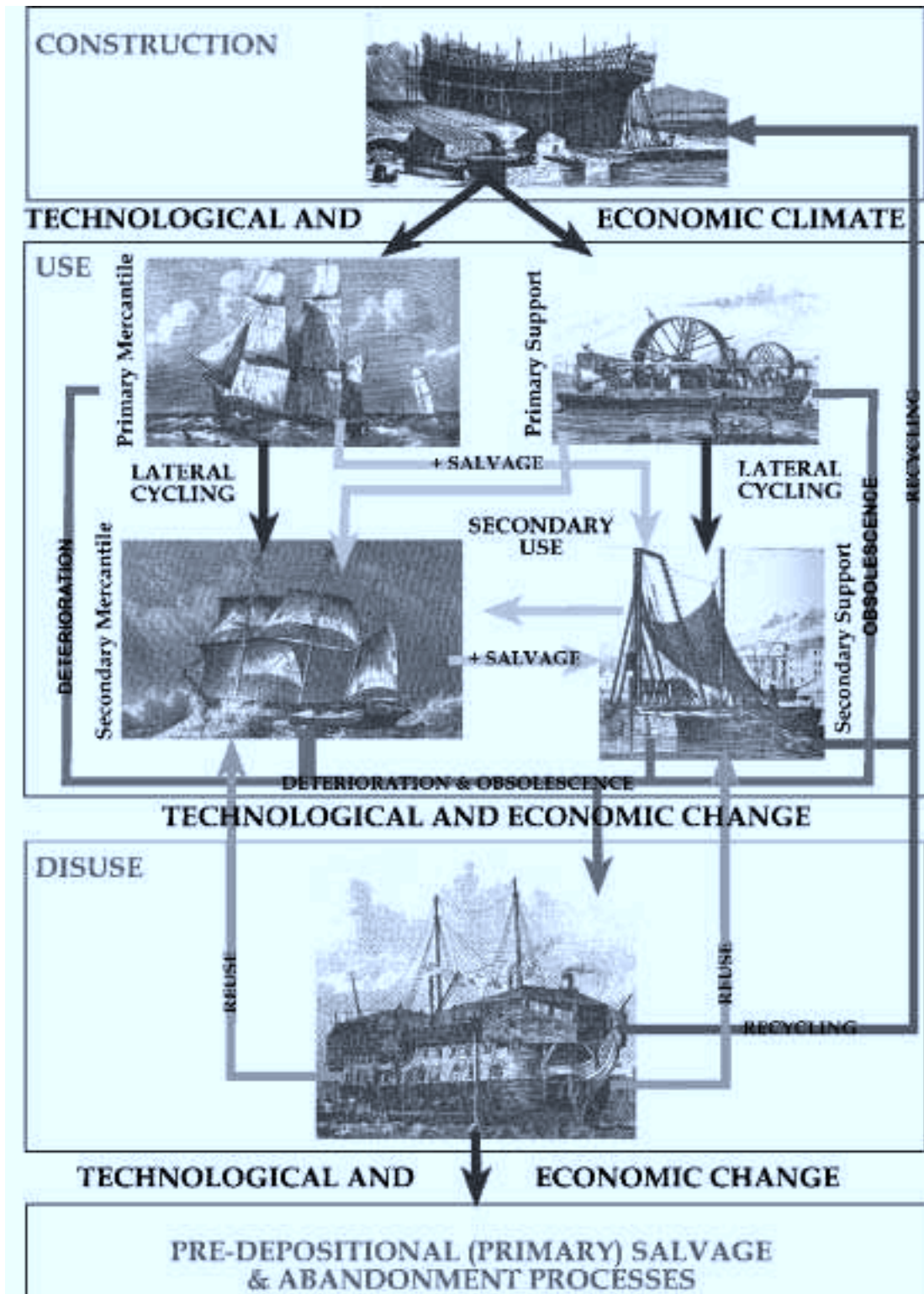
reasons behind abandonment (related to the issues outlined in Chapters 6 and 7). This chapter will concentrate on modification processes (represented in Figure 8.1) due to the consequences they have on watercraft use-life, and therefore on deliberate abandonment. They are also important, because the types of technologies represented at the time of a vessel's construction may be seen as having a direct influence on the inclination for certain vessels to be discarded, and be utilised in post-abandonment functions.

In this thesis the primary phase of a vessel's use life refers to the original intended function of a vessel. It is split into two variations;

- *Primary mercantile*, where vessels are built to fulfil an intended mercantile or commerce related function (such as a collier or tramp steamer), and;
- *Primary support*, where vessels are built to fulfil a non-commerce function, that is instead related to their use as custom made support vessels (such as towable barges or dredging vessels).

The secondary phase refers to the transformation of a vessel from its originally intended mercantile or support function to another function. This is also represented by two variations:

- *Secondary mercantile*, where a vessel is modified to fulfil a new mercantile role in a different trade (e.g. a cargo steamer that is converted to a passenger steamer), and;
- *Secondary support*, where a vessel is modified to serve a non-mercantile function that is focussed on support (a similar function to a vessel in a primary support role) (such as a hulk or lighter).



**Figure 8.1** Site formation processes acting upon watercraft in their systemic context

The important aspects of this terminology are the two dichotomies of primary/secondary where there is a transformation in the form of a vessel (intention of build v. intention of modification) and mercantile/support where there is a change in the function of a vessel. These terms are also linked with terminology in site formation theory. Transformations from primary mercantile/support to secondary mercantile/support correspond well with Schiffer's definition of *secondary use* (see Chapter 2).

Changes in the ownership of a vessel with no corresponding change in function or form, whether in a use, or a support capacity equate with Schiffer's notions of *lateral cycling*, which are not discussed here because they are not readily evident in the archaeological record due to the lack of alteration to watercraft structure. In some cases vessels also undergo conversion from a primary support function to a secondary support function. This process has been illustrated by Kenderdine (1994: 20) in her description of River Murray barges (primary support vessels) that were later converted to pump supports for use in irrigation schemes.

### **Conversion and Modification**

Conversion and modification are processes that occur in watercraft in their systemic context in both primary and secondary (or pre-abandonment) phases. In site formation terms we can understand this as relating to reuse processes connected with secondary use. Conversion is a process that has been going on for hundreds of years. The conversion of merchant vessels to naval vessels (and vice versa) in particular has occurred for a long time, such as the conversion of the merchant vessel *Baltic* into a confederate ironclad gunboat (Still 1961: 339). Kenderdine (1994: 93) has touched upon how all types of conversion can be seen as a consequence of economic change:

The abandonment of a vessel before the decline of the trade was unusual unless the hull was difficult to employ in the trade. The conversion of ... [a] vessel from paddle steamer to barge and the fact that it was built by a marine shipwright may indicate that ... [it] was not particularly capable to carry out the function required of it in the riverine environment.

Fundamentally we can see that the modification of a ship is linked to processes that define obsolescence. This is outlined by Culliton (1974: 6):

Apart from the physical life of a ship, there is also the possibility that obsolescence will end the economic useful life of a ship. It is not easy to prove that any given ship is obsolete in the sense that the operator would be better off financially to scrap it and replace it with a new one. Frequently, too, a ship which is obsolete for one service can be transferred for to another where competition is not so keen, much in the same fashion as automobiles with useful life were typically traded in by some people who replaced them with new ones, while the old automobiles continued to be used by someone else (Culliton 1974: 6).

### **Modifications from Primary to Secondary Mercantile Contexts**

Modifications of many kinds can be made to vessels. The main types of modification are those made to propulsion (as represented by propulsion source, and rig) and to the hull (either in dimension or materials). These alterations will normally bring about a change from a primary to secondary mercantile context. Since modifications are made to watercraft when their owner desires a vessel to continue to operate within a trade more efficiently, or to enable its transfer to a new trade, it is implicit that there are correlations between modification activities and times of abandonment. This is due to the fact that modification in order to make a vessel more suitable or commercially competitive is a mechanism designed to save a ship from being discarded (it is in effect a *curate behaviour*). There is often also a correlation between the

modification of the hull of a vessel and the addition and modification to its propulsion.

### *Modifications to Propulsion*

Modifications to propulsion normally serve the purposes of technological augmentation, that is the “upgrade” of a propulsion system to a new, more efficient type that will not require the replacement of the entire vessel. Where a conversion from one use, or from one source of propulsion to another occurs, the more apt term “retrofit” can be used. This term distinguishes types of conversion, and more adequately resembles the process of conversion in vessels that are being changed to suit the economic climate, or new technological developments (see Paine 2000: 107).

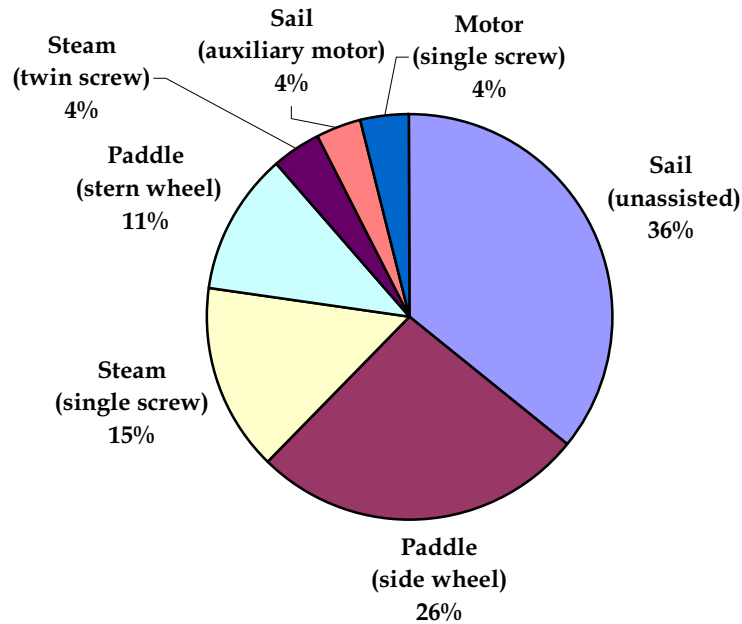
Propulsion modification processes are largely a natural reaction to the introduction of new technologies; especially ones that threatened to overtake and replace old vessel types. Many sail vessels in Tasmania after the 1870s, for instance had internal combustion engines fitted, as a reaction against the influences of steamships. As one source has suggested, “Further, it fostered a greater challenge in the design of ketches and schooners; they had to be fast to compete!” (Graeme-Evans & Wilson 1996: 31).<sup>1</sup>

A comparison of the earliest configuration of ANAVD vessels and their latest configuration (using Customs House registration documentation) indicates that only 53 vessels (around 3.4%) underwent changes to their propulsion system. Of these most changes were made to unassisted sailing vessels, followed by side-wheel paddle steamers and single screw steamships (see Figure 8.2).

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<sup>1</sup> Taylor (1998: 60), in relation to the vessel *Nell* (later *Festina*) has suggested that the removal of the engines from the vessel and its subsequent conversion and rebuilding from a paddle steamer to a ketch was due to its low purchase price. This must have been to lower the overheads of a vessel, considered to be ill suited to its current design.





**Figure 8.2** Percentages of propulsion methods subsequently modified.

Original Propulsion	Final Propulsion	Number.	%
Sail (unassisted)	Sail (auxiliary motor)	11	58%
	Steam (single screw)	4	21%
	Sail (auxiliary steam)	2	11%
	Motor (single screw)	1	5%
	Motor (twin screw)	1	5%
Paddle (side-wheel)	Steam (single screw)	5	36%
	<b>Paddle (stern wheel)</b>	3	22%
	Steam (twin screw)	2	14%
	<b>Sail (unassisted)</b>	2	14%
	<b>Sail (auxiliary motor)</b>	2	14%
Steam (single screw)	Motor (single screw)	4	50%
	<b>Sail (unassisted)</b>	2	25%
	<b>Sail (auxiliary steam)</b>	1	12.5%
	<b>Paddle (stern wheel)</b>	1	12.5%
Paddle (stern wheel)	Paddle (side wheel)	5	83%
	Steam (single screw)	1	17%
Steam (twin screw)	<b>Paddle (side wheel)</b>	1	50%
	Motor (single screw)	1	50%
Sail (auxiliary motor)	<b>Sail (unassisted)</b>	1	50%
	Motor (twin screw)	1	50%
Motor (single screw)	<b>Steam (single screw)</b>	2	100%

**Table 8.1** Breakdown of individual changes propulsion types in ANAVD vessels that have had modifications made to their method of propulsion. “Retrograde” amendments bolded. Values rounded up to nearest half percent.

This is not surprising considering that all of these propulsion systems at some time were replaced by newer technologies, and the fact that these three categories are the three most statistically dominant propulsion types in the ANAVD (and about 65% of the entire database).

However, if we examine each transition in propulsion system (see Table 8.1) we notice that changes occurred to certain systems, which, if compared to the accepted histories of technological change appear to be retrograde technological steps (these have been bolded in Table 8.1 and constitute over 25% of the sample). When we consider the types of activities that these changes represent, we can hypothesise the possible economic causes and repercussions that they may represent. These changes can all be group within the following system.

- *Technological reduction*: The removal of a particular system of propulsion. Such a process can be seen in the conversion of powered watercraft into sail vessels. This process would be relatively inexpensive and simple, and would not generally require substantial rebuilding of the vessel.
- *Technological augmentation (retrofit)*: Constitutes a process of addition where new or different technologies are added to the existing structure, normally as an “upgrade”. Such processes can be categorised as the conversion of unassisted sail vessels to auxiliary sail, steam, and motor or paddle vessels. Such processes, while complicated would be comparatively difficult and expensive to carry out.
- *Technological substitution (retrofit)*: By far the most complex process of change, this involves the removal of one form of motive power, and the addition of another. Such a change may constitute substantial structural changes, and rebuilding of a vessel at high cost.

In light of these processes, it may be possible to equate events of technological reduction and augmentation with economic issues related to fuel costs, or savings in fuel, and technological substitution with issues relating to fuel efficiency, or changes in trade requirements. For instance, early motor vessels, operating on a benzene fuel often converted to steam power because of the prohibitive associated with the procurement of that fuel.

*Modification to Hull Dimensions and Materials*

Modifications to the hull are related to changes in the dimensions and hull material of a vessel. An analysis of the ANAVD shows that historical references to vessels changing the material of their hull is very rare (under 0.5%), and is only reflected in seven individual cases (see Table 8.2).

Vessel Name	Original Material	Year of Change	Final Material	Propulsion
<i>Rapid</i> (1838 - 1851)	Wood	Unknown	Iron	Paddle steamer
<i>Kelpie</i> (1864 - 1903)	Iron	1875	Composite (iron frames)	Paddle steamer
<i>Pride of the Murray</i> (1865 - 1910)	Wood	1891	Iron	Paddle steamer
<i>Ariel</i> (1867 - 1912)	Iron	1876	Composite (iron frames)	Paddle steamer
<i>Corowa</i> (1868 - 1945)	Iron	1921	Composite (iron frames)	Paddle steamer
<i>Manawatu</i> (1873 - 1929)	Iron	1882	Composite (iron frames)	Screw steamer
<i>Albemarle</i> (1884 - 1931)	Iron	1914	Composite (iron frames)	River Barge

**Table 8.2** Table of ANAVD watercraft that have undergone changes in their hull material type.

Additionally, these changes seem to be limited to transitions in the use of iron, with five out of the seven vessels changing from iron hulled watercraft to composite hulled (in all cases these vessels remained iron framed), and two changing from timber hulled to iron hulled. This is also probably due to the fact that with the exception of the vessel *Manawatu* all of the vessels were river vessels (paddle steamers or barges).

Changes to the hull of a vessel normally constitute an extension or contraction of dimensions and tonnage. The main, and apparently easiest modification that is made to vessels, especially wooden vessels involved the two fold increase to both length and tonnage through the cutting of a vessel in half and the building of a new midships section (see Figure 8.3).



**Figure 8.3** Lengthening of an unidentified vessel, at Harry Wood's shipyard, Launceston, Tasmania (reproduced by Orme 1988: 30, held by the Queen Victoria Museum and Art Gallery, Launceston)

ANAVD data shows that at least 153 (around 10%) of abandoned vessels underwent modifications to increase size. These values are presented in Table 8.3.

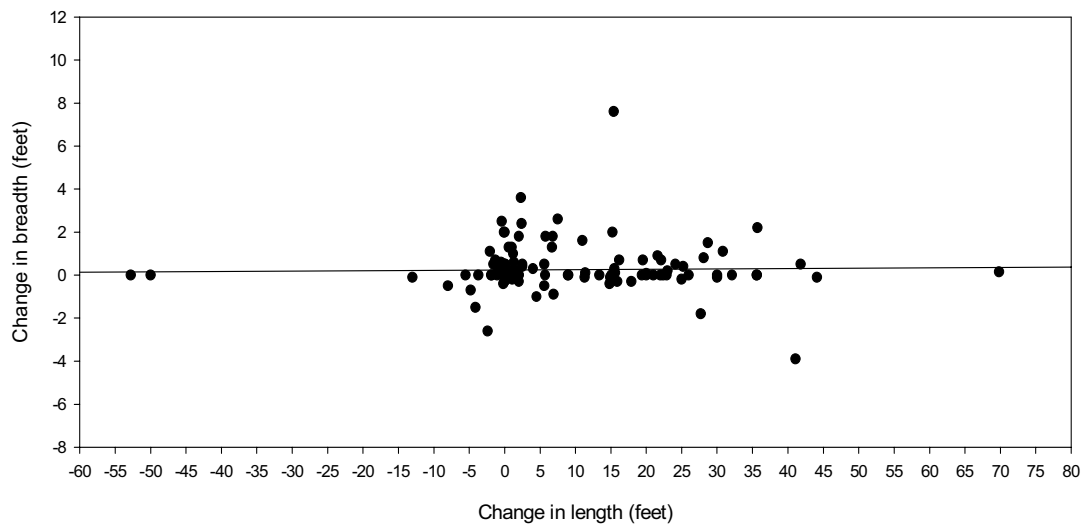
Dimension	Change	Number	%
Length	Increased	80	52.3
	Decreased	22	14.4
	Unchanged	51	33.3
Breadth	Increased	54	35.3
	Decreased	25	16.3
	Unchanged	74	48.4
Depth	Increased	30	19.6
	Decreased	44	28.8
	Unchanged	79	51.6

**Table 8.3** Table depicting the types of dimension modification occurring in modified abandoned watercraft, the number of vessels represented and the percentage (rounded to nearest tenth of a percent) of changes to particular dimensions (n=153 watercraft)

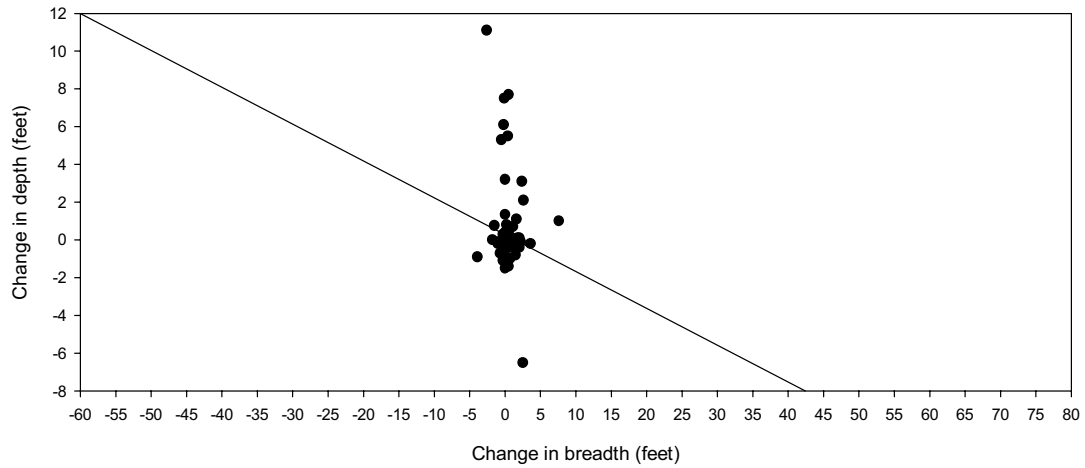
While a simple analysis (as seen in Table 8.3) suggests that dimension changes tended to constitute an increase to length with no changes to breadth or depth, a more detailed investigation shows that generally changes to length dimensions had little effect on corresponding changes to breadth or depth. However, changes to the breadth of a vessel often brought about substantial changes to the depth dimension of a vessel. This data can be seen in Figures 8.4, 8.5 and 8.6 which shows this data according to changes in the length, breadth and depth measurements in relation to each other.

153 vessels are also listed as having undergone modifications that changed their gross tonnage. The simple analysis of changes in tonnage (Table 8.4) shows that the majority of conversions actually reduced the tonnage values of most of the vessels. If we examine this in relation to the actual size of the changes that occurred, (Figure 8.7) we can see that in most cases the actual change in size of a vessel was normally not substantial.

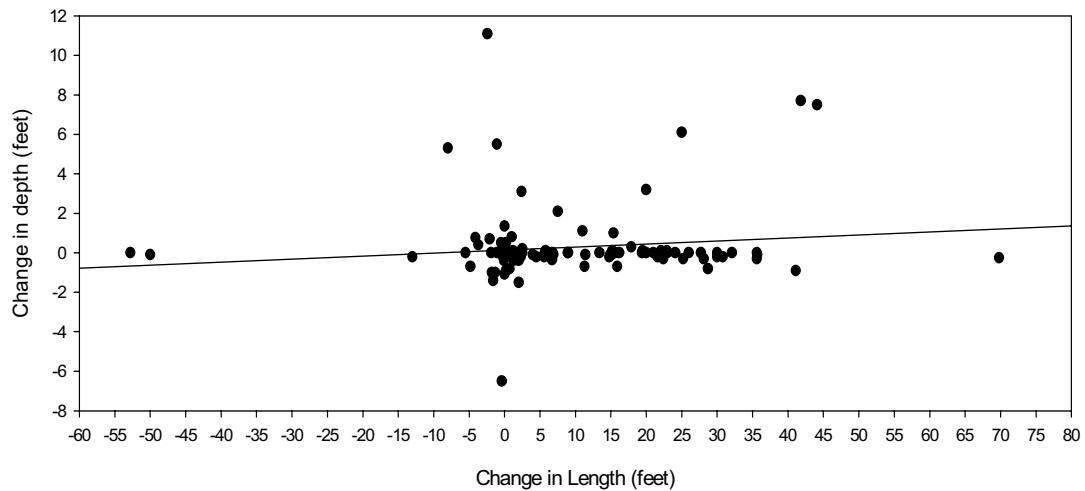
Arguably these figures suggest that the vessels are not going through modification for the purposes of simply increasing their capacity to carry more goods, or transport more passengers, but are undergoing modification for other purposes. This may be because of a change in trade that requires operation in new locations with certain environmental constraints, or may indicate that modifications are occurring to increase the efficiency of watercraft. These modifications however can be seen from another perspective – their consequences on the duration of use of a vessel. In relation to the use life of abandoned watercraft, the analysis of the ANAVD suggests that the investment in modification added an average of nine years to the use life of a vessel. In relation to the dimensions of a vessel the ANAVD is comprised of 1388 vessels that have no mention of undergoing major modification to a length, breadth or depth measurement, and 159 that are cited as having undergone such a modification.



**Figure 8.4** Changes in length dimension with corresponding changes in breadth dimensions



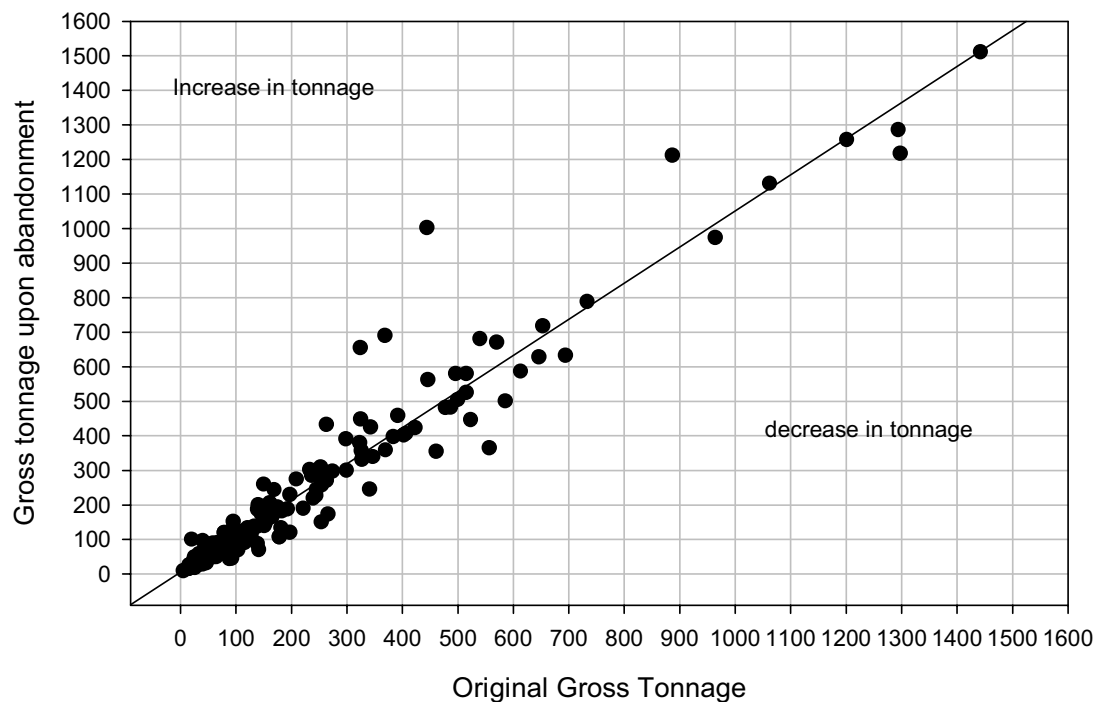
**Figure 8.5** Changes in breadth dimension with corresponding changes in depth dimensions



**Figure 8.6** Changes in length dimension with corresponding changes in depth dimensions

Change	Number	%
Increased	67	36.6
Decreased	107	56.5
Unchanged	9	4.9

**Table 8.4** Table depicting the types of tonnage modification occurring in modified abandoned watercraft, the number of vessels represented and the percentage (rounded to nearest tenth of a percent) of changes to particular gross tonnage values (n=153 watercraft)



**Figure 8.7** Changes in tonnage due to modification (n=153 watercraft)

Of the 1059 vessels in the database with known dates of build and abandonment 928 had no changes made to their dimensions, and 131 were modified. Likewise, in relation to changes in the gross tonnage of vessels there are 1359 vessels cited as not having undergone modifications to their gross tonnage, and 154 that had. Of the 1059 vessels in the database with known data of build and abandonment 905 were unmodified, and 154 were. According to this analysis modified vessels lasted on average a decade longer (expanded below).

## Support Functions and Modification

Of particular interest to this research is the conversion of vessels from their primary, and secondary mercantile uses to other functions. In particular their conversion for secondary support functions, such as conversion to lighters and hulks is of interest because in some cases this reuse mechanism can represent both secondary use, as well as recycling processes.

There are many types of hulk, and most common of which was the cargo hulk (Bathgate 1979: 39). Cargo hulks, or vessels that were used for the storage of materials were mainly comprised of coal and gunpowder hulks (see Figures 8.8 and 8.9) (Glassford 1953: 222). Each descriptive category has further variations according to what kind of barge, hulk or lighter it was (see Appendix 2, Section 8 for definitions). This tells us something about the demand for vessels fulfilling support roles, the types of stresses these vessels were subjected to, and the duration of hulk use-life. The choice of a wooden vessel as a gunpowder or explosives hulk for instance would not have made much sense in the late nineteenth or early twentieth centuries when ferrous hulled vessels were available for this purpose due to the fact that wood absorbs nitro-glycerine from sweating TNT and itself becomes explosive. The categorisation of secondary support vessels is problematic because of the nature of the work they engaged in. While some vessels may have fulfilled a singular secondary support role, others carried out many functions at once, or throughout their secondary support lifespan. Of the 532 vessels that are listed as hulked in the ANAVD at least 95 are known to have fulfilled two secondary support roles, and at least five performed three secondary support roles. In some cases this is also because of grey areas in how such vessels have been described. For example a “coal hulk” is a different kind of support vessel than a “coal lighter” according to definitions that indicate that “hulk” refers to stationary vessels and “lighter” refers to a towed vessel.





**Figure 8.8** *Santiago* as a coal hulk (1930) (Courtesy of Ron Blum Photo No.313)



**Figure 8.9** *Aladdin* as a Tasmanian government powder hulk (State Library of Tasmania Photo number 001125643593)

The conversion of a vessel to a secondary support role occurred for a range of economic reasons. Normally a vessel had become unwanted because of its condition and age (and hence an inability to gain marine insurance), or its representation of an old technology that was seen as uneconomic. In other cases it may be because a particular trade disappeared or ceased to be viable.<sup>2</sup> However, for a vessel to be turned into a hulk, there needed to be a demand for the fulfilment of such a secondary role, and the vessel needed to be of an appropriate type for its new intended function. Also, Paine (2000: 89) notes that the prevalence of many-masted schooner rigged vessels required many crew, and that this was the main reason that the rig was seen as obsolete in Maine.

High crewing requirements were also responsible for the conversion of schooners into barges and other secondary support vessels more than any other type. Additionally Gerr (1975: 399-400) has suggested that schooner rigged vessels undergo increased wear and tear because their swinging booms and gaffs act as energy sponges that contribute to the higher rate of loss, and shorter use-life of vessels. In this way we may be able to determine a correlation between rig, and rig transition through a vessel's working life, and also a correlation between last rig and the tendency to convert to secondary use. Of the 532 vessels in the ANAVD that are listed as hulked, 307 were rigged and their rig configuration was known. Of this number the two most common rig types were barque rigged (36%) and schooner rigged (35%).

There is currently no published analysis of the rig configuration of watercraft operating in Australia over the period covered by this study (1806 to 2001) that can be compared to the ANAVD. The data pertaining to "vessel type" in the AHSD (accessed 24 June 2002) was the closest comparable dataset found.

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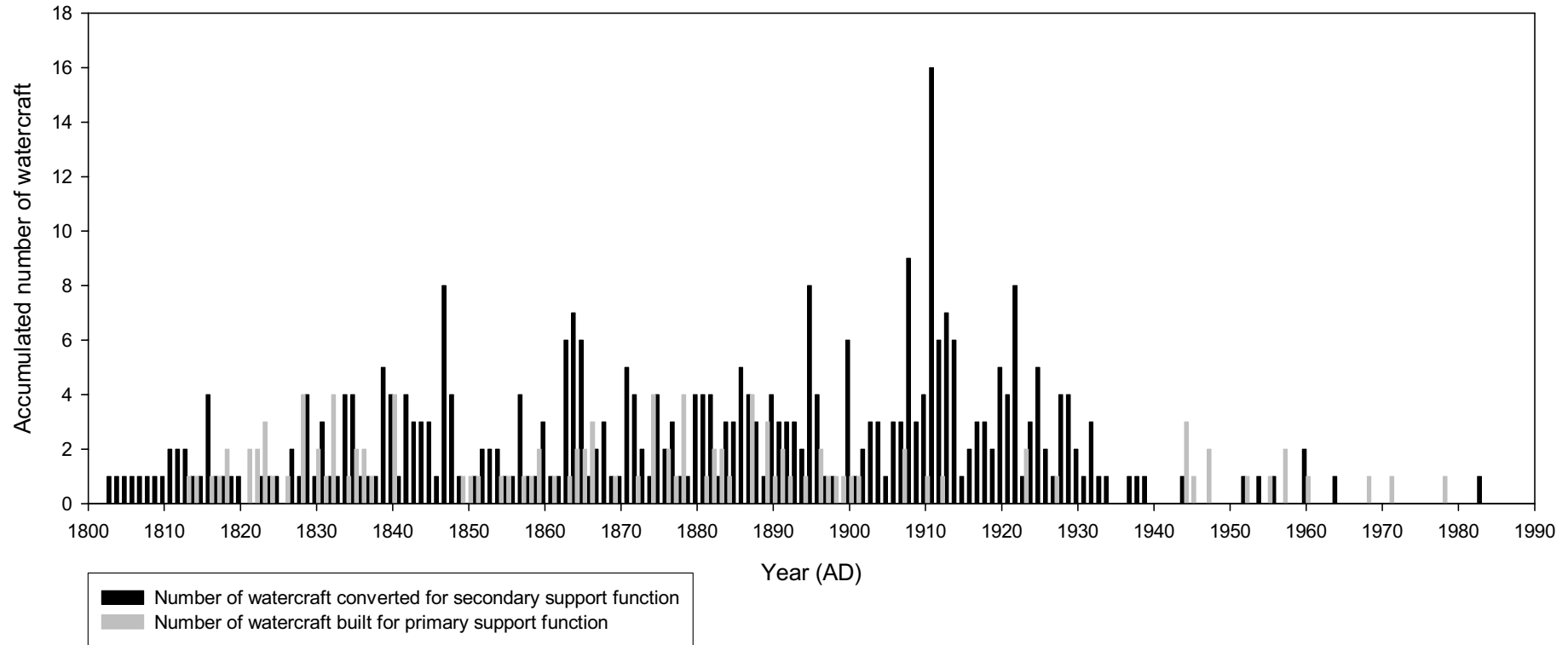
<sup>2</sup> Glassford (1953: 221-222), for instance notes that one of the first causes of the conversion of vessels into hulks was the discovery of gold, and the decline of the whaling industry in Tasmania in the 1860s. McIlroy (1986: 43) has also noted that when the Bather's Bay whaling station was closed in 1840 the whaleboats were deployed as ferries on the Swan River.

There are 5972 shipwrecks, and 42 “vessel type” designations. Of these there are 18 separate designations of rig (“schooner rig” is made up of 5 separate designations), which covers 3499 shipwrecks (or 58.59% of the database). A breakdown of prevalent rig configurations shows that the abandonment data is significantly different from shipwreck data, with the five most common rigs being the schooner rig (33.58%), ketch rig (16.09%) cutter rig (14.4%), barque rig (11.49%) and brig rig (6.49%). It should be noted that this field is an amalgam of “rig”, “type”, and “function” attributes, and is not set up well for this kind of analysis due to the tendency of type and function descriptions to obscure rig configurations (i.e. a vessel designated as “fishing boat” may, or may not be rigged).

Support vessels (in the form of barges, punts, pontoons, hulks and lighters), are often described in the historical literature. The need for vessels to fulfil support roles has only really been touched upon in the past. What is obvious is that the demands for these functions varied over time and were related to economic issues (on local through to international levels), port infrastructure, port development, and a range of other influences. The distinction that has to be made is that there are two kinds of support vessels; vessels specifically manufactured to fulfil support functions (primary support), and those converted or modified for these roles (secondary support). For instance, it appears that custom made (primary) support vessels have tended to be barges, punts, pontoons and sometimes lighters, whereas vessels fulfilling secondary support roles have almost exclusively tended to be described as hulks or lighters. This distinction between primary and secondary support is important. If vessels are being constructed with the intention to fulfil support functions, there is likely to be less of a chance that there will be a high demand for the conversion of other watercraft into hulks. The consequences of this are that vessels are more likely to be repaired and continue in a primary role, or will be abandoned earlier due to the lack of demand for any

alternative function. Figure 8.10 shows that primary support vessels are created in years where there is low demand for the conversion of vessels for secondary support. Such correlations are expected to be more marked in riverine trades because of the reliance on the use of barges in many river trades (such as wool transportation).

Many vessels seem to have undergone conversions from functional merchant vessels into barges and lighters (see Howe & Matthews 1986: 386-387; Matthews 1987a: 128, 137, 239, 1987b: 272-273). This process of conversion often occurs to vessels with a history of costly repairs. This substantial investment tended to make it more probable for a vessel to be chosen to fulfil a subsequent support role, rather than a continued mercantile function. Another trend evident in the historical literature is that before the popularity of steam propelled vessels it was more likely that vessels did not need to be condemned in order to become converted to barges (see, for instance, Matthews 1987a).



**Figure 8.10** Comparison of the years of build of primary support vessels and the years of modification of vessels to secondary support functions (n=296)

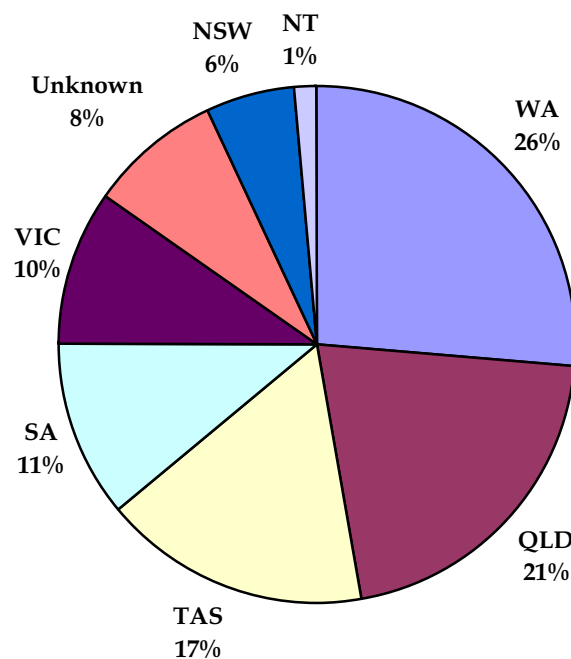
On the Australian rivers, the trend is the same, with functional paddle steamers such as the famous vessels *Lady Augusta* and *Lady Daly*, which often towed barges, becoming barges for a period before finally being disposed of (Mudie 1965: 59).

As Glassford points out, vessels have been hulked in Australia from at least the 1830s, but most of the details of these vessels have been lost. In particular he points to some of the earliest examples being lighters employed as prison and powder hulks, and wool lighters. He also mentions grain hulks and grain-mill ships, but admits that the coal hulk was by and large to most common form of hulk (Glassford 1953: 218). Coal hulks were created due to storage needs for coal for visiting steam vessels. It is obvious that the overwhelming need for the conversion of vessels in Australian ports into hulks was due to demand for coal bunkering facilities. With the growth and popularity of the oil fired and diesel powered vessel the need for such bunkering facilities ceased, thus causing a new wave of abandonment to occur (Stone & Loney 1983: 9; Cairns & Henderson 1995: 179). From the 1930s, changes in technology began to have an influence on the usefulness of hulks:

The oil-fired boiler, the diesel engine, and now the gas turbine have between them rendered the coal hulk obsolete, while the ports of the wheatfields have built silos to take the place of grain hulks. As a result, the number of surviving hulks in Australia is dwindling rapidly, and very soon now there will be none left at all ... (Glassford 1953: 252).

Generally all of the vessels that had been converted into hulks for the purposes of bunkering coal became obsolete for a second time, and as one newspaper noted in relation to the breaking up of the vessel *Graham* in 1933, "with the passing of sail the *Elizabeth Graham* became the hulk *Graham*, but oil burning vessels have now made even a coal hulk an anachronism" (*Argus* 12/12/1933; Parsons 1991a: 259).

Glassford (1953: 218), however, had noted that, “The States which produce no steaming coal of their own suitable for firing marine boilers were those that had the greatest number of coal hulks, namely, Victoria, South Australia and Western Australia”. The analysis of the ANAVD shows a slightly different story with the three states with the largest number of coal support vessels (that is any hulk, lighter or barge that was used for coal bunkering) being abandoned in the states of Western Australia, Queensland and Tasmania (see Figure 8.11).

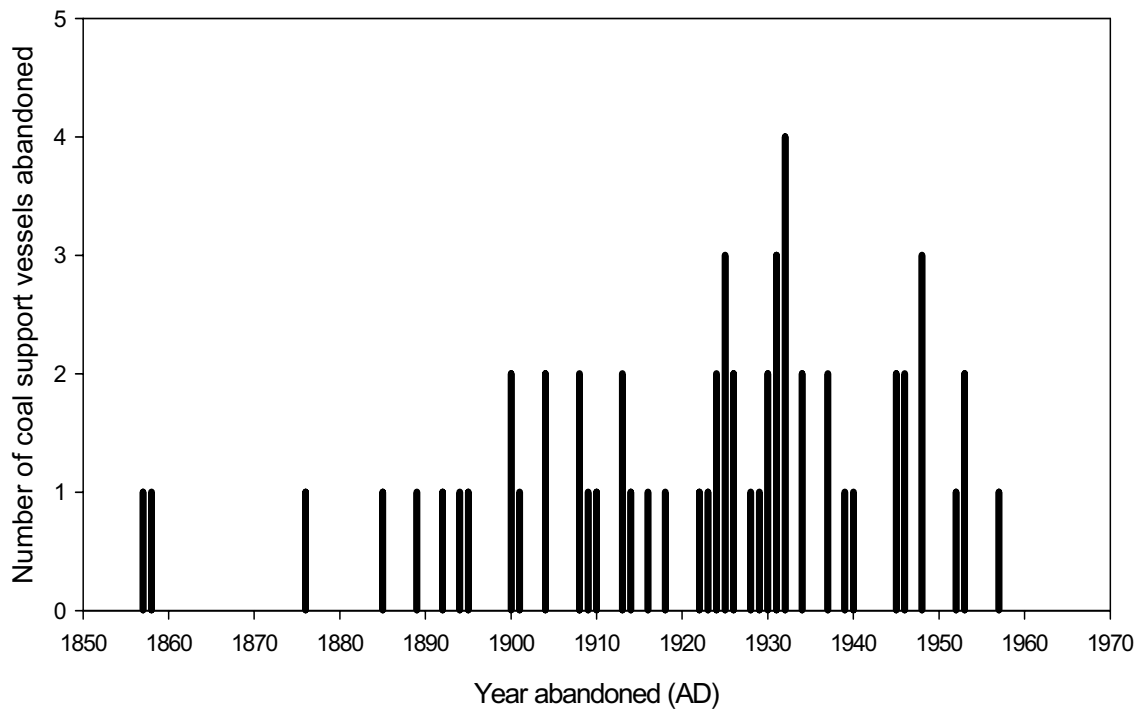


**Figure 8.11** Breakdown of states with abandoned watercraft that had been coal support vessels

While Glassford mentions Western Australia as a state with many hulked vessels, he does not mention Queensland and Tasmania. However, a more in-depth investigation of coal bunkering in Tasmania illustrates that the ANAVD is a better reflection of reality than Glassford’s information. Tasmania’s ports utilised hulks extensively, as indicated by the Marine Board’s boasting about having more coal bunkered in Hobart than any other port outside of Newcastle. Coal hulks were to be an integral part of the

carrying out of trade in Hobart well into the 1930s, and some vessels, like *Jessie Craig* and *Aldebaran* were still in operation (mainly due to their exemption from marine survey) into the 1940s (Hudspeth and Scripps 2000: 127-128, 166, 219, 243). Likewise hulks were used extensively in Queensland, mainly because of the joint influence of Burns, Philp and Company and the Australasian United Steamship Navigation Company, which from 1888 co-owned the Carpentaria Lighterage Company that operated along most of the Queensland coastline (Parsons 1992d: 8).

If we look at the time of abandonment of coal hulks/lighters/barges between 1850 and 1970 we can see that the early 1900s, mid 1920s, but especially the early 1930s and late 1940s were the main periods of the abandonment of coal hulks (Figure 8.12).



**Figure 8.12** The abandonment of support vessels associated with coal bunkering, 1850-1970 (n=75)



In other ports, barges, hulks and lighters were in use until new port infrastructure was built that took over their function. This was the case at Port Adelaide where secondary support vessels were utilised until the construction of the outer harbour (Parsons 1983d: 5). This was due to a combination of factors, with some vessels built for the construction of the harbour no longer required, and others no longer needed due to new fuel storage facilities.

### *Special Support Roles*

Not all modification of vessels to secondary support functions is related to the internal workings of harbours. There are many cases of vessels being converted for specialised uses that are unique and rare. Likewise, not all hulks were dead ships into which no investment went. The vessel *Fortuna* (ex *Macquarie*), for instance, was converted into a coal hulk in 1909 and then was modified in 1920 with mechanical elevators to become a floating plant and mechanical coal hulk (Glassford 1953: 230). One common procedure was for vessels to become lodgings after hulking (and some after abandonment). The vessel *Snimos King*, for instance, was rumoured at one stage to be about to be converted into a floating circus big top by a Japanese consortium, and *Prince George* was sold to become an Alaskan Hotel (Wanklyn 1988: 31; Rimes 1990: 10). In many cases these conversions are made because of the same economic circumstances that cause processes of modification to be carried out on vessels. Sometimes they proceed due to the whims of corporations and the gimmick value of juxtaposing new, and non-traditional functions upon watercraft.

A number of vessels are noted as having served “specialised” roles (see Table 8.5). These vessels served functions such as accommodation

vessels/residences, bathhouses, bridges, fish depots, chapels, restaurants, sugar mills, crushing plants, workshops, and wreck raising hulks.

<i>Name of Vessel</i>	<b>Function</b>
<i>Anson</i> (1812-1850)	Accommodation/Residence
<i>Ben Bolt</i> (1852-1864)	Bathhouse
<i>City of Adelaide</i> (1864 - 1915)	Bathhouse
<i>City of Grafton</i> (1876-1930)	Accommodation/Residence
<i>Clyde</i> (1884-????)	Fish Depot
<i>Excelsior</i> (1882-1948)	Floating Workshop
<i>Gen</i> (1868-1927)	Bridge
<i>Jupiter</i> (1866-1940)	Fish Depot
<i>Pride of the Murray</i> (1865-1910)	Floating Workshop
<i>Sesa</i> (1869-1928)	Accommodation/Residence
<i>Sir William Molesworth</i> (1848-1876)	Accommodation/Residence
<i>Sir William Wallace</i> (1824-1850)	Floating Chapel
<i>Sophia</i> (1800-????)	Floating Chapel
<i>Sunbeam</i> (1857-1909)	Wreck Raising Hulk
<i>Swan</i> (1916-1934)	Accommodation/Residence
<i>Trinity Bay</i> (1912 - 1981)	Floating Restaurant
<i>Walrus</i> (1864-1879)	Floating Sugar Mill/Crushing Plant

**Table 8.5** List of vessels known to have fulfilled special support roles upon conversion

Additionally at least three vessels served more than one specialised role. *Fitzjames* is known to have served as a reformatory hulk and quarantine hulk. The former HMVS *Cerberus* served as both floating magazine and floating workshop, and *Garthneill* was a floating grain mill/grain grading plant and residence (Figure 8.13).



**Figure 8.13** *Garthneill* as grain silo (1930) (Courtesy Ron Blum #2119)

*The Consequences of Support Related Modification*

Very little has been written on the actual process of converting a vessel for a secondary support role. Warne (1986a: 46) has briefly described the process of the conversion of the vessel *Lalla* to a lighter around 1906. The process of conversion entailed the slight shortening of the vessel, the removal of masts, and the addition of a towline. In most cases the transformation of a vessel into a secondary support vessel was the last stage in its working life. For this reason, the hulking of a vessel can be generally seen as a functional pre-abandonment use. This was not always the case. Sometimes, such as during the First World War, the shortage of coastal shipping in Australia meant that coal hulks were considered for refitting and conversion back to primary trade functions (Halls 1975: 9). Hulks and lighters would have had their function as support vessels continually assessed much in the same manner as if they were

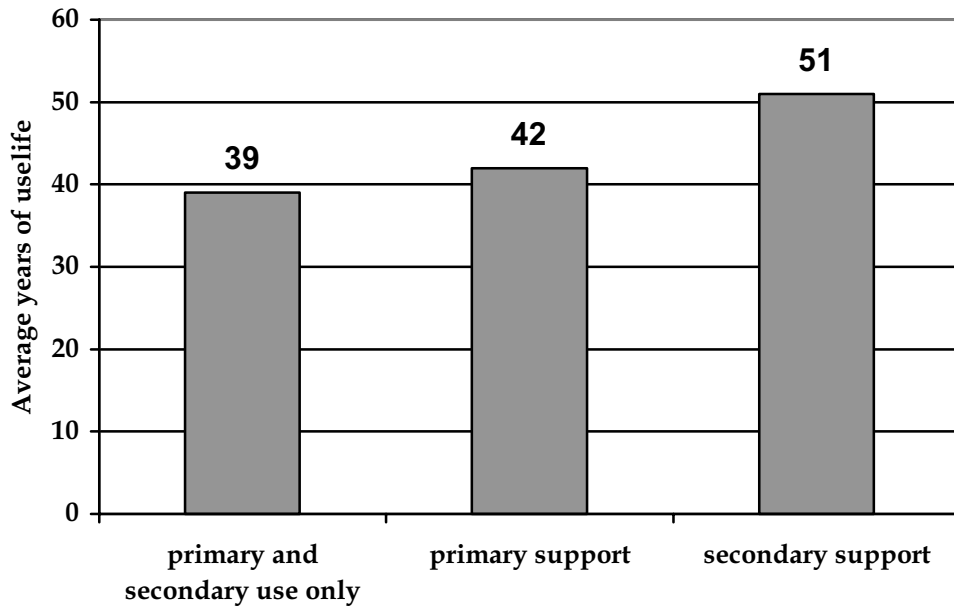
fulfilling primary functions. When the vessel started to leak, and it became uneconomical to repair, it would be salvaged and discarded (Bathgate 1979: 39).

The hulking of a vessel had substantial economic ramifications for a shipowner. While a shipowner may have liked their vessel to be in use forever, of course, such a situation was not a reality. For this reason the next preference was to use a vessel for some purpose other than the function it had been built to fulfil. Here the most obvious opportunity was the hulking of a vessel.

Of the entire ANAVD, 532 (34.5%) were used for support roles. Out of this number 90 (16.9%) fulfilled this role upon construction (primary support) and 442 (83.1%) fulfilled this function after hulking (secondary support). This is a reflection of the options undertaken by shipowners to gain money from unusable vessels, or make money from hulk trades. There are 1059 vessels of known date of build and known date of abandonment in the ANAVD. Of these 346 were built for one purpose and hulked (secondary support), 45 were built as hulks (primary support), and 668 were never hulked (utilised in primary use roles only).

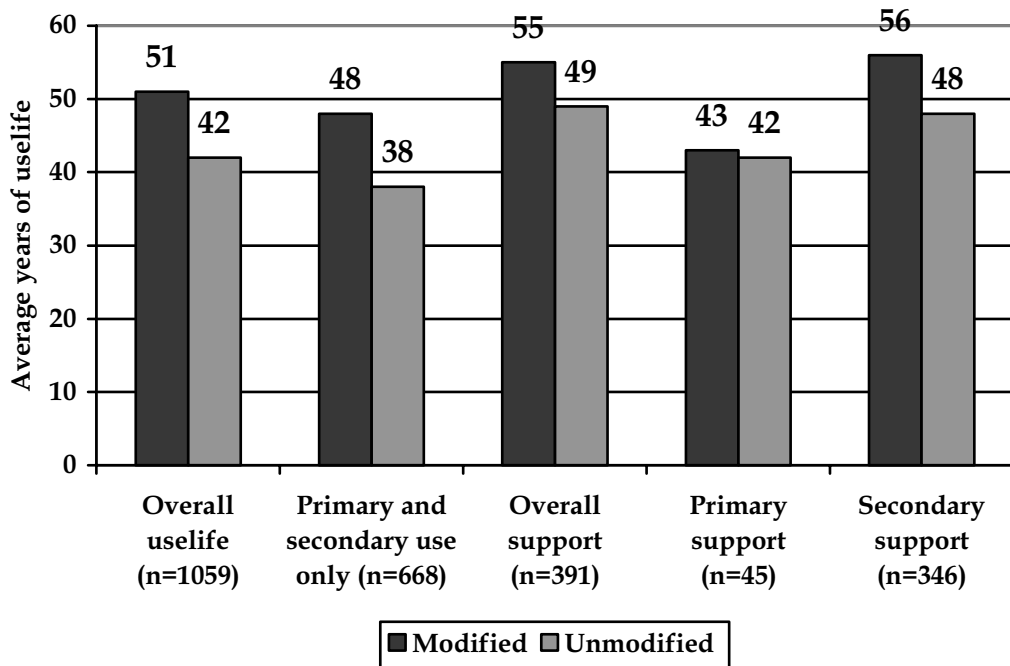
Culliton (1974: 5) has commented, "It is sometimes accepted, especially by legislation, that the life of a ship is twenty years. Experience seems to indicate that physically at least ships last much longer than 20 years". The results displayed in Figure 8.14 definitely do not indicate that the life of a ship was twenty years or less, and confirms Culliton's assertion that ships last substantially longer than 20 years. The averages of the lifespan for each category illustrates the advantages of hulking with a difference of 12 years between the vessels that were never hulked and the vessels that served as hulks (see Figure 8.14). The vessels that were built as hulks (primary support vessels) only lasted on average about three years longer than vessels that had

never been hulked, illustrating that they were probably more cheaply built and subjected to more wear, tear and rough handling while also being used in more protected working environments. These figures confirm those presented in Richards (1997: 110) regarding the average age of abandoned vessels in the Garden Island Ships' Graveyards.

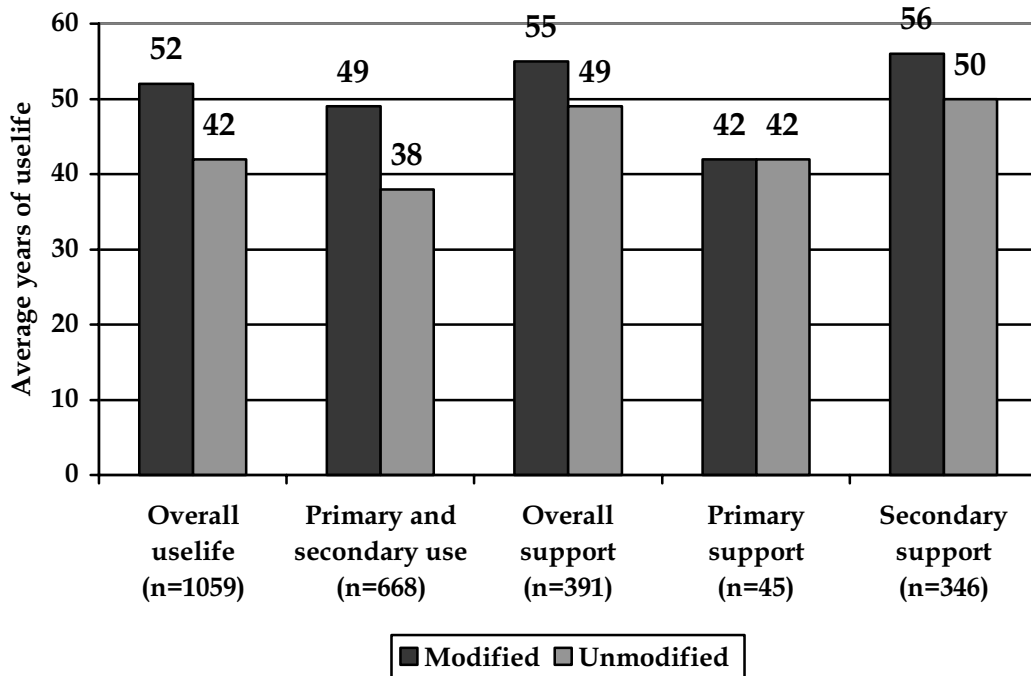


**Figure 8.14** The average lifespan of un-hulked and hulked watercraft (rounded to nearest number) (n=1059 watercraft)

A more complex examination that incorporates a comparison of modified vessels from the perspective of changes in dimension and changes in gross tonnage supports this assertion and backs up earlier conclusions concerning the advantages of modification (see Figures 8.15 and 8.16).



**Figure 8.15** The average lifespan of modified and un-modified (based on changes in dimension), un-hulked and hulked watercraft (rounded to nearest whole percentage) (n=1059 watercraft)



**Figure 8.16** The average lifespan of modified and un-modified (based on changes in gross tonnage), un-hulked and hulked watercraft (rounded to nearest whole percentage) (n=1059 watercraft)

These figures clearly support the theory that support vessels survive longer than other vessels, and that modified vessels in all categories outlast unmodified vessels. However, this analysis also illustrates that modification was a substantial benefit to vessels fulfilling primary and secondary uses, and that modification was only of slight benefit to vessels built in primary support roles. This may be because high quality repairs were carried out on primary use vessels, and shoddy repairs were carried out on low-quality primary support vessels.

Additionally, a diachronic analysis (as seen in Figure 8.17) shows that across time, and despite technological innovation, watercraft use life decreased drastically between 1790 and 1990. While this trend is undoubtedly influenced by the smaller number of vessels built at the beginning and end of this period (as seen in Figure 5.2, Chapter 5), it may indicate the influence of the steam engine in replacing sail vessels in the early nineteenth century. Another a factor was the replacement of steam technologies in the 1920s and 1930s. This brought about the replacement of support vessels, particularly for coal bunkering purposes and played a major role in the reduction in the duration of watercraft use life. This may also be attributed to the transition towards the mass-production of watercraft, and the increasing perception of ships as throwaway items with limited use by dates.

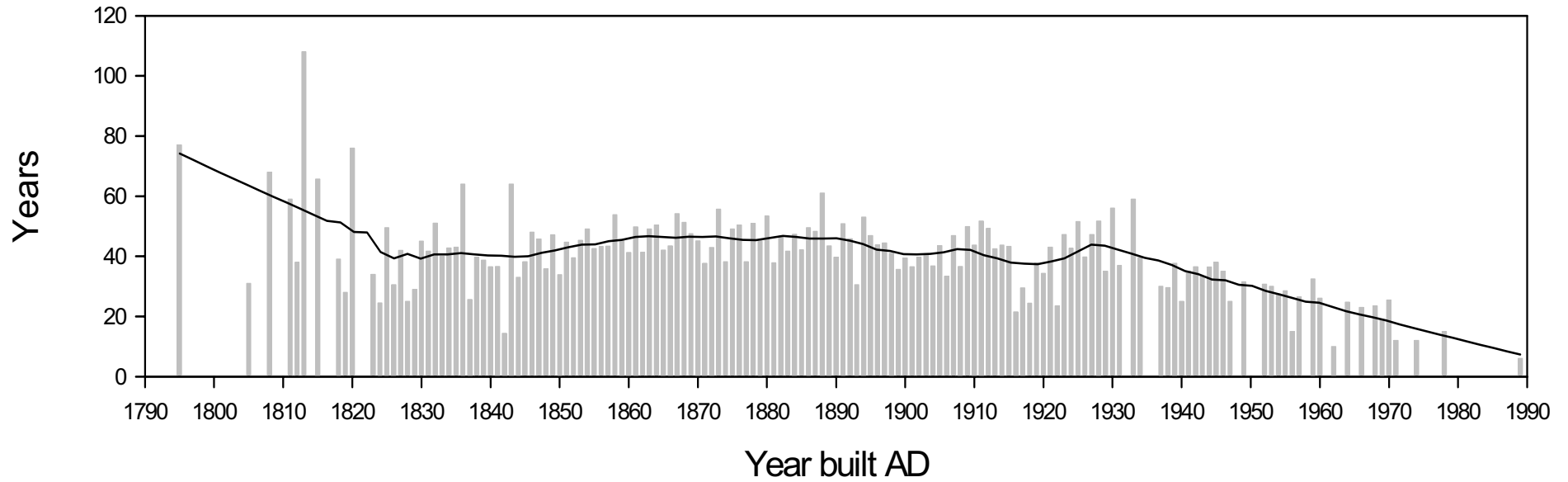


Figure 8.17 The average lifespan abandoned watercraft (1790 - 1990) (n=1059 watercraft)



### Functional Post-Abandonment Use

The term “post-abandonment use” implies that a vessel has been discarded, but for a continued functional role of some kind. In this manner, a vessel, while undergoing a range of placement assurance, salvage and hull reduction processes (to be discussed in the following chapter), remains largely in a systemic context. Post-abandonment use can also be seen from many perspectives. The most common functional post-abandonment use can be seen in the utilisation of unwanted vessels as breakwaters. Of this there are many examples, such as the vessel *William Pitt* sunk at Canoe Bay, Fortescue Bay, Tasmania in the 1960s as a breakwater for small vessels (Figure 8.18) (Jacques 1997: 71-72).



**Figure 8.18** *William Pitt* at Fortescue Bay, Tasman Peninsula, Tasmania (Photo, Nathan Richards 18/12/2000)

Indeed, Loney (1991: 138) suggests that many old iron hulled vessels were used for specific purposes when abandoned such as breakwaters around small islands or in harbour contexts. The choice of iron-hulled vessels, especially as breakwaters is attributed to the hardy nature, and slower rate of corrosion and deterioration of iron, in relation to both wood and steel (Stone & Loney 1983: 9). This however, was not just restricted to metal hulled vessels, and there are cases where wooden hulled ships were used for similar functions. Once again, the use of unwanted vessels as breakwaters illustrates

the economic issues that surround their abandonment. In 1912, the President of the Marine Board of Port Adelaide was quoted as being a, "firm believer in the efficacy of using hulks on the formation of breakwaters" (*South Australian Register* 31/05/1912: 6f). Two hulks were offered to the Engineer-in-Chief at Hog Bay, Kangaroo Island for the purposes of breakwater construction. The offer was declined and a similar scheme was proposed for the outer harbour at Port Adelaide. On this matter the marine board sought correspondence with the Public Works Department of the New South Wales Government. Despite information that the use of hulks at Newcastle (apparently for the construction of the Northern breakwater) had saved the NSW government over £4,000 in stone costs the South Australian plans were again declined, and the strategy was never enacted. Other post-abandonment functions include the use of the barque *Othello* as a landing stage and wharf at the Kaipipi Shipyard, Paterson Inlet (New Zealand) in 1927 (Watt 1989: 179, 181), which is a common function for unwanted watercraft. In 1949 a similar function was reported in the newspaper *The News* (24 June 1949) that a sunken ship was used as a wharf:

Port Moresby – A Japanese ship of about 10,000 tons, which was bombed and sunk in Rabaul Harbor during the war is now being used as a wharf for a small ship. The vessel is upright in shallow water near the shore. A wooden approach has been built to the ship from the shore and much of the superstructure has been removed. The new wharf is speeding up the turn-around of coastal ships.

Only about 7% (115 vessels) of abandoned vessels are listed as fulfilling post-abandonment uses. Of these 112 (about 97%) served as structures. Some of these vessels have served a range of functions related to their use as items of port or outport infrastructure. Watercraft like *Python*, *S.F. Hersey*, *Margaret Poynter* and *St. George* served as piers; *Induna* as a wharf, and the unidentified lighter at Port Welshpool was reputed to have served as an immovable coffer.

Additionally the Penrice/No. 1 hulk (Figure 8.19) is known to have served as an immovable explosives storage depot (and later was used to reinforce an embankment), and the vessel *Rhea* was sunk off of Sydney Heads with a load of waste.



**Figure 8.19** The Penrice/No.1 Hulk at Gillman (South Australia). Note embankment for salt pans on right hand side of image (Photo: Nathan Richards, 03/06/1997)

More common post-abandonment uses come in the form of artificial reef formations (45 vessels), breakwaters (30 vessels), reclamation devices (20 vessels), and as protective structures (eight vessels). For some sites, such as the Tangalooma artificial reef (Figure 8.20) categorisation is more problematic because it can be regarded as an artificial reef, boat harbour and breakwater. The three other non-structurally used watercraft were comprised of the vessels *Psyche* and *W.H. Gemini* which were explicitly sunk to provide a dive training site and the vessel *Inca* which was deliberately burnt for the movie *For the Term of His Natural Life* (1926).



**Figure 8.20** The Tangalooma Ships' Graveyard, Moreton Island, Queensland (Photograph: Nathan Richards, 1/11/1999)

### **Artificial Reefs and FAD**

Artificial reefs pose a small problem in the analysis of ship disposal in that they are linked with other aspects of sea dumping. Artificial reef systems have not exclusively been made up of vessel material but have also had a broad range of other materials used in their construction. For this reason vessels abandoned as artificial reefs are often also found with other materials. Darwin Harbour, for instance, has numerous artificial reefs made up of vessels and other materials such as freight containers and even a large bottle washing machine (Flynn 2000: 69). Queensland artificial reefs are noted as having a diverse array of materials from old Brisbane trams, and dry dock gates to old concrete pipes. An additional problem in researching artificial reefs is that often many small pontoons are dumped on site with very little documentation. These vessels are often unnamed, and are part of the “invisible” abandonment resource that may change the analyses undertaken in this thesis.

The domination of artificial reefs in post-abandonment contexts is a worldwide phenomenon, and many artificial reef organizations have been established in many nations that vie for unwanted vessels for the creation of such sites. One of the best examples of this is the Liberty Ships of the *Texas Artificial Reef Program* (Arnold *et al.* 1998). This program began in the mid 1970s when twelve World War Two Liberty ships were scuttled off the Texas coast in the Gulf of Mexico. This allowed for some degree of preservation (as dive sites) and also enabled the vessels to serve the community as fish aggregation devices (Arnold *et al.* 1998: 87). The Federal Congress had originally offered the surplus vessels to the coastal states of the USA in 1972. The enacting of the Federal *Abandoned Shipwreck Act 1987* has subsequently meant that Texas has had to provide private sector access and develop cultural education on the vessels, all of which had been extensively salvaged of fittings and metal before being dumped (Arnold *et al.* 1998: 88, 94).

The Canadians also have had a long and successful history in the use of vessels as artificial reefs, mainly through the Artificial Reef Society of British Columbia. The Canadian Navy anti-submarine warship HMCS *Chaudiere* (1959 - 1993), sunk off Nanaimo, British Columbia, in April 1994 is reputed to be the largest artificial reef in North America (and the third largest in the world). The process however, stirred up much debate about the issues of environmental management (*Times-Colonist*, 15/08/1992: A8; *The Providence* 28/08/1992; *The Vancouver Sun* 03/09/1992). Other examples such as the sinking of *G.B. Church* near Sidney, British Columbia in August 1991 has parallels with Australia through the financial benefits that were projected to result from its sinking (five million Canadian dollars). Similarly, early projections on the benefit of sinking HMAS *Swan* in Western Australia were put at around 1.5 million Australian dollars (*West Australian* 13/07/1996: 33).

Indeed, artificial reef programmes have been operating for some time in Australia and the use of obsolete vessels for the purposes of creating artificial reefs and fish aggregation devices has occurred in every state of Australia. A number of artificial reefs have been established in Victoria, including the vessels *George Kermode* and *Uralba* (Jordan 1995: 177).<sup>3</sup> The Department of Primary Industries and Fisheries began the first official artificial reef in Darwin Harbour in 1988, which came to be known as “Fenton Patches” (Fisheries Division 1992: 3). The Darwin Port Authority is also responsible for “strategically” locating several “steel derelict vessels to further enhance fishing opportunities” (Fisheries Division 1992: 1) illustrating that the continued creation of FADs is an ongoing part of fisheries management.

The decision to use an obsolete vessel for either an artificial reef or an FAD is not a straightforward matter. The scuttling of vessels today must be done with safe, clean vessels, and there must be inspection of the seabed prior to scuttling to ensure that the vessel will not damage seagrass. Additionally the vessel should be on a flat bottom, with little sea life (Sandilands n.d.: 6). An application for a Permit under the *Environmental Protection (Sea Dumping) Act*, 1981 for the creation of an artificial reef must also be made. This application covers many issues, such as community consultation, financial and business issues, safety (navigational and diver), environmental factors, purpose, location, site selection, vessel preparation, sinking management and logistics and post-scuttling management.

Studies in Darwin Harbour on two abandoned vessels *Marchart 3* and the so called “dumb barge” have suggested that in order to make a vessel an appropriate and effective artificial reef, modifications should be made to the structure to be sunk, in the form of additional large and small protruding objects, and the removal of solid or continuous horizontal surfaces (Hooper &

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<sup>3</sup> The difference between an artificial reef and a fish aggregation device (a fish refuge) is determined by epibenthic growth (Hooper & Ramm 1989: 23).

Ramm 1989: 23). Often structural modifications are also made for dive tourism purposes in order to allow for greater diver safety (Sandilands n.d.: 6). This, coupled with the lack of substantial salvage, shows that the behavioural aspects of the abandonment are enshrined in the material remains of the vessel upon sinking. The use and modification of vessels as artificial reefs/FAD and dive tourism sites will have consequences on the perception of historical significance under law. Current studies indicate that vessels are best suited to be used in this capacity if they have a high surface area, many holes and few continuous horizontal surfaces such as decks (hence encouraging three-dimensional growth, and small coral reef fish, and predatory fish habitation). In order to ensure high surface area modifications to the hull of the would-be scuttled vessel are recommended in the form of the cutting into, and adding of additional protruding features (Hooper & Ramm 1989: 2, 23). If these vessels are used in Commonwealth waters, after 75 years they will effectively be re-classified as historic wrecks.

Artificial reefs are created for two major reasons, for fish attraction and fish productivity. The effectiveness of an artificial reef is based on the accumulation of nutrient, adequate water flow and levels of light. Different species, and fish of different ages require different amounts of these levels. While initially thought to be the perfect way to create enriched marine environments, recent discussion has shown that there is a range of positive and negative aspects to the formation of artificial reefs. The perception of these negative environmental factors can stall attempts at the creation of artificial reefs, irrespective of their intended purpose (see *Times-Colonist* 15/08/1992: A8). The environmental concerns often tabled are multi-faceted and range from fear of environmental pollution due to materials (such as asbestos), or fuels (causing chemical slicks) left onboard the vessel upon their sinking, to the impact of the creation of such major structures to fish stocks. There are also concerns that vessels do not generally make good fish habitats.

Other recent theories concerning artificial reef/FAD formation suggest that they may also become a barrier to fish migration, due to the ready supply of food at one location, and that large artificial reefs, while increasing the biomass of an area, does so in a way unique to an artificial structure and tends to only increase the amount of large fish at a site. Small reefs have been noted to produce greater fish densities (Norty 2001: 9). Additionally the creation of artificial reefs in one area may alter regional ecology significantly and could actually lead to the depletion of fish, due to the ease at which the more sedentary population may be caught (Norty 2001: 10-11). Norty (2001: 10) has also written that:

Dumping derelict vessels or prefabricated units into the sea introduces large amounts of foreign material, and the presence of rust and corrosion on these materials can inhibit sustainable colonisation by framework building organisms. Once installed on the seabed, structures are difficult to remove, such that the area is unlikely to return to a natural state for a significant period of time. Pollution from inappropriate or incomplete cleaning of the vessel prior to sinking is a significant threat to the marine environment. The sinking of vessels for disposal purposes or the breakup of sunken wrecks due to improper planing are also important issues.

The sinking of vessels is now much sought after due to the direct benefits and flow on effects to communities that come about through dive recreation and tourism rather than environmental benefits (see Norty 2001: 11). This is evident from the way that the abandonment of vessels for post-abandonment uses have become major social issues. The sinking of artificial reefs in Australia has become such an important aspect of tourism strategy as in Canada, but on a more localised scale. In Australia, regional Artificial Reef Societies are formed, and become powerful lobby groups (such as the Geographe Bay Artificial Reef Society). Indeed, the Western Australian artificial reef programme has been substantially influenced by Canadian circumstances, with advice from the Artificial Reef Society of British



Columbia being sought (Sandilands n.d.: 5). This is particularly the case in the decommissioning of ex- Australian navy vessels, which have become the focus of the next phase of vessel abandonment. The deliberate scuttling of these vessels is not a continuation of the use of the sea as dumping ground, but can now be seen as having serious ramifications for local communities. This is seen with communities vying, quite strongly for the right to have vessels scuttled in the vicinity of their shorelines in order to attract dive tourism and for fish aggregation. The debate over the sinking of the HMAS *Derwent* was so heated that the vessel was mentioned in Commonwealth Parliament (see Senate Report 6, December 1994). HMAS *Swan* was also mentioned. This phenomenon has seen local communities in WA becoming increasingly competitive in gaining control of the scuttling location of these vessels. Arguably this began with the scuttling of HMAS *Derwent* to attract visitors –and allow the Australian Navy to conduct experiments conducted on the vessels were touted as helping “the Navy build more durable and safer ships for the future” (*Sound Telegraph* 28/09/1994). This continued with the abandonment of the HMAS *Swan* in 1997 and the scuttling of the Australian Destroyer HMAS *Perth* on 30 August 1999 after being decommissioned on 15 October 1998 (Weaver 1999: 3-4). Costs for the initial sinking of HMAS *Derwent* were expected to be around \$50,000 but blew out “exponentially” (*Sound Telegraph* 28/09/1994).

In relation to HMAS *Swan*, a dispute over the vessel erupted in 1994 with “battle-lines” drawn between the Western Australian towns of Rockingham and Busselton. During this fight the vessel seemed to become a political bargaining tool, often involving State and Federal tourism and environment agencies, and even prominent politicians (*Sound Telegraph* 14/12/1994: 3, 03/07/1996: 3, 09/10/1996: 23; *Sunday Times* 28/01/1996: 21; *West Australian* 13/07/1996). The eventual disposal of the vessel off Dunsborough, Geographe Bay on 14 December 1997 made front-page news (*Busselton-*

*Dunnsborough Mail* 17/12/1997: 1). Likewise, the sinking of the HMAS *Hobart* off the South Australian coast (scheduled for December 2002) has proved problematic for a range of reasons.

This transition towards an abandonment strategy for vessels that revolves around tourism and fish aggregation is significant because it changes the traditional spatial dynamic of abandonment. It has caused a transition from inner harbour abandonment and the relationship between high population and major port infrastructure to isolated, regional abandonment.

### Conclusions

This chapter has outlined a number of issues. On one hand it gives credence to the need to reassess the role of support vessels in maritime economies, and in port development. This is especially clear in relation to the long lives of modified watercraft and support vessels, the connections between the manufacture of support vessels and hulking activities, and their prolonged utilisation as tools of trade. Vessels fulfilling support functions are also important reminders of economic trends through the financial opportunities that they represented to shipowners when their vessels became useless. They are also indicators of the costs of technological innovation when changes to fuel and propulsion technologies brought about their displacement.

However, this research is of interest to archaeology because it illustrates the connection between conversion and reuse processes, and other associated behaviours that are evident in other countries (see Chapter 3). Even today discard and post-abandonment uses occur because of perceived economic benefits irrespective of any legislative or regulatory changes. Moreover, the signatures of these processes can be seen as evidence of behavioural change.

The modification and conversion of function, form and material of watercraft are important to consider in archaeological site formation. This is for a number of reasons; transformation processes in systemic contexts have direct, and quantifiable effects on the archaeological record, especially in relation to lateral cycling and secondary use processes. In this way we can see that pre-abandonment circumstances have a large effect on abandonment processes and post-abandonment uses. Use and modification processes are important because they have direct influences on discard practices, and can be seen to influence the time and nature of the transformation of a vessel from a systemic to an archaeological context. This can be seen particularly in use life analysis of abandoned watercraft. Moreover, the analysis of use life is also an analysis of technological change – an analysis that challenges notions of unilinear technological change. Conversion processes are themselves linked with economic and technological changes. Conversion and hulking are dependant upon economic demand for support roles – this demand is itself dependant upon demand created by new technologies. This demonstrates the interconnectedness of technological, economic, and archaeological processes.

## CHAPTER 9

### The Signatures of Discard

*A reverberating explosion, followed soon by another, then another, as gelignite explosions opened the ship to the ocean. The vessel shuddered, then listed to port, sending loose gear tumbling in chaos down the rapidly sloping deck as the green seas poured greedily into open holds, forcing her down by the head. The stern reared high into the air and within a few minutes the ship had gone, leaving great eddies and whirlpools tossing flotsam in ever widening circles (Loney 1980: 86, 1994: 186-187).*

## CHAPTER 9

### THE SIGNATURES OF DISCARD

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#### Introduction

In contrast to earlier chapters, which have concentrated on the historical, economic, technological and regulatory processes in the prelude watercraft abandonment, this chapter is concerned with the practice and consequences of discard and the signatures of these activities that are evident in the archaeological record. The discussion that follows concentrates on the analysis of the archaeological signatures of discard evident at Australian sites. International case studies have only been included where Australian examples do not exist, or where they were seen to help clarify discussion.

As with the use of vessels (outlined in Chapter 8), the discard of watercraft leaves behind unique archaeological signatures. In many ships' graveyards, and indeed for more isolated deliberately abandoned vessels the tell tale signs of abandonment can be broadly categorised as:

- Structural remains that can be highly intact;
- The absence of rigging and other evidence of propulsion, and;
- A scarcity of artefactual remains (if not artefact sterility).

Generally speaking, watercraft are not designed to be easily dismantled, and are not constructed to be de-constructed. Their very nature reflects the human desire to create improved tools of commerce. Although no shipbuilder or shipowner believes that their vessel is an indestructible object at the all-time pinnacle of technological achievement, they certainly wish that it were. A ship's hull is a hardy and expensive item; it is imbued with certain

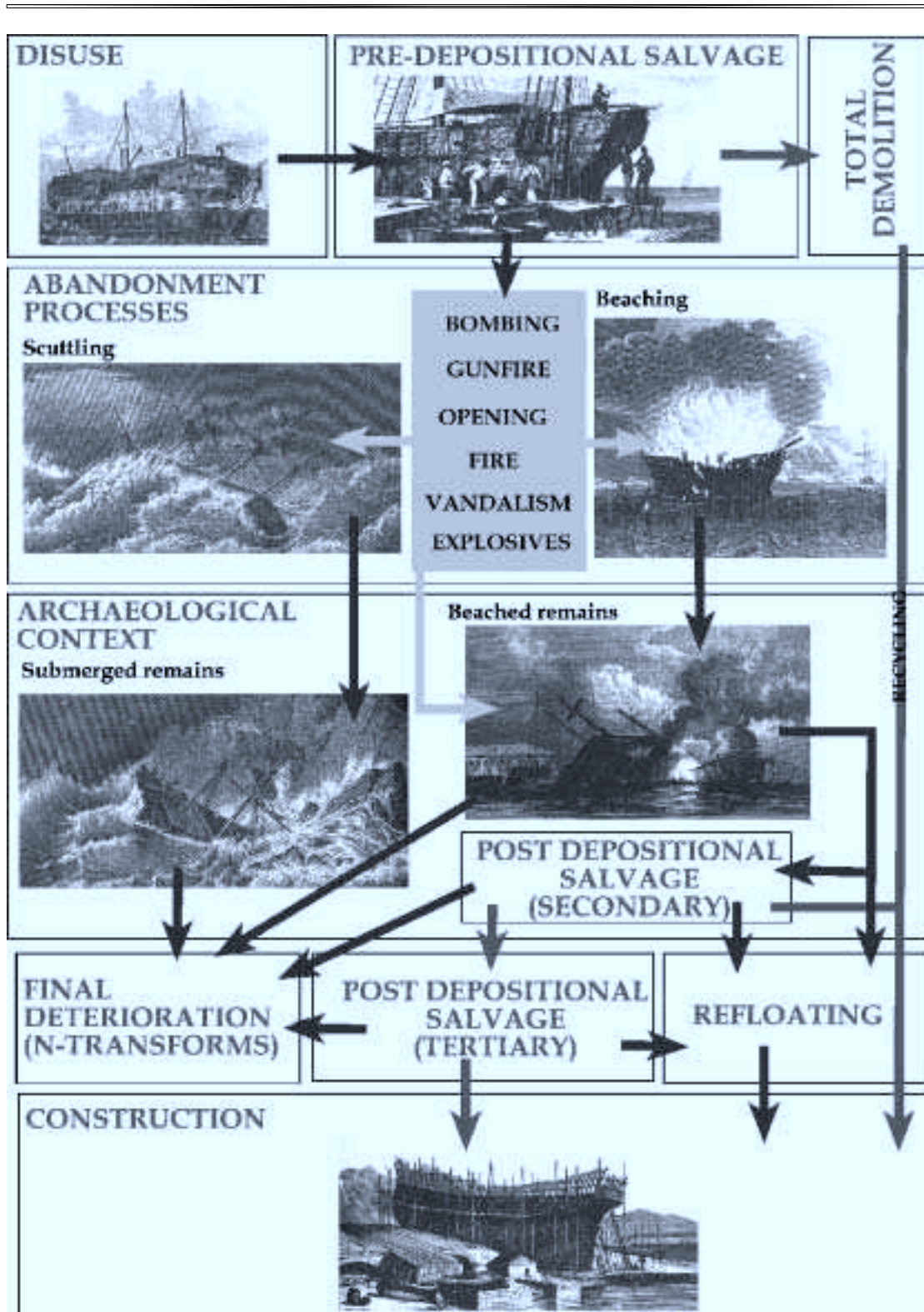
abilities that make it a difficult object to disassemble or destroy. Its functional role will be finite however, its component parts and materials, may survive for many generations. Couple this with the understanding that, unlike domestic waste, watercraft are generally too large and heavy to easily conceal, and the problems associated with vessel disposal can begin to be understood.

The destruction of a ship needs to be systematic in all of its facets. A large part of this involves dismantling, whether it is to be scuttled, beached or demolished. When the decision was to scrap and totally dismantle (whereby there will be no extant archaeological remains able to be located), this procedure constituted a process similar to abandonment. 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. If this were the case with all vessels that were dismantled then we would have no evidence of vessels used in a reuse context, or indeed of abandoned watercraft.

Salvage can take the form of pre- and post-depositional salvage. This distinction is an important one, as both types can theoretically be detected in different forms in the archaeological record. Additionally, they are also indicative of different behaviours. Vessel salvage is not simple or straightforward and the dismantling of watercraft is as technologically dependant as vessel construction. Smith, Arnold and Oertling (1987: 150) describe a case where an anti-torpedo raft from the American Civil War was beached at Dolly's Bay, Bermuda after being found at sea in 1868 in order to salvage it's timber. The attempts were unsuccessful, because of the massive timbers, and the extensive use of fastenings on the vessel. Eventually it was left to rot.

The ability to reduce the hull of a ship to its smallest dimensions also influences another aspect of ship abandonment: the location of abandonment (see Chapter 7). Here, too, a range of influences and conditions must be incorporated into the logistics of the abandonment, in order to ensure that the permanent placement of a vessel on a beach or seabed are assured after abandonment.

It is clear from historical sources in Australia and abroad, that there are certain processes in the deliberate abandonment of watercraft that illuminate the psychology of disposal. While such processes can tell us much about how a vessel's hull as a structure is perceived, it can also outline some of the archaeological signatures that the archaeologist may find on sites. These relate not only to the location of disposal of vessels, but the processing of the unwanted hull in the lead up to, and in the aftermath of, a dumping event. This chapter on the signatures of discard is split into two main sections: structure minimisation (also described as hull reduction), and placement assurance. It discusses these processes and comments on the behaviours that they represent and the reasons for such treatment. They have been depicted graphically in Figure 9.1. This figure is a synopsis of the site formation processes outlined in this chapter, and follows those discussed in Chapter 8 (see Figure 8.1). These processes can be seen as relating to the most practical way to dispose of unwanted vessel remains. They also shed light on the technology and economics of disposal, and the socio-economics of those people carrying out such activities. Moreover, changing methods of vessel disposal can tell us about the economic health of regions and nations. Additionally, it can inform us to what degree the technology used in dismantling a vessel follows the technology that was used in the initial manufacture.



**Figure 9.1** Site formation processes following the disuse of watercraft illustrating the processes contributing to the transformation of vessels between systemic and archaeological contexts



### **Structure Minimisation and Hull Reduction**

An important aspect of the logistics associated with the abandonment of unwanted vessels comes in the form of harm minimisation. In an abandonment context, harm minimisation takes the form of the systematic destruction of a vessel via a series of processes that allow for the reduction of the hull to its smallest size, as dictated by technological, temporal, economic and environmental constraints. Such a process can be called structure minimisation or hull reduction, and these strategies of systematic reduction are required when vessels are deemed to be a threat to navigation. In this way it can be generally stated that the greater minimisation of a hull's structure, the less the potential harm that can occur to other vessels

This aspect of vessel abandonment also serves to highlight a range of problems for shipowners. On one level, harm minimisation is required to enable the safe abandonment of a vessel, and ensure that there are no ongoing costs in the control of vessel remains. On another level, the costs associated with harm minimisation strategies can be expensive. Every aspect of abandonment is economically driven, and has economic consequences.

There are a number of well-documented hull reduction techniques described in the historical and archaeological literature.

### **Salvage and Scrapping Behaviour**

As already acknowledged, abandonment and salvage go hand in hand, and "scrapping" behaviour is one major aspect of abandonment. Indeed, abandonment implies that salvage activities have been carried on a vessel as Kenderdine (1994a: 178) has noted, "Abandonment and eventual sinking implies that a vessel has been stripped of all moveable items and even the

difficult to move, but valuable, boiler and engines. Cargoes and material remains of the crew are unlikely to be found". These are important considerations, because they illustrate what archaeological signatures to expect on a discard site. Kenderdine (1994a: 178) also noted that, "the extant remains of vessels potentially provide an accurate chronology of design and a typology of machinery, boilers and engines that reflect the environment, economy and function of these vessels".

The reasons for salvage are inextricably linked with the economics of the procurement of raw materials for shipbuilding, construction, and the costs of maintenance (as illustrated in Chapter 3). In this way, while the abandonment of a vessel can be seen as an economic burden to a ship owner, it can also be an economic benefit. In particular the salvage of recycled materials from ships was a common practice. As Parsons (1983d: 1) noted, "It was, particularly in the early days, quite unusual to find any ... vessels completely new throughout - great use was made of salvaged materials from larger craft that had been wrecked, dismantled, altered or for some reason or other were no longer serviceable".

The economic factors in decision-making processes concerning salvage have always been the same. Casson (1991: 88-89) has discussed Ancient Athenian methods of dealing with the cost of maintaining fleets of triremes in relation to the ongoing costs of maintenance, and the stimuli for the dismantling of vessels. The lightly built nature of the trireme meant that its expected use-life was between twenty and twenty-five years and they were classified by the Athenian Navy by their age and condition. The tiers of this system were comprised of a distinction firstly between "old" and "new" vessels, secondly by a more specific system of classification the vessels were divided into "selects", "first-class", "second-class" and "third-class". Any vessels that could not be categorised into any of the above categories had few options;

they could be converted into transports, sold out of service, or made obsolete and broken up for use in other vessels or for other purposes.

There is less inconvenience in selling off your vessel before it is useless, and always much organising in being the owner of a condemned ship. However, if the price is right, and the economic climate and scrap market are good, the salvage, dismantling and abandonment of a vessel can often be lucrative (as illustrated in Chapter 3). Indeed, there are many references to the breaking up of vessels simply for the value of their component materials. This economic aspect to the salvage of unwanted vessels is an integral part of what makes an abandoned watercraft an archaeological site. Evidence from here and overseas often suggests that certain elements of a vessel's build are regularly missing. In the case of most intact, beached vessels this is almost always the vessel's rudder, which has been noted in the case of *Jhelum* in the Falkland Islands (see Bound 1990: 43). Furthermore, it is common to find abandoned vessels that have no masts, or evidence of rigging and it is even more common to find these vessels without *in situ* boilers, engines, prop shafts or propellers (also noted by Kenderine 1994a: 178; Matthews 1998: 96) (see Figures 9.2 and 9.3). The fact that the characteristic elements missing from abandonment sites are centred on the propulsion of a particular vessel illustrates their perception as composite objects. It also shows the easy reuse of major aspects of a vessel guides their salvage, and hence facilitates their integration into the archaeological record. Often these reuse behaviours will see disarticulated vessel materials used in other structures. O'May (1985: 201), for instance notes that the timbers from the vessel *Frederica* were reused in a slipway in Tasmania.



**Figure 9.2** Stern of *Moe* at the Garden Island Ships' Graveyard (South Australia) showing missing rudder (Photo: Nathan Richards, 31/03/1997)

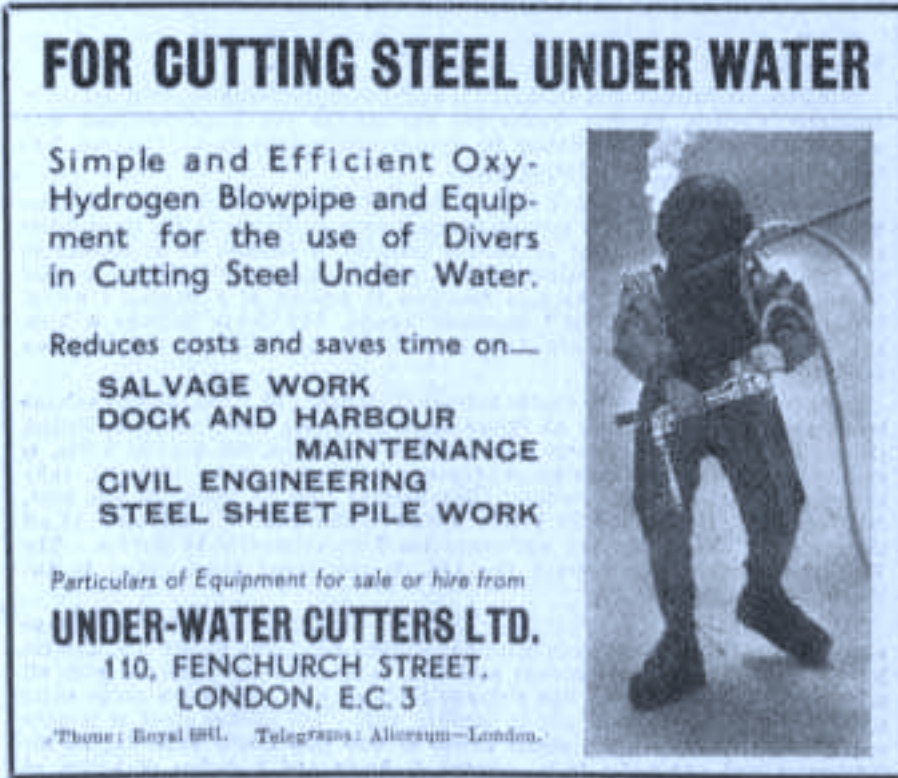


**Figure 9.3** Remains of *Federal* at the Witts' Island Ships' Graveyard (New South Wales showing absence of paddle, boilers etc.. (Photo: Nathan Richards, 27/09/2001)

Yet even scrapping processes are defined by cultural conditions. In particular economic conditions and the prices of scrap material drive where and when scrapping activities are carried out (as seen in Chapter 6). McCarthy (1983a: 1) has previously noted this in relation to the salvage of copper and copper alloy fastenings. Even vessels that had been abandoned and allowed to deteriorate for many years are later scrapped because of an increase in scrap prices. One example of this was the barque *Otago*, which was broken up when scrap prices were high at East Risdon in Tasmania (*Hobart Community Express* 04/02/1967). Another example was the vessel *Iluka*, which was accidentally beached after slipping its moorings at Hawks Nest, New South Wales in the 1920s, and then cut up almost fifty years later when steel prices rose (Coroneos 1998a: 45). At other times the abandonment of vessels occurs without substantial salvage. One such case was the scuttling of the barge *Premier*, in the Rottneest Island Ships' Graveyard. In this case it was stated, "In view of her age, it was considered that, despite the high price obtainable for the metal, the amount of steel that would be gained by breaking up the hull would not return the amount of money spent on the work" (*West Australian* 07/03/1938: 16a). Despite the assertion that there was a "high price" for steel at the time, if the price had been even higher, the issue of adequate return would not have been important, and the vessel would have been dismantled instead of scuttled. This has continued in more recent times with the International Maritime Industries Forum advising shipowners in 1982 to "scrap now before prices collapse even further" due to a tonnage imbalance (Ingram-Brown 1982: 302-303).

From at least the late 1930s the normal method of undertaking salvage work on submerged ferrous-hulled vessel remains was through the use of the "submarine blowpipe" (Figure 9.4) (such as at the shipwreck of *Victoria*, Coroneos 1997b: 91-92). The technology involved was simply an adaptation to the technology used in engineering in cutting steel above water. This

process reduced the cost of cutting steel underwater, which had previously been done by the use of manual tools, saving time and money. The blowpipe is comprised of the cutter, gas pressure regulators, gas cylinders, tubing and connections. The flame and gas pressure was regulated on the surface. It was used primarily in examples of vessel refloating in cases of collision (opening bulkheads, cutting away damaged side plating, and removing rivets) and for a range of harbour related functions, such as dock and harbour maintenance (Lloyd's of London 1938: 581-582). Such methods were expensive in relation to both money and time, and would not have been used extensively in abandoned watercraft, where by and large salvage would occur before final discard, or after discard at locations where materials were above water and still relatively accessible.



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**Figure 9.4** Advertising for underwater salvage firm, showing underwater steel cutting equipment (reproduced from Lloyds of London 1938: 580)

Scrap metal was particularly important because of its role in determining the price of pig iron (Burn 1947: 99). While it can be assumed that the price of scrap would always be below the price of newly manufactured iron and steel, the elevated price of new raw materials have at times been so much higher than scrap that the latter appeared to be the more attractive option. Although the costs of fuel in smelting, delivery and manufacture in the steel and iron industries may all fluctuate at any time, scrap, as a resource that can be stockpiled would be less likely to fluctuate as drastically, and would arguably only change in accordance to the scrap dealers awareness of prices of new materials. In Australia scrapping iron in particular was a major industry. Specifically the dependence of the Scottish iron and steel industry on scrap metal was a force that drove fluctuating scrap prices, as stated by Buxton (1976: 111):

The Scottish iron and steel industry, indeed, did come to rely on scrap to a far greater extent than elsewhere. Imports of scrap through Scottish ports rose from 32,500 tons in 1929, 35 per cent of total scrap imports into the U.K., to reach a peak of 507,000 tons in 1936, 47 per cent of the U.K. figure. Even more revealing is the fact that by 1936/8, the volume of scrap imports into Scotland amounted to no less than 90 per cent of the volume of the country's production of pig-iron.

The history of the scrap metal industry in Australia is most closely linked with Japanese demand for metal, especially in the years proceeding and following World War Two. Here there is an obvious link between the high prices offered by the Japanese for scrap iron and steel around the world and an increase in salvage activity in Australia. The Japanese were the major consortium engaged in the salvage of the vessels that they destroyed in air attacks upon Darwin during the Second World War and removed much of the structural remains of many vessels from the harbour (see Figure 9.5).



**Figure 9.5** Scrap metal cut ready for shipping to Japan in the 1950s from Port Darwin (Source: Cheater Collection, Northern Territory Library, Photo No. PH0049/0048)

In certain cases during the Second World War some vessels were actually rejected for scrapping, not because there was a perception of their continued use, but because there was an oversupply of a certain kind of scrap. Such was the case of the vessel *Hinemoa*, which was rejected in January 1944 for this very reason (Watt 1989: 220).

In modern times, single ports such as Fremantle have seen seven or eight ships each carrying twenty semi-trailer loads of scrap metal leaving per year bound for destinations traditionally in South and South-eastern Asia (Cree 1989: 17). This scrap is prepared to meet the standards of steel mills and foundries so that it can be effectively re-cycled. Loney (1991: 138) has also described how for months before abandonment ship breakers would undertake the process of stripping a vessel of all valuable materials before handing it over to the tug operator who would transport it to its final resting



place. However, often the actual scrapping of ferrous-hulled vessels would not occur in Australia. Indeed, works like Baty's *Ships that Passed* (1984), illustrate that no large passenger liners were dismantled in Australia, and that Italian, Greek, Taiwanese, English, Belgian, Chinese, German, Scottish, Mexican, American and especially Japanese ship breakers dominated the industry (see also Parsons 1981a: 15, 19, 35, 37-38, 45). While this is no surprise considering that the larger order liners were not built in Australia, and only visited for short periods, smaller passenger vessels were often broken up in Australia (as evidenced by the breaking up of vessels such as *Karatta* and *Flinders* in South Australia). At other times the scrapping of vessels was an important subsistence industry.

The real establishment of scrap salvage as a subsistence industry occurred from the time of the Great Depression of the 1930s. Survival in these times was difficult for many, especially the unemployed. In Adelaide, where the unemployed ration was the lowest, most of the day was spent in trying to obtain foodstuffs by any means possible, whether it was by raiding vegetable gardens, or begging for thrown away lamb's tongues. This desperation for food was also a central feature of the poor and unemployed in other states (as noted by Clark 1987: 336). Finding fuel for cooking and heating was just as difficult, with hordes of individuals searching railways lines for lumps of coal to heat their houses at night, or wandered the beaches in search of driftwood (Broomhill 1973: 10, 11, 1978: 105-106). Under these conditions it is not surprising that a subsistence salvage industry developed focussed on the salvage of material from discarded materials and abandoned watercraft. This is true of Port Adelaide, although the controls on the legality of the salvage appear to be more stringent as contracts had to be made for the salvage of material from watercraft. Removal of material without permission was considered illegal and only occurred clandestinely. Also in Port Adelaide there are cases studies, which illustrate the impact of the Great Depression of

the 1930s on the local population, while at the same time providing valuable insight into the growth of the salvage industry in that state.

*Fides* was four masted Norwegian barque of 430 gross tons burden and built in 1918 at a cost of £35,000. In 1926 it took 15 months to sail from Gothenburg to Australia with a cargo of Baltic timber and during this journey the vessel suffered storms, calms, mast damage, rigging damage, engine troubles, and crew sickness and was forced to put into port on two occasions, in the Amazon at Rio Para and in Queensland. It was destined for Adelaide, where it was to be used in the trade between South Australia and New Zealand. When *Fides* arrived at Port Adelaide in early 1928 the timber trade had collapsed and the vessel could not find work. In late 1928 it was berthed and for four years laid idle. The laying up of vessels due to a lack of trade was to become a common behaviour during the downturn, with other vessels in other states, such as *Leeta May* being laid up at Melbourne, in 1931 due to a lack of cargo and hence, a lack of trade (Graeme-Evans and Wilson 1996: 83).

By 1931, the situation in Port Adelaide was desperate and the Reverend T.P. Williaison of the Port Adelaide central Methodist Mission and the Captain of *Fides*, J.A. Olsen embarked upon a plan to recondition the vessel and crew it with the unemployed of Port Adelaide to conduct fishing operations off the West Coast of South Australia and in the Great Australian Bight. Two prominent Adelaide men Sir Langdon Bonython and Mr. Barr-Smith promised £500 towards the project, which did not get off the ground. The reasons for this were the unsuitability of the vessel for fishing and the unsound nature of the vessel. Finally *Fides* was given to the Methodist mission and broken up for firewood and some spars reportedly went to the manufacture of other ships. The firewood was then given free to the unemployed and destitute. The vessel was to be stripped in the Jervois Basin, but allowed to remain in a floating condition so that it could be transported to

the North Arm Ships' Graveyard. Instead, the vessel was broken down too much and was left where it lay, abandoned in the Jervois Basin in 1933, only thirteen years after its construction.

Another example was *Dorothy H. Sterling*, a 2526-ton, six-masted wooden schooner built in 1920 by the Peninsula Shipbuilding Company of Portland, Oregon costing £50,000 (Figure 9.6). When the vessel arrived in Port Adelaide in 1929, the American crew found themselves abandoned in port without wages and provisions. After many attempts to provide for themselves, the crew took to stealing stores and destroying sails in order to sell the fabric for tablecloths. Eventually the Harbours Board seized the vessel for unpaid harbour dues, and sold it at auction for an undisclosed amount believed to be £50. Although only nine years old the vessel was broken up over a period of three years, featuring prominently (almost monthly) in local newspapers over that time (*News* 05/02/1931, 17/02/1931, 04/03/1932; *Advertiser* 02/08/1930, 06/03/1931, 30/04/1931, 03/02/1932; *South Australian Register* 15/01/1930, 24/02/1930, 03/07/1930).

The salvage of the vessel was well documented throughout primary source documentation and illustrates the degree to which elements of vessels can be reused. Some sections, such as masts were cut and made into masts for other ships or as harbour fenders, the wheel was made into a pergola, the cabin a holiday shack, and the rest became firewood. While the vessel was broken up in the customary way, with wedges and hammers splitting and rending frames and planks apart, oxy-acetylene was also used (probably for the first time in Port Adelaide), allowing for more sections to be dismantled at a faster rate, and hence saving time and money. The vessel was then abandoned in the North Arm Ships' Graveyard in March 1932.



**Figure 9.6** *Dorothy H. Sterling* (South Australian Maritime Museum Image 1854)

The destruction of these vessels was much lamented in the Port of Adelaide. Even though they both were to provide people with much needed monies and resources they were seen as the true end of a romantic period of sail and the victory of steam.

### Salvage Processes

Evidence from many sources, and concerning sites over a long period has shown that there are certain behaviours pertaining to the salvage of deliberately abandoned vessels that have persisted to the present day. There is evidence from the HMS *Vixen* site in Bermuda (Chapter 3), for instance, that there was both official pre-depositional and post-depositional salvage activities and unofficial salvage activities that can, to some degree, be inferred from the archaeological remains (Gould 1989: 71).

The separation of salvage into phases for the purposes of appropriate interpretation has been attempted in the past. McCarthy (1996: 157, 213)

suggests that “primary salvage” is a term that aptly describes the salvage of materials of shipwreck remains after their wrecking by the “owners, insurers of their agents” and that secondary salvage describes work activities out by “professional salvors or sports divers”.

This study of abandoned vessels suggests that there are three main phases in the salvage of vessel remains. This scheme differs with McCarthy’s because it concerns a deliberately disposed of resource that is defined by its use as a material source. For this reason the system commences before any section of the vessel has become part of the archaeological record.

- *Primary salvage*: refers to pre-depositional salvage carried out before final deposition or abandonment;
- *Secondary salvage*: refers to the phase of salvage that occurs post-depositionally (post-abandonment) in the short term normally by the owner/abandoner of the vessel. Such salvage attempts are usually related to the appropriate abandonment of the vessel, or are a part of the cost recovery efforts associated with the decision to abandon;
- *Tertiary salvage*: refers to attempts at salvage that occur through time after abandonment. Such attempts are intermittent and opportunistic, and will usually occur after a change in ownership to an individual or group of individuals not related to the primary and secondary phases of salvage (as this is a site formation quite removed from initial post-abandonment salvage activities it is not discussed in this thesis).

Not all three phases may be undertaken on a vessel. In cases where there is not the appropriate infrastructure for ship breaking very little or no primary salvage activity will be carried out and the vessel may simply be discarded. Likewise primary salvage may be seen to be substantial enough to not warrant further demolition of the hull and it may simply be left.

### *Primary Salvage*

Primary salvage involves the reduction of the hull in such a way that the most expensive or accessible items are removed before the vessel is deposited at its final resting place. The most important aspect of this is that the hull is kept in a floating condition, so that it can be moved to a final dumping place before being further salvaged or broken up. There are demonstrated cases where over-zealous activities of pre-depositional salvage have in fact destroyed the floating capacity of the hull and have meant that a hull must remain where it was originally placed (as with *Fides*). There are also places where pre- and post-depositional acts of salvage have occurred at the same location. Stammers and Kearon (1992: 108), in discussing the Port Stanley hulk *Jhelum* have commented that:

It would be interesting to know if she was stripped of her gear before or after she was beached. Is it likely that much of the re-usable, easily removable equipment such as sails, boats, steering gear, winch, upper masts and spars was removed close to the FIC's stores and workshops for they probably had the most use for such materials.

While it is obvious on many discarded vessels that salvage of hull material has occurred, often evidence of *pre-depositional salvage* does not translate well into the archaeological record, due to the removal of material (which is after all, the purpose of such activity). More specifically any evidence of pre-depositional salvage may not be evident due to confusion with, or the carrying out of post-depositional salvage of a hull. Hence, we can see the dangers in describing all activities in relation to salvage as post-depositional.

There are a number of sites that have been examined or documented as a part of this study, which can be seen to represent areas where primary stage

salvage activities occurred. The sites, located at the Jervois Basin (Port Adelaide, South Australia) (Figure 9.7), Corio Bay (Geelong, Victoria) and Homebush Bay (Sydney, New South Wales) (Figure 9.8). Where there are structural remains of watercraft left at these sites, it is almost impossible to determine pre- and post-depositional stage salvage activities from the archaeological signatures left behind.

### *Secondary Salvage*

Due to the reasons outlined above, the line between pre- and post-depositional salvage, from an archaeological perspective is blurred. Owing to the need to keep a vessel in a floating condition, and in order to get it to a final resting place, it can quite reasonably be argued that the only real evidence of post-depositional salvage that is guaranteed is the absence of material from areas crucial in maintaining flotation. In this way, it can be assumed that a vessel salvaged of structural material towards its keel and garboard strake, below the turn of its bilge has had post-depositional salvage activities occur. We can see the importance of making the distinction between pre- and post-depositional salvage in comments made by McCarthy (1983b: 361) concerning the vessel *Amur* (ex *Agnes Holt*):

She was fastened entirely with yellow metal, and her abandonment would have likely been followed by subsequent heavy salvage for her valuable fastenings. If she was afloat, her owners would have required to move her to an area away from shipping, and the nearby graveyard including Jervoise Bay appeared a likely possibility.



**Figure 9.7** Overview of the Jervois Basin Ships' Graveyard (Port Adelaide, SA), showing the remains of *Alert* (foreground) and in the background *Trafalgar* (left) and the Old Fish Barge (right) (Photo: Nathan Richards, 12/02/2000)

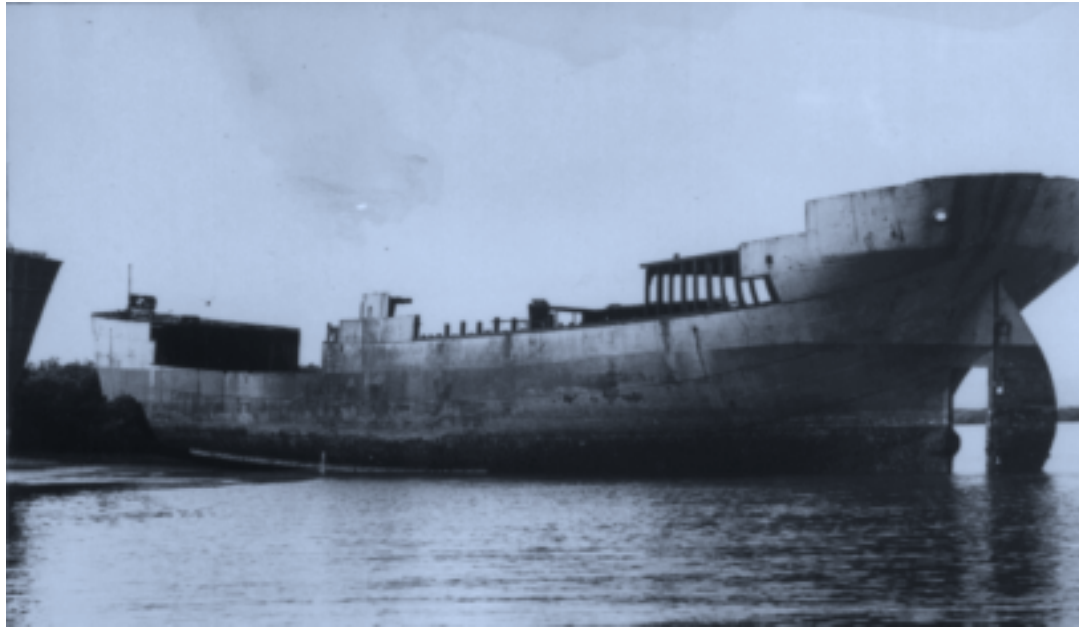


**Figure 9.8** Homebush Bay Ships' Graveyard (Sydney, NSW) showing remains of *Mortlake Bank* and *Ayrfield* (Photo: Nathan Richards, 09/09/2001)



From these statements we can see that if appropriate planning processes in the breaking of a ship have not been made, and a vessel is broken down too much, then there may be adverse results. One possible scenario would be that the vessel, no longer in floating condition will not be moveable and will have to stay where dismantling was carried out, thus polluting an area not intended for discarded vessels. Where such events happen continuously the only outcome is the creation of an area for ship breaking and abandonment – a type of ships’ graveyard that can be referred to as a primary refuse site (as described in Chapter 2). As ship breaking often occurs where appropriate facilities present, and because facilities are most often located in inner port or harbour locations, the demolition or salvage of vessels can have serious repercussions for port utilisation. Where the location of salvage is the same as the eventual disposal location no pre-depositional salvage will generally take place. On the other hand a lack of facilities imposes limitations by not enabling the appropriate minimisation of the hull. In other words salvage activities can determine the location of the abandonment of a vessel and whether it will be totally dismantled or dumped in an isolated or ships’ graveyard context.

The degree to which post-depositional salvage occurs is clearly evident in a photograph of the vessel *Grace Darling* in the Garden Island Ships’ Graveyard (Figure 9.9). The image depicts the vessel in a post-abandonment context, showing the vessel relatively intact and probably watertight. While it is not clear whether the hull material missing was removed before or after discard (the vessel may have been towed to this location in this condition), comparison with recent photographs shows the degree to which secondary salvage has occurred (see Figure 9.10).



**Figure 9.9** *Grace Darling* after disposal the Garden Island Ships' Graveyard (South Australian Maritime Museum Image 8070)



**Figure 9.10** *Grace Darling* (view to stern) after disposal the Garden Island Ships' Graveyard (Photo: Nathan Richards, 03/07/1997)

The reason why ships that have been abandoned can still be detected archaeologically, and why they were not totally dismantled is both a technological and an economic issue. To get access to the submerged portions of a hull takes time and specialised infrastructure. Large vessels are often not flat bottomed, and will not sit upright without the aid of a cradle or some other type of support. In other words it takes more money, with less opportunity for economic reward. Furthermore, these sections of the hull are very hardy and much less easily demolished.

### *Fire*

The utilisation of fire is a major aspect of post-depositional secondary salvage, as well as a hull treatment used in association with placement assurance strategies (discussed later). In the case of wooden vessels, or hulls with substantial wooden structural components, fire is the easiest way to destroy hull material not wanted for salvage, or not cost-effective to recover (see Figure 9.11). Marshall and Miners (1979, 1986: 13) have noted the probable use of fire on the vessel dubbed “the wreck of stones” (believed to be *Redemptora*), which they surveyed and undertook test excavation in Western Australia in 1979 (see Chapter 8). The vessel was most likely set alight after all of the accessible materials were recovered during salvage (it is not known whether the vessel is indeed an abandonment or a wreck site). Another case study of an Australian vessel showing evidence of burning is the vessel *Day Dawn*, abandoned in Careening Bay, Western Australia around 1890 and said to have been “stripped and burnt, perhaps deliberately for recovery of fittings” (Kimpton & Henderson 1991: 25, see also McCarthy 1997: 124). Indeed, fire is a common strategy for salvage and structure minimisation (to be discussed) in the ANAVD with 43 instances of vessels being burned. Of these vessels, the majority were wooden (37), followed by unknown material (2), composite hulled (2) and iron hulled (2). The iron vessels mentioned as being destroyed by fire, *Gannet* (1884 – 1946) and *Moolgewanke* (1856 – 1940),

were both paddle steamers that had been used in riverine trades, and therefore would have had substantial wooden construction.



**Figure 9.11** *Margaret* burning (Source: WA Maritime Museum, Albany Hulks File, Richard McKenna collection)

In many cases, the burning of wooden hulls was also related to salvage strategy. There are many cases of American merchant ships being burnt in order to gain the metal used in the hull (usually copper and iron fastenings)(see Matthews 1987a: 160, 231, 1987b: 3, 151, 186, 229, 301, 332). The vivid description of the burning of one of these vessels, *Glory of the Seas*, (dated 23 May 1923) provides us with some insight into the effect of burning upon ships, and the attitudes associated with the destruction of these vessels:

Nearing the beach, instead of her topmasts through the trees, I saw a thin cloud of smoke and felt that she might have been smouldering for a week and I would see nothing but her keel.

Down to the beach and found that she had been burning only a few hours but at that nothing was left of her but a fire-punctured shell, a section of which would occasionally fall into the waters of Puget Sound with a dull explosion. Her badly charred fore and main masts were alongside, the mizen [sic] hanging over the port quarter, the whole mixed up with bolts, wire and remnants of another burned hull. The picture made one think of the effect of a tidal wave followed by fire.

The only spectacular bit I saw was when, from the weight of the bowsprit, the entire bow from catheads to stempost at the bobstays fell overboard in one huge chunk. I felt glad that the goddess who formerly capped the stem, was saved the humiliation of being smashed to splinters by gravel and shallow water in a junk yard.

That the old ship was to be burned that day was not made public so only a few residents, mostly children, saw the end of what was to them merely a lot of wood bolted together and called a "boat." (Matthews 1987b: 151-152).

Fire was also commonly used in the salvage and destruction of the "Emergency Fleet" (Shomette 1996: 247-252), and these same behaviours are exhibited in Australian cases with vessels such as the barque *Maida* listed as having been "burnt for her copper rods and bolts" (*Courier Mail* 4 July 1986: 1; 30). McCarthy (1980a: 8) also refers to the coal burning steamer *Zephyr* "being progressively burnt and hauled up the beach till her hull was completely destroyed and all the copper fastenings recovered" around 1966.

While fire is the most obvious way of reducing a hull, and is an apparently efficient means of destroying a wooden vessel, how this translates into the archaeological record is problematic. While fire may be seen as a method associated with the salvage of valuable fittings from vessels, it may be hard to

distinguish this from subsequent vandalism un-associated with the salvage of such materials. Moore (1995a: 86) has suggested that in relation to the Kingston Inner Harbour graveyard, that there, “is some historical evidence that vessels entering the graveyard were bonfired”. No archaeological evidence was, however, found that backed this up. One other example of this is the vessel *Myall River* (1912 - unknown), abandoned at Witts Island, Port Stephens (New South Wales) and subsequently burnt by children at a much more recent time (Nutley and Smith 1999: 14, 19). Evidence of this event were still evident when the site was inspected by the author in 2001 (Figure 9.12)



**Figure 9.12** Possible evident of the burning of *Myall River*, Witts Island (Tea Gardens, New South Wales (Photo: Nathan Richards, 27/09/2001)

In this case, the reasons for a lack of an archaeological signature can be due to cultural and/or natural site formation processes. Where post-depositional salvage has occurred such evidence is removed. Where burnt timbers have been left exposed in an intertidal or submerged environment the subsequent action of natural forces such as wear, and consumption by *teredo navalis* will

reduce the evidence. It can be hypothesised that such activity will only be detectable where the remains of the vessels were covered by an anaerobic layer of sediment soon after the vessel has burnt, stopping subsequent natural or cultural impact.

### Placement Assurance

Fire has often been used as a way of sinking a vessel and assuring that it remains submerged. The burning of vessels in order to make them sink sometimes met with disastrous results. One such scenario in Port Phillip (Victoria) is described by Jordan (1995: 115) in relation to the vessels *Palace* and *Birchgrove*:

The tug crew set the two vessels on fire and cast them adrift, however, the fires went out, before burning the vessels to the waterline. The vessels drifted ashore ... where they were broken up, by the action of the sea.

The scuttling, or sinking of vessels at sea has often been the preferred option for the disposal of watercraft. This has traditionally been because of a desire not to “slew the coastline with old wrecks” (see Letter to the Chief Harbour Master from the Secretary 11 August 1923 in WAMM 194/79/1).

This traditional way to dispose of a vessel at sea is described by Loney (1980: 86, 1994: 186-187):

With a tug boat ahead the hulk was taken seaward on a lengthened tow line and once the distance was run the position was checked to ensure that there was no risk of the vessel sinking in shallow water where it might foul fishermen's nets. Then the explosive charges were fired.

Sometimes, however, scuttling simply does not work:

The old paddle steamer *Hygeia* made a bold attempt to escape her destroyers while being towed by the tug *Eagle* to be sunk outside Port Phillip Heads in 1931. In rough seas and a strong westerly she broke away from the tug late in the afternoon of 27 August, bumped across Mud Island and disappeared in the darkness with two men still aboard. Next morning she was found aground near [the town of] Rosebud with about 400 tons of water in her but was eventually refloated and taken out to her grave (Loney 1980: 87).

The issue of placement assurance is an important one, especially in an examination of the cultural aspects of site formation. The methods used in ensuring the appropriate abandonment of a vessel, whether it relates to the burning, salvage of materials, or hull perforation activities will leave certain archaeological signatures behind that will enable interpretations to be made on other sites less adequately described in historical sources. This has been a neglected area within maritime archaeology, although most archaeologists would take it for granted that such a process occurs. McCarthy (1997a: 5) in his report on the “Black Cat” Catalina aircraft scuttled off of Rottnest Island, Western Australia in 1945 and 1946 reinforced the relationship between abandonment method and the subsequent *in situ* remains when he wrote, “The mode of disposal of scuttling of these aircraft will have an effect on the nature of the remains and the method used in the abandonment process will have ramifications for the recovery, conservation and exhibition of the remains”.

Historically, placement assurance has always been an issue when abandoning a vessel because the ownership of abandoned vessels is much the same as that of shipwrecks: someone is always the owner. However, whereas an insurance payout may compensate the owner of a shipwreck (thereby taking over ownership), there is usually no agency that would seek to own an unwanted vessel. The only exception to this occurs where the agency or individual was



confident that they make money from salvaged material. From this perspective, once a vessel is salvaged or abandoned, the owners, while still responsible for the remains of the vessel, would like to have nothing more to do with it unless there are post-abandonment uses in mind. In order to dispose of such a vessel the owner needs to ensure that it will not cost them money by floating off, or moving and causing damage to other ships, or port structures. There are cases of vessels not being properly abandoned and causes subsequent problems for their owners. The case of the American Clipper ship *Twilight* illustrates this point:

It was found inexpedient to make repairs and in May she was sold at auction for \$4575, to be stripped and broken up. As though objecting to this ignominious end, she floated off the beach one night at high tide, drifted through Raccoon Straits into the upper bay and stranded near California City. From there she was towed back to Sausalito, securely beached and then broken up and burned (Howe and Matthews 1986: 673).

Hopkins (1995: 74) notes similar problems in association with the Mallows' Bay Graveyard, "The WWI hulls in Mallow's Bay would not sink quietly into mud. In the years prior to WWII there was constant concern that the hulls would break loose and drift into the Potomac shipping channel".

One Australian case study in particular illustrates the need for placement assurance (cited by Richards 1997: 59-60). The iron barque *Moe* was abandoned at the Garden Island Ships' Graveyard (South Australia) sometime after August 1926. Subsequently, and some years later the vessel was taken up by a high tide on two separate occasions (25 July 1929 and 1 February 1930), damaging a wharf in the latter incident. The vessel was then re-abandoned in the same area on 25 September 1931. Part of this last abandonment procedure included the dumping of an unwanted pontoon on its stern (see Figure 9.13).



**Figure 9.13** Iron pontoon deposited on the remains of *Moe* (Photo: Mark Staniforth, 22/03/1997)

This placement assurance, can take many forms, but can generally be separated into two categories, the appropriate treatment of the hull, and the choice of an appropriate environment. While placement assurance techniques are the mechanisms designed to facilitate the transferral of a vessel from a systemic context to an archaeological one, this process may be reversed. There have been isolated documented cases of vessels being refloated for re-integration into mercantile or support functions. One such example was the vessel *Seminole* abandoned initially at the Garden Island Ships' Graveyard (Port Adelaide, South Australia) in 1906, subsequently refloated, reused (and

probably partially rebuilt), and re-abandoned around 1908 within the same disposal area (see Richards 1999b: 16). The systemic re-integration of such vessels however, is rare.

### Appropriate Hull Treatment

Besides guaranteeing that adequate salvage has occurred that will make certain a vessel can no longer float, there are a range of other processes that can be used to affect the buoyancy of a waterborne hull, and ensure that it remains where it was supposed to. These processes are generally the same in the case of disposal sites of both the beached and scuttled varieties. The usual difference between them relates mainly to the lack of extensive pre- and post-depositional salvage in the latter kind, and related to the higher degree of buoyancy required getting vessels out to such sites. Mention of these hull treatment procedures is not common in the historical record, and there are problems with the detection of many of them from the archaeological record because of post-depositional processes that mask or destroy them. At least 90 vessels in the ANAVD are listed as having had hull treatment procedures (including the use of fire, as already discussed) undertaken on them before abandonment (Figure 9.14). Of these, only five are listed as having had multiple procedures.

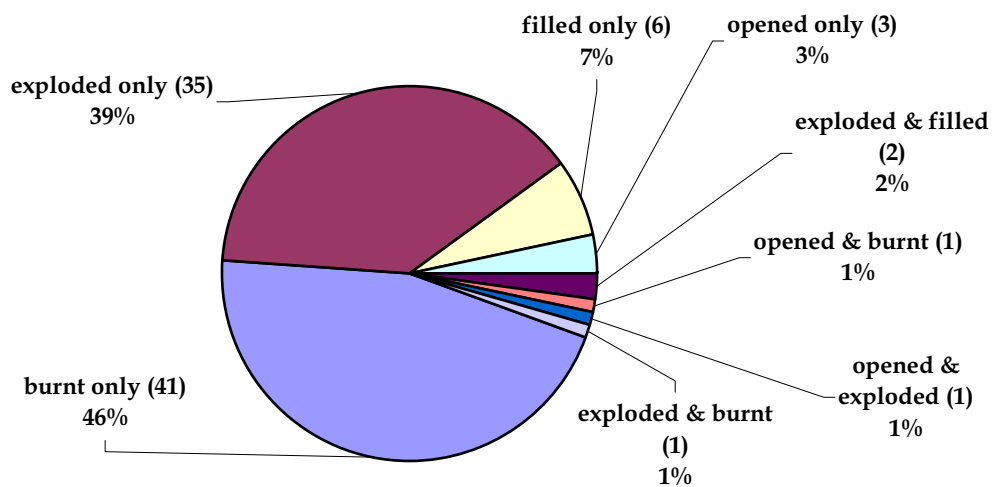


Figure 9.14 Breakdown of hull treatment procedures in the ANAVD (n=90)

*Explosives and Other Hull Breaching Procedures*

Obviously the easiest method of breaching a vessel in order to inundate a hull is to open it to the sea. Although it can be expected that the most common way of facilitating this would be through the opening of the seacocks, this is not recorded in many instances (five documented cases in the ANAVD). By and large, the use of explosives is the most common method (reported in 39 cases). While explosives can be used in conjunction with post-depositional salvage, for the purposes of loosening plates of hull, it is also one of the most popular ways of ensuring that a hull does not maintain watertightness, or seaworthiness. The use of explosives on the hull of a ship is one procedure well attested to in the historical literature. For instance, descriptions from various primary and secondary indicates that the method is the same whether trying to ensure rapid sinking at sea, or steadfast placement on a beach – explosives need to be set off within the bilges of the vessel sources (see GRG 51/32/5 HB 887/31: 199, 235, 51/170/887/1931, 51/170/901/1937; *News* 29/11/1935: 3; Loney 1991: 138; Richards 1997: 66-67, 70, 90).

Very little, however, has been specifically published on the procedure used on vessels to be deliberately abandoned at the end of their use-life. Some literature exists on the deliberate scuttling of vessels at times when that vessel is in danger of becoming totally wrecked without hope of ever refloating or salvaging the vessel. These references can be found in many of the second volumes of the *Manual of Seamanship*, which are volumes issued to British seamen by the Lords Commissioners of the Admiralty (see for instance, Lords Commissioners of the Admiralty 1932: 329-330). The procedure outlined involves the deliberate breaching of a hull in order to allow water to flow in and sink the vessel at a time of distress, and imminent disaster. Specifically mentioned is that a choice must be made concerning a method and position for the hull to be breached. Methods suggested include the chiselling,

hammering, drilling or perforation by oxy-acetylene equipment so as to allow for a clean hole to be made. In certain instances, small charges of explosives are endorsed (in urgent situations) as a means of fulfilling this end. The crucial things that are stressed are that the holes should be accessible at low tide (that is, above water), and that these should be small holes with minimal distortion or rough edges, so that the patches used in refloating attempts can be made watertight easily. While this gives some insight into the methods used in this specific instance, where refloating is the primary aim of such activity, it may also give us some insight into the behaviours associated with discard related deliberate scuttling.

It appears as if the precepts outlined above could be reversed in relation to deliberate scuttling, where the archaeological evidence suggests that large amounts of explosives, set off as low as possible was the preferred method. This makes sense for two reasons. In the first instance large holes, low in the water will allow for fast and efficient foundering despite the depth of water. This also maximises the potential for total inundation, which assures the vessel's placement on the seabed or beach. The use of large amounts of explosives, which has been seen to greatly distort and bend the intact plates while causing large "peeling back" of other sections of plate (as with *Garthneill* in Figure 9.15) will, in the case of beached vessels serve as a deterrent to people wishing to refloat the vessel illegally.



**Figure 9.15** Exploded metal plates in the bow of *Garthneill* (Photo: Mark Staniforth, 22/03/1997)

One of the problems with the sinking of vessels is that it may not sink fast enough. *Musgrave*, for instance was a vessel that was to be scuttled in the Little Betsey Island Ships' Graveyard (Storm Bay, Tasmania) in 1930, but drifted for an estimated four hours before settling in a different location adjacent to the island (Jacques 1997: 52). This has understandably caused major problems in the re-location of the vessel. Additionally the newspaper *West Australian* (21/06/1968: 1) cited in relation to the sinking of the vessel *Norwhale* off Rottnest Island, that it took three attempts to blow a hole in the vessel to sink it.

The use of explosives, like any other method of ensuring the sinking of a vessel is an economic issue. Generally the principle is the more explosives used, the more likely the vessel is to sink properly. In the cases where large, ex RAN vessels have been scuttled up to twenty detonator charges are used (*Bussleton-Dunsborough Mail* 17/12/1997: 1). This is in direct contrast to the

scuttling of other vessels, where two or three charges may be used. While the increased usage of explosives is an indication of the size of such vessels, it is also a suggestion of the costs required, and the costs willing to be spent to create artificial reef and recreational dive sites. In certain cases there are complications. Vessels such as HMAS *Derwent* were “used to test the effects of various types of explosives” (*West Australian* 13/07/1996: 33), and could therefore not be taken as an indication of the number of explosives normally needed to sink a vessel of her size.

Many of the vessels examined during fieldwork for this research had obvious use of explosives still evident when examined. Of particular interest were the vessels at Tangalooma which had “dynamite charges ... exploded in the bottoms of the ships to sink them” (*Courier Mail* 01/08/1963, Davenport 1986: 703) that could in some cases be noticed. The use of explosives in the abandonment of vessels for functional post-abandonment uses in inter-tidal contexts, such as those vessels at Tangalooma is not a simple matter. This is particularly well described in the following excerpt from Watt (1989: 186), which describes the scuttling of the *Tarawera* as a breakwater, wharf and store-ship in New Zealand, December 1927:

... a coil of gelignite was ... laid by a diver ... unfortunately, on detonation, the hulk tipped the wrong way. The result was that her deck, rather than her bottom, lay outward and exposed to the sea, and as a result she subsequently broke up faster than expected; the old iron bones never did satisfactorily serve their purpose.

### *Filling*

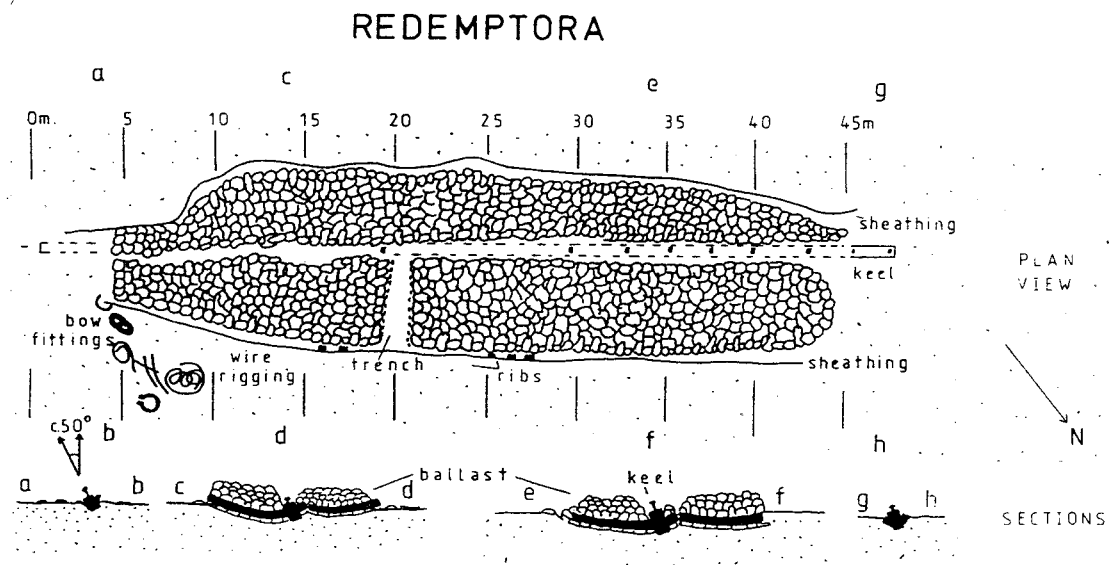
Likewise, the filling of a salvaged hull is well attested to in the historical and archaeological literature (with eight vessels listed as “filled” in the ANAVD). When vessels were deliberately beached in order to save them from being wrecked it was recommended that, “Ballast should be taken in during the

beaching operation to cause the ship to settle securely on the bottom” (Cockcroft 1983: 200).<sup>1</sup> This can be seen as also being the sensible thing to do in cases of deliberate abandonment, with the added weight working against any residual buoyancy of the salvaged and breached hull. Many of the sites visited during the archaeological site survey component of this research have been noted as filled up with rocks, cement, and gravel, something previously noted at the Mallows’ Bay Ships’ Graveyard, Maryland (see Chapter 3). Amongst other archaeological studies of abandoned vessels, however, it is not often acknowledged as a factor in site formation. In some cases anomalous findings in vessel contents can be interpreted as methods of placement assurance. The large amount of ballast stone found in the hull of the “wreck of stones”, identified as the American vessel *Redemptora* (Figure 9.16) was described as anomalous due to the amount of stone being “to the detriment of her carrying capacity” (McCarthy 1983b: 364). Instead, it could be considered a measure taken for proper sinking and assured placement on the seabed, and hence a factor in the site’s formation. This amount of stone taken in consideration with the already mentioned use of fire on the vessel means that it would have sunk faster as the structure burnt. Such processes could have also ensured that the vessel stayed where it sank. These activities have also been noted in Chapter 3 in relation to the sites of *Jhelum* (Port Stanley), and the Cypress Landing Shipwreck (North Carolina).

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<sup>1</sup> Cockcroft (1983: 201) notes that the term “stranding” is normally used when referring to accidental grounding, as distinct from “beaching” which is intentional.





**Figure 9.16** Plan of the remains of *Redemptora* showing ballast stone *in situ* (by Mike McCarthy, reproduced from McCarthy 1996: 204)

The inclination to disregard hull contents as indicators of potential deliberate discard activity is also reflected in overseas studies. Illsley and Roberts (1979), in their commentary on the bateaux style slate carrying “Padarn Boat” found in North Wales (believed to date between 1788 and 1824) acknowledge that the vessel is a shipwreck due to the *in situ* slate in the hold of the vessel. The question one must ask is whether this is enough to prove a wrecking incident, especially in the case of a vessel such as this, which is in a remarkably good state of preservation and articulation. Is it reasonable to use the large amount of slate and non-site specific historical documentation regarding the profitability of the slate industry at a particular time to determine the time of wrecking, or for identifying a wrecking incident (Illsley & Roberts 1979: 55)? Using other evidence in their work, which outlines the existence of a highly articulated hull that was not perforated, or upturned but filled with heavy material, may alternatively suggest deliberate abandonment. According to this perspective the slate ceases to be seen as cargo, and becomes evidence for placement assurance. This alternative view is not one that is necessarily advocated by the writer. It is the highlighting of these alternative hypotheses, however, that can shed light on visualising

possible conceptual problems in how we view submerged vessel remains. This also reiterates the importance about transparency in the interpretation of the archaeological remnants of vessel remains and the exploration of all possible alternatives in site formation. For instance, in the case of a site at Claflin Point, Wisconsin, Rodgers (1995: 15, 28), noted a large quantity of dolomitic limestone but concluded that it represented cargo, and that the vessel was a wrecked rock transport barge and not a discarded watercraft. Rodgers conclusions, however, are based upon the stone's worth, and the way that the material had been packed, not upon assumptions about the nature of the vessel's deposition.

There are also instances of vessels being filled with rubbish, in an attempt to weigh down the hull, but more importantly as a method of rubbish disposal. The vessel *Premier*, for instance was cited as "Carrying a miscellaneous cargo, including broken up parts of motor vehicle bodies which, like herself, had reached the end of their useful life" (*West Australian* 30/03/1938: 16a).

#### *Pile Utilisation*

There is much evidence of other constructions being used in relation to the abandoned hulls of watercraft. They are found in three separate instances:

- Delineation of disposal areas;
- Associated jetties, and;
- Placement assurance.

Sets of multiple piles have been noticed delineating abandonment areas. This occurs for a range of reasons. At the Garden Island Ships' Graveyard (South Australia) the piles were specifically placed to outline the abandonment area. At the Jervois Basin Ships' Graveyard (South Australia), an area piled as a log

pool later became a useful area to abandon vessels safely without impeding navigation (see background of Figure 9.7, and also Figure 9.17). At Homebush Bay (New South Wales) the piles were used primarily to facilitate safe navigation while restricting access to the ship breaking area.

At two sites, the Otago Bay Ships' Graveyard (Tasmania), and at the North Stockton Ships' Graveyard (New South Wales), jetty piles associated with makeshift jetties are adjacent to the remains of abandoned watercraft, apparently used in association with salvage activities (Figures 9.18 and 9.19). Piles have also been actively used in the pinning down of at least one vessel, the paddle steamer *Jupiter* at the Mutton Cove Ships' Graveyard (South Australia) (Figure 9.20), and may have once pinned down the remains of *Fides* at the Jervois Basin Ships' Graveyard (South Australia). In all cases, piles can be seen to relate directly with placement assurance activities, whether directly associated with ensuring that a vessel would stay where it was discarded (as with the driving of piles through its hull), or through their association with hull reduction strategies (salvage), aimed at least partially with reducing the residual buoyancy of a ship's hull. Both strategies relate to the need to reduce threats to navigation through the accidental refloating of abandoned hulls.



**Figure 9.17** Piles delineating the Jervois Basin Ships' Graveyard (Ethelton, SA) showing log pool and abandoned watercraft (section of photograph, reproduced from Samuels 1987: 11)



**Figure 9.18** Painting "Ships' graveyard, Old Beach" by Samuel James Marchant, showing jetties alongside the remains of *Westralian* and *Otago* (Source: State Library of Tasmania Image 1125297978)



**Figure 9.19** Jetties at North Stockton (New South Wales) adjacent to remains of the abandoned watercraft *Kate Tatham* and *Sylvan* (Photo: Nathan Richards, 27/09/2001)



**Figure 9.20** Remains of *Jupiter*, Mutton Cove Ships' Graveyard (Port Adelaide, South Australia) showing pile driven through the bow of the vessel (Photo: Nathan Richards, 12/02/2001)

## Appropriate Abandonment Environment

The appropriate environment of abandonment is a crucial factor in ensuring the placement assurance of vessels that are beached. Certain hull treatment procedures can be adversely affected by certain environmental conditions. At beached abandonment locations for instance, if a hull has not been thoroughly breached, be it with the use of explosives or some other procedure, or has not been adequately weighed down and is in a particular environment, it may be that the vessel will float off or move. We can see that there are a range of environmental conditions that affect the appropriate, and seemingly final stage of abandonment. These are usually limited to two factors: substrate and tide. These in turn are affected by the method of beaching, and the speed at which the vessel has been beached.

### *Substrate*

*Nicholl's Seamanship and Nautical Knowledge* (Cockcroft 1983: 200) indicates that in the case of the beaching of a vessel in the context of imminent, undesired sinking, "The beach should, preferably, be of sand or gravel and free from rocks". While this is stated because of a desire to minimise damage to a vessel when beaching it to save it, the situation in beaching for discard purposes is significantly different. The first trend seems to be beaching in a silty substrate. While this means that the vessels will not suffer much damage due to their beaching (as noted by Babits & Kjorness-Corbin 1995: 3), it means that the vessel can settle into the substrate, and will be less likely to float off. This has been noticed in many cases such as the ships' graveyards at Port Adelaide, South Australia (see Figure 9.21) and, from descriptions of the Bishop Island Ships' Graveyard in Brisbane. Other ships' graveyards, such as that at Witts Island, Tea Gardens, New South Wales (Figure 9.22), and Bulwer, Moreton Island, Queensland (Figure 9.23) have been deposited on a sand substrate, but this is also due to the use of the vessels in the creation of a

small boat harbour, as well as placement assurance. Indeed, the vessels beached in this instance have been exceedingly salvaged and would not float, irrespective of the underlying substrate. In the case of wooden vessels, the examination of the substrate at the East Arm burning beach where the remains of at least six Indonesian fishing vessels met their fate suggests that the running ashore on a rocky shore allowed damage to be inflicted that would affect seaworthiness, and would also allow for the maximum amount of material to be destroyed through the use of fire (Figure 9.24). In this way the substrate of the ships' graveyard or abandonment area may describe the perception of the hull, and the behaviour that may be carried out on a particular hull in its post-depositional phase.



**Figure 9.21** Muddy substrate at the Mutton Cove Ships' Graveyard (Port Adelaide, South Australia) showing remains of *Excelsior* sinking (Photo: Nathan Richards, 12/02/2000)



**Figure 9.22** Sandy riverine substrate at the Witts Island Ships' Graveyard (Port Stephens, New South Wales) showing remains of *Federal* (Photo: Nathan Richards, 27/09/2001)





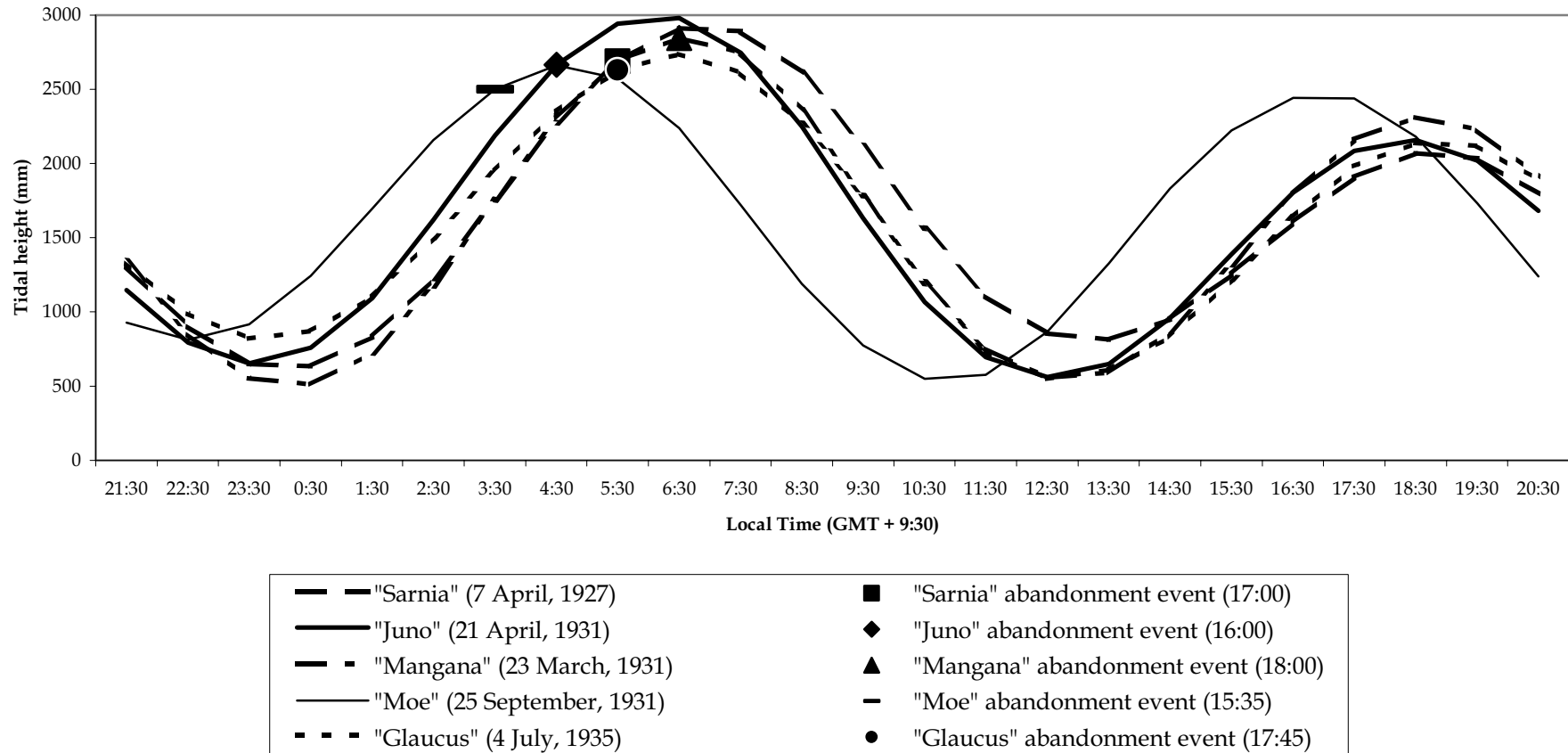
**Figure 9.23** Sand substrate at the Bulwer Ships' Graveyard and boat harbour (Moreton Island, Queensland), showing remains of *Hopewell*, *Mount Kembla* and *Kallatina* (Photo: Rhiannon Walker, 1/11/1999)



**Figure 9.24** Rock substrate at the "East Arm Burning Beach" (Darwin Harbour, Northern Territory) showing solid footing, and effect of burning (Photo: Nathan Richards, 06/06/2000)

### *Height of Tide and Tidal Variation*

*Nicholl's Seamanship and Nautical Knowledge* (Cockcroft 1983: 200) also suggests that in the case of the beaching of a vessel that, "If there is an appreciable range of tide it will be best to beach the ship on the falling tide, just after high water, to give as much time as possible to secure the vessel before the tide rises to the same level again, and to give more opportunity to effect repairs". While it is not the case that repairs would need to be carried out on the deliberately abandoned vessels that make up a part of this study, the issue of tide may have been a factor that allowed the abandoners enough time to ensure placement, or carry out more modifications to ensure the vessel stayed where it lay. While tide is not a concern with submerged hulls, which once sunk will never float again; it is a concern at beached abandonment sites where extensive salvage has occurred. Shomette (1994: 90, 1996: 267), for instance, has noted that the use of fire to reduce a hull will decrease that hull's weight and therefore increase its buoyancy. If such a hull was not weighted with enough stone, and if a tidal variation was large enough, the remains would be likely to leave its location of disposal. While the same could be said of ferrous-hulled vessels, the inherent buoyancy of wood, under the right conditions may make it act in a raft-like way irrespective of whether it had been extensively breached. Hence the most probable hypothesis is that vessels were beached at high tide in order to get it as far as possible on land, and then further hull minimisation was carried out at low tide. In the case of the Garden Island Ships' graveyard historical research provided five separate abandonment events between 1927 and 1935 where there were known dates and times of abandonment. This allowed for an assessment of this hypothesis by examining when watercraft were abandoned in relation to the height of the tide (see Figure 9.25). For this site, it shows conclusively that tidal height was a consideration in planning abandonment, with all five events occurring at, or just before the daily tidal maxima on each occasion.



**Figure 9.25** Sea levels for select vessels at the Garden Island ships' graveyard showing sea level change in association with abandonment event (Sea levels for Port Adelaide (inner harbour) are supplied by the National Tidal Facility, The Flinders University of South Australia, Copyright reserved).

### *Speed and Orientation*

On the issue of speed it has been noted that low speeds, and a right angle to shore is the most desirable way to minimise problems of refloating vessels (Cockcroft 1983: 200). Previous work by Richards (1997: 89) has addressed the issue of the angle of beaching at the Garden Island Ships' Graveyard noting that vessels were beached approximately perpendicular *or* parallel with the shore. However, it was noted that smaller, flatter bottom vessels were placed parallel, and larger watercraft were run in at right angles. This may have been due to spatial constraints at the site, which is within a tidal inlet, rather than exposed beach. Nevertheless, in these cases it can be reasonably inferred that these vessels were run aground at as high a speed as manageable in order to make the most of the space at hand, place the vessel as high up on the beach as possible, and inflict the maximum amount of damage to the hull as possible. No sources, however, have been found confirming the desirability of high speeds when "running around" vessels.

### **Conclusions**

While the use of explosives in the sinking of a vessel is a common method associated with ship discard, such an activity does not typify the whole abandonment process. Deliberate abandonment can best be understood in relation to the systematic processes associated with placement assurance, hull reduction, and salvage activities. In the consideration of any one of these processes it is important to consider that they are as much technologically dependant as the construction and modification of watercraft. These practices also represent the interaction of human decisions in relation to technological and economic conditions, as well as environmental restraints.

The decision to scuttle or destroy depends on a number of factors – such as the cost and ease of disassembly (related to the type of vessel), and the regulatory protocols in relation to discard (to be discussed in the following chapter). Logistical issues associated with all of these processes are important to understand, in order to appreciate the causes and consequences of discard activities.

In the case of watercraft discard three stages of salvage exist. While not all of these stages may be represented at any particular sites, they can in many cases be detected archaeologically. Understanding different causes and consequences of these stages are important because they illustrate the socio-economics of, and responsibilities associated with ship owning. Additionally, the circumstances behind salvage can be read to a degree from the archaeological record and salvage can be seen as a cause of abandonment (when prices for materials are high), as well as a consequence of abandonment (when economies are at a low ebb). While salvage activities can be seen as a process of reduction, the signatures of each type of salvage, with the differences in method, and sections of the vessel being broken up – may leave behind vastly different signatures that relate to the method and hence the socio-economic group that carried out these activities. These processes are more than just events in a vessels life or archaeological transformation. They are evidence for the assessment of the behaviours relating to the use and disposal of watercraft, and are clues to the reasons for abandonment and the perception of a vessel as a salvageable item.

# CHAPTER 10

## Conclusions

*We have stern keepers to trust her glory to-the fire and the worm.  
Never more shall sunset lay golden robes on her, nor starlight  
tremble on the waves that part at her gliding. Perhaps, where the low  
gate opens to some cottage-garden, the tired traveller may ask, idly,  
why the moss grows so green on its rugged wood; and even the  
sailor's child may not answer, nor know, that the night-dew lies deep  
in the war-rents of the wood of the old Temeraire (Ruskin 1904:  
171-172).*

## CHAPTER 10

### CONCLUSIONS

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Watercraft are built to particular technological standards within the economic parameters dictated by their owner. They exist within a flux of diverse, changing conditions that see them pass through an array of systemic, techno-economic reassignments. As tools of commerce they invariably came to their end within a causal and behavioural spectrum; at one end catastrophically lost, at the other deliberately discarded. This research suggests a number of things; discarded vessels are not shipwrecks, they are non-catastrophically made a part of the archaeological record. The array of decision-making processes that defines this makes them a reflection of the changing techno-economic circumstances associated with their abandonment.

For this reason discarded watercraft can be used as a mirror to the events and processes that brought about their disposal, and they are an extremely rich database that sheds light on the effect of technological and economic change, on economic, and social circumstances. The analytic potential of abandoned watercraft relates to discard behaviours, and how we view them. On one level we can see discard as a process, with a myriad of interconnected causes, and on another we can see discard as an event, which culminates in a number of consequences for the use and reuse of watercraft.

### Discard as Process

The process of discard can be illustrated in the rate of abandonment through time – this is known as the discard trend. This thesis has indicated that discard trends on national levels are particularly attuned to the economic changes brought about by economic rise, decline, warfare and the aftermath of war (Chapters 6 and 7).

The relevance of warfare in relation to the deliberate abandonment of watercraft is relatively simply stated: war creates incentives for industrial expansion. This is done through a dramatic increase of demand for goods and services for a range of uses (such as munitions). It has a particular effect on ship construction due to fears of shipping shortages by dramatically increasing ship construction. The inevitable effects of this are that such sectors emerge in a “glut” of surplus capacity following the conflict. This brings about a decrease in the availability of trade, and the disposal of vessels. These programmes of tonnage sterilisation normally commence with older or obsolete watercraft sold at cheap prices, and eventually discarded. In such situations the only alternative to disposal behaviour is stockpiling behaviour. This has been noted in other studies on watercraft abandonment (as mentioned in Chapter 3).

While there would appear to be a link between economic expansion and a decrease in discard behaviours, and the opposite during times of financial hardship, this is not always the case. The scope and nature of particular economic boom times are expressed differently within regional analyses (Chapter 7). This illustrates the degree to which discard sites can be seen as the sensitive indicators of trade conditions. Indeed, the abandonment trend itself can be seen as an historically unique signature of economic and technological change within nations and regions.



Another important aspect to discard behaviour are the alterations to watercraft that occur while still functional. The lateral cycling and reuse of ships have discernible effects on their use life. These events of modification and conversion are also intimately linked with the nature of changing trade conditions. They also reflect the tendency to dispose of watercraft as they occur at times when economic and technological circumstances are changing the most rapidly. Indeed, discarded watercraft are somewhat defined by their prolonged lives, and the number of mercantile and support functions that many fulfilled over substantial periods of time (Chapter 8).

Another contributing factor to the discard trend are the cultural constraints that predetermine the nature of the vessels to be abandoned (Chapter 6). Regulatory, and legislative controls play a pivotal role in dictating the type of ships operating, the nations that can be traded with, and the technological and economic standards in shipping. They are reflected in the abandoned watercraft record by the types of vessels abandoned over time, and the nationality of these vessels. Similar cultural constraints also control the processes of discard itself. Federal sea-dumping and environmental protection, as well as state ports, and harbours legislation have played a major role in controlling the methods involved in the disposal of unwanted or unusable watercraft. They also play a major role in the location of areas for abandonment.

### **Discard as Event**

The discard processes outlined above also have an influence on the nature of discard as an event. The discard event can take one of three routes – the beaching, scuttling, or demolition of watercraft. The processes associated with these events are varied, but relate to a number of standard behaviours – all of which leave behind their own archaeological signatures. Hull reduction strategies, including salvage are processes that aim to diminish a vessel to a

great extent, weighing requirements for subsequent “safe” abandonment with the economic costs of dismantling and transport (Chapter 9). Placement assurance techniques are those that facilitate the final placement of a vessel at an intended location, and the methods that ensure that it stays permanently disposed of, and will not become a future hazard to navigation. These two processes are the most fundamentally important discard processes that facilitate the transformation of a vessel from its systemic context to an archaeological context. They, can however also be seen in certain instances as mechanisms that bring about the continued use of watercraft. In the case of post-abandonment use, abandoned watercraft have their function as floating vessels discarded, and they become objects with other purposes, such as bathhouses, breakwaters, or artificial reefs. Over time, these final functions are abandoned, and barring their re-building and reuse, they cease to be in a systemic context.

This thesis has also suggested that the signatures of use and discard are more temporal than previously thought. The placement assurance, hull reduction and salvage mechanisms that can be detected from the examination of archaeological remains are as technologically dependant as the processes of ship construction. Although, this thesis does not assert that the abandoned watercraft resource is as a good representation of technological innovation as the shipwreck resource is, its findings do indicate that it is a good indicator of technological change. This is reflected in the small number of vessels that have undergone major technological transformations through their use life. Certain processes that act upon watercraft while in a systemic context, such as conversion and modification activities have a direct influence on their passing into an archaeological context by artificially extending their use-life. In this way, certain technologies can be seen to be “flexible” in that they are more open to amendment and use-life extension.

Indeed, the fate of all of the abandoned vessels mentioned here can be seen as the direct consequence of the type of vessel that they were. Whether in the context of military campaigns or changing economic and technological circumstances, at their most fundamental level they are a reflection of *choice*. Moreover, as the embodiment of human decision making processes they can be seen as a reflection of the consequences of economic, historic and technological pressures. By considering the interaction between vessel design (a reflection of technological and economic development and change) and particular historical contexts (itself a reflection of these same processes) such discard sites have the potential to expose to us the social histories of humans at particular times in history, and even throughout periods of human history.

An understanding of the nature of abandoned watercraft in the past has many benefits for the analysis of that same resource in the present. While on one hand it provides a framework within which we can clearly see that there has been a transition in the types of abandonment sites that have formed, we can more specifically understand, that there are the same underlying issues revolving around the sacrifice of watercraft. Moreover, it becomes clearer that there is a high level of continuity within the political, technological and economic causes and consequences of such discard behaviour in relation to old, obsolete, or unwanted watercraft. From here we can begin to see that unwanted watercraft *are not just abandoned*; they are abandoned for a range of reasons that tell us much about the people who used them. Many of the themes that have been outlined above will emerge throughout this thesis. As has been demonstrated, the benefit of archaeological methods and assumptions coupled with the wealth of historical literature on the Australian experiences of deliberate vessel abandonment, will serve to confirm the potential of this resource.

### Analytical and Methodological Innovations

This thesis has made a number of analytical and methodological contributions. By seeing discard as a reflection of economically driven, and technologically derived trade that can be discerned from the archaeological record, it has merged two assumptions previously communicated in maritime archaeology; that watercraft are artefacts imbued with cultural norms, and that they are an “extraordinary database for anthropologically oriented archaeologists” (Lenihan 1983: 63).

The comparative methods used in this research, which basically entail the dissection of useful historical and archaeological data, its categorisation into meaningful classificatory schema and reassembly into relational aggregates is an extension of similar methods from shipwreck-based studies. The methods used here have really been no different from any number of other archaeological studies, whether concentrating on artefact types, use-wear analysis, of geographical distribution. However, these methods have not been widely used within maritime archaeology, despite being a useful way of carrying out the comparative analysis. The application of these methods would be undoubtedly useful for any number of other types of sites, and is simply dependant on the possibilities of their classification. Many other aspects of the seascape (and landscape for that matter), especially when they have a major technologically derived aspect are perfectly suited to being classified, and can similarly be used as indices related to technological and economic trends.

This research also has significant consequences for how discarded vessels are perceived by maritime archaeologists around the world. In particular, this research has potential repercussions for cultural heritage management. The analyses included in this thesis have utilised a resource of which only

approximately one third is acknowledged in the Australian Historic Shipwrecks Database. While it is not currently known what percentage of the ANAVD translates to real archaeological sites for management, it has made a case for the significance of discarded watercraft through its applied use of the resource. Moreover, this applied use of the resource has shown that the significance of abandoned vessels cannot really be assessed in the site-specific manner that the shipwreck resource can. Other implications relate to how the investigation into new unidentified sites proceeds, and how clues from the landscape, and the archaeological signatures on sites can be used as indications of abandonment or wrecking processes. Asking questions such as “was this vessel wrecked?” or “was this vessel deliberately discarded?” have huge ramifications for how we identify sites, and how we come to understand them. This in turn contributes to the interpretive potential of watercraft in the archaeological record, irrespective of how they came to be at a particular location.

Indeed, the discard trends communicated in this thesis, while admittedly open to further refinement and analysis, are themselves an interpretive tool. An understanding of the peaks and troughs in these trends illuminate potential new interpretations for many shipwrecks, especially when seen in relation to the correlations between historic events and maritime fraud.

### **Potential Research Directions**

The potential directions for research into the discard of watercraft, and discard in general is immense. Indeed, from one perspective the innumerable directions evident at the conclusion of this study could be seen to represent the failings of the research. It is clear now that in many ways that this dissertation was working backwards. In hindsight it may have made more sense to undertake a comparative study on a regional or statewide level. Such a study would have been able to make a detailed study of the economic,

technological, political, and geographic factors dictating discard trends in relative isolation, and with minimal confusion from the myriad of factors at play within the many regions of Australia that were actually studied. Such a study would have been undoubtedly easier. However the challenge in exposing the significance of the entire abandoned vessel resource in a meaningful, and broad-reaching way was too much of a challenge to back down from.

Nevertheless, this has meant that there are many potential research directions emerging from this thesis drawn from the need to refine the dataset, and more comprehensively establish, dismiss and discuss any number of discard trend correlates. In particular, the concentration on watercraft discard on regional levels is an area that was only really touched on in this study. While Doyle (2000), has to a degree examined discard in relation to the state of Queensland, the subject is open to any number of similar studies focussing on state-wide, or port-focussed discard trends and their relationship to the events, and multiplying factors that not only communicate the causes and consequences of discard events, but also the casual relationships between economic, technological and social processes. This is not only limited to watercraft discard. There are large amounts of data available concerning the official and illicit discard of any number of other types of material culture; including munitions, chemicals, dredge spoil, car bodies, scrap metal, medical supplies, aircraft, and other assorted equipment and refuse in the seas and oceans off Australia. This data may serve to reinforce, or reappraise the findings contained in the thesis, as well as communicate the history of the use of the sea as a dumping ground. Indeed there are probably many site types that could have some light shed on them from the application of a generalist framework similar to the one espoused here.

Additionally, any number of studies, on local, regional, national and even international levels focussing on any aspect of the technological development

of ships and shipping is likely to make a contribution to how we view the diffusion of technologies, or indeed, the role of watercraft as vectors of technological change. With an appropriate system of classification, and sample the diachronic analysis can make contributions to the way we see archaeological methods as reinforcing or redefining the causal relationships in technological and economic models, and history in general.

Finally, similar examinations of discard behaviours in other countries may illustrate the common features, or stark differences in separate trends. This in itself may contribute to how we understand the interaction of national economies, the causes and consequence of the shifts in economic and political power, and the degree to which the effects of global economic phenomena may be drawn from archaeological remains.

### Conclusions

Many previous studies have acknowledged the scientific, experimental and educational significance of discarded watercraft, and a select few have recognized the archaeological significance of this resource. However, there has been no appreciable attempt to understand the nature of discard, in conjunction with the applied use of data from discarded watercraft, and the subject has lacked thorough exploration. This is in part a problem arising from the particularist manner, and site-specific methods in which these studies have proceeded, and the way that they have ignored the causal and behavioural uniqueness of this particular resource.

This thesis was an attempt at a comparative/nomothetic approach to maritime archaeological material. It has shown that comparative methods coupled with broad theoretical underpinnings have the potential to re-contextualise undervalued categories of maritime heritage. It has shown that such an approach is not simply a useful tool within maritime archaeology for

behaviourally oriented studies; for some aspects of the maritime archaeological record they may be the only way feasible way of assessing or re-casting meaning and significance. It is hoped that this work may have some influence on the re-casting of the significance of the undervalued abandoned watercraft resource, and bring about further attempts at its analysis.



## **APPENDICES**

**Appendix 1: ANAVD Sources**

**Appendix 2: Field List for ANAVD**

**Appendix 3: An Overview of Systems of  
Tonnage and Dimension Deduction**

**Appendix 4: Commonwealth Declared Areas**

# **APPENDIX 1**

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#### Northern Territory:

1. *Northern Standard*
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#### Queensland:

1. *Courier Mail*
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#### South Australia:

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#### Tasmania:

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#### Victoria:

1. *The Portland Guardian*

#### Western Australia:

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# **APPENDIX 2**

## **Field List for Australian National Abandoned Vessel Database (ANAVD)**

## APPENDIX 2

### FIELD LIST AND RATIONALE FOR THE AUSTRALIAN NATIONAL ABANDONED VESSEL DATABASE (ANAVD)

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#### Introduction

Below is the list of fields in the Australian National Abandoned Vessel Database (ANAVD). This appendix outlines the fields used within the database, outlines the historical definition of field attributes, and explains the reasoning behind the use of specific terminology and maritime nomenclature in the ANAVD. The list is separated into *sections*, which groups categories of data. These sections were grouped according to seemingly related types of data, as well as constituting *tabs* in the actual database (see CDROM #1 attached), which facilitated the easier entry of data from certain standardised forms of historical literature.

Some of these fields were included for future research, and do not include comprehensive data because they were not intended for use in the analyses carried out in this research. Additionally, some fields represent evolving classificatory schema. As a consequence of this, some fields may currently include terms that overlap with other terms. Every attempt has been made to acknowledge this.

#### Section 1: Identification

The identification of vessels has proceeded in two ways in the database. Firstly, a system of tagging records was required for the tracking and comparison of the data within the ANAVD. Secondly, fields were required to

note the traditional methods for the identification of the vessels, for the purpose of historical research.

*Identification Tag:*

For the purposes of creating a relational database that could be used in the analysis of vessel data, as well as link tables containing other information, a unique number was attached to each individual record contained within the ANAVD. This number is essentially an automatically generated number sequentially arranged in relation to the creation of new records of individual vessel entries. This enforces referential integrity between records, and also serves as the means for the linking of tables.

*Name of vessel:*

This field contains the last known name of the vessel, or the name given to the vessel as an unidentified entity. The naming of a vessel is important for historical purposes, as it provides a way into historical registers, providing additional elements of the vessel in question such as dimensions, origin and date of destruction/removal.

*Ex-name(s) of vessel:*

This field contains all known previous names of a particular vessel. The ex-names of a vessel allow for its archaeological remains to be traced back through time. This allows for a greater understanding of the development of the vessel historically, through changes in geography and ownership while also exposing changes that might have been made to the structure of the vessel through amendments or upgrades.

*Official Number:*

This field contains the official number of the vessel from its primary register. In most cases, this is a number from the *Lloyds Register of Shipping*, the primary register for merchant vessels trading in Australia, and is often also reflected in Customs House Register documentation after 1855 (Farr 1969: 10). In cases where an alternative shipping register is used, as in the case of certain American traders, a prefix is added (for example in the case of the *Dorothy H. Sterling*: US200005).

The official number of a vessel was theoretically was similar in type to the identification tag that was created for this database. It was intended to be a unique number that would last throughout the entirety of the life of a particular vessel registered within a particular register, irrespective of any changes to the name of that vessel. In this way any discrepancies caused by the re-naming of a vessel through its use-life could be traced by its official number. Some cases have been noted of vessels changing register (and hence being assigned a new official number), being so substantially rebuilt as to qualify for re-registration under a different number, or re-numbered under dubious circumstances (for instance, in the case of theft). The official number is supposed to be, “cut or punched on to the main beam of the vessel, but when this is inaccessible it is customary to have the number stamped on the after end of the forward hatch coamings” (Stevens 1947: 82 see also Lloyd’s of London 1981: 501; 1991: 380).

## **Section 2: Manufacture Details**

*Date Built:*

This field contains the year of manufacture of the vessel. This field is one of the most crucial in any analysis. Used in conjunction with aspects of original

configuration an analysis of technological preference and technological innovation can be attempted. Used in conjunction with the date of abandonment, an analysis of the trends in use-life can be undertaken. Lloyd's of London (1959: 245 see also Lloyds of London 1965: 260) defines the date of build as:

The date of completion of the Special Survey during construction of ships built under the Society's inspection will normally be taken as the date of build to be entered in the Register Book. If, however, the period between launching and completion or commissioning is, for any reason, unduly prolonged, the dates of launching and completion of commissioning may be separately indicated in the register Book.

*Geography of Build:*

This field contains the location of the manufacture of the vessel. It is linked to a geographical location table, containing place, region, and nation. This field has been set up to allow for analysis on local, regional, state-wide, national and international levels.

*Vessel Builder Name:*

This field contains the name of the individual or company that manufactured the vessel. It is linked to a vessel/engine builder database that lists name, location and whether builder made vessels and/or engines.

**Section 3: Propulsion Details**

*Propulsion Type:*

This field contains the last form of propulsion that a vessel had prior to its abandonment. The table of propulsion types is separated into two sections.

The first section is the “type of propulsion” and describes the general category, or how a particular vessel is defined as being propelled. The second section is the “means of propulsion”, which describes the method by which the vessel is propelled. This is best illustrated in the descriptions below which have been amended from Coroneos and McKinnon (Coroneos1997: 30, Coroneos and McKinnon 1997:20).

### *Types of Propulsion*

- 1) *Motor*: Paasch (1978:502) refers to a motor being any applied force acting upon a vessel, be it steam, sail, or hand power. In this study it refers to a motor ship or motor vessel that has a mechanical engine as its main motive power, usually in the form of an internal combustion engine running on a liquid fuel such as benzene, diesel, or petroleum (DeKerchove 1961: 523). There is some difference in motor engines across the board. These differences are mainly due to fuel sources and to some extent due to the type of ignition. Petrol or paraffin engines ignite through the electrical ignition of fuel and air vapour whereas diesel fuels require only an injection of air vapour in order to create ignition (Reed 1966: 87).
- 2) *None*: Where a vessel is not self-propelled, and is instead towed.
- 3) *Sail*: Where the main source of propulsion is force of the wind against a piece of, or assemblage of material unfurled and extended from a mast, boom and yard (DeKerchove 1961: 673, Paasch 1978: 338, Kemp 1988a: 737-738)
- 4) *Steam*: Denotes where the vessel uses a type of engine that runs on steam power as its main form of propulsion, the main force being the rotary motion of shafts turning either screw or paddle (Paasch 1978: 7). In essence, as described by Embelton (1966: 195), there are only really two truly distinct kinds of steam engine, the reciprocating engine and the steam turbine engine. All that steam engines really do is serve the

conversion of heat energy (through an increase in temperature of water into steam) into mechanical energy (Embelton 1966: 250). The difference between the two types of steam engine is the motion of the shaft that serves as the main driving force of the engine, with a reciprocating engine using a static motion on a piston, which drives the shaft upwards and downwards whereas the turbine engine uses a dynamic rotary action. There are two types of turbine engine. They are classified as the "impulse" and the "reaction" turbine. A description of the engines can be seen in Embelton (1966: 250-256). It should be noted that turbine steam engines were a later development in steam technology, and as such reflect a development that allowed for more efficient engines that extracted more work from heated steam than its counterpart. Furthermore, its thermal efficiency is being drastically higher, its fuel consumption much reduced as well as having negligible vibration, better balancing, less size necessities, less wear and less requirements for maintenance. Turbine engines however are non-reversible, and therefore require a separate engine for moving astern (Embelton 1966: 258, 259-260).

- 5) *Unknown*: Used for vessels where the means of propulsion is not described in historical sources.

#### *Means of Propulsion*

- 1) *Jet*: Refers to a vessel propelled by the intake of water and its expulsion through apertures in its stern (Paasch 1978: 8). Refers to motor and steam vessels only.
- 2) *Paddle: Side Wheel*: Refers to two wheels being used as the main means of propulsive force mounted on the port and starboard sides of the vessel (Paasch 1978: 7). Only applies to motor or steam driven vessels.

- 3) *Paddle: Stern Wheel*: refers to a wheel being used to propel a vessel that is mounted at the stern of the vessel (Paasch 1978: 8). Only applies to motor or steam driven vessels
- 4) *Single Screw*: Used to describe a steam or motor driven vessel where there is one propeller and propeller shaft running down the centre of the vessel and leading to the engines (Paasch 1978: 7-8).
- 5) *Twin Screw*: Used to describe steam or motor driven vessels where there are two propellers being run off a single or multiple engines (Paasch 1978: 8).
- 6) *Triple Screw*: Used to describe steam or motor driven vessel where there are three propellers being run off of a single engine, or multiple engines
- 7) *None*: Refers to where there is no means of propulsion. Refers only to towed vessels or sail vessels without auxiliary power sources.
- 8) *Auxiliary Steam*: Refers to sailing vessels only that have small steam engines driving a single screw as a secondary propulsive force. Usually the engines are only used in calm weather or imminent danger (Paasch 1978: 7)
- 9) *Auxiliary Motor*: Refers to sail vessels only that have small motor engines driving a single screw as a secondary propulsive force.

In relation to the “means of propulsion”, if an entry is listed as belonging to categories of 1-6 and there is an entry in the rigging field, this denotes that the sail was a secondary source of motive power. If the entry is listed as being in either category 8 or 9, an entry in the rigging field denotes that sail is the primary form of motive power. In this way, certain elements of the “Type of Propulsion” field can never be association with the “Means of Propulsion” field. As described by Moore (1970: 83) vessels were only ever rigged with distinct primary and secondary variations of motive power for three reasons. That is where steamers were rigged with sails 1) to be used in cases of emergency or to ease the engines, 2) on vessels with weak engines and a large



sail area and 3) auxiliary powered vessels using engines in time of emergency or when there are light winds or calms. Generally it is accepted that there was a transition from vessels of type 1 to vessels of type 2 and that with the development in the marine steam engine, by the 1920s vessels of type 1 were became extinct. The only exceptions to this rule are of course, training ships, which have been preserved to allow for the experience of such situations.

Turbine steamers, described by Paasch (1978: 8-9) as being of a separate category have not been singled out here as turbine engines have the same propulsion type (steam) and means (screw) as other screw steamers, and are therefore considered simply another engine variation.

By having these as distinct lists, which can be married, it allows an analysis to be done on both the types of propulsion, both the source of the propulsion and the technique of propulsion.

*Engine:*

This field contains a description of the engines used in steam and motor vessels. While currently a list, it is intended to be a linked table with standardised data outlining number of engines, type of engine, horsepower rating, type of horsepower, number of cylinders, type of boilers, fuel type (see Sennett 1885: 26, Crawford 1939: 18, Guthrie 1971: 69-70, 171, McCarthy 1996: 392-394 for more information). The analysis of engines alone is a worthwhile analysis, as the type, and aspects of each model are likely to be the most scrutinised aspects any prospective shipowner was to make in relation to a new purchase. The analysis done here could show the interlinked effects of reliability, cost and even the marketing skills of engine builders.

*Engine Builder Name:*

This field is linked to the same table as the vessel builder field and shows the name of the builder of the last engine used in a particular vessel.

*Number of Masts:*

This field simply contains numeric data on the number of masts that a particular vessel had.

*Rig:*

This field contains the last known rig of a particular vessel prior to its abandonment, and is used for the same reasons as described with the number of masts. Indeed, where information pertaining to the number of masts is not found, the mention of a specific kind of rig informs us of the number of masts on the vessel (not in all cases). Rigging present on steam vessels in an auxiliary manner is an indicator of the technology and effectiveness of the steam engines used in its propulsion. One other important consideration in the use of rig as a meaningful descriptive field is outlined in Moore (1970: 51) who states, "generally ... it is the ocean-going ship that is square-rigged and the coaster that is fore-and-after". Rig also often denotes speed, manoeuvrability, stopping ability, stability and the capacity of a vessel. Although rig is not generally seen as an indication of carrying capacity (O'Reilly 1999: 56), larger vessels more often carried square rigging. The descriptions, as outlined below, are descriptions of a range of vessels, which due to the diversity of their number of masts and the type of sail upon those masts, can be distinguished from one another. A vessel is considered "square rigged" if any of the vessel's main sails are square-rigged. This means that a barquentine, for instance is square rigged although only one of its masts has square sail and rigging (Moore 1970: 39). The list of types of rig presented

below is an unashamedly general description of rigging types which is subject to interpretation, augmentation and constant amendment and expansion, as Moore (1970: 80) asserts, "It is not wonderful that nomenclature is inexact", and as Jones (n.d.: xiii) says, "The differences are easily found, but the reasons are more difficult to understand".

- 1) *Barque*: Barque refers to a vessel of three masts generally, with a four masted barque being called a "four masted barque" (Moore 1970: 62). The term "barque" is distinguished from the term "barquentine" according to Moore (1970: 26) due to the fact that it is square rigged on two of its masts, rather than only one.
- 2) *Barquentine*: The term "barquentine" is distinguished from the term "barque" according to Moore (1970: 26) due to the fact that it is square rigged on only one of its two masts. Barquentines can also belong to the subcategories of "incomplete barque", also known as a "jackass barque" (Moore 1970: 61). Another quote from Moore (1970: 60) confuses the matter further, "Eighty years or so ago [around 1865] barquentines were called three-masted schooners ... it is not always easy to distinguish between a three masted schooner and a barquentine" (my parentheses).
- 3) *Brigantine*: Moore (1970: 25) explains that the terms "brig" and "brigantine" were often interchangeable although historically there was some difference attributed to each type. The term "brig" normally was attributed to a fully square rigged vessel, and a "brigantine" to a vessel that was partially square rigged. While this description appears in the case of the difference between barque and barquentine the term brigantine has only been used here. Moore (1970: 47) further explains that brigantines, as opposed to brigs appear to have gone through a more drastic transformation through time. While both terms are interchangeable, brig became the word for the more evolved version of the rig. Another matter is that Brigantine, as a form of Brig

has also been called a Hermaphrodite Brig “which is a brigantine that has lain aside all after square canvas and, is therefore square forward and fore and aft rigged at the main” (Moore 1970: 49).

- 4) *Cutter*: Often confused with “Sloop”, a cutter rig refers to “a one-mast rig with gaff mainsail, stay foresail, stay foresail, job and topsail, running or reefing bowsprit, and long housing topmast” (DeKerchove 1961: 193-194). The term is also used in relation to a clinker-built rowing or sailing boat attached to a vessel, a sailing yacht and steam vessels in the United States Navy of around 2,000 tons (DeKerchove 1961: 194, Kemp 1988a: 221-222).
- 5) *Dandy*: Dandy has also been used by British fishermen to describe any vessel of a ketch or yawl rig (Blackburn 1978: 117). Information from Moore (1970: 187) supports this view that Dandy refers to occupation rather than rig, but instead explains that dandies were traditionally cutter rigged fishing vessels.
- 6) *Ketch*: The term ketch has likewise exhibited much variation in description according to its region of use. References to variations in rigging in the state of Maine, USA illustrate that the description of this type of vessel pertained more to offshore fishing vessels that had two masts, and was rigged square on both rather than fore-and-aft (Paine 2000: 86). In Tasmania, Australia trading ketches were known as “barges”, and is believed to have been carried over from the terms applied to English flat-bottomed trading sail vessels (Parsons 1983d: 2, Kerr 1993: 22). This is backed up by a quote from Moore (1970: 25) which states, “Any flat-bottomed coaster, with a square bilge is commonly called a barge, whatever her rig; but since the barges that are most numerous are rigged in a particular way, with a sprit mainsail, that rig is often called a barge rig”, he also ascertains that a barge (or more specifically a Thames Barge or “Hoy”) refers mainly to the hull type and two essential elements of that hull, 1) a flat bottom and 2) sharp chines (Moore 1970: 148). Other variations include the

“Nipcat Barge” (Thames barge with a pointed stern), “Topsail Barge” (Thames Barge with a topsail), and “Stumpy Barge” (Thames Barge without a Topsail) (Moore 1970: 149-150). Kerr (1998: 3, 6, 8) discounts that Tasmanian barges were adapted Thames barges and stipulates that in Tasmania the term barge refers to a ketch or cutter rigged vessel, with flat bottom, shallow draft, centreboard or leeboard with a slight rise of floor in the mid sections of four to five degrees and trading exclusively out of Hobart. On the use of the term “ketch” specifically Moore (1970: 188-189) maintains that the term was applied exclusively to any two-masted trading vessel. The ANAVD, and analysis contained within this thesis, however has not used this term at all in relation to rig and has preferred to use the actual rig type (that is, either “ketch” or “cutter”) when describing the vessel to avoid confusion. This has been another problem in relation to the identification of rigging in the ANAVD, as the term “barge” implies a dumb vessel (which has no rig), as described below.

- 7) *None*: Where a vessel is not rigged. In some cases a vessel may have an unrigged mast (a derrick) this seen in the combination of a number in the mast field with no rig.
- 8) *Schooner*: Paine (2000: 87) describes the regional definition of schooner in Maine, USA by citing that the name “tern schooner” referred to vessels of schooner rig, but ones with three masts instead of two. While there were some references to “Schooner (fore and aft)” in the historical literature, such vessels were classified as “Schooners”.
- 9) *Ship*: Ship, in the context of rig refers to a three masted vessel with square sails on all of its masts (Dana 1970: 10, Moore 1970: 63). This term, in the post-sail era and the present day has been applied to many other things and has become one of the most general terms in relation to watercraft. In particular it has been defined as “a vessel of any description used in navigation and not propelled by oars whether completed or in the course of completion” (Stevens 1947: 81). Stevens

also notes that this definition is defined by Section 742 of the British *Merchant Shipping Act 1894* (see Hamilton 1903: 756).

- 10) *Sloop*: Refers to a single masted, fore-and-aft rigged vessel similar to a "Cutter" (DeKerchove 1961: 747, Kemp 1988a: 809-810). Also refers to a class of Naval vessels used from the 17<sup>th</sup> to the 19<sup>th</sup> Centuries, and the smaller classes of anti-submarine vessels used during World War 2.
- 11) *Smack*: Moore (1970: 25) cites that the term "smack" in the late eighteenth and early nineteenth centuries meant a small cutter rigged vessel but in the twentieth century refers to a fishing craft irrespective of rig (see DeKerchove 1961: 749, Kemp 1988a: 810).
- 12) *Snow*: DeKerchove (1961: 753) refers to "Snow" as rig which, "differed from the brig by having a trysail mast abaft the main lower mast, to which the boom mainsail was hooped" (see also Kemp 1988a: 814).
- 13) *Unknown*: Where the rig (of vessel definitely defined with primary or secondary sailing capacity) is unknown.
- 14) *Yawl*: The term yawl appears to apply mainly to sub-categories of yacht, and are not often used in the description of trading vessels (Moore 1970: 189). Nevertheless they are present within the ANAVD.
- 15) *Lugger*: Lugger is an anomalous term, used after the Seven Years War that refers to the use of lug sails (a combination of square and lateen sail) on two or more of their masts (Moore 1970: 206-211).

#### **Section 4: Hull**

##### *Hull Type:*

This field contains the last known hull type and framework material of a particular vessel. The types of build are listed below:

- 1) *Composite hull, iron framework*: Used for vessels noted as being composite, and having iron framing. Although the term composite

implies a wooden outer hull, for the purposes of analysis hull material and framework material are separate, but linked entries. This allows for analysis by hull and by framework. Composite vessels were first used in the China trade between 1860 and 1870, but never became common. Many ships were classed as composite, but by proper definition were not. This is because the rules for composite ships were not laid down until 1867, with all vessels of both iron and wood construction before this being classed composite and experimental and subject to biennial survey requirements (McCarthy 1983b: 361).

- 2) *Composite hull, iron and steel framework*: Refers to vessels of wooden hull material with both iron and steel material used in their framing. Only one vessel the Murray River barge *Emerald* (1899 - unknown), built at Morgan South Australia is noted as having this kind of construction in the ANAVD.
- 3) *Composite hull, steel framework*: Refers to vessels where the historical records suggest a wooden outer hull was supported by a steel framework.
- 4) *Composite hull, unknown framework*: Used for vessels described as composite, but not describing the material of the framework. In this way, an analysis of all composite vessels can still be made, although the material of the vessel's framework may be historically invisible. Some variation in the definition of composite exists. For instance, vessels of wooden construction, but with elements such as cross bracing and knees are still considered wooden vessels. Furthermore, paddle steamers that were iron hulled below the bilges were also considered wooden. The term "composite" then only refers to the ferrous nature of the frames of the vessel in relation to the wooden hull outer hull. The term composite in the past has also been used to describe vessels built with a combination of traverse and longitudinal framing, although this is not used in this thesis (DeKerchove 1961: 171-172, Kemp 1988a: 191).

- 5) *Ferro-Concrete hull and framework*: A rarity in the ANAVD, ferro-concrete vessels are quite new, first being constructed in Professor Luigi Nervi in Italy in 1943 and being based in the concrete ships of World War 1. Although not necessarily having a ferro-concrete framework (the vessel is usually moulded), the term ferro-concrete framework is used to denote that the inner structural members are the same as the outer hull lining. Ferro-concrete hull construction is only reflected in two candidates in the ANAVD, the sailing vessels *Aroonee* (unknown date of build - 1991) and *Solace* (unknown date of build - 1984). This technique involves the used of ferrous mesh which is welded to steel and covered in a liquid cement mix. This is also known as ferrocement, cement-mesh or ferrocrete (Kemp 1988a: 299).
- 6) *Iron hull and framework*: Refers to vessels of total iron construction.
- 7) *Steel hull and framework*: Refers to vessels of total steel construction
- 8) *Unknown, Unknown*: Refers to vessels where there is no mention in historical documents of the hull type.
- 9) *Wood hull and framework*: Is used for vessels of total wooden construction. This includes vessels with iron or steel knees.

*Timber Species:*

This field contains the timber species for wooden vessels. This field was added due to rare occurrences when the timber species used in the construction wooden and composite vessels that could be used in the confirmation of archaeologically identified remains where timber samples were taken. A list of timber species adapted from Paasch (1978: 31-32, 1997: 35-36) and supplemented with data from historical sources on particular wrecks is included below:

- |                   |                     |                 |
|-------------------|---------------------|-----------------|
| 1) <i>Angelly</i> | 3) <i>Banaba</i>    | 5) <i>Beech</i> |
| 2) <i>Ash</i>     | 4) <i>Batitinan</i> | 6) <i>Betis</i> |



**Deep Structures: An Examination of Deliberate watercraft abandonment in Australia**  
 Appendix 2: Field List for Australian National Abandoned Vessel Database (ANAVD)

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7) <i>Birch</i>	39) <i>Maple</i>	69) <i>Thingam</i>
8) <i>Black Birch</i>	40) <i>Rock Maple</i>	70) <i>Tropical</i>
9) <i>Black Butt</i>	41) <i>Molave</i>	<i>hardwood</i>
10) <i>Blue Gum</i>	42) <i>Morra</i>	71) <i>Tulip-wood</i>
11) <i>Box</i>	43) <i>Morung Saul</i>	72) <i>Turpentine</i>
12) <i>Cedar</i>	44) <i>Mulberry</i>	73) <i>Vanatica</i>
13) <i>Chestnut</i>	45) <i>Oak</i>	74) <i>Walnut</i>
14) <i>Cuba Sabicu</i>	46) <i>Live-Oak</i>	75) <i>Black Walnut</i>
15) <i>Dungon</i>	47) <i>White-Oak</i>	76) <i>Yacal</i>
16) <i>Ebony</i>	48) <i>Olice</i>	77) <i>Yew</i>
17) <i>Elm</i>	49) <i>Palomaria de</i>	78) <i>Hard-wood</i>
18) <i>Grey Elm</i>	<i>Playa</i>	79) <i>Seasoned Wood</i>
19) <i>Rock Elm</i>	50) <i>Pine</i>	80) <i>Soft-wood</i>
20) <i>Fir</i>	51) <i>Huon Pine</i>	81) <i>Unknown</i>
21) <i>Greenheart</i>	52) <i>Oregon Pine</i>	82) <i>N/A</i>
22) <i>Guijo</i>	53) <i>Pitch Pine</i>	83) <i>Jarrah</i>
23) <i>Gum</i>	54) <i>Red Pine</i>	
24) <i>Hackmatack</i>	55) <i>White Pine</i>	
25) <i>Hemlock</i>	56) <i>Yellow Pine</i>	
26) <i>Hickory</i>	57) <i>Plane-tree</i>	
27) <i>Horn Beam</i>	58) <i>Puhutukawa</i>	
28) <i>Iril</i>	59) <i>Red Gum</i>	
29) <i>Iron Bark</i>	60) <i>Rose wood</i>	
30) <i>Jarrah timber</i>	61) <i>Brazilian Rose</i>	
31) <i>Juniper</i>	<i>wood</i>	
32) <i>Karri</i>	62) <i>Sabicu</i>	
33) <i>Kauri</i>	63) <i>Satin-wood</i>	
34) <i>Larch</i>	64) <i>Spruce</i>	
35) <i>Lignum-vitae</i>	65) <i>Stringy Bark</i>	
36) <i>Locust</i>	66) <i>Tallow wood</i>	
37) <i>Mahogany</i>	67) <i>Tamarac</i>	
38) <i>Mangachapuy</i>	68) <i>Teak</i>	

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Some problems in the classification of hull types were expected, as in the occurrence of vernacular or obscure hull types. Examples of paddle vessels from the River Murray such as *Gemini* (also known as the “Siamese Twins”) which was constructed at Mannum, South Australia in 1855 of two hulls (one new, the other the lengthened hull of the *Mary Ann*), joined by a common deck, and propelled with a central paddle (see Mudie 1965: 64) did not occur in the historical material examined.

### Section 5: Build Details

#### *Number of Decks:*

This field contains the number of decks recorded on a particular vessel and besides having historical interest was recorded for possible identification aspects.

#### *Stern Type:*

This field contains the type of stern (aft or back section) configuration of a particular vessel. Once again, this was seen as an aid in the identification of remains suspected as abandoned and a source for the marrying of historical details to archaeological remains. The list of stern types is listed below and is adapted from descriptions of stern types seen in Australian Customs House Records and supplemented with information from other sources.

- 1) *Counter*: Refers to a stern where the portion between the knuckle and the waterline overhangs the rudder. Also known as a fantail stern type (DeKerchove 1961: 180, Kemp 1988a: 208)

- 2) *Cruiser*: Refers to a stern type where the underwater surface close to the stern is broad and nearly flat, leading to a conical surface which inclines forwards towards the vessel's bow. The cruiser stern gives certain advantages in buoyancy, stability, deck room, propeller efficiency and better protection to propellers when berthed. A variation of the cruiser stern is known as the spoon stern or canoe stern (DeKerchove 1961: 188, 767). Pursey (1959: 118) considers the cruiser stern a "continuation of the main part of the hull" and adds that they are defined by their extension "below the load water line, but above the light water line" (supported by Stokoe 1968: 85). Cruiser stern type is that which is found mainly on ocean-going vessels (Eyres 1980: 224)
- 3) *Elliptic*: Described as almost an opposite to the cruiser stern with a conical shape emerging from the knuckle of the stern upwards and outwards, away from the bow. Some sources cite elliptic sterns as the same as the round stern type (see DeKerchove 1961: 258), although Paasch (1978: 97) includes separate entries for both. Pursey (1959: 116) also relates the term "elliptical stern" to the term "ordinary stern". Vessels in the ANAVD have been found described as both round and elliptic. Elliptic and round sterns have been noted as the preference of build in sailing vessels because they avoid the snagging of aft sheets and therefore avoids tearing and damage occurring to sails (O'Reilly 1999: 53). Rounded stern vessels were also better on deep-sea routes, and are therefore more often found on schooner-rigged vessels (O'Reilly 1999: 134-135).
- 4) *Half-round*: A stern configuration not reflected in descriptive treatises on ship design and construction. One candidate described in its Australian Custom House Register (Sydney: 81/1886), that of the iron paddle steamer *Barwon* (1886 - 1938) built at Moama, New South Wales, Australia has been recorded.
- 5) *Oval*: A stern configuration only noted in reference to Australian Customs House Registers (Fremantle: 7/1874 and 12/1874) of the

wooden cutter *Scud* (1874 - 1878) built at Fremantle, Western Australia, Australia and the wooden cutter *Dania* (1874 - 1886) built at Vasse, Western Australia, Australia. This description appears to be a discrepancy attributable to a variation in recording or perhaps ship construction in Western Australia.

- 6) *Round*: see Elliptic.
- 7) *Round-Counter*: Apparently a variation or hybrid of both the round and counter stern types described. This type is only seen in the Australian Customs House Register (Adelaide: 9/1913 and Melbourne: 3/1921) of the iron barque *Moe* (1876 - 1931) built at Liverpool, England, United Kingdom.
- 8) *Semi-elliptic*: This type of stern is only described in the Australian Customs House register (Newcastle: 12/1874) of the wooden brigantine *Transport* (1865 - 1888) built at Pt. George, Annapolis, Nova Scotia, Canada.
- 9) *Sharp*: Refers to a 'pointer' stern of triangular cross-section. The sharp stern has certain advantages in its cheapness to build, best longitudinal balance at sea and greater comfort in bad weather, although it does not provide good buoyancy, deck space, or room below deck. Also called a lifeboat stern or whaleboat stern (DeKerchove 1961: 714)
- 10) *Square*: Is used to describe a stern where all sides of the stern's counter runs perpendicular to the longitudinal axis of the vessel. Also known as a flat stern or square transom stern (DeKerchove 1961: 291, 771, and see Paasch 1978: 59). O'Reilly (1999: 53) has written that this type of stern was sometime built because of advantages that it provided in relation to buoyancy. She also notes that in wooden sailing vessels square sterns were sometimes a problem because aft sheets could sometimes snag.
- 11) *Straight*: This type of stern is only noted in reference to the composite paddlesteamer *Arcadia* (1903 - date unknown) built at Goolwa, South Australia, Australia. Although while may possibly be an error in the

description of the vessel (it is also noted as having a straight stem), it is equally possible that as the vessel is a paddle steamer, that both ends were straight.

- 12) *Unknown*: Applies to vessels where the configuration of the vessel is not known, or has not been recorded.
- 13) *Budget*: Kerr (1998: 8) uses the term in relation to vessels designed like Thames barges in Tasmania. No reference to this term was found during research into the ANAVD.
- 14) *Tuck*: Kerr (1998: 8) uses the term in relation to vessels designed like Thames barges in Tasmania. No reference to this term was found during research into the ANAVD.

#### *Build Type:*

This field contains the build type of a particular vessel, where “build” generally can be defined as the method of planking in wooden vessels or the shift of butts in ferrous-hulled vessels. The type of build, in the configuration of plates and planks is a major distinction where vessel design is concerned, and affects the efficiency and longitudinal strength of a vessel (Stokoe 1968: 49-50).

- 1) *Carvel*: A system of hull build where plates or planks are flush laid (where the landing edges touch each other and do not overlap), with no overlap so as to create a smooth finish to the outer hull. The space between strakes is then usually caulked (often with oakum or cotton) to make watertight. An advantage of this method is in the cleaning of the hull of marine organisms, which can more easily be scraped off due to the smoothness of the hull (see Hornell 1948: 238, DeKerchove 1961:129-130, Palmer 1971: 6, Paasch 1978: 48, Kemp 1988a: 143, Kerr 1993: 146). O’Reilly (1999: 53) has also said that carvel built wooden

sailing vessels were easier to repair and stronger. In the case of welded ferrous hulls, it is often referred to as “flush welded” (Stokoe 1968: 51).

- 2) *Clincher*: A clincher built vessel is one where each plank or plate (besides the lowest, or garboard strake) overlaps the highest edge of the strake below it. Traditionally clincher construction is seen to predominate in traditions of small boat building, due to the increased friction brought about by the greater wetted area, and has advantages due to its resistance to the opening of seams along planks in summer (see Hornell 1948: 238, DeKerchove 1961: 152-153, Palmer 1971: 6, Paasch 1978:51, Kemp 1988a: 172, Kerr 1993: 146). Additionally O’Reilly (1999: 19) notes that clincher construction was employed to support the wide breadth of a vessel. It cited as not often used in ferrous shelled vessels (Stokoe 1968: 50). Also known as clinch planking, clenched planking, lap planking, clinker construction and lapstrake construction. Marsden, in his analysis of ancient vessel remains in the United Kingdom has noted that there are examples of “reverse clinker” construction in which the sequence of overlapping strakes is reversed (lower strakes overlap the upper) citing archaeological evidence from a late sixteenth century vessel from Morgan’s Lane (Marsden 1996: 18, 31). While this is significant because it may indicate that a vessel is built “upside-down” (from gunwale to keel) it has not been included here because it has not turned up in any archaeological investigation or historical research carried out in this thesis.
- 3) *Clincher (in and out)*: A rare form of build, often used on riveted ferrous-hulled ships (Stokoe 1968: 50). This type is often not listed on historical records, and is only discernible from the archaeological remains of fairly intact vessels. This form of clincher build entails the overlapping of planks or plates in an alternate fashion with one plate being located inside of both the plates on each of its sides, rather than overlapping on one side and being overlapped on the other. This type

of build for instance is noticed on the remains of the steel barque *Garthneill* (1895 - 1935) built at Glasgow, Scotland, United Kingdom.

- 4) *Clincher and Carvel*: A rare form of build, but one listed in the Australian Customs House Registers is a combination of the two main forms of build type. In the database it is only represented by two vessels the wooden sailing ketch *Wild Duck* (1851 - 1888) built at Brisbane Water, New South Wales, Australia and the *Red Wing* (1850 - 1892) built at D'Entrecateaux Channel, Tasmania, Australia. Where each type of building technique has been actually used (i.e. in the upper or lower portions of the hull) is unknown from the historical record. While this technique stretches back as far as the "Bremen Cog" and Henry V's *Grace Dieu* (1418 - 1434) it is also recorded as having been used in fishing vessels from Spencer Gulf, South Australia in the early to mid twentieth century (Johnstone 1974: 130, Kerr 1993: 146).
- 5) *Unknown*: Where the form of build is not listed, or is not discernible.

#### *Gallery:*

Kemp (1988a: 335) describes a gallery as a "walk built out from the admiral's or captain's cabin in the larger sailing warships" similar to a sternwalk while DeKerchove (1961: 322) describes galleries as obsolete structures constructed like "[b]alconies over the stern of ships with access from the stern windows". This field contains data that relates to gallery descriptions noted in Australian Customs House Registers:

- 1) *Bridge*
- 2) *False*
- 3) *None*
- 4) *Sham/Mock*
- 5) *Quarter*

No reference to these descriptions were found during research, and are currently unidentified. For this reason this list cannot be expected to be comprehensive. Indeed, it is expected that the terms “Sham/Mock” and “False” belong to the same category.

*Head (Stemhead)Type:*

This field contains the head type at the bow of a particular vessel (for an expanded history see de L. Marshall 1994). A list and description of head types is included below:

- 1) *Bluff Bowed*: Kerr (1998: 8) noted this term in relation to Tasmanian vessels designed along British lines. The term does not seem to be used predominantly and seems to be a general description of the bow's shape.
- 2) *Billet*: Refers to a vessel with no figurehead, and where the end of the end of the head forms a fiddle-shaped scroll, which turns inward and aft. Sometimes referred to as billethead fiddle-figure head or fiddlehead and often-used in reference to the termination of a clipper bow (see below) (DeKerchove 1961: 64, Kemp 1988a: 300 and see Paasch 1978: 18).
- 3) *Clipper bow*: Refers to where the bow of a vessel makes a concave slant out of the water, as in the sharp rake of a clipper ship, which often terminates in a billethead. Also called a clipper stem, fiddle bow, cutwater bow, knee bow and overhanging bow (DeKerchove 1968: 153, Paasch 1978: 437, Kemp 1988a: 172).
- 4) *Common*: While no description to this type of stem-head has been found it has been found to describe the configuration of the wooden schooner *Crinoline* (1863 - unknown).



- 5) *Convex Elliptical*: Despite this term being used to describe the steel hulled single screw motor vessels *H.A. Lumb* (1943 – 1994) and *Karoola* (1947 – 1974), no description has currently been located.
- 6) *Curved Stem*: This term was used to describe the steel hulled screw steamer *Kos 2* (1929 – 1974) and the wooden sailing vessel *Violet* (1881 – unknown). No definition has been found so far.
- 7) *Cutter*: Used to describe the Thai-built vessel *Kate* (1871 – 1906), this term apparently has no official definition.
- 8) *Cutwater*: The term “cutwater” refers to “A term used in modern parlance to denote the forward edge of the stem, at or near the waterline. Also called the false stem. In wooden ships it referred to a timber of the knees of the head fayed to the stem above the gripe” (DeKerchove 1961: 194). This term has only been found in one example, the wooden ketch *Fleetwing* (1867 – 1915).
- 9) *Double ended*: A “double-ender”, or “double bowed” vessel refers to a boat with a sharp stem and similar lines either end, or a vessel where both ends are the same so as to facilitate motion in both directions (DeKerchove 1961: 234-235). Because of this, the term may refer to a range of configurations described above where both ends are the same, usually where the stem and stern of the vessel are straight (Graeme-Evans and Wilson 1996: 14).
- 10) *Fiddle*: Referred to as a “substitute for the traditional figurehead in the form of a scroll. It is generally called a fiddle head when the scroll turns outward (evolute) and billet head when it turns inward (involute)” (DeKerchove 1961: 279).
- 11) *Figure Head*: Refers to the ornamental carved and often-painted figure traditionally placed adjacent to the head of a vessel, usually underneath the bowsprit (DeKerchove 1961: 279-280, Paasch 1978: 18, Plate 9; Kemp 1988a: 302-304). A figurehead is probably the most obvious denotation of the symbolic meaning imbued in watercraft, with the figurehead most usually associated with the name of a vessel

or associated with some desired function or ability. The advent of steam, and the changes in vessel design that accompanied it spelt the end of the figurehead. Common figureheads include gendered busts (full or three-quarter length) and animal busts.

- 12) *Flare bows*: Flare bows refer to the sides of a vessel towards the front and in the upper strakes flare out giving the vessel increased breadth and allows the water to be thrown away from the ship rather than coming over the bow. Also known as “flare out bows” (DeKerchove 1961: 290, Kemp 1988a: 314).
- 13) *Medallion*: A type of figure head, generally a “small, medal - like representation on the vessel’s bow of a person or design” (de L. Marshall 1994: 6, Matthews 1998: 112).
- 14) *None*: According to some Australian Customs House registers there were certain vessel with no head. This does not, of course mean that the vessel lacked a stem, but rather that the vessel did not carry figure head, or any ornate work and did not have a racking, clipper type stem configuration. It is not sure whether this means that such vessels were swim-headed, or simply lacked an ornate aspect to its bow.
- 15) *Overhanging bows*: An unknown description used to classify a number of diverse types of vessel included in the ANAVD.
- 16) *Plain*: An unknown designation for a number of sail and steam vessels in the ANAVD. May refer to vessels with undecorated, straight or swim-heads.
- 17) *Punt*: A title used for the steel twin screw motor vessel *Norwhale* (1943 - 1968), but not described in any found source.
- 18) *Raked/Raking Stem*: Defined as “A straight stem having a forward rake or extending beyond the forward perpendicular” (DeKerchove 1961: 633). This type of stem is noted for reducing damage underwater if there is a collision, while also providing additional stream lining to the vessel, increasing buoyancy and seaworthiness.

- 19) *Schooner Bow*: Moore (1970: 252) describes “schooner bow” as, “an overhanging bow with a curved raking stem, concave forwards, such as is usual in schooner yachts”.
- 20) *Scow Bow*: No description to this type of bow was found during research. However, this type of bow was mentioned in relation to two wooden screw steamers constructed in New South Wales, *Pelican* (1890 - 1915) and *Tabbo* (1908 - 1930).
- 21) *Scroll*: Often described as the opposite of a billethead, a scroll (or scroll head) is an ornately curved piece of timber attached to the head in the place of a figurehead. It is distinguished from a billethead by the outward turn of the scrollwork (DeKerchove 1961: 692).
- 22) *Scroll and Shield*: As definition of “Scroll” with the addition of an ornate shield. A common designation (de L. Marshall 1994: 8).
- 23) *Sharp bow*: The only reference to a vessel having a sharp bow is in the case of the wooden paddle steamer *Britannia* (1902 - 1961) built at Moama, New South Wales, Australia. The term “sharp bow” has not been found in any other historic literature pertaining to ship design.
- 24) *Shield*: An ornate figure that resembles a shield.
- 25) *Spoon/Shovel Bow* - While not reflected in the ANAVD a spoon or shovel bow refers to “A bow, with full round sections, the shape which bears a general resemblance to the bowl of a spoon. It is mostly found on yachts, and on stern-wheel steamers designed for shallow river travel” (see DeKerchove 1961: 767).
- 26) *Square*: A head configuration used to describe the wooden side wheel paddle steamer *Barangaroo* (1889 - 1932) but not defined in historical documentation.
- 27) *Square Scow*: Designation used to describe the wooden stern wheel paddle steamer *Waterlily* (1880 - 1908), but not found in historical documentation.

- 28) *Stem*: A reference to the wooden upright post in a vessel. In reference to head configuration true meaning could not be located, but was a common designation. May instead refer to “straight stem” (see below).
- 29) *Straight Stem*: Refers to a stem that is wedge shaped and raked in a straight line or is perfectly perpendicular to the waterline. Also called a “straight bow” (DeKerchove 1961: 796).
- 30) *Swim*: A swim-headed vessel refers to a vessel with no stem, similar to the front of a punt where the front of the vessel whether purely vertical or raking towards the stern is totally flat, and quite broad (see Moore 1970: 148, Kerr 1998: 8). Effectively, all of the other categories with the exception of “none” can be termed “stem-headed”.
- 31) *Unknown*: Used in conjunction with vessels of no registration documentation, or where the documentation neglects to note the configuration of the head.

*Number of Bulkheads:*

This field contains numeric data on the number of bulkheads of a particular vessel. Bulkheads are best described as internal vertical structural elements that extend either longitudinally or athwartships effectively compartmentalising the vessel for the purposes of strength and safety. Major bulkheads extend the length or breadth of the vessel but are made watertight by extending from floors to weather deck, sometimes with access doors. A collision bulkhead is often placed in the fore part of a vessel in order to seal a vessel in the case of a collision (DeKerchove 1961: 103, Paasch 1978: 44, Kemp 1988a: 117). As the vessels in this study are often greatly salvaged, the number of bulkheads is a major diagnostic element used in the marrying of surveyed archaeological remains and historical sources.

*Number of Water Ballast Tanks:*

This field contains numeric data on the number of water ballast tanks of a particular vessel. The evidence of ballast tanks upon a vessel can be seen as a diagnostic tool for the identification of watercraft remains. The use of water as ballast means that ballast tanks that can be filled and emptied according to load requirements. This dates from 1884 when the French introduced water ballast tanks (Weski 1998: 22). Before this solid ballast of a range of types was carried in order to weigh and balance the vessel by way of adjusting its trim and making it ready for a voyage (DeKerchove 1961: 36-37, Paasch 1978: 415, Kemp 1988a: 55-56).

**Section 6: Tonnage**

*Gross Tonnage:*

This field contains numeric data on the gross tonnage of a particular vessel. Gross tonnage (often abbreviated as g.r.t) is defined as a vessel's permanently enclosed internal space below the tonnage deck (the upper deck of ships with less than three decks, and the second deck from below in other kinds of vessel) with the addition of all enclosed spaces above the tonnage deck, but excluding the space dedicated to a double bottom, measured in increments of one hundred cubic feet (Stevens 1947: 47, Pursey 1952: 5; 1959: 199, Lloyd's of London 1959: 256; 1973: 426; 1981: 496; 1991: 377, Stokoe 1968: 116, 121, Palmer 1971: 67, Baty 1984: 11).

*Net Tonnage:*

This field contains numeric data on the net tonnage of a particular vessel. Net Register Tonnage (often abbreviated as n.r.t.) is a calculated tonnage

measurement taken as one hundred cubic feet per ton of any space that is enclosed in a vessel minus any space dedicated to the engines, propulsion, navigation, and crew living spaces (which are subtracted from a vessel's gross tonnage) (Stevens 1947: 65, Pursey 1952: 5; 1959: 199-200, Lloyd's of London 1959: 256; 1973: 427; 1981: 500; 1991: 380, Stokoe 1968: 116, 121, Palmer 1971: 67).

Stevens (1947: 47) has suggested that although there is no scientific way to determine the relationship between gross and net tonnage, there is a general rule that the approximate proportions of gross to net tonnage is about 3:2.

#### *Other Tonnage Measurements*

There are many other tonnage terms and measurements used. Lightweight tonnage refers to the tonnage of the ship itself, machinery such as the engines, boiler, and boiler water. Displacement tonnage refers to the weight of the water displaced by a particular waterborne hull when loaded to its load draught (line of maximum allowed immersion). Deadweight tonnage refers to the number of tons a vessel can have loaded before she reaches her load draught (Pursey 1952: 5, Lloyd's of London 1959: 256; 1973: 425; 1981: 493; 1991: 373, 374, Eyres 1980: 4). Under deck tonnage refers to the volume (cubic capacity) of space enclosed below the tonnage deck (Lloyd's of London 1981: 507; 1991: 385). Modified tonnage refers to vessels designed to "run in service at a load draught which is much less than that allowed by the Load Line Rules", and upon classification becomes known as Alternative tonnage (Stokoe 1968: 121-122). It should also be noted that while tonnage is a useful measurement, the institution of load lines, which vary according to a range of variables, such as water salinity and season, of which there is now an international convention (1966) on came to be the more accurate and widely used standards in the proper loading of materials on vessels (Cockcroft 1983: 333, 337-343). Eyres (1980: 308-311) also refers to British tonnage.

McCarthy (1996: 137 footnote 1) has also noted that while “tonnage” is often cited in historical records, which one of the specific types of tonnage that this represents is not often specified.

### **Section 7: Dimensions**

The fields are set up with a required imperial measurement to be inputted which have then been used as data for the calculation of metric conversion. This metric conversion was used for the comparison of vessel remains with unidentified archaeological remains.

The data on dimension in the ANAVD is mainly historical data. In some cases archaeological data has been used due to secondary source historical information citing metric dimensions for certain vessels (such as seized refugee and fishing vessels in the Northern Territory).

#### *Length (Feet):*

This field contains numeric data on the length (feet and tenths of a foot) of a particular vessel.

#### *Breadth (Feet):*

This field contains numeric data on the breadth (feet and tenths of a foot) of a particular vessel.

#### *Depth (Feet):*

This field contains numeric data on the depth (feet & tenths of a foot) of a particular vessel.

## Section 8: Hulking details

The term “hulk” for the purposes of this thesis refers generally to any vessel traditionally known as a “dumb vessel”. The definition of a “dumb vessel” is any vessel that has never had, or was converted so that it has no means of self-propulsion (Blackburn 1978: 132, 205). However, within a descriptive list of “hulk types”, the term has it’s own specific meaning (see below).

*Was Vessel Hulked?:*

This field contains data on whether a vessel was hulked or not.

*Hulk Type(s): (2 fields)*

These fields contain data on the types of hulk or the specialised purposes as hulks that a particular vessel fulfilled. It is linked to a table containing the following fields (interim data): There are five major classification descriptions where this field is concerned:

- 1) *Barge*: Barge is a term of many diverse descriptions. Originally, it is believed to denote the rig of a ship similar to that of the “Barque”. It has also been known to be used in relation to ceremonial vessels (such as “state barge”), the second vessel of a British warship and a range of regional vessel types such as the British Thames Barge, Hay Barge and Topsail Barge and the Dutch Barge (Blackburn 1978: 31-34, Kemp 1988a: 59-60). A further complication, as already mentioned arises in that the classification for the rig “Ketch” in Tasmanian registration systems was traditionally “Barge”. For the purposes of this study a barge is considered to be a “dumb vessel” and seen characteristically as a square planned, single decked, and often hard-chined vessel used in



the transportation of goods or materials around port. In such a function barges are most commonly identified as the vessels towed behind river steamers on the Murray-Darling system (Parsons 1983d: 5). Indeed for the purpose of marine insurance, a “dumb barge” is listed as referring to any barge without any means of motive power (Stevens 1947: 36, Lloyd’s of London 1981: 494; 1991: 374, Parsons 1983d: 5). There is one case of a vessel, the iron motor vessel *Pelican* (1880 - 1971) being described as a “motor driven barge” in that ANAVD which does not fit any normal system of classification. In the case of all vessels listed as a barge and being obviously unrigged the term “dumb barge” or “general barge” has been used in the ANAVD.

- 2) *Hulk*: The term hulk has traditionally meant many things. Originally, it was used to denote a large cargo ship similar to a carrack. Later it was used to describe a large awkward vessel with a round stern and in the eighteenth century, it was used as a general means of describing the hull of any ship (Blackburn 1978: 174, Kemp 1988a: 406). For the purposes of this study, a hulk is a vessel, no longer insured for or engaged in an active trade, but instead fulfilling a secondary, support function. This function sees it as a stationary vessel, either afloat or beached and used in either the storage or transportation around port of goods within its hull. Another term traditionally used in the place of “hulk” is that of “receiving ship” where a vessel became a barrack in a navy port (Blackburn 1978: 281).
- 3) *Lighter*: A lighter is generally considered a vessel, with no means of propulsion that is used to carry cargo from a ship to shore and vice versa (Blackburn 1978: 205, Kemp 1988a: 482). For the purposes of this study a lighter is a vessel, no longer insured for or engaged in an active trade, but instead fulfilling a secondary, support function. This function sees it as a floating vessel used similar to a barge where it is towed behind another vessel. A lighter can be distinguished from a barge because its hull shape is often more suited to offshore activity

and it may have multiple decks, as well as deck space that can be used. There are some exceptions to this rule. For instance, vessels described as “hoppers” which are towed and used in the transportation and dispersal of dredged silt (Blackburn 1978: 170) have not been categorised as lighters, but fully functional (primary support) vessels. Other complications arise in that there are vessels in the ANAVD that list vessels such as the wooden steamer *Nirimba* (1895 - 1945) and the wooden screw steamer *Myall River* (1912 - date unknown) as “steam lighters” and the steel screw steamer *Centipede* (1913 - 1990), the iron paddle steamer *Samson* (1865 - 1915) and the iron screw steamer *Alexandra* (1863-1906) as “motor driven lighters”.

- 4) *Pontoon*: A pontoon is a vessel with only one deck and no hold, often used as a platform of some sort or within the same general function as a barge. There are many adapted functions of a pontoon, although every variation is somewhat similar, and usually entails a flat bottomed, platform like vessel used in a support function (see Blackburn 1978: 263, Kemp 1988a: 659).
- 5) *Specialised*: A vessel, not fitting into any of the above categories, but seen as fulfilling a unique secondary role such as use as a bridge, or bathhouse (see Chapter 8).

*Was vessel a customised hulk?:*

This field concerns whether a vessel was built for a purpose akin to that which vessels are hulked for.

*Date hulked:*

This is the date in which a particular vessel was “hulked” or converted for secondary support function. In the case of a vessel built for hulk like purposes, the hulking date equals the build date.

*Hulk tonnage:*

This field contains numeric data on the recorded tonnage of the vessel as hulk. This indicates whether there was substantial amendment made to the hull that caused a reclassification of its tonnage according to an increase or decrease in overall capacity.

**Section 9: Modification Details**

*Date Modified:*

This field contains the year of a previous modification of a vessel. A modification will occur to a vessel if that modification makes it more suitable to a trade, and if the owner sees that vessel making more money in that new function. Modification, often seen in the lengthening, deepening or broadening of the vessel, and sometimes in a reduction to dimension is of a major expense and is therefore an important indicator of economic status and climate (see Chapter 8).

*Previous Propulsion:*

This field contains the previous propulsive means of a particular vessel. This field is linked to a table containing the same data as is seen in the propulsion field. Additionally the term N/A (not applicable) is used to describe vessels that have not been modified.

*Previous Number of Masts:*

This field contains the previous number of masts of a particular vessel. If the number is 0 and not referenced it means that it was not modified, if 0 and referenced, then the vessel previously did not have a mast.

*Previous Hull Type:*

This field contains the previous hull type of a particular vessel. This field is linked to a table containing the same data as is seen in the hull type field. Additionally the term N/A (not applicable) is used to describe vessels that have not been modified.

*Previous Gross Tonnage:*

This field contains numeric data on the previous gross tonnage of a particular vessel. If the number is 0 and not referenced it means that it was not modified, if 0 and referenced, then the vessel previously did not have a mast.

*Previous Net Tonnage:*

This field contains numeric data on the previous net tonnage of a particular vessel. If the number is 0 and not referenced it means that it was not modified, if 0 and referenced, then the vessel previously did not have a mast.

*Previous Length:*

This field contains numeric data on the previous length dimension of a particular vessel. If the number is 0 and not referenced it means that it was not modified, if 0 and referenced, then the vessel previously did not have a mast.

*Previous Breadth:*

This field contains numeric data on the previous breadth dimension of a particular vessel. If the number is 0 and not referenced it means that it was not modified, if 0 and referenced, then the vessel previously did not have a mast.

*Previous Depth:*

This field contains numeric data on the previous depth dimension of a particular vessel. If the number is 0 and not referenced it means that it was not modified, if 0 and referenced, then the vessel previously did not have a mast.

## **Section 10: Archaeological Identification**

*Archaeological Status:*

This field contains data on the archaeological status of a particular vessel. It is used primarily for the choosing of vessels for study, and due to the large sample size a means for excluding vessels for active investigation. It is also included to show which vessels have been included in previous archaeological studies or investigations. The terms

- 1) *Definite Identification:* Where the located and surveyed archaeological remains of a vessel have been positively matched with an entry for a vessel in the ANAVD
- 2) *Provisional Identification:* Where the located archaeological remains of a vessel have been provisionally matched with an entry for a vessel in

the ANAVD. In most cases this will be pending further investigation and will

- 3) *Unlocated*: Where a particular vessel in the ANAVD is unlocated
- 4) *Unsurveyed*: Where a particular vessel in the ANAVD is located and believed to be matched with an entry for an ANAVD vessel, but has not been examined in this study.

## Section 11: Abandonment Details

### *Geography of Accumulation:*

This field contains the name of an accumulation of abandoned vessels that a particular vessel may be a part of (i.e. a ships' graveyard name). This field is linked to a table containing the ships' graveyards in Australian Waters defined before, or during this study

### *Geography of Abandonment:*

This field contains the geographical naming details of the location of a particular vessel. It is linked to a table that contains the place of abandonment, and Australian state of abandonment, giving the abandonment location and/or the location of a particular ships' graveyard

### *Environment of Abandonment:*

This field contains whether a vessel was abandoned in a riverine or marine environment. In this way an analysis of the cross-section of the types of vessels operating in a given region can be established.

*Port of Abandonment:*

This field is linked to a table that has within it the major port from which the vessel travelled from in order to be abandoned.

*Date Abandoned:*

This field contains numeric data of the year that a particular vessel was abandoned.

*Actual Date Abandoned:*

This field contains the period within which a particular vessel was abandoned, as although the year of abandonment is often known, unlike most shipwrecks the specific time, date and month may not be known.

**Section 12: Aspects of Abandonment**

*Salvaged?:*

This field contains data concerning whether a particular vessel is recorded as being salvaged at some stage for scrap and fittings.

*Dates of Salvage:*

This field contains data concerning the dates when material was salvaged off a particular vessel.

*Reason for Abandonment:*

In order to assess the pressures that lead to the abandonment of a particular vessel, a tentative reason list has been created. There are four 'themes' within this list.

- 1) *Technological*: The innovation and wholesale adoption of new technologies on a range of levels has demonstrable effects on vessels representing old methods. This normally makes a vessel obsolete (to be discussed)
- 2) *Condition*: The effect of age and wear and tear may culminate in the decision to abandon a vessel
- 3) *Economic*: Historic events such as the Great Depression or of particular trades and industries disappearing
- 4) *Unknown*: Where there is no historically mentioned reason.
- 5) *Crime*: The abandonment of vessels as a criminal act, either from a mutinous crew, or as an attempt at marine insurance fraud.

*Post Abandonment Use:*

The abandonment of a vessel for a particular purpose appears to be common behaviour and is shared between many candidates (see Chapter 9). There are a number of themes pertaining to this:

- 1) *Structural*: In many cases vessels have been sunk for use as underwater, intertidal or dry structures such as artificial reefs (underwater), breakwaters (underwater and intertidal), piers and mooring markers. Often vessels have also been used as a means of beginning, speeding up or increasing reclamation efforts in order to fill in waterways that are to be used for other purposes.
- 2) *Storage*: A variation of the structural theme, often vessels have been abandoned to be used as storehouses in order to allow easy storage



and transportation of goods of a particular type (such as explosives) to and from water borne transport.

- 3) *Other*: In certain isolated cases, vessels have been abandoned for special reasons, such as movie props and dive training facilities.
- 4) *Unknown*: Used for vessels of unknown post-abandoned use.
- 5) *Military*: Often vessels have been chosen for the explicit purpose of providing the military with a target upon which to test its crews or weapons.
- 6) *Salvage Only*: In a large number of cases vessels have been beached in order to obtain raw materials from them.

*Means Abandoned:*

The place of abandonment can be communicated in many ways. As well as spatial co-ordinates, another important factor is where the vessel was placed in relation to tidal height. In many cases this is done according to the intended purpose of the vessel after its abandonment, such as in the case of requiring access to the hull to salvage materials, or it is done in relation to the costs associated with the transportation of a vessel to deep enough water in order to sink it. There are only really two forms of abandonment from the perspective of how the vessel was disposed of, where the vessel has been run aground before being modified in order to make it unable to displace water and hence float, and the opening of a vessel at sea in order to sink. The later method describes here is generally known as “scuttling a vessel” which is defined as “To let water into a ship for the purpose of sinking” (Stevens 1947: 78), although it seems to be popularly understood as using explosives on a vessel at sea in order to purposefully sink it in deep water. The choices in this field are as follows:

- 1) *Shallow water*: Where the vessel was abandoned in an intertidal area where it is only exposed for a portion of any given day, or can only be

seen from the surface in a given season. The remains of this vessel may pose a navigation hazard.

- 2) *Deep Water*: Where the vessel is submerged one hundred percent of the time and is in no way a threat to navigation. It can only be impacted upon by forces acting upon it from under the water.
- 3) *Beached*: Where the vessel was placed so that it was highly accessible and any substantial portion would have been visible all of the time.
- 4) *Demolished*: Where the vessel was so impacted upon by salvage and hull minimisation that no visible archaeological remains are expected to still exist
- 5) *Unknown*: Where there is no historical documentation pertaining to where the vessel was placed.

One problematic aspect of this categorisation is that over time changes to surrounding land, waterway depth or indeed sea level will have affected the status of the vessel in relation to the tides, especially where vessels once in shallow water are now dry and where beached vessels are increasingly becoming inundated.

*Abandonment Assurance:*

This field refers to a number of placement assurance and abandonment processes referred to in Chapter 9.

- 1) *Opened*: Where there is an historical reference to the vessel having its sea cocks opened in order to facilitate sinking.
- 2) *Gunfire*: Where the vessel has been used in a military training exercise that meant gunfire (large calibre) was used as a primary source of it being sunk.
- 3) *Bombed*: Where the vessel has been used in a military training exercise that meant airborne bombing practice facilitated sinking.

- 4) *Filled*: Where there is historical or archaeological evidence that the vessel was filled with material in order to assure that it sank or was beached permanently
- 5) *Burnt*: Where there is historical or archaeological evidence that a vessel was burnt in order to assure its abandonment.

### Section 13: Registration Details

Shipping registers of many different kinds provide the researcher with an opportunity to gain insight into aspects of vessel histories that no other source can provide. The history of shipping registers is intimately linked with marine insurance and has been discussed in Chapter ??

*Primary Registers:*

Start Primary Register: (eg/- 1883)

End Primary Register: (eg/- 1930)

*Secondary Registers:*

So called secondary registers are useful in the augmentation of information gained from primary registers, and many cases register vessels not otherwise registered elsewhere, but are often lacking in the detailed information of such insurance registers as Lloyds. Secondary Registers such as the Mercantile Navy List (also known as the Mercantile Navy Register)

Start Secondary Register: (eg/- 1884)

End Primary Register: (eg/- 1940)

*Customs House Registers:*

There are two fields specifically related to customs house registers in the ANAVD

*End Customs Register:* This is the last date of registration in any customs house register for a particular vessel. If a vessel should happen to transfer to another registry notification is usually given of that transferral and to which register, it has been transferred to.

*Registration History:* The full history of registration in particular customs house registers including name of port, number in year of registration (i.e. 13/1872 means it was the 13<sup>th</sup> vessel registered at a particular port in 1872) and the registered name of the vessel. Through the inclusion of the official number of a vessel on most records, it is then easy to track changes in registered name through the years and across ports of registry.

#### **Section 14: Ownership Details**

Mainly for historical interest and for problematic identification of similarly named candidates, the ownership section of the ANAVD lists all known owners of a particular vessel. This may shed some light on the pattern of purchase for large and small companies engaged in trade in Australia and may show the decline or rise of particular companies according to their purchases in particular vessels and particular technologies.

*Ownership History:* Referenced list of vessel owners through time.

#### **Section 15: Function Details**

The intended purpose of vessels indicates to some degree the commencement and health of particular economic niches and trades. For the purposes of this study a list of purposes adapted from Coroneos and McKinnon (Coroneos 1997: 31, Coroneos and McKinnon 1997: 21). This system allows for analysis of the data by thematic category, larger purpose, or specific type.

Defining vessels for the purposes of quantitative analysis is dangerous, because while a vessel may predominantly fulfil on function, it may have also fulfilled a range of ancillary functions that are not likely to be reflected in the available histories of that vessel. Nevertheless, there are a few general categorisations that can be used in looking at function. Stokoe, for instance defines passenger ships as “one which may accommodate more than twelve passengers” (1968: 1).

*Purpose1: (eg/- 98)*

*Purpose2: (eg/- 98)*

*Purpose3: (eg/- 98)*

*Environment of Purpose:*

The environment in which the vessel was intended to be operated in is of great relevance as it dictates the suitability of a design of vessel to a particular place (ie/- at sea or on inland waterways).

## **Section 16: Notes**

*Historical Notes:*

This field contains extended discussion and historical miscellany concerning a particular vessel and relates each point to the source reference list.

## **Section 17: References**

### *Source Reference List:*

This field contains a list of sources for primary, secondary and tertiary sources written on or referring to a particular vessel. It refers to a central reference list, contained in the references of this thesis (see Appendix 1 and Reference List)

### *Photographic Reference List:*

This field contains a list of sources for historical and site photographs of a particular vessel

## **Section 18: Image**

### *Historical Photo:*

This field contains an OLE embedded image of the vessel in operation.

### *Photo Caption:*

This field contains a caption, and source information for the historical photograph.

# **APPENDIX 3**

## **An Overview of Systems of Tonnage and Dimension Deduction**

## APPENDIX 3:

### AN OVERVIEW OF SYSTEMS OF TONNAGE AND DIMENSION DEDUCTION

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#### Introduction

Included below is a brief overview of systems of tonnage and dimension deduction that have been used in marine surveying and classification in the past. While this is just a brief overview, it serves to illustrate some of the inherent problems with using historically documented tonnage and dimension values for the comparative analysis of watercraft from different nations over long periods of time (as described in Chapter 4).

#### Tonnage Deduction

Although there have been various attempts at international standardisation for the methods in deducing tonnage of merchant ships, their introduction came quite late. The first movement towards global standardisation, the British “Moorsom” system was adopted by most maritime nations between 1865 and 1885 (and the concept of net tonnage was not incorporated into this system until 1867) (Kaukiainen 1995: 29). Major changes in deducing and classifying the tonnage of vessels in the nineteenth and twentieth centuries have been made with tonnage rules being changed in 1894, 1959 (an amendment to the 1894 rules) and 1967 (Stokoe 1968: 115-122). As late as the 1930s the League of Nations took on the task of uniformity and international standardisation, and by 1947 had proposed the “Oslo Rule” for tonnage deduction that was signed by nine European countries (Kaukiainen 1995: 35-36). The International Maritime Organisation (IMO) again made changes in 1969 in an international agreement because of the perceived imperfections of



the Moorsom system (Kaukiainen 1995: 29). Despite such changes, these systems have evolved over time, especially when new technologies call for amendments, due to changing perception of useable tonnage spaces. Examples of this are the exemption of water ballast tanks and deckhouses from being included as tonnage (Kaukiainen 1995: 35). Nevertheless, there were quite a number of variations to the deduction of shipping tonnage before this the current rules in relation to tonnage deduction that need to be acknowledged to understand problems for comparison. For instance, as French (1973: 434) has noted, "During the eighteenth century various methods existed for obtaining shipping tonnages". Tonnage has been deduced via a range of methods and has meant that a number of nations, over time have all used a range of names denoting different methods of determining the tonnage of a particular vessel. Early systems had simple formulae, usually a combination of other dimensions such as the length, breadth and depth of a vessel divided by a given number. This often gave a number that was assigned as a "measured tonnage", a number different, but related to another concept - "registered tonnage" (which was often two thirds of the other figure). This is not to say that all methods used in the obtaining of tonnage values for ships were always either reliable, or sensible.

### **Vessel Dimensions**

The most widely known method for determining the length of the vessel as cited by Coroneos and McKinnon (Coroneos 1997b: 32, Coroneos & McKinnon 1997: 22) is for the measurement to be taken "from the forepart of the stem under the bowsprit to the aft side of the head of the stern-post". Pursey (1959: 4) outlines a different method, being the distance along "the summer load line, from the fore side of the stem to the after side of the rudder post, or to the centre of the rudder stock if there is no rudder stock". Likewise the normal way for determining the breadth of the vessel as cited by Coroneos and McKinnon (Coroneos 1997: 32, Coroneos and McKinnon 1997:

22) is for the measurement to be taken from the “main breadth of the vessel to outside of the outside”. It is important to note that some definitions differ according to minutiae within the language. The American Bureau of Shipping for instance explicitly states that breadth is determined by moulded depth, that is the breadth at the moulds extremes, not that at the deck level (American Bureau of Shipping 1950: 4). Pursey (1959: 4) concurs with the definition of the moulded breadth but adds that it is “measured from side to side, outside the frames, but inside the shell plating”. The normal way for determining the depth of the vessel as cited by Coroneos and McKinnon (Coroneos 1997: 32, Coroneos and McKinnon 1997: 22) is for the measurement to be taken from the “depth at the main hatchway from the underside of the tonnage deck to ceiling planking at the inside of the limber strake”. Pursey’s definition (1959: 4) seems to differ somewhat being cited as “measured vertically, at the middle length of the ship, from the top of the keel to the level of the top of the beams at the side of the uppermost continuous deck”. It should be noted that the depth of a vessel is different from its draught (the distance from the keel to the waterline). Whereas the latter term refers to the depth of the hull that is immersed when the vessel is waterborne (that is, the depth of water the hull draws), the measured depth of a vessel is the combination of that draught (usually defined as a load draught) and the vessel’s freeboard (the depth of the hull from waterline to uppermost deck, although some sources cite the distance from load line or plimsoll mark to the deck) (Lloyd’s of London 1959: 256; 1981: 495). As with breadth, the American Bureau of Shipping further stipulates that it is moulded depth that is the standard of appropriate classification (American Bureau of Shipping 1950: 4). Eyres (1980: 9) has also noted that dimensions in the modern world are very different with a range of ways to measure – length may be overall or Lloyds beam and draft may be moulded or extreme.

Sexton (n.d.: 6-7) notes the following standards for determining the dimensions of a vessel in Customs House Register. Length is taken as the fore

part of the stem to the aft side of the sternpost. Beam (breadth) is taken as the distance of the outside planking except between 1836 and 1854 when it was measured as the distance between the internal aspects of the inside of the hold. Depth is taken as the total height of the hull of a vessel, except before 1836 when the distance between decks was taken as the depth of multi-decked watercraft. Likewise the tonnage measurement before 1836 was old measurement (length of the keel times by the beam squared and divided by 188). "Simpson's rule" or "new measurement" was introduced in 1854.

# APPENDIX 4

## Commonwealth Declared Areas

## APPENDIX 4

### COMMONWEALTH DECLARED AREAS

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#### Introduction

As mentioned in Chapter 10, there are fourteen officially designated areas set aside for the dumping of unwanted watercraft in Commonwealth waters. These areas were decreed in Australian Commonwealth legislation entitled the *Beaches, Fishing Ground and Sea routes Protection Act 1932* (Act No. 7 of 1932), and were described in the *Statutory Rules for Commonwealth Acts 1933* (pps. 98-104). The maps of these areas, and the published description of the locations have been reproduced on the following pages.

### The Commonwealth Areas

Area No.1 – for Sydney: Outside the 100 fathom line within a circular area 5 miles in diameter with centre of latitude  $34^{\circ} 0' S.$ , longitude  $151^{\circ} 36' E.$ , with South Head Lighthouse bearing  $299^{\circ}$  distant 18 miles (Figure A4.1).

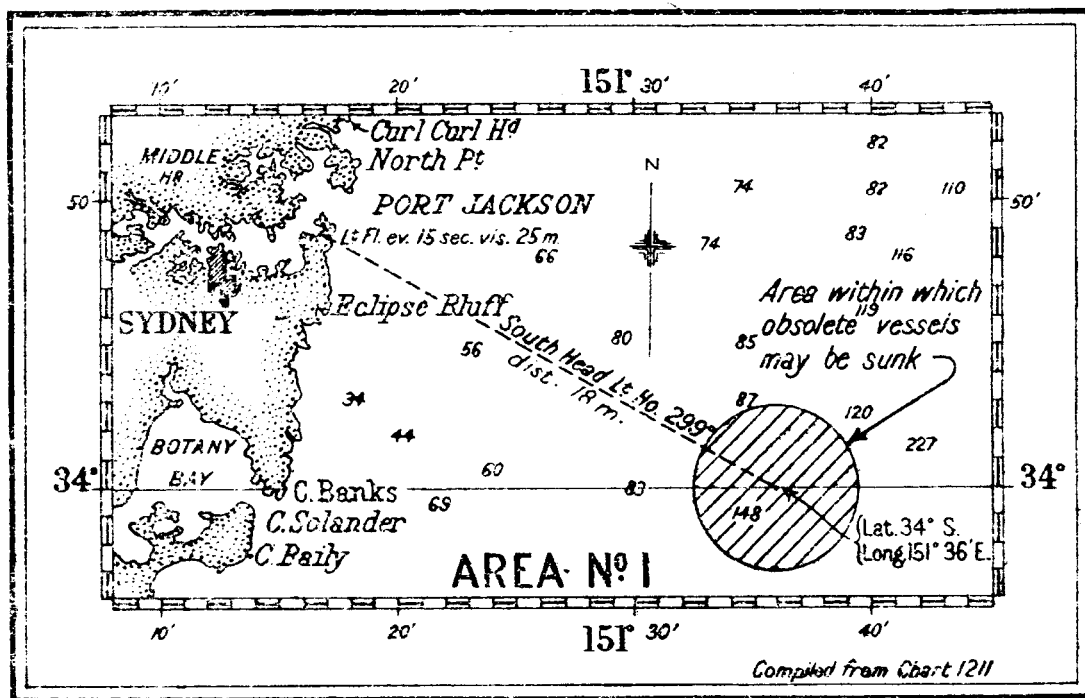


Figure A4.1 Commonwealth Area 1 (Sydney) (reproduced from Statutory Rules, Commonwealth Acts 1933: 98)

Area No.2 – for Newcastle: Outside the 100 fathom line within a circular area 5 miles in diameter with centre in 33° 3' S., longitude 152° E., 104° distant 33 miles from Nobby's Head. Port Stevens Lighthouse distant 22 miles, with high land of Toomere Head bearing 326° (Figure A4.2).

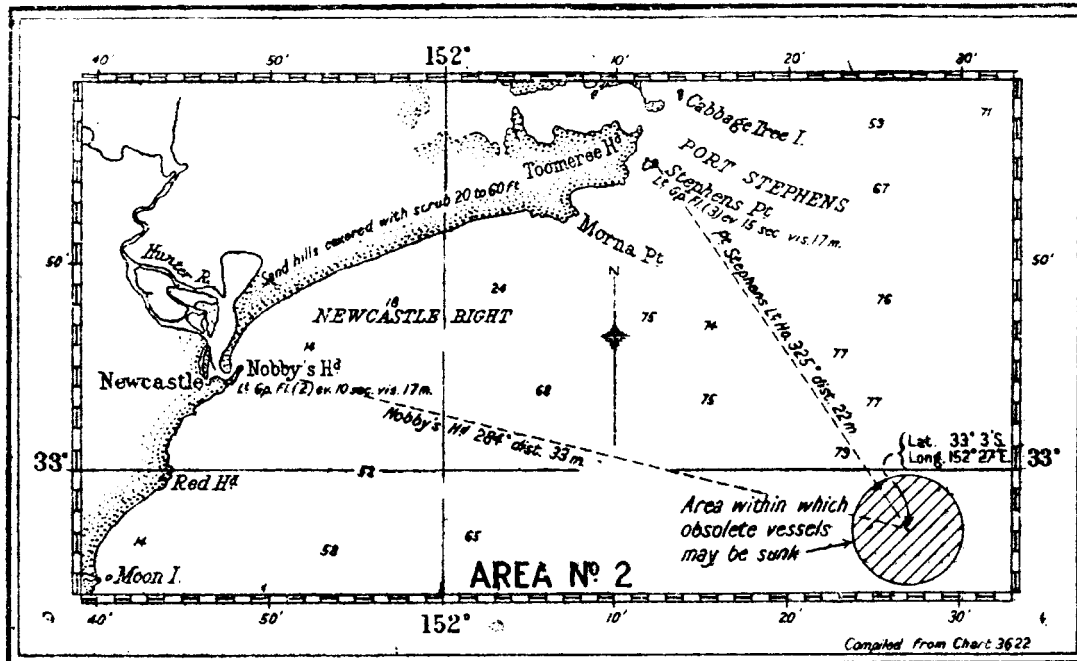


Figure A4.2 Commonwealth Area 2 (Newcastle) (reproduced from Statutory Rules, Commonwealth Acts 1933: 98)

Area No.3 – for Melbourne and Geelong: In about 25 fathoms within a circular area 3 miles in diameter, with centre in latitude  $38^{\circ} 21' S.$ , longitude  $144^{\circ} 25.5'E.$ , with Barwon Heads bearing  $46^{\circ}$  distant 5 miles (Figure A4.3).

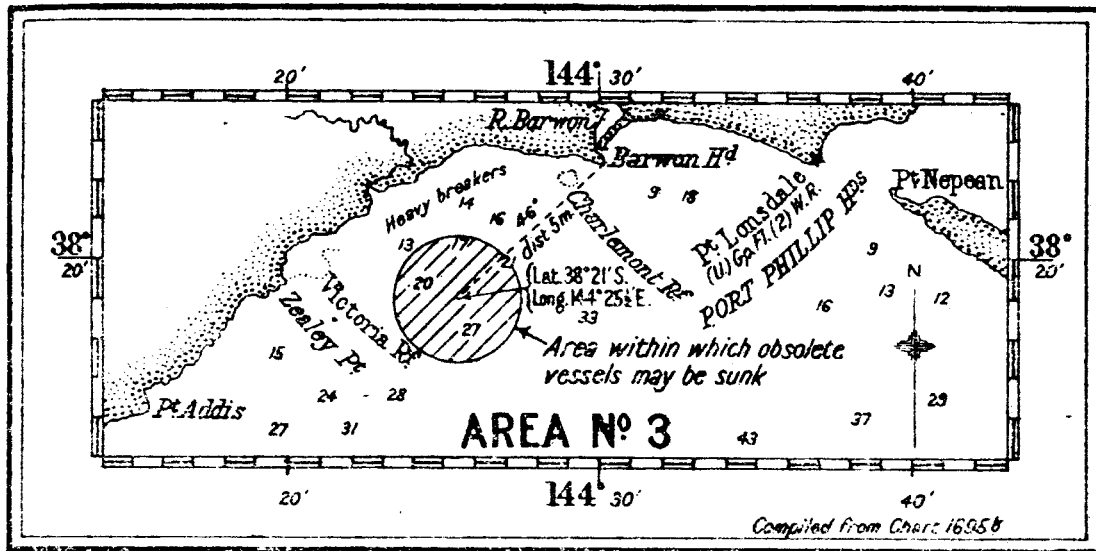


Figure A4.3 Commonwealth Area 3 (Melbourne and Geelong) (reproduced from Statutory Rules, Commonwealth Acts 1933: 99)



Area No.4 – for Hobart: Outside the 100 fathom line within a circular area 5 miles in diameter with centre in latitude 43° 14' S., longitude 148° 22' E., Tasman Island Lighthouse bearing 270° distant 15 miles. Note: The sinking area within the Hobart port limits is on the edge of the reef at the south end of Betsy Island situated to the eastward of the entrance to the Derwent River (Figure A4.4).

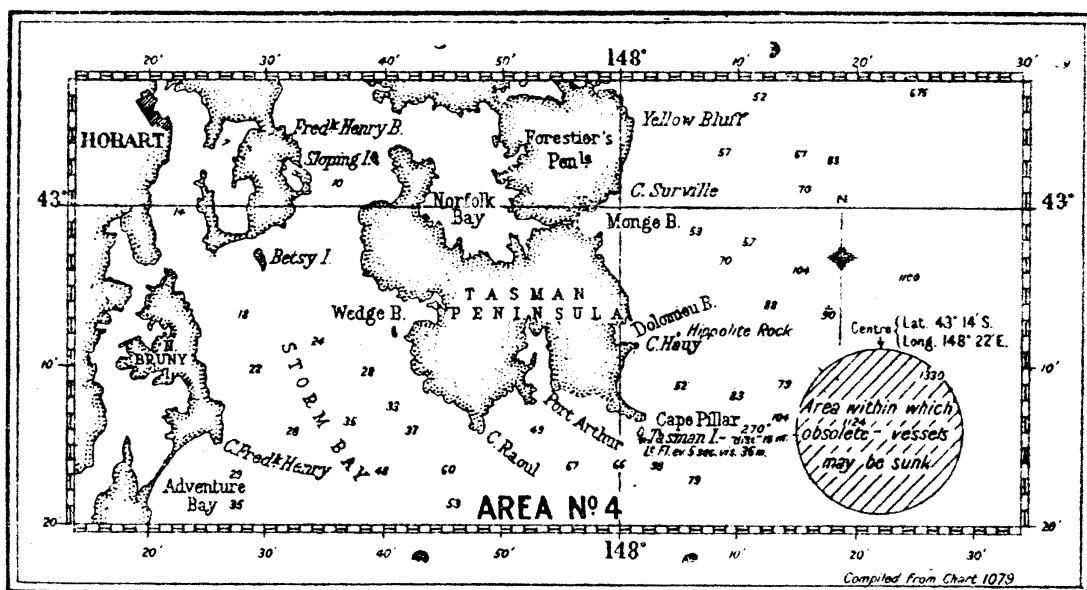


Figure A4.4 Commonwealth Area 4 (Hobart) (reproduced from Statutory Rules, Commonwealth Acts 1933: 99)

Area No.5 - for Adelaide and Gulf Ports (eastern area): South of Macdonnell Peninsula in 26 fathoms within a circular area 5 miles in diameter with centre in latitude  $35^{\circ} 57.5' S.$ , longitude  $137^{\circ} 55' E.$ , Cape Hart bearing  $63^{\circ}$  distant 7 miles (Figure A4.5).

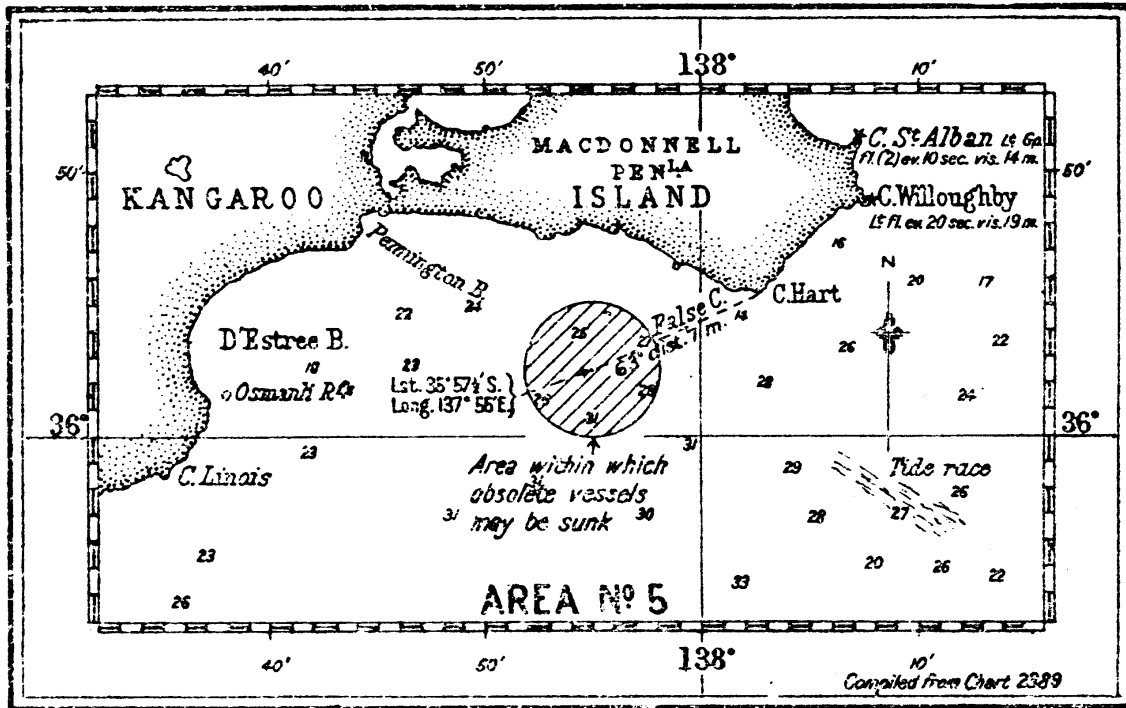


Figure A4.5 Commonwealth Area 5 (Adelaide and Gulf Ports - East)  
(reproduced from Statutory Rules, Commonwealth Acts 1933: 100)

Area No.6 – for Adelaide and Gulf Ports (western area): West of Kangaroo Island in 50 fathoms within a circular area of 5 miles in diameter with centre in latitude  $35^{\circ} 57.5' S.$ , longitude  $136^{\circ} 25.5' E.$ , Cape Coudie bearing  $115^{\circ}$  distant 15 miles (Figure A4.6).

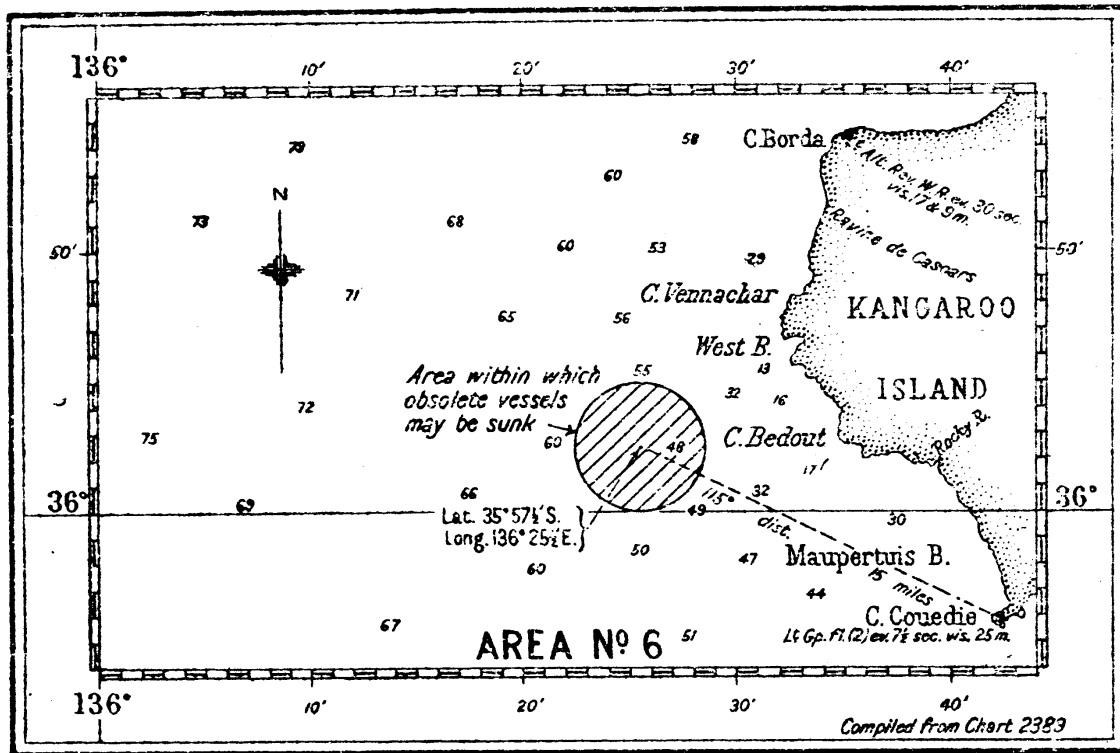


Figure A4.6 Commonwealth Area 6 (Adelaide and Gulf Ports - West) (reproduced from Statutory Rules, Commonwealth Acts 1933: 100)

Area No.7 – for Fremantle: Within a circular are 7 miles in diameter with centre in latitude  $32^{\circ} 4' S.$ , longitude  $115^{\circ} 20' E.$ , with Rottnest Island Lighthouse bearing  $68^{\circ}$  distant 11 miles (Figure A4.7).

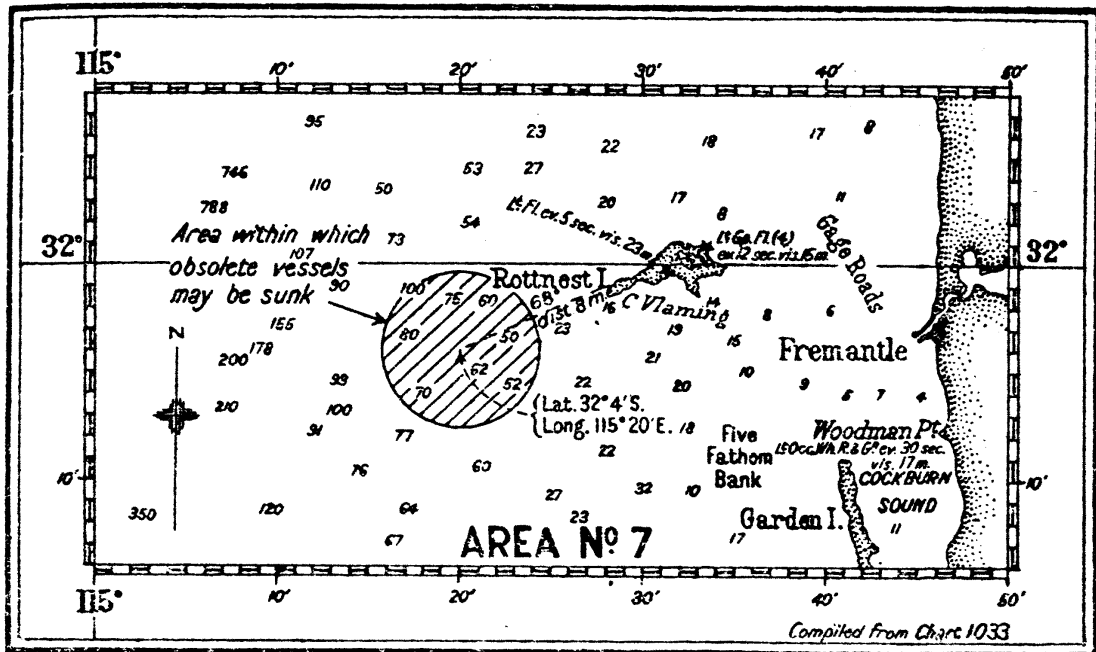


Figure A4.7 Commonwealth Area 7 (Fremantle) (reproduced from Statutory Rules, Commonwealth Acts 1933: 101)

Area No.8 – for Albany (Eastern Area near Cape Vancouver): Within an area bounded – To the westward – by a line between the south end of Inner Island and the north end of False Island. To the northward – by a line between the south end of Inner Island and the nearest part of the mainland. To the eastward – by the mainland. To the southward – by the northern shore of False Island (Figure A4.8).

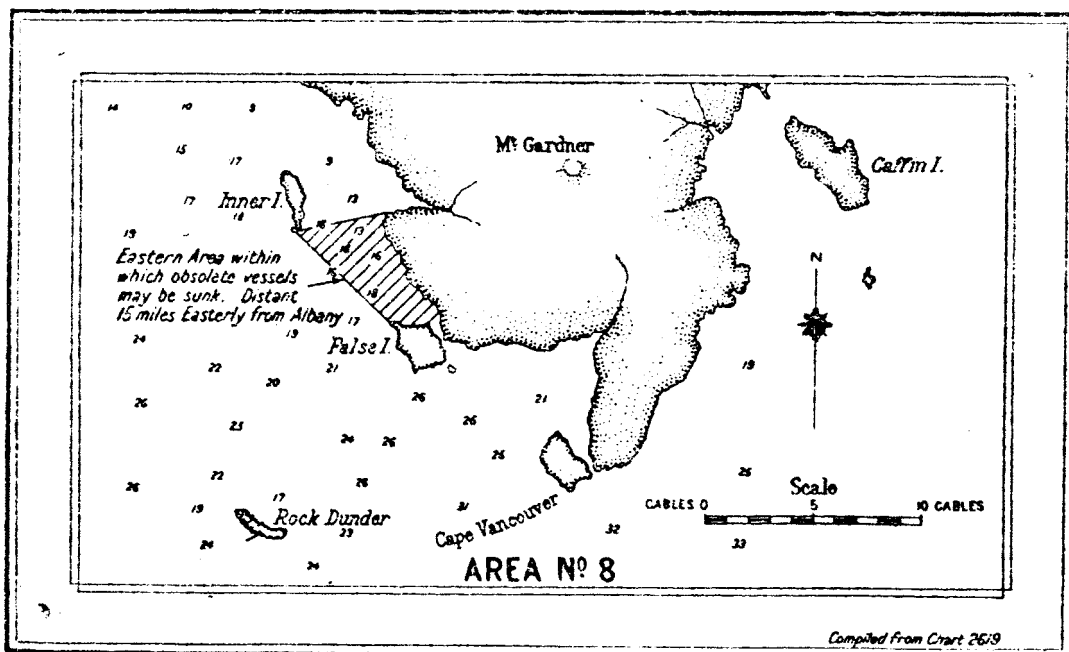


Figure A4.8 Commonwealth Area 8 (Albany - East) (reproduced from Statutory Rules, Commonwealth Acts 1933: 101)

Area No.9 – for Albany (Western Area near Bald Head): North of a line between the headlands of the Middle Bay (unnamed on chart 2619). South of the Limestone Head Peninsula (Figure A4.9).

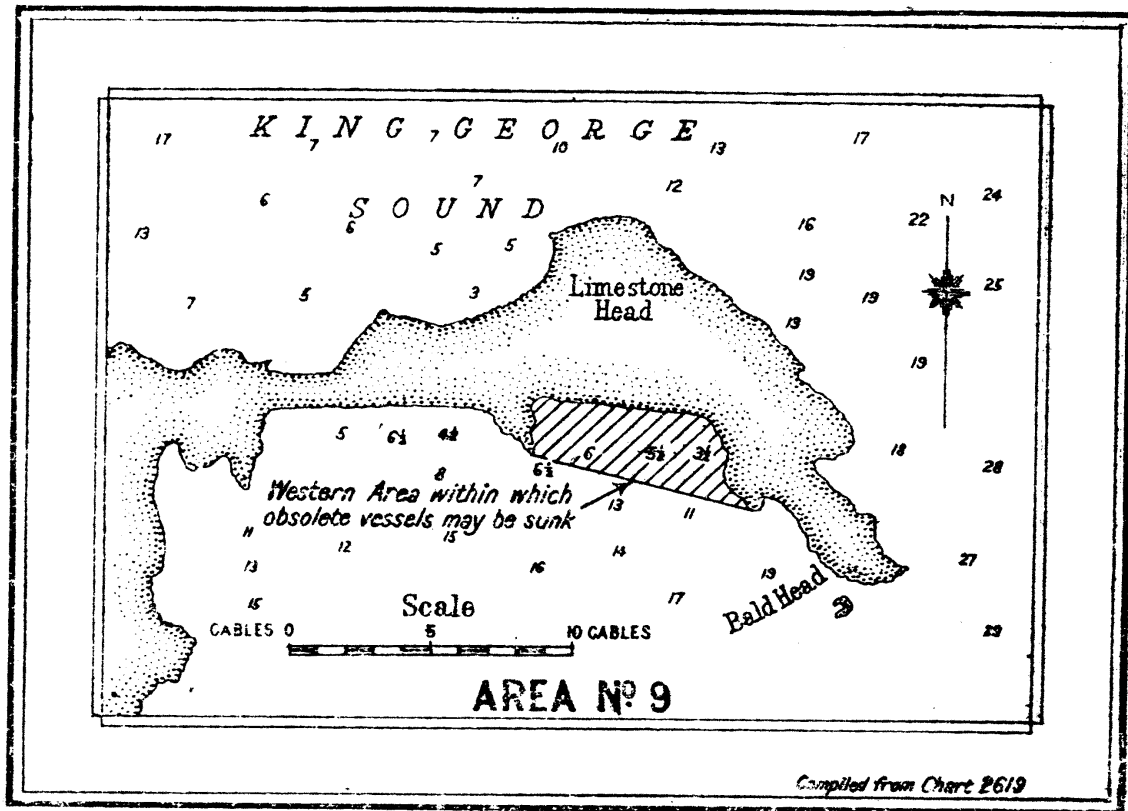


Figure A4.9 Commonwealth Area 9 (Albany – West) (reproduced from Statutory Rules, Commonwealth Acts 1933: 102)

Area No.10 – for Brisbane: Outside the 100 fathom line within a circular area 5 miles in diameter with centre latitude 27° S., longitude 153° 42' E., with Cape Moreton Lighthouse bearing 260° distant 12.5 miles (Figure A4.10).

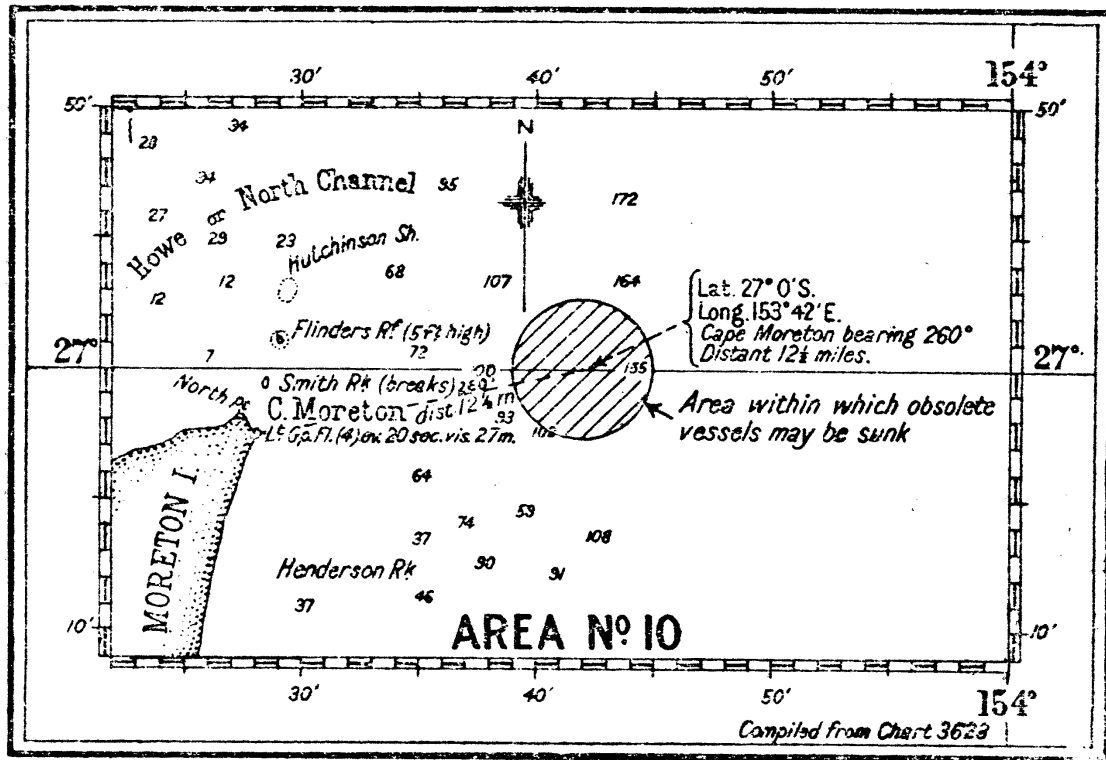


Figure A4.10 Commonwealth Area 10 (Brisbane) (reproduced from Statutory Rules, Commonwealth Acts 1933: 102)

Area No.11 – for Rockhampton: Outside the 100 fathom line within a circular area 5 miles in diameter with centre in latitude  $23^{\circ} 14' S.$ , longitude  $152^{\circ} 15' E.$ , with North Reef Lighthouse bearing  $280^{\circ}$  distant 18.5 miles (Figure A4.11).

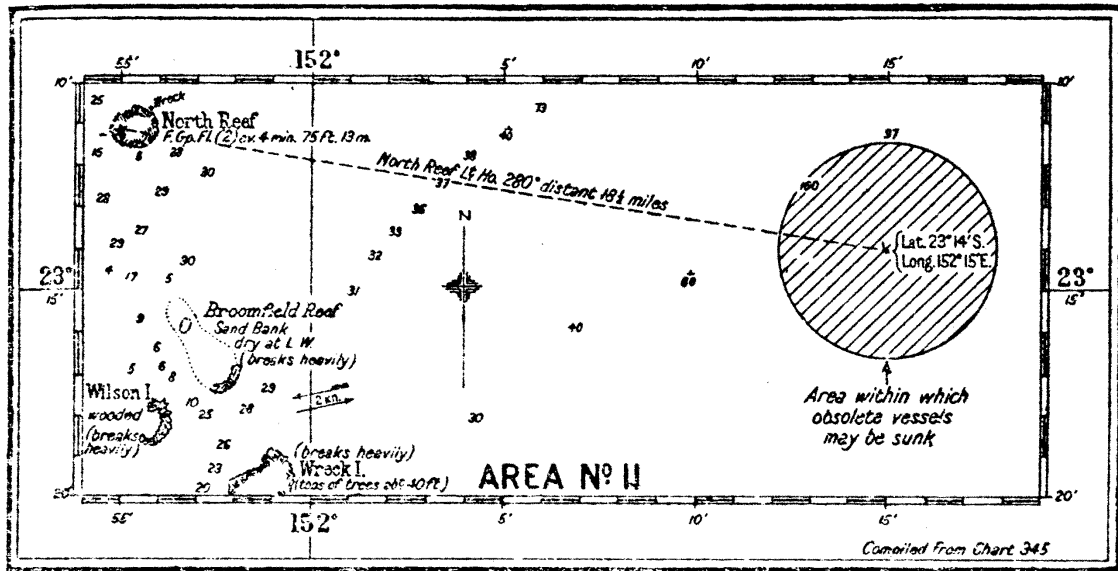


Figure A4.11 Commonwealth Area 11 (Rockhampton) (reproduced from Statutory Rules, Commonwealth Acts 1933: 103)



Area No.12 – for Bowen: In 28 fathoms with a circular area 5 miles in diameter with centre in latitude  $19^{\circ} 46.5' S.$ , longitude  $148^{\circ} 31' E.$ , with Holborne Island bearing  $288^{\circ}$  distant 9 miles and Gloucester Head bearing  $198^{\circ}$  distant 12.5 miles (Figure A4.12).

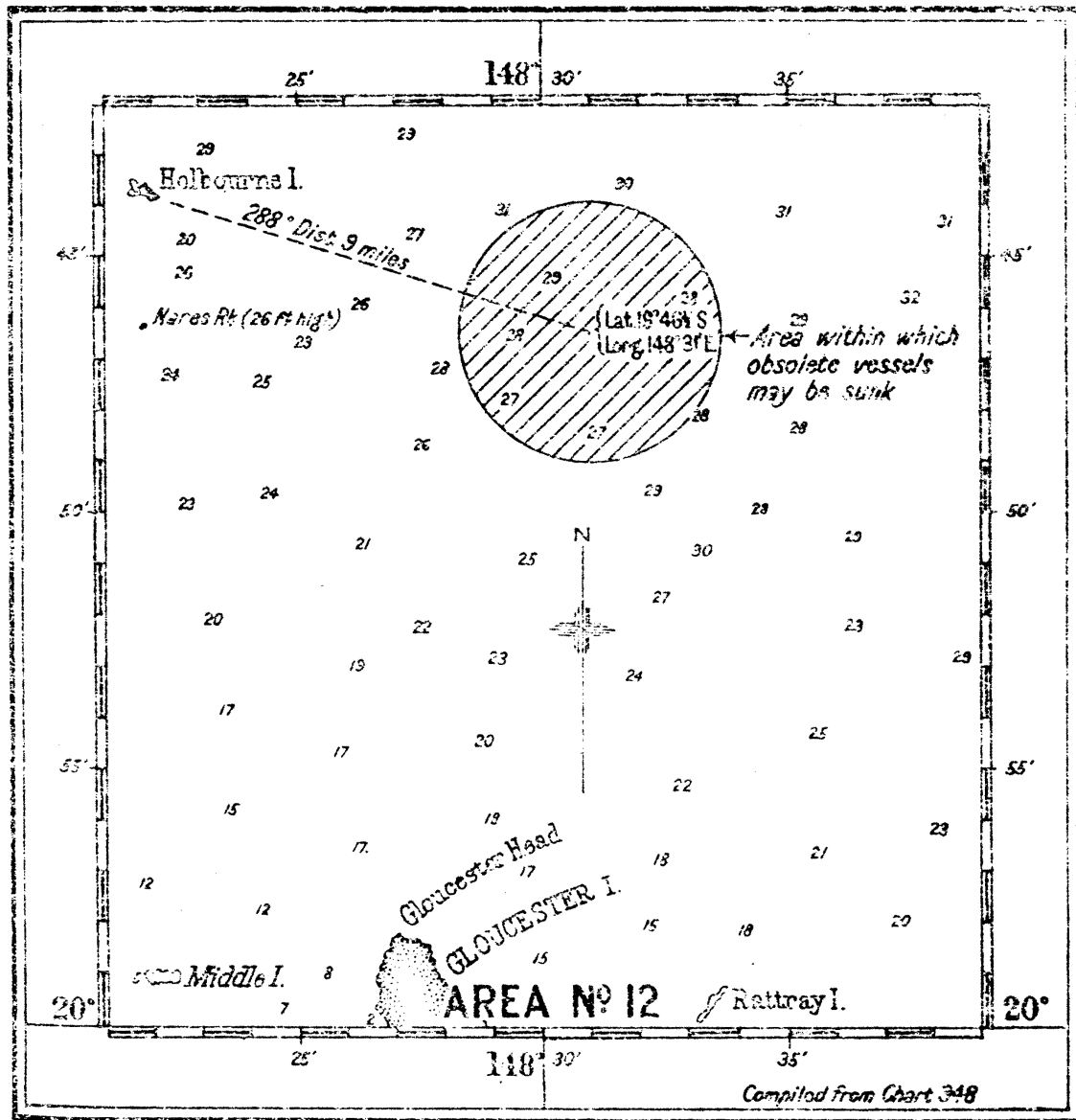


Figure A4.12 Commonwealth Area 12 (Bowen) (reproduced from Statutory Rules, Commonwealth Acts 1933: 103)

Area No.13 – for Townsville: In 27 fathoms with a circular area 5 miles in diameter with centre in latitude  $18^{\circ} 46.5' S.$ , longitude  $147^{\circ} 24.5' E.$ , midway between Keeper and Wheeler Reefs, 45 miles north-east from Townsville (Figure A4.13).

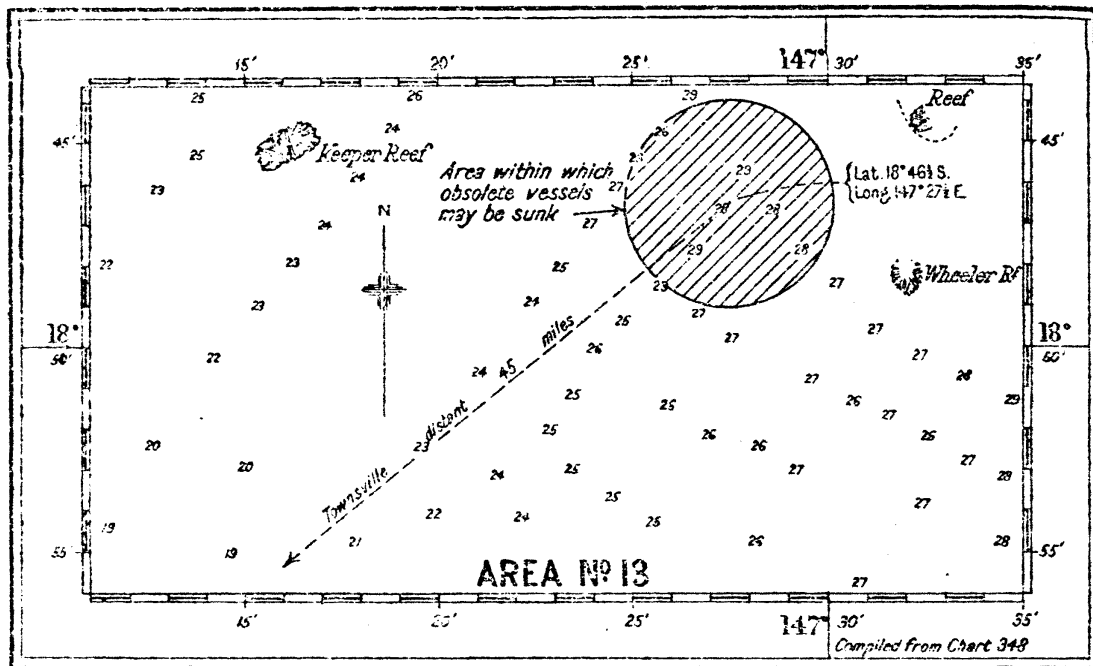


Figure A4.13 Commonwealth Area 13 (Townsville) (reproduced from Statutory Rules, Commonwealth Acts 1933: 104)

Area No. 14 – for Cairns: Outside the 100 fathom line, near the entrance to Grafton passage, within a circular area 5 miles in diameter with centre in latitude  $16^{\circ} 40' S.$ , longitude  $146^{\circ} 21' E.$ , Euston Reef bearing  $253^{\circ}$  distant 5.5 miles, 40 miles from Cairns (Figure A4.14).

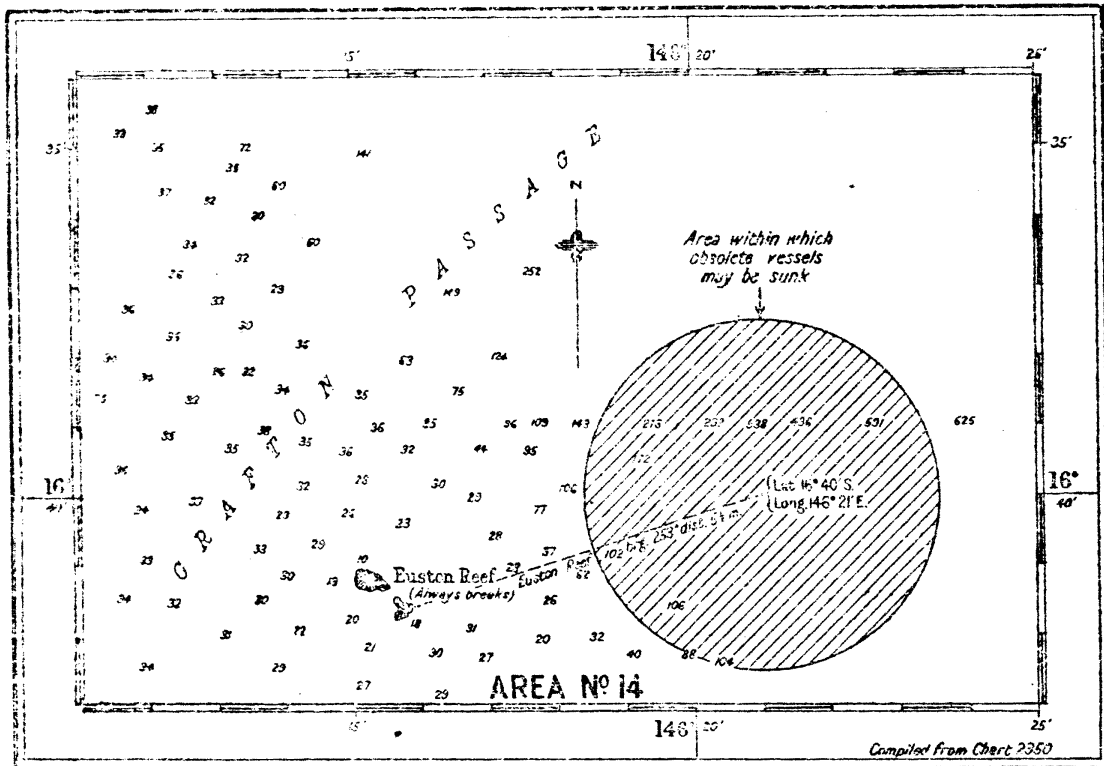


Figure A4.14 Commonwealth Area 14 (Cairns) (reproduced from Statutory Rules, Commonwealth Acts 1933: 104)

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