

PEOPLE, PLACE AND SPACE: THE MARITIME CULTURAL LANDSCAPE OF OTAGO HARBOUR

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ABSTRACT

The relationship between human culture and the environment is an area of fundamental importance to modern archaeological enquiry. The investigation of this relationship led researchers to develop what has become known as the landscape approach, which focuses on the archaeological and environmental evidence of the interactions between people and the environment. Over the last two decades this approach has been utilised to investigate maritime cultural landscapes, with considerable success – albeit internationally. In New Zealand, landscape archaeology has been practised since the late 1970s. However, the investigation of maritime cultural landscapes has yet to be explored; resulting in considerable gaps in our understanding of the past.

This study applied the maritime cultural landscape approach to Otago Harbour in order to investigate the relationships between the harbour's inhabitants and the marine environment. Evidence of this interaction was investigated through archaeological records of sites with maritime associations, targeted site survey of areas of foreshore and historical research.

The evidence of these interactions were discussed in relation to the themes of marine resource exploitation, navigation and landing places, hulks and abandoned watercraft, shipbuilding and repair, shipwrecks, harbour warfare and defence, and anthropogenic change to the harbour.

The application of the maritime cultural landscape approach to Otago Harbour revealed a great deal of information about the ways in which the inhabitants of Otago Harbour have interacted with the marine environment over time. This study also showed the considerable strength of this framework as a tool for heritage management and the need to investigate the maritime cultural landscapes of the other major harbours of New Zealand.

ACKNOWLEDGEMENTS

I began this research with a passion for maritime archaeology and the knowledge that, as a field, maritime archaeology in New Zealand is critically underdeveloped. This thesis seeks to help redress this situation by undertaking a maritime archaeological investigation within an academic framework in order to reveal the potential that such research has for uncovering our past. However, without the support and encouragement of so many people, my progression into the field of maritime archaeology and, subsequently, this thesis would not have been possible.

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1.

INTRODUCTION

The evidence of our collective past is all around us; it both informs our present and helps to shape our future. This past, and thus our history, is a product of the interactions between generations of humans and the environments that they lived in (Anschuetz et al. 2001:191). The ways in which the physical world shapes, and is itself shaped, by human society and culture has long been a subject of fundamental importance and has found itself as a central tenant of modern archaeological enquiry. The investigation of this relationship led researchers to develop what has become known as the landscape approach which focuses on the archaeological and environmental evidence of the interactions between people and the environment (Knapp & Ashmore 1999:2). This approach has subsequently been applied to the marine environment by researchers such as Westerdahl (1992, 1994), Kenderdine (1993), Aberg and Lewis (2000) and McErlean et al (2002). This thesis applies the theories and methods from these previous studies to investigate the maritime cultural landscape of Otago Harbour and in doing so, provides us with insights into the interactions between the inhabitants of the harbour and the marine environment over time.

Otago Harbour is located next to the city of Dunedin, New Zealand and is the only naturally sheltered anchorage on the east coast of the South Island between Banks Peninsula and Bluff (McLean 1985:26). Today two wharf systems operate within the harbour; the Port of Dunedin and Port Chalmers the deepwater port of the harbour.

1. INTRODUCTION

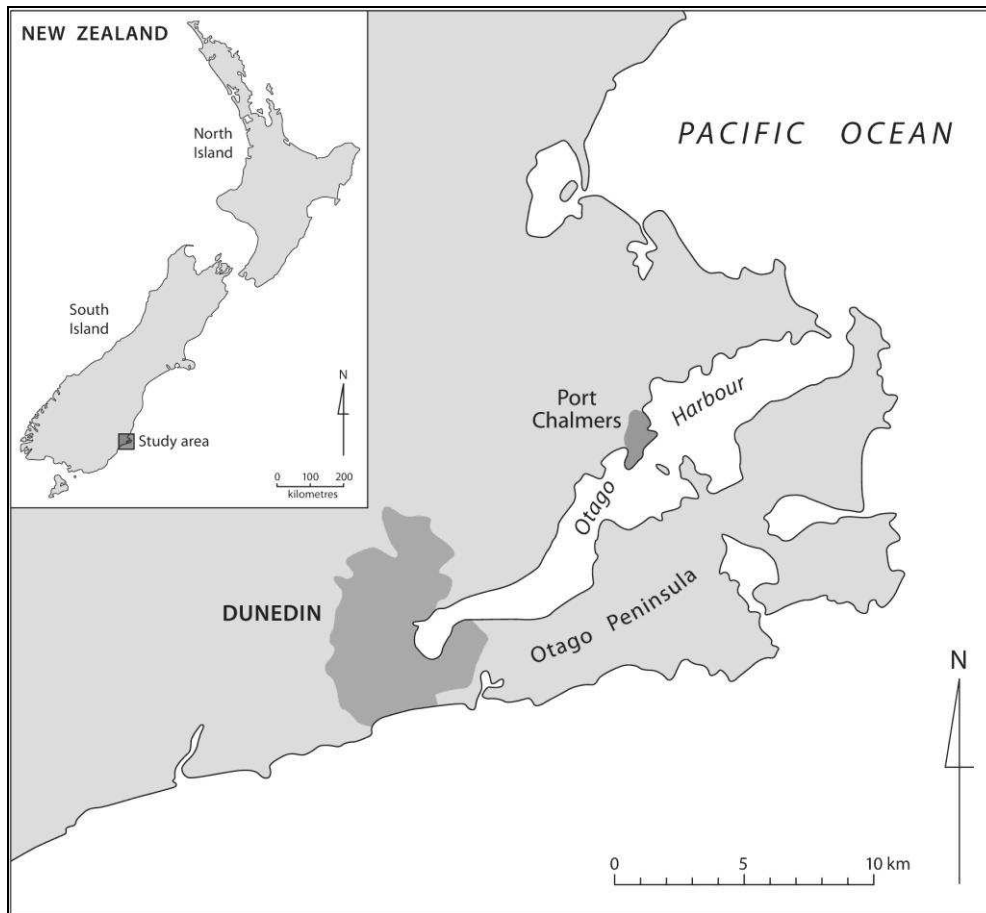


Figure 1: Location map of Otago Harbour.

The archaeology and history of Otago Harbour dates from the arrival of the first colonists from Eastern Polynesia around 1250 A.D (Hamel 2001a). Over the following 550 years, successive waves of colonists entered the harbour, drawn by its bountiful marine food resources and strategic location. Around 1809 the first Europeans arrived in the harbour, signalling the start of European interest in the region and inexorably linking the development of the province of Otago with that of its harbour (McLean 1985). The next 200 years have seen cycles of boom and bust firstly with sealing and whaling, the gold rush of the 1860s and the subsequent manufacturing boom, the export of frozen meat in the 1880s and the continual development of farming in the hinterlands. Each step of expansion and retrenchment has left its mark on the harbour and today we are left with a palimpsest of these actions providing the basis for this investigation of the maritime cultural landscape of Otago Harbour.

PURPOSE OF THE STUDY

This study utilises the historical and archaeological record of Otago Harbour to investigate the interactions between the inhabitants of the harbour and the marine environment. Through the investigation of this changing relationship over time, the maritime cultural landscape of the harbour can be understood as the product of generations of activities within and around the marine environment. Although a small number of studies have been undertaken on individual sites with maritime associations within the harbour, no holistic studies of these sites have ever been undertaken. As a result, sites with maritime associations within the harbour are severely underrepresented in the New Zealand Archaeological Association site record and other management schedules. This investigation of the maritime cultural landscape of Otago Harbour will also be the first time that a maritime cultural landscape has been investigated in an academic framework in New Zealand offering the opportunity to test this concept in a new environmental setting. In addition, by investigating the maritime cultural landscape, archaeological databases will be combined with the historical record to create a synthesis of the relationships between the harbour's inhabitants and the marine environment that cannot be understood from databases alone.

This thesis will:

- Apply the theories and methodologies of the maritime cultural landscape approach as practised internationally to investigate the maritime cultural landscape of Otago Harbour.
- Investigate the environmental variables that have influenced the formation and evolution of Otago Harbour.
- Create a comprehensive inventory of archaeological sites with maritime associations throughout the harbour.
- Combine the archaeological and historical record of the harbour to create a thematic narrative of the various activities that the inhabitants of the harbour engaged in to form the maritime cultural landscape that is evident today.

- Evaluate the different sources of evidence utilised to investigate the maritime cultural landscape and compare the findings of this thesis with work undertaken nationally and internationally.
- Examine and assess the value of investigations of maritime cultural landscapes for heritage management.

OVERVIEW

Chapter Two will present an overview of the literature concerning the development of landscape archaeology and the subsequent emergence of the maritime cultural landscape approach. The role that landscape archaeology has played in New Zealand is also examined placing this thesis within the broader context of New Zealand archaeology.

Chapter Three outlines the major environmental variables of Otago Harbour providing an understanding of the forces which have shaped and formed the harbour over time.

Chapter Four presents an overview of the archaeology and history of Otago Harbour, providing an understanding of the broader context in which the maritime cultural landscape was formed.

Chapter Five outlines the area chosen for survey and the methods employed in this investigation including historical research and field walking.

Chapter Six presents the results of the investigations of the historical and archaeological record of the harbour. This research is divided into separate themes of: marine resource exploitation, navigation and landing places, hulks and abandoned watercraft, shipbuilding and repair, shipwrecks, harbour warfare and defence, and anthropogenic change to the harbour. These themes represent the different types of activities that have contributed to the formation of the maritime cultural landscape. By discussing individual sites within these themes they are placed within the context of the historical activities that were undertaken in the harbour and more broadly, as components of the maritime cultural landscape.

The discussion in Chapter Seven provides an evaluation of the archaeological and historical records utilised during the research for this thesis. The results of this investigation are then compared with work undertaken both nationally and internationally. The role of maritime cultural landscapes as a tool for heritage management is then investigated and the contribution that this thesis has presented for such management discussed.

2.

LITERATURE REVIEW

THE LANDSCAPE APPROACH

The intellectual framework that is the landscape approach is an archaeological research strategy that enables various disciplines to take a holistic perspective in viewing the interrelationships between people and place, through space and time (Knapp & Ashmore 1999:2). The subject of interest in such studies is the landscape in its entirety which is viewed as “the material manifestation of the relations between humans and the environment” (Crumely 1994:6). Landscapes are thus created by people through their experience and engagement with the specific environmental conditions that are present at a point in time or space (Bender 1993:1). Change within such a landscape occurs through the interaction of cultural (human) and natural (ecological) forces, which ensure a state of flux or disequilibrium whereby the individual both shapes and is shaped by the environment in which they live (Phillips 2000:167, Hood 1996:125). This approach places human history at the centre of archaeological enquiry, allowing us to go beyond the insular study of artefacts to investigate how our ancestors interacted with each other and the world they lived in.

DEVELOPMENT OF LANDSCAPE ARCHAEOLOGY

The analysis of societies at a broad level is not new to archaeology, and as noted by Anschuetz et al (2001:157), the intellectual foundations of the landscape approach can be traced back at least to the 1920's to the work of geographer Carl Sauer. However, despite this historical depth, the application of a specific landscape approach to archaeological studies has only really emerged within the last 30 years (Wandsnider 1992:287, Fisher & Thurston 1999:630). Early archaeological investigations of landscapes typically viewed the environment and thus the landscape as either a passive backdrop to, or a forcible determinant of culture. However, in recent years these understandings of human-environment relationships have been shown to be overly simplistic and the landscape is now seen as an active and far more complex entity in relation to human lives (Knapp & Ashmore 1999:2). Contemporary archaeological practice has embraced the landscape approach as a research method which facilitates the "recognition and evaluation of the dynamic, interdependent relationships that people maintain with the physical, social, and cultural dimensions of their environment across time and space" (Anschuetz et al. 2001:159). To this end, landscape archaeology in its current form draws not only on the archaeological record but also historical geography, human geography, ecology, anthropology, and place name studies to investigate human-environment relationships (Palmer 2000:6, Rossignol 1992:4).

The practice of landscape archaeology in such an interdisciplinary milieu has encouraged the development of the approach into two contrasting, yet complementary areas. Firstly there is the new ecology approach which describes the environment as a system to which behaviour must adapt, respond, or negotiate in order to overcome perceived constraints (Layton & Ucko 1999:9). Within this approach, consideration and analyses of the environment is seen as critically important for the understanding of human society and culture. As such, these studies emphasize the natural (e.g. ecological, geomorphological, and hydrological) processes that shaped and were shaped by human societies to form a particular landscape in space and time (Anschuetz et al. 2001:157). The second approach views the landscape as a representation of a socially prescribed order by which communities define, legitimize and sustain the occupation of their environment (ibid:178). This method of landscape analysis encourages the archaeologist to view the landscape as the product of

human values, meaning and symbols, thus providing insights into how the landscape was perceived and experienced by those who inhabited it (Robertson & Richards 2003:2).

Despite the apparent separation of the two approaches along the natural-cultural continuum, studies in recent years have begun to combine both the socio-cultural and environmental approaches to profitably investigate the relationships between humans and their environments (McGlade 1999:480). The usefulness of such a holistic landscape approach has ensured the continued popularity of landscape investigations and has also promoted the application of landscape archaeology to new areas. It is to one such development, the maritime cultural landscape that we now turn.

MARITIME CULTURAL LANDSCAPES

The archaeological examination of sites of maritime culture dates back to the investigations of Mediterranean shipwrecks by George Bass in the 1960s. Since this tentative start, maritime archaeology has progressed rapidly into a sub-discipline of archaeology, providing insights and interpretations about the role of the sea and seafaring in the development of human history. A relatively recent development in the field of maritime archaeology has been the application of the landscape approach to maritime sites. The concept of a maritime cultural landscape was first introduced by Christopher Westerdahl during the maritime archaeological survey of the Coast of Swedish Norrland from 1975-1980. For the purpose of this survey Westerdahl sought a theoretical framework that would take a holistic approach to all remnants of maritime culture on land as well as underwater. Westerdahl popularised this approach in his seminal paper “The maritime cultural landscape” in the *International Journal of Nautical Archaeology* (1992). Westerdahl defined the maritime cultural landscape approach as:

the investigation of the human utilisation (economy) of maritime space by boat: settlement, fishing, hunting, shipping and its attendant sub-cultures such as pilotage, lighthouse and sea-mark maintenance (Westerdahl 1992:5).

This approach stressed the conceptual unity of the maritime cultural remains located on both land and under water which resulted from human utilisation of maritime space (ibid:6). By investigating the various elements of the maritime cultural landscape of a particular area through time, Westerdahl believed the relationships between the areas inhabitants and the

coast and sea could be studied as a single functioning system. In 1994 Westerdahl extended his definition of the maritime cultural landscape to include not only the physical manifestations of maritime culture but also the cognitive, cultural and social activities/aspects of the study area (Westerdahl 1994:266). Building on this broader definition, Westerdahl was able to create a 'checklist' of areas of investigation that would allow the maritime cultural landscape of a region to be profitably explored. These included:

- Shipwrecks.
- Terrestrial artefacts – including maritime structures, monumental beacons, grave cairns, churchyards, ballast dump sites, and sailing marks.
- Traditions of usage – informal local knowledge which may be evident in the form of Pilots and their precursors (e.g. in Sweden farmer/fishermen acted as keepers of local maritime knowledge).
- The study of natural topography and safe havens.
- Toponymic investigation – the study of locally named areas could reveal the cultural reasons for allocated names.

Westerdahl's introduction of the landscape approach to maritime archaeology has thus provided a new and exciting way for maritime and underwater archaeologists to explore and interpret their unique datasets. As such, the framework of a maritime cultural landscape has been utilised in a number of diverse studies from around the globe. Although first developed for use in the interpretation of Scandinavian landscapes, the maritime cultural landscape approach has since been applied to a diverse range of other environments including those of the United Kingdom.

The largest and most important investigation of maritime cultural landscapes in recent years is the Strangford Lough Project from Northern Ireland. This large-scale project was commissioned by the Northern Ireland Environment and Heritage Service and involved the comprehensive survey and description of all archaeological sites within the coastal, intertidal and sub-tidal zones of Strangford Lough. The results of this 5 year project were published by Thomas McErlean, Rosemary McConkey and Wes Forsythe in 2002 under the title *Strangford Lough: An archaeological survey of the maritime cultural landscape*. The authors discussed the survey results according to several themes: fish and fishing; ports and harbours; navigation and pilotage; landing places; and shipwrecks and maritime casualties.

Using these classifications the authors were able to place the individual sites within a broader context, which allowed the sites to be understood as components of the overarching maritime cultural landscape. The quality of this publication is such that, although originally developed as a cultural heritage management tool, demand from the general public has meant that the book is now in its second edition. This study as an investigation of the maritime cultural landscape has a number of strengths which are pertinent for this thesis. Firstly, this work investigates the interactions between the inhabitants of the Lough and the marine environment over a period of more than 10,000 years spanning from the Mesolithic to the modern era. This holistic approach enables the maritime cultural landscape to be studied as a dynamic construct which has been shaped and modified by the generations of people who have lived there. This study is also based heavily on the results from field based site survey providing a strong archaeological basis for the interpretations of the maritime cultural landscape.

Although the Strangford Lough publication is the seminal text in maritime cultural landscape studies there are a number of other studies which have contributed to the development of methodologies and theories currently utilised in the approach. One such study was undertaken in 1999 by A.J. Parker who investigated the maritime cultural landscape of the Port of Bristol as it was in the Middle Ages. In this study Parker found that the maritime cultural landscape of the area reflected not only the economic but also the cognitive aspects of the time period (Parker 1999:323). By integrating the archaeological evidence of various ship types with iconography and historical sources, Parker viewed the development and improvement of the various structures within the medieval port as a response to the ever larger and increasingly complex sailing vessels that visited the port. The cognitive aspects of the landscape were also investigated by looking at how the inhabitants of the town of Bristol would have perceived their port and also how seafarers entering the port would have interpreted it. This study is notable for a number of reasons; firstly, Parker's study applied the maritime cultural landscape approach to an environment in which it had not previously been tested. This study also utilised a range of different evidence sources including archaeology and iconography to investigate the economic aspects of the maritime cultural landscape of medieval Bristol. Interestingly, this study also investigated the cognitive factors that shaped the maritime cultural landscape providing insights into the lives of both the sailors and inhabitants of the town. This study also investigated the maritime cultural landscape as it existed in a particular point in time

namely ‘the medieval period’ providing insights into the flexible yet powerful nature of maritime cultural landscape studies.

Another study from the United Kingdom is that by Nigel Bannerman and Cecil Jones (1999) who investigated the different types and technologies of fish-traps used throughout coastal Wales from the Mesolithic to the mid 19th century. Although this study concentrated on one site type, Bannerman and Jones stressed the importance of understanding fish-traps as part of the broader context of the maritime cultural landscape. The authors thus noted that fish-traps held a special place within the maritime cultural landscape as they were “usually associated with human settlements, trade patterns and religious establishments” (Bannerman & Jones 1999:70). The significance of this paper is that Bannerman and Jones encouraged archaeologists to view fish-traps as components of a larger system and therefore to move away from particularistic studies to a more inclusive and broader understanding of maritime culture.

The evident value and popularity of the maritime cultural landscape as a method of enquiry in the United Kingdom led to a collaboration between the Nautical Archaeology Society and the Society for Landscape Studies in the form of a conference held in 1999. This conference and the subsequent publication entitled *The Rising Tide: Archaeology and Coastal Landscapes* (Aberg and Lewis eds. 2000) reflects the ongoing interest of archaeologists to integrate ideas of landscape within maritime archaeology.

The utility of the maritime cultural landscape approach has also been shown through a number of studies undertaken in Australia. The first of these was Sarah Kenderdine’s (1993) study of the cultural landscape of the Murray River. In this study Kenderdine applied cultural landscape theory to a riverine environment and found that; “the archaeological sites and the associated exploitative culture could be seen as juxtaposed with the other economic activities of agriculture, pastoralism, dairying and irrigation” (Kenderdine 1993:13). By looking at the economic factors that shaped the maritime cultural landscape of the Murray River she was able to link these sites to the growth and decline of shipping on the river. Kenderdine’s report also made detailed evaluations of the significance of sites and suggestions for their management. This study was the first to utilise the maritime cultural landscape approach in a riverine environment and as such, offered a new perspective to the approach and encouraged the broadening of the traditional understanding of the subject of such investigations. This report is also notable for its use of a landscape approach in the

management of maritime cultural resources. Kenderdine encouraged the viewing of individual sites as part of the cultural landscape and as such, for sites to be of greater significance than when viewed in isolation as ‘dirty old bits of boat’.

The investigation of maritime cultural landscapes in Australia has also been undertaken within an academic framework in the form of a number Honours, and Masters theses. One such study was undertaken by Brad Duncan who investigated the physical and cognitive aspects of sea usage to understand the patterning of the maritime cultural landscape/seascape of the Gippsland Region, Victoria. Duncan utilised the Victorian Shipwreck database to investigate how one particular aspect, risk, influenced the “cognitive and physical structure of seascape development” (Duncan 2000:1). He found that risk, and perceived risk, did play a major role in the location of shipwrecks and thus in the patterning of the maritime cultural landscape. A unique component of this thesis is the theme of seascapes which Duncan goes to considerable length to define and provides an explicit methodology for identifying a “Western seascape” based on four key characteristics: conceptions of the sea as a terrestrial extension (or vice versa), extension of a land tenure system to include areas of ocean, cultural markers in the seascape and formal and informal knowledge networks (Duncan 2001:31-40). As well as the cognitive aspects of seascapes this thesis is important for Duncan’s argument that for heritage management to be successful it must be undertaken at a landscape/seascape level (ibid:151-154).

Aiden Ash’s (2004) thesis applied the theories and methods developed from previous studies of maritime cultural landscapes to investigate the ‘Western’ maritime cultural landscape of Port Willunga, South Australia. This study incorporated a range of evidence including archaeological sites, historical records and oral histories to look at the types of infrastructure used at the port and to trace its development and decline in the 19th century. Ash divided the archaeological sites within the landscape into the themes of; land structures associated with maritime activity, navigational features, changes in the environment, fishing and recreation. By placing sites with maritime associations within these themes Ash enabled them to be understood as components of the maritime cultural landscape providing a greater level of context and significance for the individual sites. A significant result of this work is that the economic factors that shaped the maritime cultural landscape were investigated through the archaeological record. Ash was then able to use these economic factors to model the rise and decline of the port’s infrastructure at a landscape level. In addition by using the theories and methods of other landscape studies in

his thesis Ash was able to show the validity of applying existing frameworks of maritime cultural landscape studies to areas in which they had not previously been applied to uncover evidence of human behaviour.

In her thesis Andrea Smith (2006) investigated the utility of applying a maritime cultural landscape approach to an island environment, namely that of Kangaroo Island in South Australia. Smith used the concept of a maritime cultural landscape to explain the archaeological patterning of two areas of the island namely; Kingscote, the main town, and West Bay, a remote area of Flinders Chase National Park. Investigation found that the maritime cultural landscape around Kingscote comprised of considerable maritime infrastructure and associated sites relating to the development of the adjacent harbour. In contrast, West Bay provided little evidence of human interaction with the marine environment apart from the establishment of a Shipwrecked Mariners Relief Station (Smith 2006:27). As a result of her study Smith contends that the maritime cultural landscape of Kangaroo Island reflects the responses of the islands inhabitants toward two differing marine environments (ibid:75). Smith's study is notable for its application of the maritime cultural landscape approach to a new study environment, that of an island. In addition, Smith's argument that the patterning of the archaeological sites included in the study are the result of environmental factors places the environment as an active participant in the construction of the landscape and not simply as a passive backdrop.

Jun Kimura's (2006) Masters investigation of the maritime cultural landscape of South Australian coastal waters is another notable study. Kimura's thesis investigated the distributional meaning of 218 shipwrecks in correlation with the cultural and natural factors that affected their distribution. Using a range of GIS based models he found that the spatial distribution of shipwrecks was directly related to both the economic and social expansion of the colony of South Australia (Kimura 2006:136). One of the strengths of this research is its investigation of the environmental variables of the prevailing winds, currents, hydrography, channel alignments, and bottom sediments with the study area. By combining these environmental variables with the cultural variables Kimura was able to explain the distribution of these shipwrecks as the product of both natural and anthropogenic factors and as such, providing a greater understanding of the overarching maritime cultural landscape of the area. The use of GIS modelling is another notable feature of this study. Kimura revealed that not only is GIS a powerful method for managing and displaying

information related to maritime heritage but also, when used appropriately, it has significant utility as a tool for data analysis (ibid:149).

THE NEW ZEALAND CONTEXT

The investigation of cultural and natural features through their spatial relationships to one another was the basis of early studies of prehistoric settlement in New Zealand (Sutton et al. 2003:4). The Wairarapa (Leach & Leach 1979), Motutapu (Davidson 1978), and Poutu (Irwin 1985) projects are important examples of these early studies and have contributed to the foundation on which the landscape approach has been built in contemporary New Zealand archaeological practice. These early projects incorporated extensive site surveys to view the distribution of sites, and such spatial information was then used as a proxy for relationships between social groups (Marshall 2004:71). Although these projects generated vast amounts of valuable archaeological data, criticisms regarding their interpretations arose. Critics claimed that by concentrating solely on only particular aspects sites were decontextualised from their cultural and environmental settings; therefore such investigations “reduced sites to a series of interacting dots on a map” (Sutton et al. 2003:9-10).

A method for remedying these concerns was seen in the application of the landscape approach to archaeology (Phillips 2000:7). In her book *Waihou Journeys* (2000), Caroline Phillips investigated the interrelationship between the human and physical landscape and the developments that occurred along the Waihou River from first human arrival, to the years after European settlement by using a landscape approach. Within this framework Phillips incorporated a range of multi-disciplinary data to create a historical narrative that described the phases of occupation and identified the multiple causes and influences of change along the Waihou (Phillips 2000:1). This narrative described changes in peoples’ interrelationships with the environment, their economy, settlement system, population and political organisation. Through this landscape approach Phillips provided a history of the region in which “people living along the Waihou, those elsewhere and the environment itself were all actors” (ibid:59).

Another landscape project in New Zealand, although not specifically stated as such, was the Pouerua project of Sutton, Furey and Marshall (2003). This study incorporated aspects of a landscape approach so that “the pa and the cultural landscape that surrounds it

could be understood as the products of people actions” (Sutton et al. 2003:10). The project itself started in the 1980s and encompassed several different types of studies including site survey and excavation in order to “intensively study the Maori cultural landscape” (ibid:17). By combining the various studies Sutton and colleagues created a socio-political interpretation about the role of the Pouerua pa in the surrounding cultural landscape (ibid:17). This interpretation emphasised the ceremonial, symbolic and defensive purposes of Pouerua pa suggesting that it was “a form of monumental architecture.....placed so that it dominated the surrounding landscape” (Sutton et al. 2003:238). By applying aspects of the landscape approach Sutton et al. were able to interpret the form and function of the Pouerua pa in the context of its place within the surrounding landscape and settlements (ibid:238).

A ‘landscape-like approach’ was also utilised by Geoff Irwin during his investigations of the Maori lake village of Kohika. This project incorporated contributions from 20 scholars on a variety of topics which allowed detailed information to be gathered on the relationship between the former environment and the people who resided at the site. Irwin used the results of these multi-disciplinary studies to provide information on the environment, settlement pattern, site stratigraphy, material culture, economy, household structure and function of the site, allowing it to be seen as a technological, economic and cultural entity (ibid:239). When combined, this information formed an integrated picture of Kohika as a late northern Maori lake village within a dynamic and changing landscape (ibid:239).

Another recent and constructive landscape investigation in New Zealand was that by Angela Middleton (2003) who investigated the Maori and European landscape of early nineteenth century Te Puna in the Bay of Islands. Combining historical archaeology and an anthropological approach, the landscape of Te Puna was investigated in relation to a number of themes including Maori concepts of mana and tapu, evidence of cultivation, and European and Maori perception of the colonial era (Middleton 2003:110). Middleton found that the dynamic interactions between Maori and European took place within a cultural milieu whereby an individual’s actions were culturally dictated by both the economic and sacred values associated with the landscape (ibid:112-114). Middleton found that the differing understandings of the landscape between Maori and European led to offence and retribution ‘in a cycle that marked the early decades of the nineteenth century’ (ibid:11). By studying this unique landscape in such a way, Middleton was able to discover the different

kinds of relationships that Europeans had with the Maori of Te Puna and to explore how these interactions impacted upon the long established Maori constructions of landscape.

Despite the proven value and seemingly high level of popularity of the landscape approach in New Zealand this enthusiasm has not spread to the sphere of maritime cultural landscapes with a great deal of success. One exception is Katharine Watson's (2004) archaeological assessment of the Oamaru Harbour. The assessment was commissioned by the Waitaki District Council and incorporated a 'landscape-like' investigation of a number of maritime related archaeological sites. However, as the report was an archaeological assessment it focused solely on describing the various archaeological features and assessing their significance. Consequently, interpretations about the relationship between these sites, the people who inhabited the area, and the marine environment were not made.

CONCLUSION

Since its tentative beginnings as a methodological approach to the holistic study of maritime culture, Westerdahl's concept of a maritime cultural landscape has developed into a hugely valuable tool for both the understanding of our past and for the managing of this past in the modern world. The strength of this approach can be seen in its applicability to diverse geographic locations and cultures as well being a framework through which differing questions can be asked to interrogate the past. However, the almost complete lack of investigations of the maritime cultural landscape in New Zealand has meant there is a major gap in our understanding of the way in which both prehistoric and historic groups interacted with the maritime environment, an environment that was and still is hugely significant in the shaping of our island nation.

3.

THE EVOLUTION OF OTAGO HARBOUR

COASTAL MORPHOLOGY

The coastal morphology of Otago Harbour results from the combined action of waves and tidal currents on the remnants of a volcanic landscape. Continuous modification of the landscape has occurred since the end of the last glaciation (about 15,000 years BP), at which time the harbour basin was flooded with seawater and began to be filled with sediment (Single & Benn 2007:20). As described by Single et al. (2010:33), rising sea levels between 9,600 and 6,500 years BP swept sand into the harbour building a tombolo out from St Clair, joining what was an island to the mainland, creating what we now know as Otago Harbour.

The contemporary harbour is a long and narrow non-estuarine inlet which extends 21 kilometres, from the entrance in the north to the city of Dunedin in the south. The harbour is typically between 1.0 and 4.5 kilometres wide with a minimum width of only 400 metres at the entrance adjacent to Harington Point (Inglis et al. 2006:7). The harbour is aligned along a SW/NE orientation and is bounded to the south and east by Otago Peninsula and to the north and west by the hills of Mount Cargill.

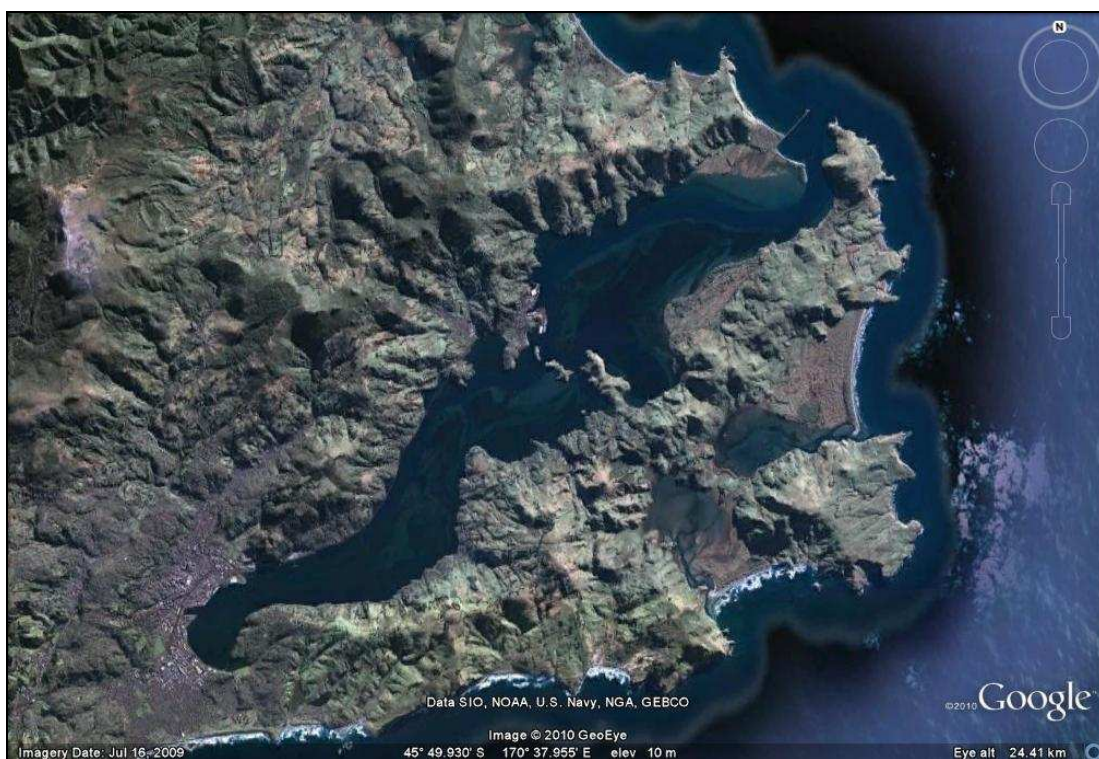


Figure 2: Satellite image of Otago Harbour. Source “Otago Harbour”45° 49.930’ S and 170° 37.955’E. Google Earth. July 16, 2009. February 11, 2010.

The interior of the harbour occupies an area of approximately 46 km² and is divided into upper and lower sections by a chain of islands running east to west (Bell et al. 2009). Throughout much of the harbour there are extensive areas of intertidal sand flats, most notably on the southern side of the harbour and extending south from the mouth of the harbour at Aramoana (Figure 5) (Single & Benn 2007:6). Oceanic currents have played a considerable role in the shaping of the harbour, the most significant being the Southland Current that moves northwards up the East Coast of the South Island (Single et al. 2010:64). Each year this current carries some 3.14 million tonnes of sediment from the Clutha River into the East Otago coastal system; around about a third of which is deposited on the beaches and nearshore north of Otago Peninsula (Carter 1986). Tidal currents also play a significant role in shaping the harbour, especially near the entrance. As noted by Single & Benn (2007:22), the flood tide period is shorter and its flow stronger than the ebb tide and, as such, the tides are flood dominated with sediment naturally infilling the harbour. The impact of offshore wave energy on the shape and

form of the harbour has only been limited due to the narrow entrance between Heyward Point and Taiaroa Head which prevents the majority of these waves from entering the harbour (Figure 3) (Single et al 2010:19).

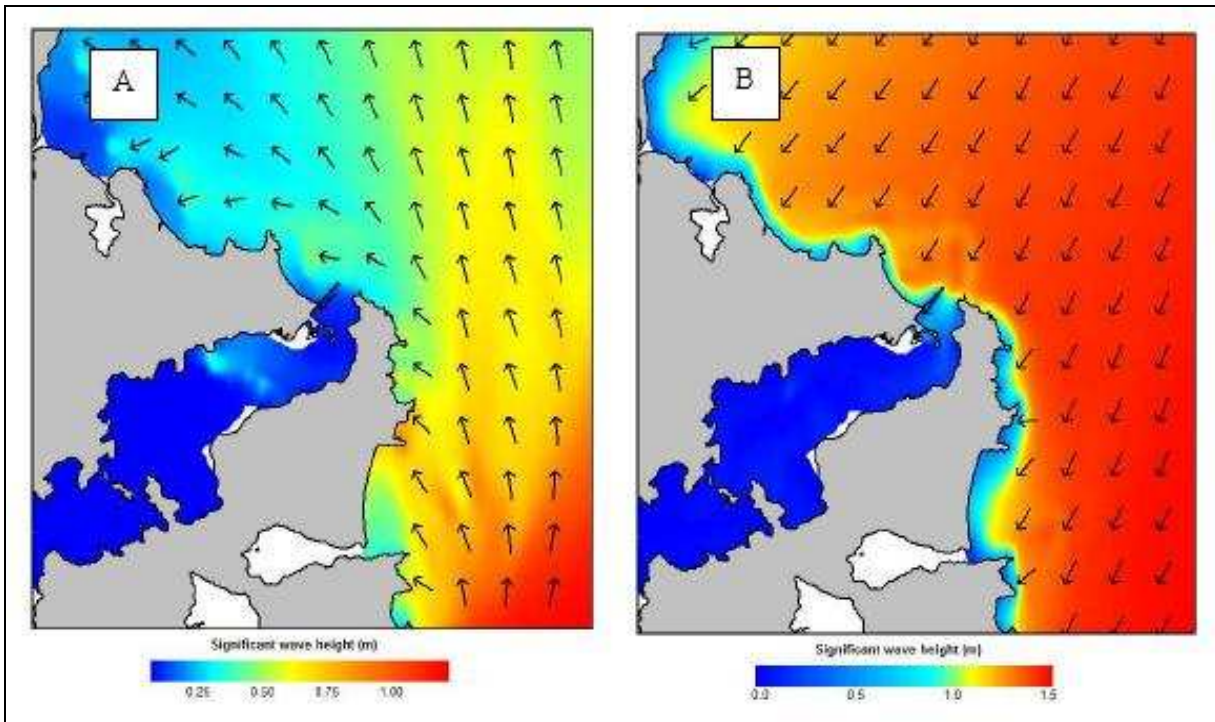


Figure 3: Typical wave height patterns for waves from the southeast (A) and the northeast (B) (Source: Figure 8.6, Bell et al. 2009).

However, due to the alignment of the harbour the prevailing winds from the SW and NE quadrants maximise local wave heights as a result of the large wind fetch along this orientation (Bell et al. 2009:17). Over time, this interior wave energy has been a significant factor in modifying the coastal morphology of the harbour. As described by Lauder (1991), in addition to the natural forces of currents, tides and waves, the harbour has been substantially modified by human activity in the form of reclamation, causeway and jetty construction, dredging and channel stabilisation, catchment modification and the lining of the harbour shoreline with seawalls.

GEOLOGY

Otago Harbour lies on the Pacific Plate approximately 200 kilometres southeast of the active Alpine Fault Line which defines the plate boundary in this area (Glassey et al. 2003:25). In this location the harbour lies in a transition zone between plate boundary uplift to the west, and extensive offshore sedimentary basins that are subsiding to the east (ibid:25). The geology of Otago Harbour area represents four major stages of geological history. As described by Single et al. (2010), these constitute:

- 1) The Basement rock - comprised of Tertiary schist;
- 2) Two Tertiary sedimentary sequences;
- 3) Three late Tertiary eruption phases of the Dunedin Volcano; and
- 4) Glacial and inter-glacial deposits laid down approximately 15,000 to 10,000 years BP.

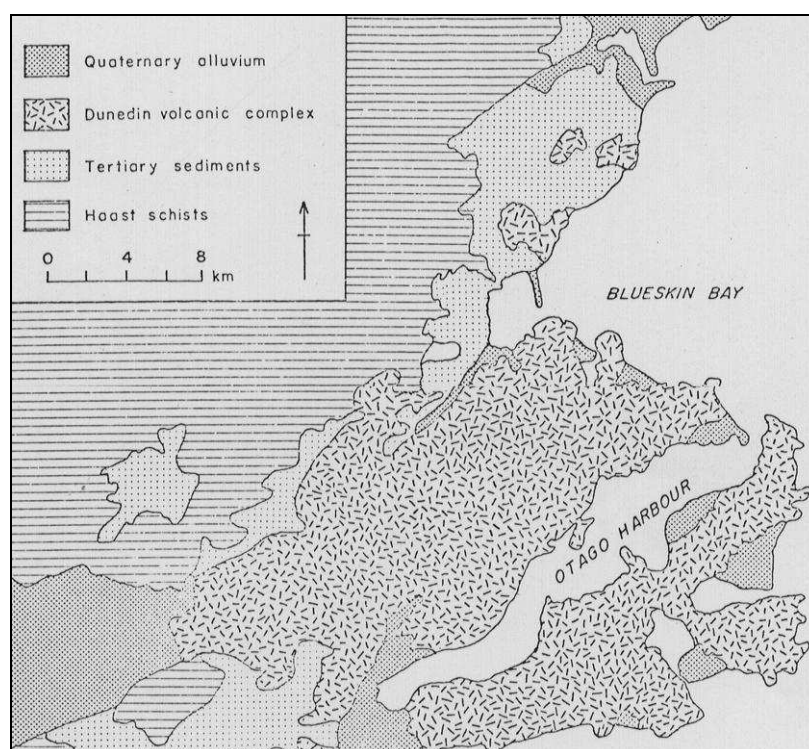


Figure 4: A generalised map of regional geology of Otago Harbour and surrounding hinterland (Source: Nicholson, 1979).

The harbour itself lies on the deeply eroded remnants of a shield volcano that formed between 13 and 10 million years ago during the Middle to Late Miocene (Glassey et al. 2003:23). The volcano some 25 kilometres across was formed by successive lava flows which progressively overlapped in a westward direction (Single & Benn 2007:8). At the end of the last glaciation the harbour was flooded with seawater and by around 6,000 BP the Dunedin volcano was joined to the mainland giving the harbour its modern shape. Since its formation, the harbour has been subject to infilling from the erosion of sediments from the surrounding catchment hills and from sand transported north by longshore drift from the Clutha River (Lauder 1991, Glassey et al. 2003:28).

CLIMATE

Otago Harbour is situated approximately 46 degrees south and has a cool temperate, sub-humid maritime climate (Glassey et al. 2003:25). The varied topography of the harbour produces a range of microclimates with marked differences in temperature and rainfall. Mean annual rainfall is between 790 and 940 mm/year in low-lying parts of the harbour and up to more than 1000 mm/year in some locations (ORC 2000). The mean 24 hour temperature is 15 °C during mid-summer and 6 °C in mid-winter (ORC 2000).

THE INTERTIDAL ZONE

The shallow nature of Otago Harbour means that nearly 30 % of its interior comprises sediment flats, between 0.0 metres and 1.0 metres above chart datum, which are exposed at low spring tide (Port of Otago Ltd 2010). Outside the main channels these intertidal flats are prominent, especially in the shallow reaches of the Upper Harbour, on the eastern side of the Lower Harbour and extending South from Aramoana (Figure 5). The sediments that make up the intertidal zone comprise mostly of fine to medium sand with sparse patches of algae, relict shells with evidence of recent bioturbation (Port of Otago Ltd 2010). As described by James et al. (2009), the intertidal zone in Otago Harbour provides a wide range of habitat types, encouraging habitation by highly diverse species of flora and fauna.

THE SUBTIDAL ZONE

Otago Harbour is a shallow tidal inlet with an average depth of just 3.3 metres below mean sea level (Port of Otago Ltd 2010:61).

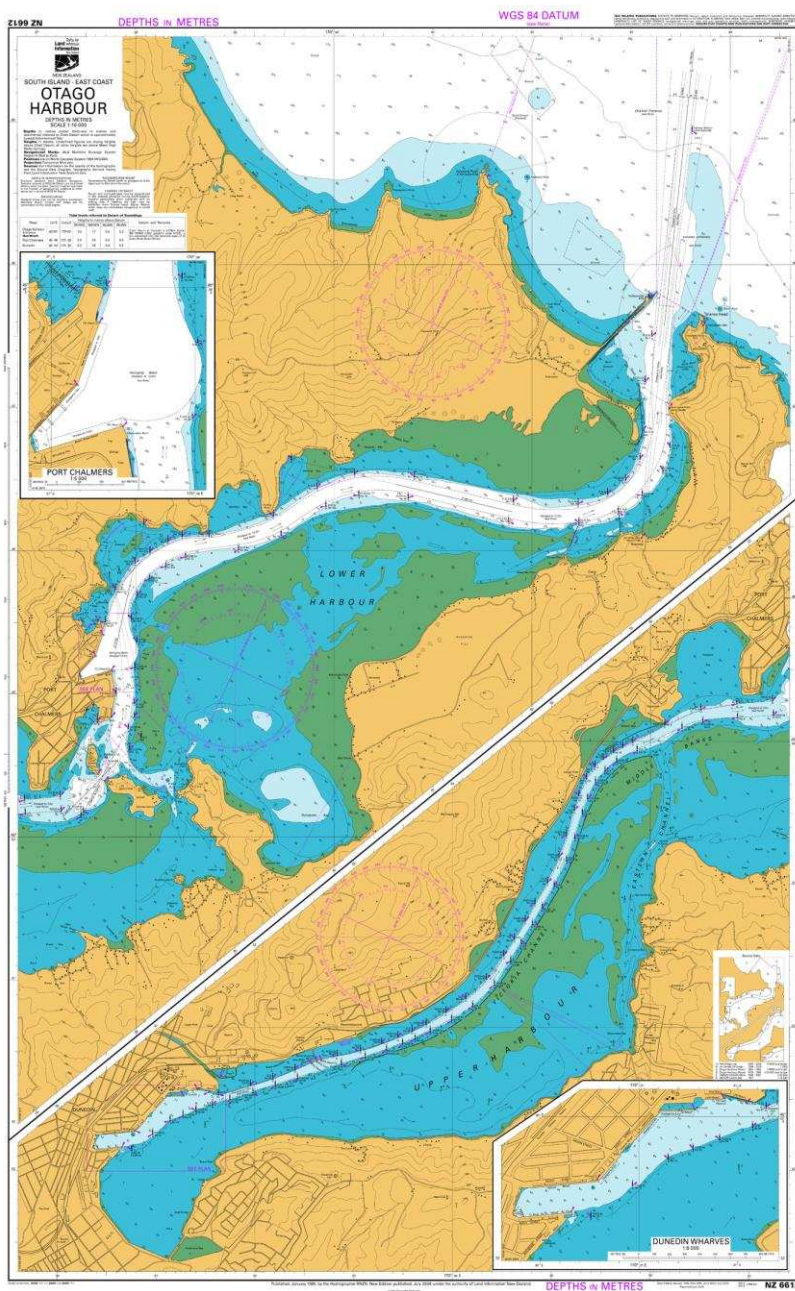


Figure 5: LINZ Chart of Otago Harbour showing bathymetric depths within the harbour. Sourced from Land Information New Zealand data. Crown Copyright Reserved.

Outside the harbour entrance at the Mole, depths of 14.5 metres are common, while inside, a shipping channel leads to Port Chalmers which is maintained to a depth of 13 metres (ibid:61). Between Port Chalmers and Dunedin runs the Victoria Channel which is maintained to a depth of 7.5 metres (Inglis et al. 2006:8). Outside of the shipping channels, water depths are mostly less than 2 metres, accounting for some 14 km² of the harbour (Port of Otago Ltd 2010:61). At high spring tides the harbour has a mean water surface area of 46 km² with a tidal range of 1.98 metres at Port Chalmers and 2.08 metres at Dunedin, while the neap tidal range is 1.25 metres at Port Chalmers and 1.35 metres at Dunedin (Single et al. 2010:38). The tidal prism (total water volume) passing through the entrance of the harbour is 6.8 x 10⁷ m³ going out on the ebb tide and 6.5 x 10⁷ m³ coming in on the subsequent flood tide (Old, 1998). Current velocities associated with these tidal movements in the harbour have been estimated to between 50 and 75 cm/sec in the Lower Harbour and less than 50 cm/second in the Upper Harbour (Rainer 1981). A notable feature of these hydrodynamics is the residence time of water in the harbour. As described by Inglis et al. (2006:8), water in the Upper Harbour has a residence time of between 4 and 14 days while that in the Lower Harbour has a residence time of only 1.2 tidal cycles. This is largely due to the lack of tidal movement in the Upper Harbour compared with that in the Lower Harbour.

THE SEABED

The seabed of Otago Harbour has been the subject of a number of investigations, providing us with insights into its physical nature. Sediments in Otago Harbour range from fine silt to coarse sand containing shell fragments (Single et al. 2010:34). The finer grained sediments including mud and silts are predominantly found in the Upper Harbour, while coarser sand sizes are found with the fine sand in the Lower Harbour (Port of Otago Ltd 2010:62). As described by James et al. (2009), the seabed of Otago Harbour has created 11 different broad habitat types:

1. Relict shell on medium sand with sparse patches of algae.
2. Shell hash.
3. Mudstone or consolidated clay pavement with pockets of coarse sand or shell.

4. Relict shell on medium sand with sparse patches of algae but with silty or flocculent layer, no sand ripples, recent bioturbation obvious.
5. Medium sand with ripples.
6. Thick algal mats.
7. Seagrasses on medium sands.
8. Macrofauna burrows/mounds (including ghost shrimp and lugworms), indications of burrowing bivalves minimal.
9. Living cockle beds.
10. Sediment surface dominated by closely packed macro faunal tubes.
11. Deep habitat with cobble-sized stones and mollusc shells fused together, signs of high water flows, with sessile (attached) animals such as sponges, hydroids and tunicates.

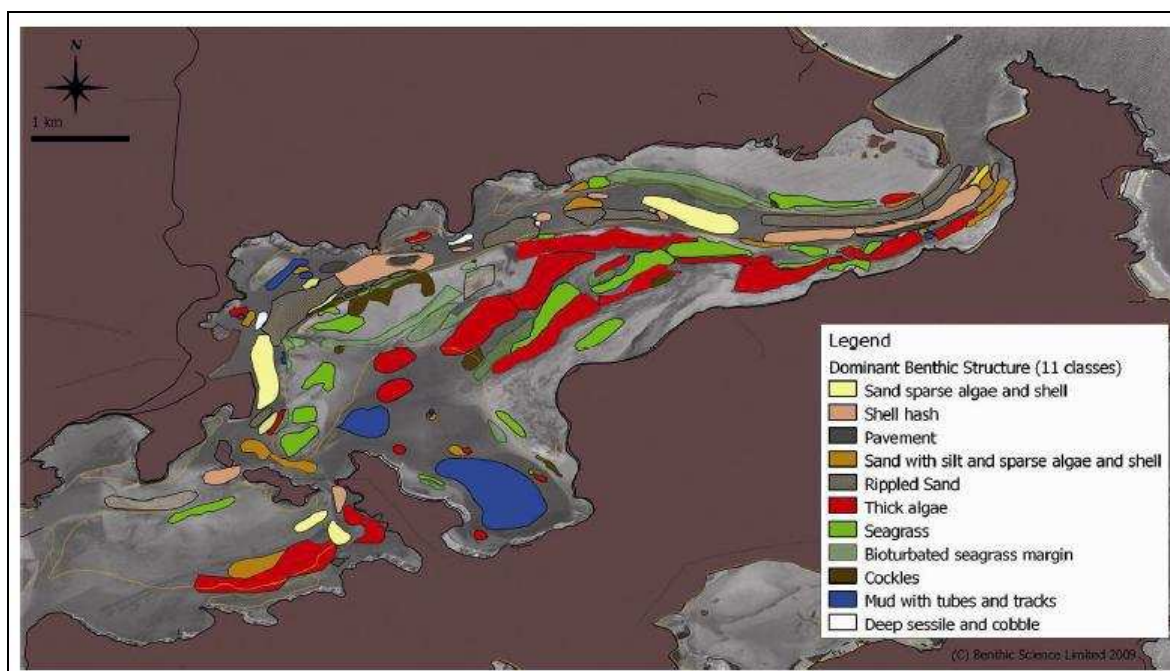


Figure 6: Interpolated map of dominant benthic structures (11 class scheme) from combined 2008 and 2009 survey data. (Background LINZ I44/J44 1999-2000 aerial imagery) (Source Fig 5 James et al. 2009).

These diverse habitat types support over 190 different benthic taxa, a number of which have been exploited by human populations through their interaction with the marine environment (James et al. 2009:14).

By investigating the environmental variables that have shaped and continue to shape the marine environment of Otago Harbour, one gains an understanding of the environment as an active player in the evolution of the harbour. As such, the marine environment should be viewed not as a static canvas on which the actions of humans take place, but as a dynamic medium that both shapes and is shaped by the those human populations (Phillips 2000:167, Hood 1996:125).

4.

THE ARCHAEOLOGY AND HISTORY OF OTAGO HARBOUR

THE ARCHAIC PHASE

The Archaic Phase of Maori Culture in Otago dates to between ca. 1250 AD and ca. 1550 AD and includes both the initial phase of the human colonisation and the expansion of Polynesian groups throughout the region (Hamel 2001a:11). The arrival of these groups from Eastern Polynesia represented the culmination of thousands of years of seafaring and also marked the colonisation of the last major habitable landmass on the planet (Kirch 2000). These wayfaring settlers rapidly explored their new island home and settled in many places along the coast, exploiting the abundant natural resources that were available to them. The Otago area presented these new colonists with an environment unlike any they had experienced before; not only was the territory huge and diverse but the traditional Polynesian cultigens they had utilised for generations were unable to grow south of Banks Peninsula (Anderson 1998:111). However this apparent shortcoming did little to stifle the expansion of these peoples and the Otago province was soon explored and colonised (Hamel 2001a:9).

The speed at which these Polynesian arrivals spread throughout the country was made possible by a colonising toolbox that had been perfected over millennia during the colonisation of Polynesia. This suite of technologies and skills allowed the new colonists to apply their traditional skills to new material resources in a foreign environment. This fusion of Polynesian culture and new raw materials led to the creation of a unique material culture assemblage which has come to characterise the Archaic Phase (Furey 2004:39). This Archaic artefact assemblage is typified in the Otago region by a stone flaking technology based on Eastern Polynesian traditions, which allowed the creation of a wide range of adze types, very large silcrete blades, large awls and the production of very strong and distinctive fish hooks (Hamel 2001a:17).

In Hamel's (2001a) seminal publication on the archaeology of Otago, six Archaic sites were recorded within the vicinity of the present study area of the Otago Harbour; namely the lower layer at Murdering Beach (site I44/20), Purakaunui (site I44/21), Long Beach (site I44/23), Harwood (site I44/76), the lower layer at Kaikai's Beach (site I44/127) and Andersons Bay (site I44/172) (Figure 7).

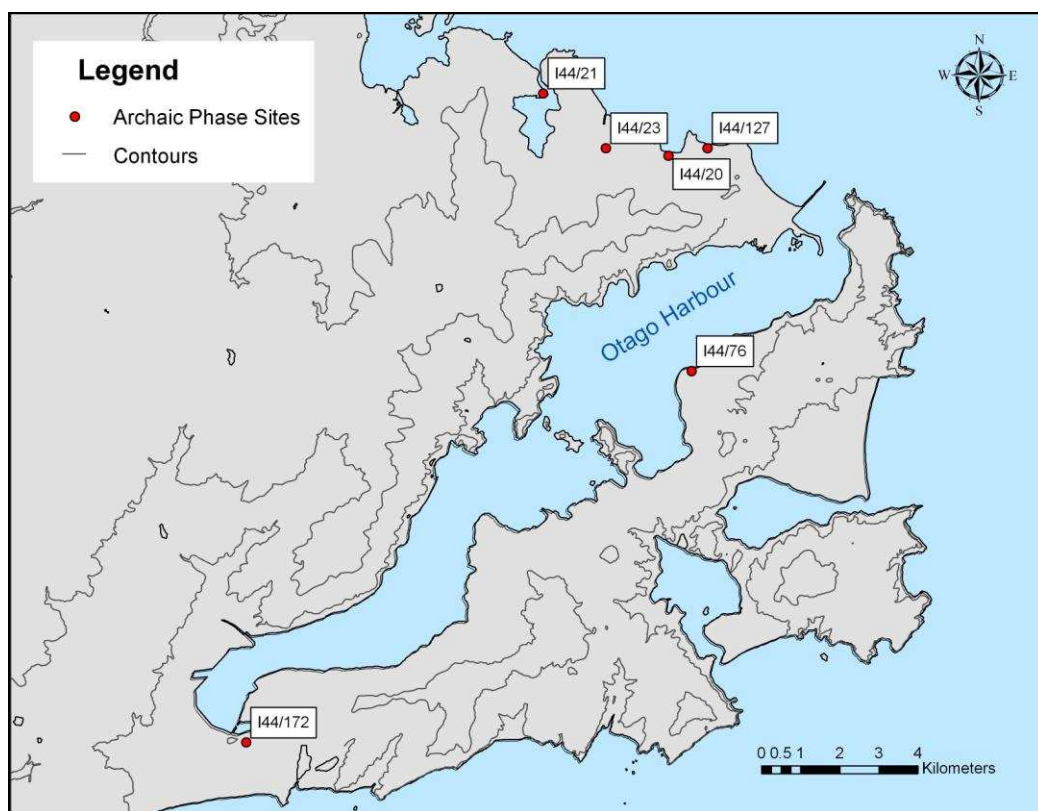


Figure 7: Archaic Phase sites in the vicinity of Otago Harbour that have been investigated archaeologically.

These sites, and the collections taken from them, have been investigated in an ad hoc manner over the last 100 years and as a consequence vast amounts of information have been lost to both the fossickers shovel and coastal erosion. However, the information that has been recovered from these sites is of immense value when combined with the information gained from other sites at a regional level and this provides us with the basis for interpreting the Archaic Phase in the Otago region.

The earliest evidence of human occupation in the Otago region has been radiocarbon dated to around 1250 AD and marks the arrival of Eastern Polynesian peoples to the area (Hamel 2001a:13). Through a number of archaeological excavations at Archaic sites such as Shag River Mouth (site J43/2) (Anderson et al. 1996), Long Beach (site I44/23) (Hamel & Leach 1977), Purakaunui (site I44/21) (Barber 2002) and Harwood (site I44/76) (Park 1976), both the subsistence practices and settlement patterns of these Archaic settlers have been investigated. Palaeoenvironmental studies such as those undertaken by McGlone (1989) have shown that the earliest settlers to the Otago region would have entered a pristine environment in which large game was not only naive to human predation but was also abundantly available in both the forests and the marine environments. The excavations at Shag River Mouth by Anderson et al (1996) have revealed that these settlers, being unable to cultivate food, established large permanent villages to exploit the plentiful animal resources nearby. These villages appear to have been occupied all year round and yet they were relatively transient, only being occupied for a period of between 20 and 50 years (Anderson & Smith 1996). This settlement pattern comprised of strategically sited villages on the coast that provided a base from which both moa in the adjacent forests and seals on the nearby coast could be easily hunted (Anderson et al 1996:287). The coastal emphasis of these sites also allowed the gathering of shellfish and the continuation of fishing both of which were important components of the Polynesian diet. Also associated with the coastal villages were smaller specialised sites throughout the region, which were used for moa processing, fishing, fowling and the collection of rock resources (Anderson 1983). The artefact assemblages from the various Archaic sites reveal that new resources were readily exploited by the settlers, with moa and seal bone being integrated as a raw material for the creation of both tools and pendants (Furey 2004:39). Rock sources from throughout the entire province, such as Southland Argillite and Oturehua silcrete and porcellanite, were also readily assimilated into the tool making traditions of the colonists for the creation of adzes and other cutting tools (Hamel 2001a:89).

The subsistence practices, settlement pattern and tool technology of these early inhabitants created a cultural milieu that enabled the rapid growth of the human population within the Otago region (Hamel 2001a:89). However, the enormous pressure that these people placed on the native flora and fauna soon led to the demise of the large moa populations and the reduction of fur seal breeding colonies within the region (Hamel 2001a:74). The loss of these easily available meat packages meant that the established system was no longer viable and a whole new strategy of life had to be devised.

THE CLASSIC PHASE

The Classic Phase in Otago dates to between ca. 1550 AD and ca. 1809 AD and can be distinguished from the Archaic Phase by considerable differences in material culture, subsistence practices and settlement patterns (Hamel 2001a:85). In the Otago region these changes are linked to the movement south of Ngati Mamoe and Ngai Tahu into land occupied by the Waitaha (ibid:85). The migrations of these two groups occurred in a relatively piecemeal fashion over a period of around two hundred years. Through small scale raids and intermarriage, the Waitaha were supplanted by the Ngati Mamoe and they in turn by Ngai Tahu (Anderson 1998:57). The arrival of Ngai Tahu around the time of the 17th century stimulated a huge increase in the use of pounamu as a resource, hence the Classic Phase is typically characterised by ground pounamu adzes, mere, hei matau, hei tiki and chisels as well as elaborate notched and barbed fishhooks, bone clubs and toggles and flutes made of Albatross bone (Anderson 1998:146).

Classic Phase archaeological sites have been documented at four locations within the vicinity of the present study area: Long Beach (site I44/23), Murdering Beach (site I44/20), Pukekura (site J44/77) and Tarewai Point (site J44/3) (Hamel 2001a:217) (Figure 8). Unfortunately our understanding of the Classic Phase in Otago is limited as archaeological excavations of Classic villages in Otago have not been undertaken on a scale comparable to those undertaken at Archaic sites in the region. However, the prodigious collections from ‘curio-hunters’ and the small-scale archaeological investigations that have taken place provide us with insights into the lives of those who inhabited the harbour during the Classic Phase.

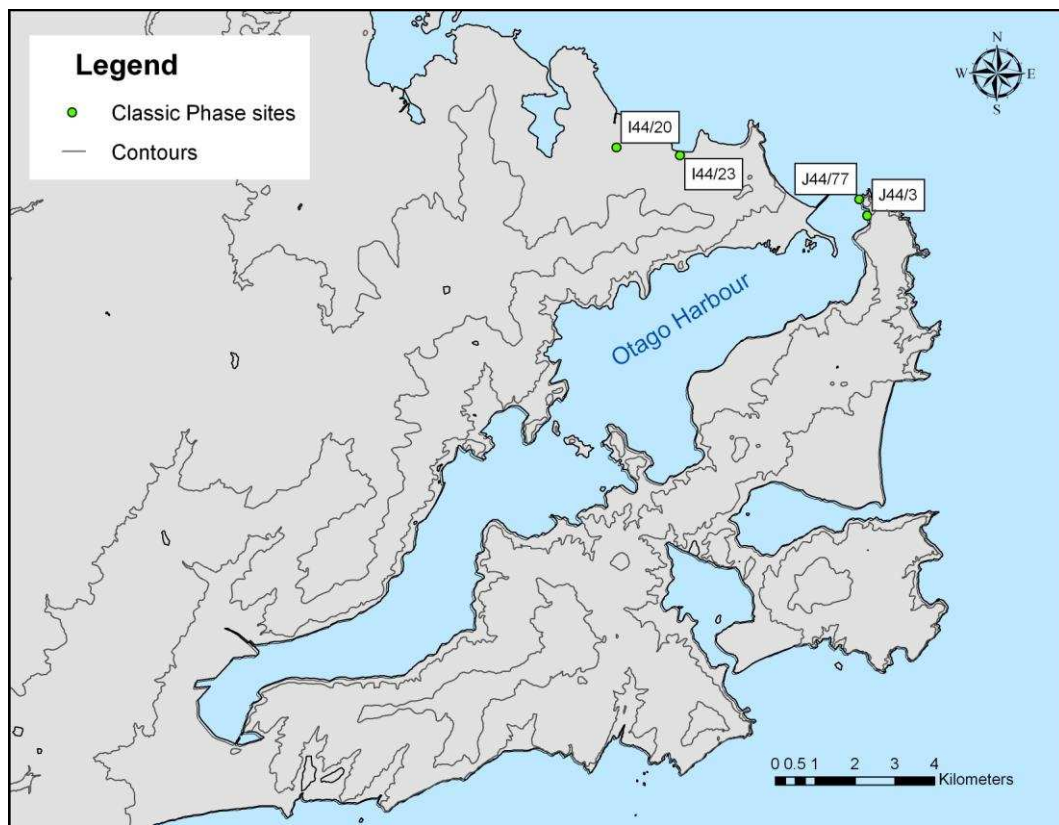


Figure 8: Map of Otago Harbour showing archaeologically investigated Classic Phase sites.

The loss of moa and the extirpation of fur seals in the Otago region during the Archaic Phase meant that the area's inhabitants were now reliant on food resources that were far more patchy and scattered than ever before (Hamel 2001a:87). In order to overcome this new hardship, Maori in the Otago region intensified their fishing and shell fishing effort while also increasing the production of kauru from cabbage tree roots and stems and increasing their use of preservation for the storage of foodstuffs (ibid:1). These new subsistence practices required far greater mobility in order to gather the more widely distributed and lower calorific food resources (Anderson 1998:118). Archaeological investigation of Classic sites in the Otago region has suggested that seasonally occupied hamlets and camp sites became increasingly important in this period so as to enable the gathering of these dispersed food resources known as mahinga kai (Anderson 1996). Also at this time another component of the Classic period settlement pattern becomes apparent, namely the development of the headland pa, such as the one at Pukekura (site I44/77), where food gathered at the various small camps and hamlets could be stored and defended during the winter period (Anderson et al. 1996:287-88). These fortified places were

supported by a complex and wide-ranging system of trade and exchange known as *kai kaukai* (a reference to feasting), which enabled the distribution of resources throughout the Otago region and as far afield as the North Island (Anderson & Smith 1996:368). The importance of this trade to the development and maintenance of Ngai Tahu dominance in the south was readily recognised and Ngai Tahu Chiefs who were becoming increasingly powerful took actions to control the flow of goods throughout the region (Anderson 1998:127-128). The abundance of pounamu at various Classic sites in coastal Otago is a testament to the importance placed on trade by Ngai Tahu, who established themselves as the principle manufacturers and traders of South Island pounamu (ibid:146). In the years prior to European contact, Ngai Tahu in Otago could be characterised as an influential, organised and united series of hapu, who, through the extraction, trade and exchange of a diverse range of resources, maintained a position of strength and wealth (Anderson 1998). This complex system developed during the Classic Phase was interrupted with the arrival of Europeans an event that was to have far-reaching consequences for the inhabitants of Otago Harbour and its environs.

THE PROTOHISTORIC PERIOD

The protohistoric period in the Otago region dates to between ca. 1809 AD and ca. 1850 AD and marks the arrival of Europeans and their associated material culture into a dominant Maori society (Anderson 1998:76, Hamel 2001a:80). The arrival of Europeans or ‘*tongata bulla*’ – people of the boats – to New Zealand introduced both Maori and Europeans to a way of living that was completely foreign to their own (Olssen 1984:6). As described by Knight (1979:14), the first Europeans to enter the Otago region were sealers and whalers who arrived in the early 19th century, bringing with them iron tools and weapons, together with beads and other trinkets to trade with the local Maori. These new materials and tools were highly desired and once obtained, were readily assimilated into the lives of protohistoric Otago Maori (Anderson 1998:210). This incorporation of European technology into Maori culture during the protohistoric period can be characterised as the gradual replacement of traditional tools and implements with those made of brass and iron and the introduction of metal fish hooks, pots, pans and other domestic articles (Hamel 2001a:76). This introduction of foreign technology had enormous implications for Maori

society in Otago, especially in terms of established subsistence practices and settlement patterns.

As noted by Hamel (2001a:81), the protohistoric period is poorly represented in the archaeological record for the Otago region with most sites characterised by “a few early European artefacts mixed in with otherwise Maori midden material”. Within the present study area of Otago Harbour there are reportedly 15 protohistoric sites, however only seven of these are known archaeologically. These are the upper levels at Pukekura (site J44/4, Hamel 1992), Te Umu Kuri (site J44/44, Hamel 1992), the upper levels at Tarewai Point (site J44/3, Teviotdale 1939), Weller’s whaling station (site J44/5, Campbell 1992, 1994), Parihaumia (site I44/16, Hamel 2005a), Tapumaeomokoia (site J44/144, Hamel 2005b), and Turnbull (site I44/29, Hamel 2005c) (Figure 9).

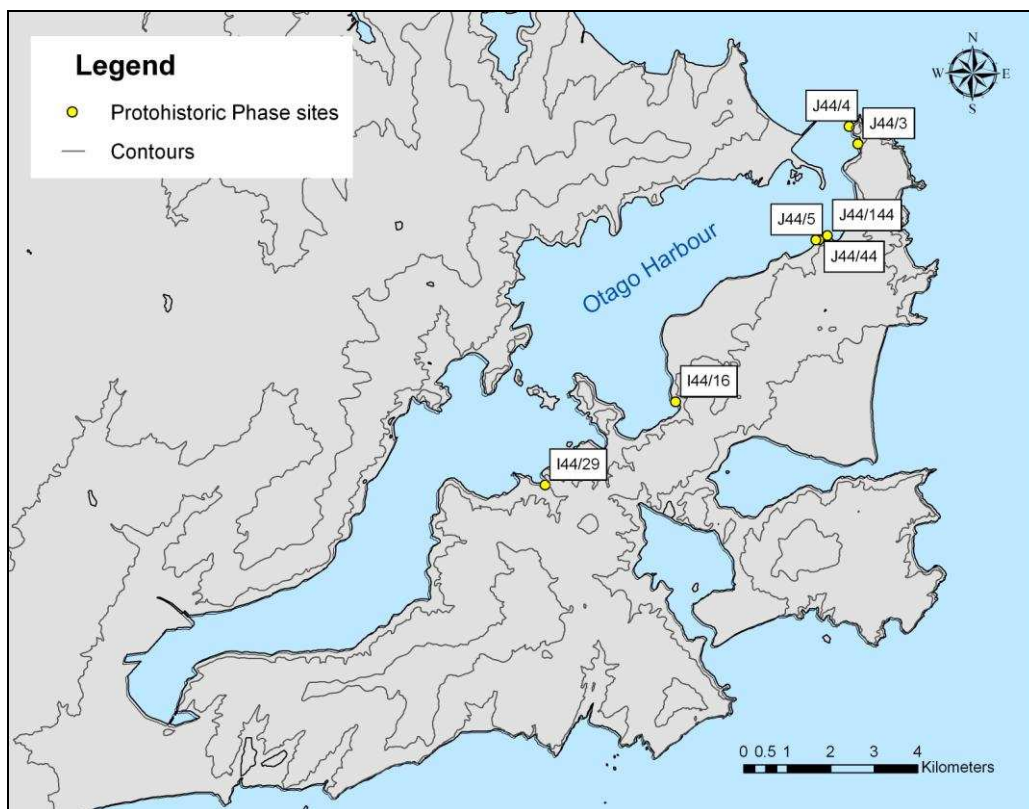


Figure 9: Map of Otago Harbour showing archaeologically investigated protohistoric period sites.

Although only limited archaeological information has been gathered from these sites, when such information is combined with evidence from traditional accounts,

recollections of Maori informants and European observations, an understanding of the lifeways of Otago Maori in the protohistoric period is possible.

As noted earlier, Otago Maori were faced with the very significant economic boundary of living in the non-horticultural zone of the South Island and, as such, were unable to cultivate traditional food crops (Anderson 1998:131). In order to compensate for this deficit these groups relied solely on the hunting and gathering of available food resources. The arrival of Europeans in the early 19th century presented Maori with two valuable additions to their subsistence regime: *Sus scrofa* and *Solanum tuberosum* or, more simply, pigs and potatoes (Hamel 2001a:87). The capacity of these two species to thrive in the temperate environment that is Otago meant that Maori were readily able to integrate them into their diet, and, more significantly, could use them as a means to acquire the increasingly desired European goods such as clothing, weapons, and rum (Anderson 1998:75). The vigour with which Otago Maori incorporated these new species into their society is evidenced by that fact that in a little over three years, pork and potatoes were available for trade to provisioning ships all along the coast from Otago to Ruapuke Island; a considerable distance (ibid:77).

The extent of the impact of European interaction with Maori society in Otago is evident in the rapid changes that occurred in settlement patterns during the protohistoric period. As noted by Hamel (2001a:88), in order to grow the vast quantities of potatoes and pigs required for trade with the Europeans, many Maori groups took up small-scale farming. This new labour-intensive industry forced many Otago Maori to become increasingly sedentary and therefore to reduce their forays to seasonal hunting camps, thus significantly disrupting the established system of *kai kaukai* (Anderson 1998:128). In the Otago Harbour area this meant that farming settlements were established along the fertile banks of creeks and streams, representing a move away from the headland pa and hunting camps to small permanent villages (Hamel 2005c:3). Another method that Otago Maori adopted in order to acquire European goods was to integrate themselves into the market economy by working in the European-developed extractive industries such as sealing and whaling (Anderson 1998:174). The appeal of such work, and the desire to be closer to their new trading partners, meant that many Otago Maori in the protohistoric period abandoned their old settlements in favour of those concentrated around the Weller's whaling stations and other European enclaves (Hamel 2005a:8).

Maori-European interaction during the protohistoric period resulted in enormous change to Maori society. The European ships that entered Otago Harbour brought with them not only valuable trade goods but also old-world diseases for which Maori had little, if any, immunity (Hamel 2001a:87). The arrival of Europeans to the Otago region also saw the first challenges to Maori traditional beliefs, with the introduction of Christianity and the loss of many Maori women through intermarriage with European sealers and whalers (Anderson 1998:186). The late protohistoric period also saw a number of incursions by Ngati Toa into Ngai Tahu territory, culminating in the infamous sacking of Kaiapoi pa. The resulting loss of population and the movement of refugees significantly affected the coherence and balance of Ngai Tahu, which had significant implications for their dealings with the land-hungry Europeans (ibid:90). These unprecedented challenges to the traditional lifeways of Otago Maori were compounded on the 31st of July 1844, when Ngai Tahu sold the Otago block to the New Zealand Company for £2,400 (Church 2002:13). On selling this land, Otago Maori found themselves increasingly marginalised as their land holdings were hugely reduced and many Maori became confined to the meagre 'native' reserves. In 1848 the 663-ton ship John Wickliffe sailed into this uneasy social climate carrying 97 settlers. On the 15th of April she was joined by the barque Phillip Laing and the planned European settlement of Otago began (McLean 1985:31).

THE HISTORIC PERIOD

The Historic period in Otago dates from ca. 1850 and represents the wholesale change that accompanied the planned European immigration to the Otago region. The planned settlement of Otago was the design of the Scottish Presbyterian Free Church with Captain William Cargill and the Reverend Thomas Burns as appointed leaders (Church 1994:12). Under this immigration scheme around 12,000 immigrants arrived in the Otago region in the first decade of settlement; this number comprising mostly Scottish Presbyterian farmers, petty merchants and tradesmen (Olssen 1984:34). The immigrants brought with them from Britain the various foods, clothes, tools, household gear, farming implements, raw materials and livestock that they were accustomed to (Hamel 2001a:106). As such, upon arrival these settlers were able to apply their traditional skills and tools to an unfamiliar and, at times, unforgiving environment. These settlers gradually implanted their

ideas about ‘civilisation’ onto the shoreline of Dunedin and then further, inland through the paving of roads and the establishment of small businesses and farms.

Within the present study area of Otago Harbour, the Historic period is represented by a considerable number of archaeological sites which cover the wide spectrum of activities being undertaken during this time (Figure 10).

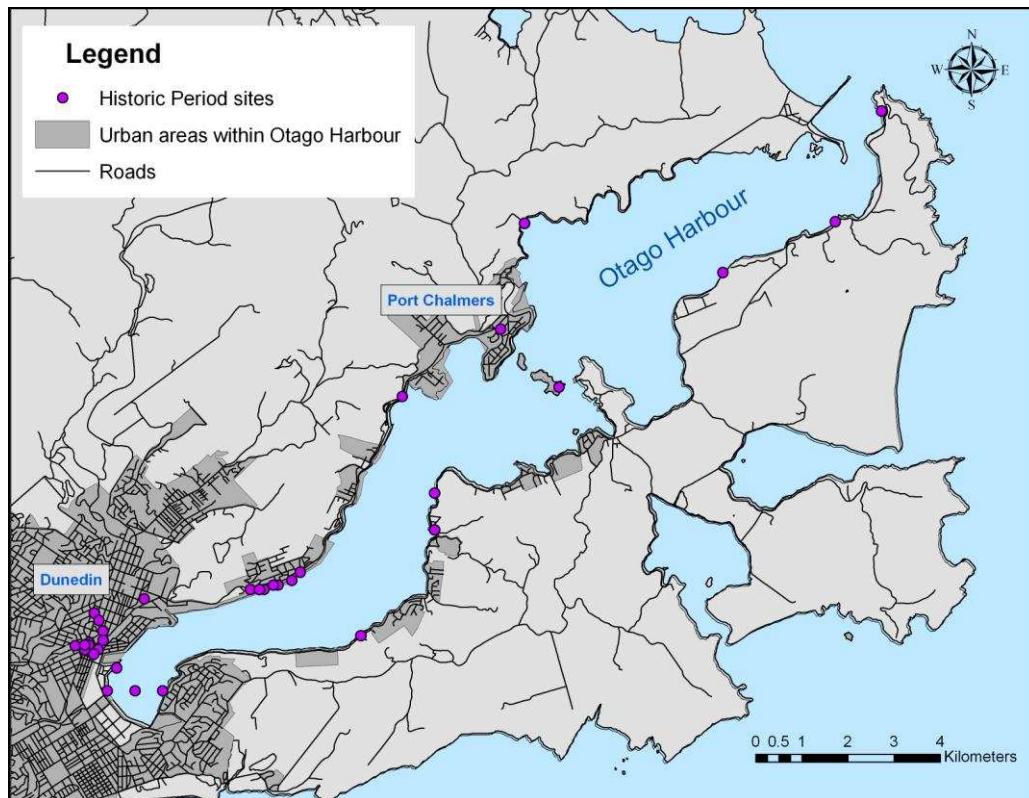


Figure 10: Map of Otago Harbour showing archaeologically recorded historic period sites.

Although a number of historic sites have been investigated archaeologically throughout the harbour, they typically have offered little additional information to that described in the historical record and as such, our understanding of this period is predominantly built on historical information.

The Scottish Presbyterian immigrants who left Britain to make a new home in the Otago region embarked on one of the longest migrations in human history (McLean 2001a:43). After a torturous journey of between 75 and 100 days at sea, depending on the weather and the seaworthiness of the vessel, these first colonists would have arrived in Otago Harbour only to find the ‘Edinburgh of the South’ was in fact a primitive village with

unformed roads and cesspools that overflowed into the streets during heavy rain (McLean 2001:43, Olssen 1984:82). The vast distances that separated Otago from the rest of the country, let alone the rest of the world, meant that in these early days shipping was vital, bringing both goods essential for survival and ‘new chums’ into the developing population. The first years of European settlement in Otago were characterised by scarcity and struggle in the underdeveloped townships. However, by the late 1850s, the hinterlands of the region were beginning to be populated by considerable numbers of sheep, a growing industry that was complemented by grain farming, another fruitful endeavour (McLean 1985:37). In the 1860s, this slow but steady growth was propelled into a full-blown economic explosion with the discovery of gold in central Otago. In just 10 years the Otago region was saturated with over £21 million of gold and thousands of immigrants who rushed to the diggings (Olssen 1984:66). This gold rush established Dunedin as a city of permanent buildings and, almost overnight, Otago Harbour became the busiest harbour in New Zealand and the third most important in the South Pacific (Hamel 2001a:110, McLean 1985:43). The enormous flow of speculative capital into this fledgling settlement also stimulated an unprecedented growth in manufacturing, which soon earned Dunedin the title of New Zealand’s leader in heavy industry (McLean 1985:90). As a consequence of the massive influx of shipping associated with the gold rush and the manufacturing boom, the primitive nature of the shipping facilities of Otago Harbour were exposed for all to see. In order to overcome what was rightfully perceived as a chokehold to progress, the Harbour Board began a development program of dock and breakwater construction, dredging, channelling and reclamations, which completely transformed the harbour (Bowman 1978:26). These harbour improvements were enormously expensive and required almost continued planning and implementation to stay ahead of the constantly shallowing harbour and the ever larger ships that were visiting it. The reward for this expenditure is illustrated most auspiciously by the trade in frozen mutton that developed out of Port Chalmers in the 1880s. Such trade was only made possible by the efforts of the Harbour Board who ensured that both the facilities and required water depth were available for this innovative industry (McLean 1985:79). As a result, this trade profoundly influenced the economic prosperity of Otago and is recognised as a factor that helped pull New Zealand out of the Depression of the 1880s (Church 1994:87). At the end of the 19th century, after many tumultuous decades of incessant dredging, spoil disposal and persistent reclamation, Otago Harbour was firmly established as the door through which the wealth of the province flowed.

THE 20TH CENTURY

The Otago region in the 20th century saw the expansion and consolidation of the pattern that had been established in the late 1800s. With the decline of gold mining, farming became increasingly important and consequently become a major source of income for the region (Hamel 2001a:187). Dunedin, as the principal city of the region, continued to grow. However, the once dominant manufacturing industry was gradually waning and was slowly being replaced by commercial enterprises and small businesses (Bauchop 2008:14-15). The loss of the region's industrial capacity was made worse by the outbreak of the two World Wars, which reduced the manpower available in the region and turned Otago Harbour into a global backwater (Olssen 1984:193). After the Wars, the chronic shortage of manpower and the inadequate shipping facilities continued to plague the harbour and, by proxy, the region as a whole (McLean 1985:176). However, during the late 1960s the container revolution swept through the shipping world and provided Otago Harbour and its hinterland with a lifeline (Church 1994:164). Fortunately, the Harbour Board realised the implications of adopting this 'unitisation' and the need to sell Port Chalmers as the sole South Island container port. After a programme of massive harbour works Otago Harbour was given full container port status (McLean 1985:196-208). The container revolution provided Otago Harbour and the surrounding region with a much needed economic boost, similar to that of the gold rush over one hundred years earlier (Church 1994:164). Today the Otago region continues to prosper through a combined economy of farming, tourism and industry, which is supported by the Port of Otago as the primary export port in the South Island.

5.

ARCHAEOLOGICAL SURVEY OF OTAGO HARBOUR: METHODS AND RESULTS

Through archaeological investigation and survey, studies of maritime cultural landscapes have demonstrated the importance of archaeological sites found within the intertidal zone (e.g. McErlean et al. 2002, Westerdahl 1992, Bannerman & Jones 1999). As such, the archaeological survey of the foreshore of Otago Harbour is an integral component of this study, providing insights into the interactions between the harbour's inhabitants and the marine environment.

SURVEY AREA

Although the entire harbour was the subject of the present study an area of foreshore approximately 19 kilometres in length was selected for intensive survey. This survey area runs along the western side of the harbour, extending from the mouth of the Leith River in the south to Hamilton Bay in the North (Figure 11). This particular area of the harbour was selected for survey for a number of reasons. Firstly, compared to the eastern side of the harbour, very little archaeological work has been undertaken along the western foreshore, thus presenting an opportunity to significantly add to our knowledge of the archaeology in this area of the harbour.

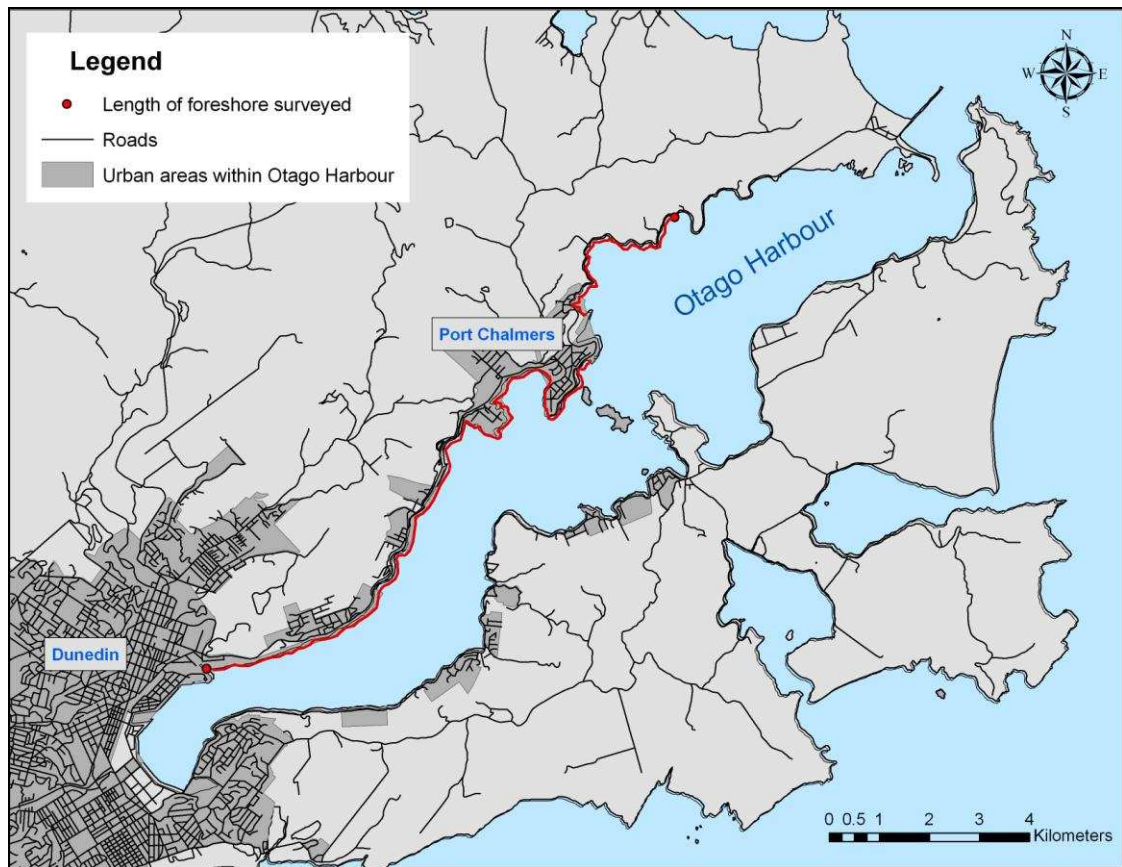


Figure 11: Map of Otago Harbour showing the length of the foreshore surveyed in this study.

Secondly, the survey area includes some of the major features of the Otago Harbour maritime cultural landscape, most notably Port Chalmers, Careys Bay and Deborah Bay; locations in which concentrated maritime activity has been historically recorded. The survey also included lengths of foreshore which in contrast, had no historically recorded sites of maritime activities, thus allowing comparisons to be made between the different areas. Another factor considered was the foreshore itself, as considerable expanses of shoreline are exposed at low tide along this length of the harbour, thus providing a suitable pathway for survey and also a larger area in which to search for archaeological sites. Finally, the foreshore along the planned survey route was easily accessible by foot, meaning that more time could be spent surveying as opposed to travelling to the area that was to be surveyed.

SURVEY METHODS

The first phase of the survey was a desk-based assessment of the harbour area. This involved the collection of existing NZAA sites records with maritime associations from around the harbour. Local histories of the harbour, historic maps and aerial photographs were then investigated for evidence of maritime sites. This information was then collated and the location of possible sites of maritime activity recorded on an Excel spreadsheet. The area to be surveyed was then viewed on Google Earth and divided into seven sections of roughly equal length. The sites recorded in the Excel spreadsheet were then assigned into their corresponding section within the survey area. This information was then printed, allowing a list of historically recorded sites in a particular section to be taken into the field. The second phase of the survey involved a physical walk-over of the seven different sections that made up the 19 kilometre survey area. The survey itself involved seven days of fieldwork undertaken between January 2009 and December 2010. Due to the tidal nature of the survey area and the desire to investigate as much of the foreshore as possible, the survey was limited to around 1 hour on either side of low tide to ensure the widest coverage possible was achieved. As sites and areas of interest were encountered along the survey area, their location was recorded using a Trimble GeoXT hand-held GPS unit. All sites and areas were then photographed and descriptions of the dimension, orientation and function of each site recorded were. No sites were disturbed or artefacts removed during the survey.

RESULTS OF PHASE ONE: HISTORICAL ASSESSMENT

The desk-based assessment found a total of 124 archaeological sites with maritime association recorded in the NZAA site record scheme within the harbour area (Appendix 1). Of these sites 24 were found to be within the area to be surveyed (Table 1 and Figure 12). Investigation of local histories, historic maps and aerial photographs revealed an additional 309 sites with maritime associations as being historically recorded around the harbour (Appendix 2). A total of 40 of these sites were recorded as being within the survey area (Figure 12).

Table 1: Archaeological sites recorded in the NZAA site record within the survey area.

Site	Description
I44/372	Sea wall
I44/400	Old railway formation
I44/407	Stone culvert
I44/398	Stone culvert/wall
I44/409	Stone culvert
I44/399	Stone culvert/walls
I44/408	Stone culvert
I44/342	Stone culvert
I44/312	Signal Pole
I44/359	Rifle butts
I44/476	Stone revetment
I44/294	Isbister's slipway
I44/467	Hulk of the Moa
I44/466	Hulk of the Prince Alfred
I44/116	Midden
I44/465	Hulk of the Thomas and Henry
I44/463	Hulk of the California
I44/464	Hulk of the Esk
I44/303	Hulk of the Don Juan
I44/340	Torpedo mole
I44/295	Slipway
I44/137	Midden
I44/138	Midden
I44/75	Midden

RESULTS OF PHASE TWO: PHYSICAL SURVEY

During the field walking phase of the survey, 25 previously unrecorded sites of archaeological interest were found (Figure 12).

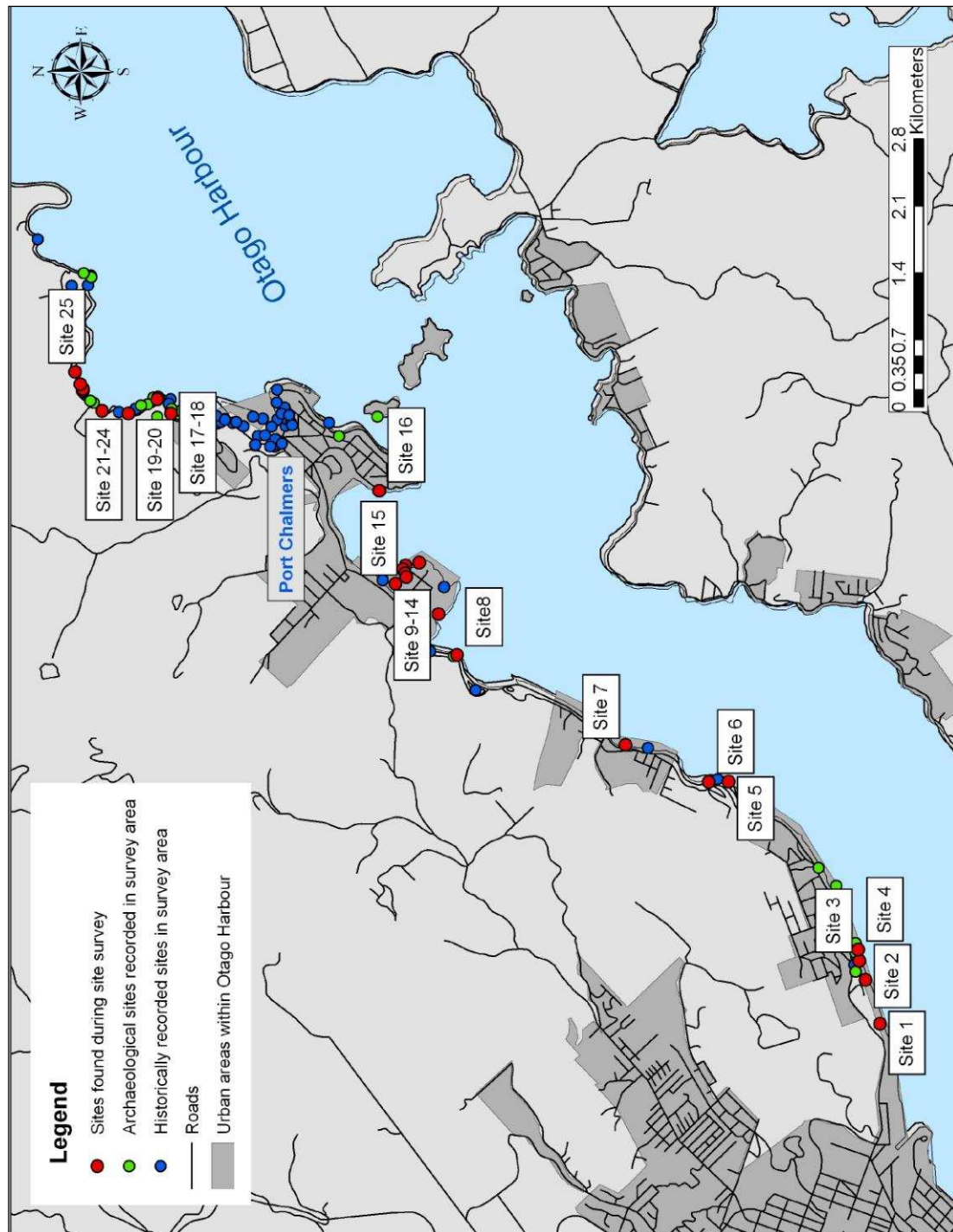


Figure 12: Map of Otago Harbour showing archaeological sites identified during Phase 1 and 2 of this archaeological survey.

A brief description of each of these sites is provided below:

SITES 1-4

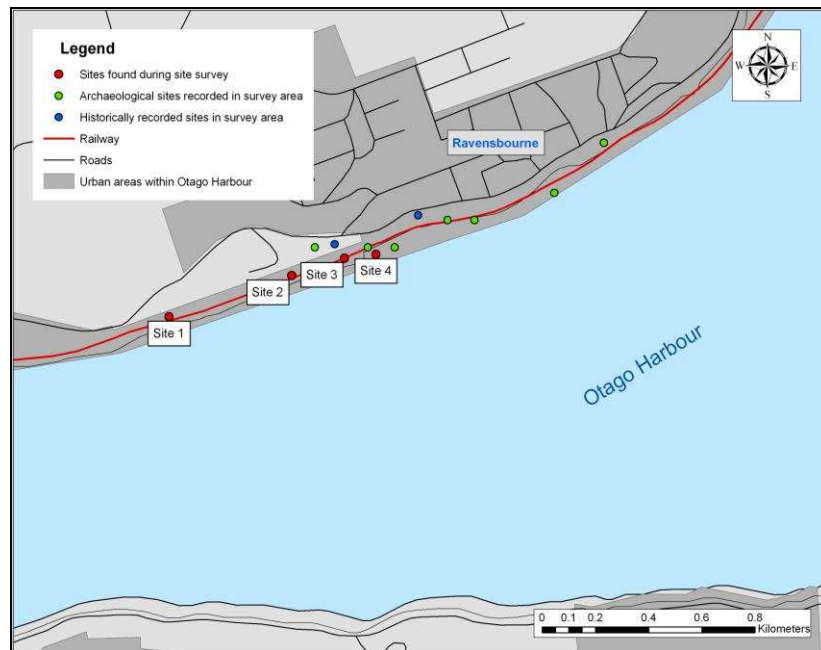


Figure 13: Map of the survey area showing Sites 1-4 found during the site survey.

Site 1: Wooden culvert framing. This culvert would have been part of the drainage system that was built when the sea wall was extended along the foreshore during the reclamation of the Ravensbourne area around 1877. The original culvert pipe has been removed and replaced with a plastic pipe; however the wooden framing still remains.



Figure 14: Photograph of Site 1 showing wooden culvert framing.

Site 2: Large wooden mooring post. This post is 2.3 metres high and has no notches or framing associated with it to suggest it was once part of a larger structure. It is likely that this post was used to tie up the punts which brought the spoil from the dredge to the edge of the sea wall for the reclamation of the area.



Figure 15: Photographs of Site 2 showing large wooden mooring post.

Site 3: Wooden Jetty. The current jetty is built from the remains of an earlier jetty constructed on the same site. The original jetty was much longer and twice as wide with a landing stage for small vessels approximately halfway along its length. Although an exact construction date is unknown, the jetty post-dates the construction of the sea wall in 1877 and is present on W.T. Neill's 1901 map of the harbour.



Figure 16: Photograph of Site 3 showing wooden jetty.

Site 4: Ravensbourne Boating Club. The original Boating Club shed is associated with the jetty described above and is likely to have been built at the same time. As noted by Cotton and White (2002:39), the Boating Club shed was built on the piles used by the sand punts for the reclamation of the bay. The original building was destroyed in the 1930s and the current building on the site was constructed on top of the original pile foundations.

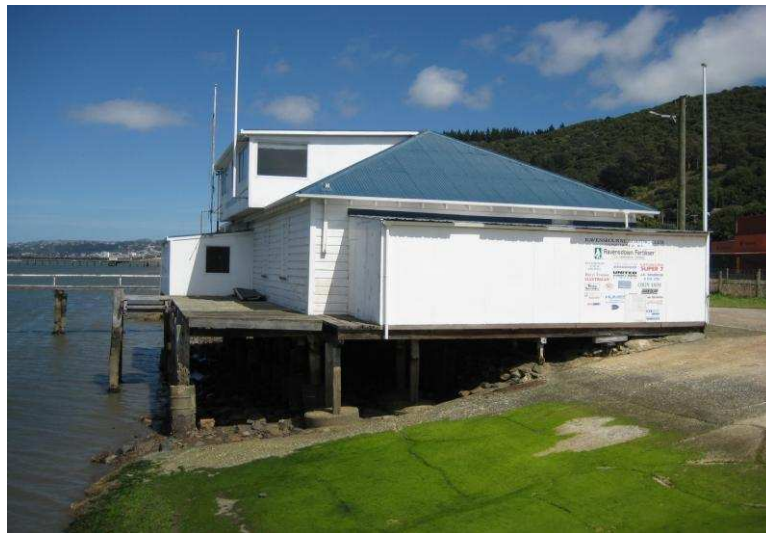


Figure 17: Photograph of Site 4 showing Ravensbourne Boating Club.

SITES 5-7

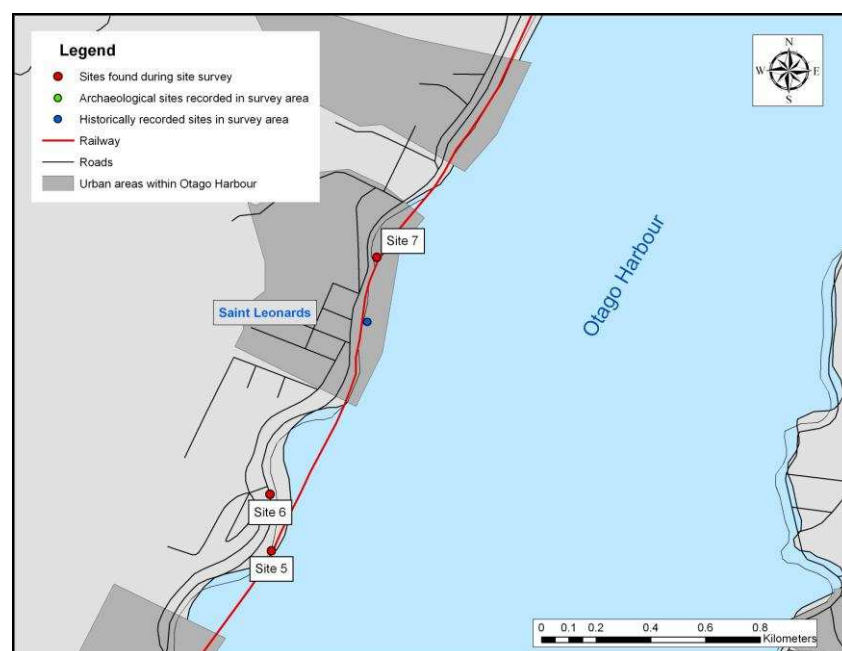


Figure 18: Map of the survey area showing Sites 5-7 found during the site survey.

Site 5: Boatshed and slipway. The current boatshed and slipway are built on top of an earlier shed and slip, making use of original stone foundations and piles. This type of site is relatively rare for this area as it is located on the original foreshore and has not been affected by construction of the railway or highway. As such, this site may be representative of the many sites that were destroyed during subsequent development of the foreshore in this area.



Figure 19: Photograph of Site 5 showing boatshed and slipway.

Site 6: Old railway embankment. This site is part of the embankment built for the Port Chalmers to Dunedin railway in the 1870s. Two large wooden railway sleepers are eroding from the bank below what is now the highway from Dunedin to Port Chalmers.



Figure 20: Photograph of Site 6 showing old railway embankment.

Site 7: Stone Groyne. This structure is approximately 30 metres long and is comprised of a loose fitting stone base overlain with concrete and rubble. Similar structures are recorded as being built around the harbour to keep sand from being washed off swimming beaches i.e. Back Beach (Church n.d:19).



Figure 21: Photograph of Site 7 showing stone groyne.

SITES 8-15

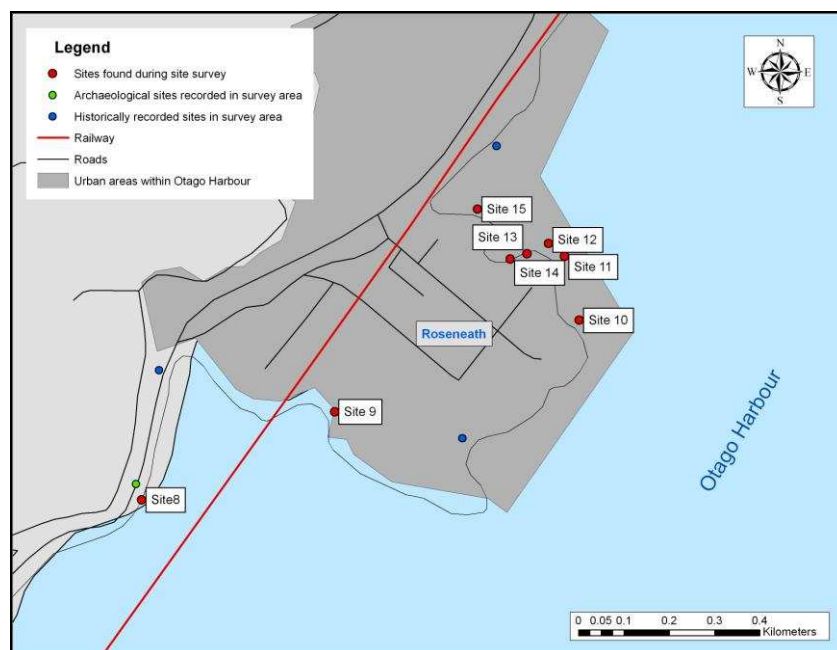


Figure 22: Map of the survey area showing Sites 8-15 found during the site survey.

Site 8: Stone formation. An area of built up stone with large metal inclusions that is approximately 4 metres long and 1.5 metres wide. Possible stone foundations of a small boatshed and slipway.



Figure 23: Photographs of Site 8 showing stone formation.

Site 9: Alignment of wooden posts. Remains of a wooden structure built out onto the foreshore; possible site of a small wooden jetty.



Figure 24: Photograph of Site 9 showing alignment of wooden posts.

Site 10: Boatshed foundations. Large L-shaped stone foundations with lengths of railway iron, scatters of broken glass and ceramics. Also associated with the site are the remnants of wooden piles from a possible jetty and a railway iron mooring post with a large chain wrapped around the outside.



Figure 25: Photograph of Site 10 showing boatshed foundations.

Site 11: Boathouse. The site of a modern boathouse and slipway that appears to have been built on top of an earlier structure. The stone foundations and wooden piles from the original structure are incorporated into the modern boathouse now situated on the site.



Figure 26: Photograph of Site 11 showing boathouse.

Site 12: Jetty and breakwater. An alignment of four wooden posts extending into the water from the shore; a possible jetty site. Just to the north of this possible jetty is a hand built rock formation, extending in an L-shape out and along the beach. Considerable care has obviously been taken in its construction, with large rocks stacked end to end on the outside and smaller rubble placed in the middle. The interior of the 'L' has had all the rocks removed leaving a soft sand shore which would be suitable for the landing of small boats.



Figure 27: Photographs of Site 12 showing jetty and associated breakwater.

Site 13: Water tanks and an artefact scatter. Dense scatter of ceramics and glass on the foreshore, including case gin, ring seal wine and black beer bottles. Also associated with this scatter are five iron water tanks, each measuring 1 metre by 1 metre and cut approximately 2 metres into the bank. These are highly corroded with only the bases remaining.



Figure 28: Photograph of Site 13 showing remains of water tanks and an artefact scatter.

Site 14: Water tank. Iron water tank with a tap on the front, located on the foreshore.



Figure 29: Photographs of Site 14 showing remains of an iron water tank.

Site 15: Water tank and artefact scatter. Remains of an iron water tank associated with a large area of debris, including various pieces of glass bottles, concreted metal and scattered brick.



Figure 30: Photograph of Site 15 showing remains of an iron water tank and an artefact scatter.

SITE 16

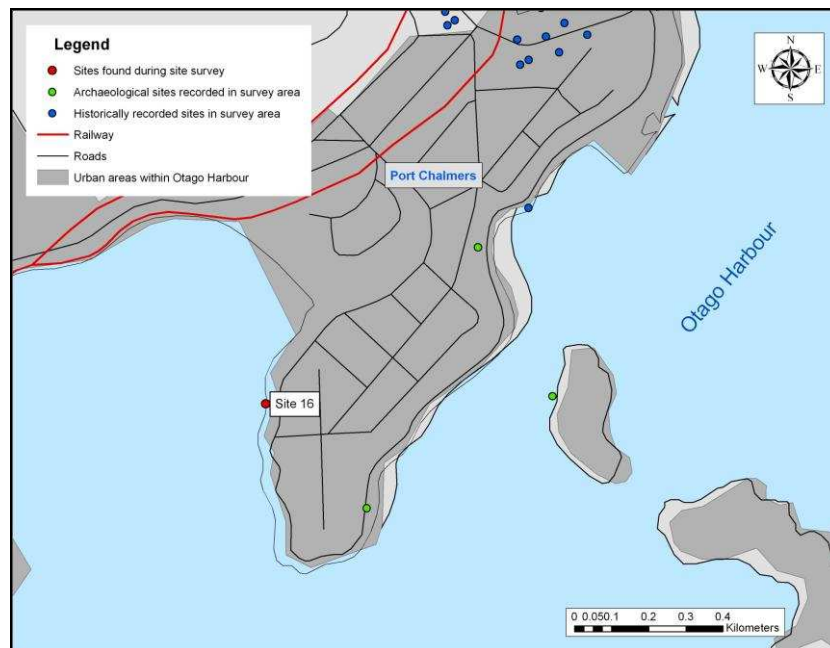


Figure 31: Map of the survey area showing Site 16 found during the site survey.

Site 16: Boathouse foundations and slipway. A large area of stone foundations measuring approximately 1 metre high, 2 metres wide and 10 metres long. A cleared area of the foreshore is likely to have been a small slipway and beside this, vertical wooden posts are possibly from a small wooden jetty. Lengths of railway iron are also present.



Figure 32: Photograph of Site 16 showing boathouse foundations and slipway.

SITES 17-25

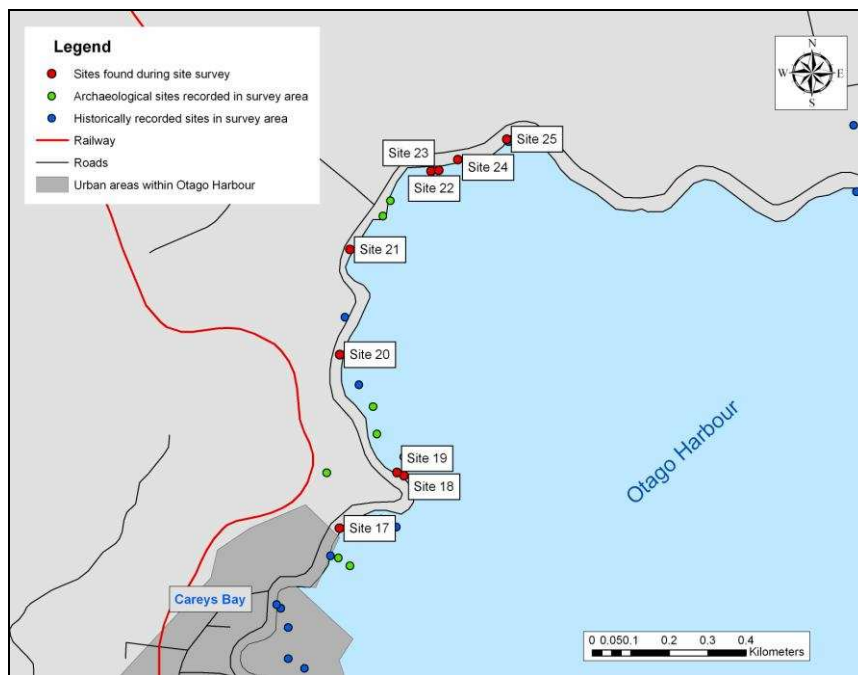


Figure 33: Map of the survey area showing Sites 17-25 found during the site survey.

Site 17: Artefact scatter. Dense scatter of artefacts along the foreshore, including stoneware ceramics, beef bone, coal, shoes, black beer and ring seal wine bottles. No evidence of associated structure or rubbish pit.



Figure 34: Photographs of Site 17 showing artefact scatter including the remains of a shoe.

Site 18: Metal concretions. An area of thick metal concretions and brick adjacent to a built up area of foreshore on which a number of boathouses are built. The concentrations of scrap metal suggest an industrial process of either shipbuilding or ship breaking was being undertaken in this area.



Figure 35: Photographs of Site 18 showing metal concretions.

Site 19: Artefact scatter. Scatter of artefacts extending approximately 15 metres along the foreshore. Artefacts include broken glass bottles, including black beer and ring seal wine, beef bones and various pieces of ceramic. Possible structural remains in the vicinity of the scatter exist in the form of iron footings dug into the foreshore.



Figure 36: Photographs of Site 19 showing artefact scatter and iron footings.

Site 20: Metal concretions. A large area of metal concretion extends approximately 20 metres along the foreshore and is likely to extend under the sea wall. The concretion is composed of various pieces of metal, including bolts, chain and wire rope. The volume of metal concretion suggests it is from an industrial context, such as ship breaking which is recorded to have been undertaken in this bay (Ledgerwood 2006:95).



Figure 37: Photographs of Site 20 showing metal concretions.

Site 21: Artefact scatter. A scatter of artefacts spread across approximately 10 metres of the foreshore including broken bottle glass and pieces of ceramic. There is no evidence of an associated structure within close vicinity of scatter.



Figure 38: Photograph of Site 21 showing artefact scatter.

Site 22: Boat haul out. A stone retaining wall built from rocks and a large log to a height of approximately 1 metre above the shore. This structure provides a platform on which a small boat could be pulled out of the water above the high tide mark.



Figure 39: Photograph of Site 22 showing boat haul out.

Site 23: Stone alignment. The possible remains of the stone foundations of a small boathouse with associated jetty/slipway. The widening of the sea wall in this area in the 1930s may have buried the rest of the foundations.



Figure 40: Photograph of Site 23 showing stone alignment.

Site 24: Boat landing area. Three definite, but possibly as many as six, rock formations extending from the bank into the water, providing breakwaters and areas clear of rock from the beach to allow small craft to be hauled up. Bay 1 was cleared of all rocks to leave a clear sandy shoreline. Bays 2 and 3 have had large rocks removed but are ‘paved’ with smaller rocks. Bays 4 and 5 are more similar to the sandy shoreline in bay 1.



Figure 41: Photograph of Site 25 showing artificial boat landing area.

Site 25: Small wooden pier. The base of the pier is comprised of large boulders on the outside with wooden posts and smaller rocks in the middle. There are also broken glass and concretions in the vicinity of the structure.



Figure 42: Photograph of Site 25 showing remains of small wooden pier.

This archaeological survey of Otago Harbour involved both desk-based and field-based research. The desk-based assessment found 124 archaeological sites with maritime associations recorded in the NZAA site record for the harbour and an additional 309 historically recorded sites of maritime activities. The site survey detailed in this chapter involved the survey of 19km of shoreline within Otago Harbour and revealed an additional 25 previously unknown areas of archaeological interest. By combining the results of this site survey with investigations of the 124 archaeological sites and the historical record, including the 309 historically recorded sites of maritime activities, this study will now use this information to create a thematic narrative to explore the maritime cultural landscape of Otago Harbour.

6.0.

THEMES IN THE MARITIME CULTURAL LANDSCAPE OF OTAGO HARBOUR

The maritime cultural landscape of Otago Harbour is the product of generations of interaction between the inhabitants of the harbour and the marine environment. In order to explore this relationship, the historical and archaeological records of the harbour (including the above site survey) were investigated and the results divided into a number of interconnected themes. The themes of marine resource exploitation, navigation and landing places, hulks and abandoned watercraft, shipbuilding and repair, shipwrecks, harbour warfare and defence, and anthropogenic change to the harbour, represent the different types of activities that have contributed to the formation of the maritime cultural landscape of the harbour.

6.1. MARINE RESOURCE EXPLOITATION

For thousands of years maritime cultures around the world have harvested marine food resources as a highly predictable and nutritious supply of food (McErlean et al. 2002:132). The importance of marine food resources meant that their acquisition was a major area of interaction between people and the marine environment and therefore, is highly significant in studies of maritime cultural landscapes.

MARINE FOOD RESOURCES IN OTAGO HARBOUR

Boyd's (2008:3) study of the fisheries resources in Otago Harbour describes how the large size and predominance of shallow, sheltered water in the harbour makes it a valuable habitat for many different types of fish and shellfish. Most notable are the extensive areas of intertidal and subtidal mudflats that support large populations of bivalve shellfish, while the large seagrass beds provide refuge for a range of small and juvenile fishes (Boyd 2008:3). These favourable environmental conditions support an abundance of marine food resources that have been exploited by the harbour's various inhabitants and include shellfish, fish, coastal birds and marine mammals.

SHELLFISH

The vast interior sandbanks and rocky shores of the harbour support a range of edible shellfish species. Cockles (*Austrovenus stutchburyi*), pipi (*Paphies australis*) and tuatua (*Paphies donacina*) were collected from the shallow intertidal areas, while mussels (*Perna canaliculus*), paua (*Haliotis iris*) and catseye (*Lunella smaragdus*) were found on the surrounding rocky shores (Hamel 2001a:35, James et al. 2010:1-4).

FISH

The fisheries environment of Otago Harbour is an extension of the surrounding sea rather than an estuary and, as such, the majority of species caught within the harbour are typically found in moderately shallow inshore water (Boyd 2008:3, Hamel 2001a:33). As described by James et al. (2010:7-12), these fish included the various flatfish species of the *Pleuronectidae* family, Blue Cod (*Parapercis colias*), Blue Moki (*Latridopsis ciliaris*), Butterfish (*Odax pullus*), Red Cod (*Pseudophycis bacchus*), Red Gurnard (*Chelidonichthys umu*), Trumpeter (*Latridopsis lineata*) and various species of wrasse (*Pseudolabrus* spp.). Offshore fisheries were also targeted, providing a range of different fish species including Barracouta (*Thyrstites atun*), Hapuku (*Polyprion oxygenios*), Ling (*Genypterus blacodes*) and Tarakihi (*Nemadactylus macropterus*).

COASTAL BIRDS

In addition to such abundant marine life, the harbour also supports large populations of coastal birds, including both marine species and shorebirds. It appears that these birds were hunted opportunistically throughout prehistory and as a result, over 30 different species of marine birds have been recorded from middens throughout the region (Smith 2011: in press). These species include penguins (*Eudyptes pachyrhynchus*, *Megadyptes* spp, and *Eudyptula minor*), albatross (*Diomedea exulans* and *Thalassarche cauta*), shearwaters (*Puffinus griseus* and *Puffinus gavius*), petrels (*Pelecanoides urinatrix*) and shags (*Leucocarbo chalconotus*) (see Smith 2011:in press, Table 14 for a full list of species).

MARINE MAMMALS

A wide range of marine mammals have been recorded around the Otago coastline and at various times have been hunted by the harbour's inhabitants. These include various seal species, such as the New Zealand fur seal (*Arctocephalus forsteri*), New Zealand sea lion (*Phocarcos hookeri*), southern elephant seal (*Mirounga leonina*) and the leopard seal (*Hydrurga leptonyx*) (Hamel 2001a:29). Other marine mammals that were hunted around Otago Harbour include the common dolphin (*Delphinus delphis*), Hector's dolphin (*Cephalorhynchus hectori*) and even several species of whale, which were hunted from Weller's whaling station in the 1830s.

ARCHAEOLOGY OF MARINE RESOURCE EXPLOITATION

The harvesting of marine food resources has been one of the major areas of interaction between the harbour's inhabitants and the marine environment. These interactions have differed not only in terms of the resources exploited, but also in the physical remains that such activities have been left behind. An example of this is seen in the archaeological evidence of fishing which is particularly difficult to detect, especially in terms of the fishing techniques utilised. In contrast, archaeological evidence of shellfishing is readily apparent from the numerous shell middens distributed around the harbour. This difference is illustrated in Figure 43, which shows the type and number of marine resource gathering sites around Otago Harbour that are recorded in the NZAA site recording scheme.

Within the study area, fifty-five sites of marine resource gathering are recorded in the NZAA site record. Unfortunately, the level of detail included in these site records varies greatly and only a relatively small number of sites of marine resource gathering have been investigated in any detail (Figure 43). These sites include:

- Pukekura Pa (site no. J44/4; Leach & Hamel 1978, Hamel 2001a).
- Parihaumia (site no. I44/16; Hamel 2005a).
- Tapumaeomokoia (site no. J44/144; Hamel 2005b).
- Turnbull Bay (site no. I44/29; Hamel 2005c).
- Harwood (site no. I44/29; Park 1976).
- Weller's rock (site J44/5; Campbell 1992, Campbell 1994).

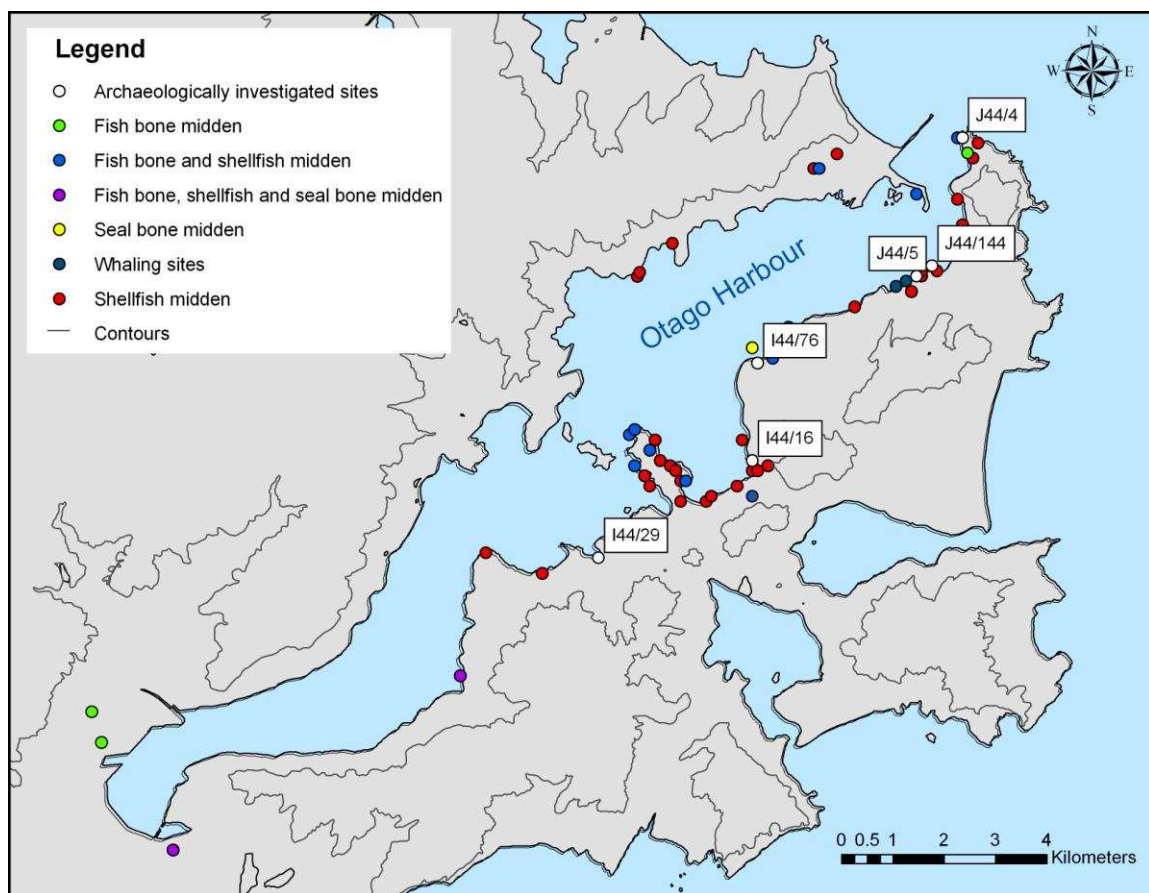


Figure 43: Type and number of NZAA recorded marine resource exploitation sites in Otago Harbour and sites investigated archaeologically.

The archaeological evidence contained within these reports reflects the importance of such food sources in the diets of the harbour's inhabitants. By combining the information from these reports and other archaeological investigations with the historical record, it is possible to gain a clearer understanding of the interaction between the people of the harbour and the marine environment. It is to this synthesis that we now turn.

MARINE RESOURCE EXPLOITATION IN PREHISTORY

The first arrivals to Otago Harbour would have entered a pristine marine environment in which marine food resources could be exploited easily and efficiently, with only minor variation to the tools and techniques these colonists brought with them from Polynesia. Investigations of early middens from coastal Otago have shown a predominance of marine mammal bone over other food remains (Smith 2002:21). This heavy reliance on marine mammal food resources most likely reflects the abundance and ease of capture such a resource presented and also suggests that the hunting of marine mammals was a major activity for the areas first inhabitants (Smith 2005:8). The rocky foreshores and sandy beaches of the harbour and its surrounds would have provided a range of suitable locations for the New Zealand fur seal (*Arctocephalus forsteri*) and the New Zealand sea lion (*Phocarctos hookeri*) to thrive, thus presenting the harbour's first inhabitants with a plentiful local food resource. In his PhD entitled *Sea mammal hunting and prehistoric subsistence in New Zealand*, Smith (1985:337) describes how the regularity with which seal remains occur in middens indicates that these animals were acquired by deliberate hunting rather than by chance findings. It is likely that these hunters would locate seals at their regularly occupied colonies and once approached, the seals would be "despatched by a blow to the snout with a club made of wood or bone" (Beattie 1919:138). The ease with which seals could be hunted meant that mass capture of this resource was possible and, as such, seal flesh was often preserved for later consumption by either smoking or storage in kelp bags (Smith 1985:13). Typically, such preservation involved separating seal flesh from bone and, as noted by Smith (1989:81, 2005:9), bones from seals that had been preserved would only be found in sites close to where the seal was butchered.

The harbour's prehistoric inhabitants also hunted other marine mammals, such as the common dolphin (*Delphinus delphis*). As noted by Hamel (2001a:31), dolphins have been identified in middens from six Otago sites, including Andersons Bay (site I44/172),

often in association with harpoon points, indicating they were harpooned at sea. However, it is not known whether they were hunted deliberately by Maori or, alternatively, were killed opportunistically while fishing at sea (Smith 1985:336). Over time, the hunting of marine mammals had a significant impact on the harbour's prehistoric inhabitants. The persistent culling of juvenile and sub-adult seals meant that breeding colonies in the vicinity of the harbour would have decreased in number until their disappearance altogether from the south east coast by the 16th or 17th century (Smith 1989). With the decline of this readily available source of protein and fat, the harbour's inhabitants would have had no choice but to turn increasingly to other more reliable food sources. Specifically, the Maori economy moved from big game hunting of moas and seals, to small game such as fish, small birds and shellfish (Anderson & Smith 1996:364).

The gathering of shellfish would have provided Maori with the most reliable source of food from the sea (Anderson 1998:138). The vast sandy intertidal areas of Otago Harbour offered an ideal environment for the collection of cockles, pipis and tuatua and would have provided an almost inexhaustible supply of shellfish. The harvesting of such food was typically the work of women and children who would use their hands and feet to collect the shellfish in small woven flax bags (Anderson 1998:138). Rocky shores were also exploited by Maori, adding mussels, paua and catseye to the range of shellfish harvested (Anderson 1981). The vast quantities of shellfish midden discovered in the archaeological record demonstrate that shellfish made a valued addition to the diet of the harbour's prehistoric inhabitants (Hamel 2001a:73). Shell middens around Otago Harbour have been dated to all phases of prehistory reflecting the fact that, despite their small size relative to seals and moas, shellfish were harvested from the time of first arrival. It is likely that the first colonists concentrated their harvest on the larger individuals of the edible shellfish species and that over time, the average size of the harvested shellfish decreased (Leach & Boocock 1993:32, Hamel 2005b:4). Hamel (2001a:86) notes that with the extirpation of seals and the extinction of moa from Otago Harbour, the predictable availability of food along the shoreline would have been attractive to the harbour's inhabitants. Furthermore, evidence suggests that activities at coastal sites after ca. 1550 AD concentrated on fishing and shellfishing (Ibid:90). As such, an intensification of shellfish harvesting compared to previous time periods is likely to have occurred, although it appears that the same species were continually targeted throughout prehistory (Smith 2011:in press).

A considerable amount of research has been directed toward the study of fishing in prehistory and through recent works such as Smith (2004a, 2011:in press), Anderson (1997), Leach & Boocock (1993) and Leach (2006), a clear picture of this important industry has emerged. Archaeological evidence from middens around coastal Otago shows that fishing played a major role in the subsistence activities of the area's prehistoric inhabitants (Hamel 2001a:32). As described by Leach & Boocock (1993:25), marine fish were one of the leading food sources for prehistoric Maori. As such, in terms of food collection, fishing would have been of comparable to the hunting of marine mammals in its significance to the harbour's prehistoric inhabitants (Smith 2004a:25). Prehistoric middens from Otago Harbour show that Maori concentrated on relatively few species of fish; namely barracouta (*Thyrscites atun*), red cod (*Pseudophycis bacchus*), ling (*Genypterus blacodes*), wrasse (*Pseudolabrus* spp.), hapuka or groper (*Polyprion oxygeneios*), blue cod (*Parapercias coleus*) and black cods (*Notothenia* spp.) (Leach & Hamel 1978:7, Hamel 2001a:33). These fish were generally taken in shallow inshore waters, over reefs and rocky outcrops and occasionally over sandy bottoms (Anderson 1997, Hamel 2001a:33). The prehistoric inhabitants of the harbour utilised large single-hulled or double-hulled canoes to put out to sea for fishing and once there, it appears that the main fishing methods involved "the use of multiple bait hooks on spreaders to catch the smaller species, large wooden shanked hooks for hapuka and sharks, and the immensely efficient matere and pa (barracouta lure) for pelagic species, especially barracouta" (Anderson 1998:133). Interestingly, there is no evidence to suggest that nets or traps were utilised by the inhabitants of the harbour even though fish traps have been recorded in Akaroa Harbour to the north (Hamel 2001a:72). Although multiple species were targeted by the prehistoric inhabitants of the harbour, by far the most common was the barracouta, which, being a voracious feeder, struck readily (Bowman 1948:10). Midden sites around coastal Otago provide evidence of the importance that barracouta played in the diet of prehistoric southern Maori, being the dominant species in the majority of middens investigated (Anderson 1997). As described above, with the decline of marine mammals, fish became increasingly important for the prehistoric inhabitants of the harbour. In Otago this encouraged the intensification of barracouta fishing and as a result, a major industry developed at Otakou for the capture and preservation of such fish (Hamel 2001a:84).

Compared to the exploitation of other marine food resources, the relatively low number and small meat weights of coastal birds in the archaeological record of the Otago region suggests that they were only a minor part of the prehistoric diet (Hamel 2001a:20). Investigations of middens in both the Otago and Catlins areas have shown that the hunting of coastal birds tended to be an opportunistic strategy, with assemblages often recording multiple species and little evidence for the close targeting of specific species (Smith 2011:in press). The taking of coastal birds was not a new strategy for the early inhabitants of the harbour, whose hunting traditions can be traced back to the colonisation of Polynesia. As described by Steadman (1997), the hunting of coastal birds incorporated a range of techniques, including snaring and spearing, through to the hand harvesting of burrow-nesting and colonial seabirds. The varied topography of Otago Harbour provided a range of environments suitable for the taking of coastal birds with penguins and shags being taken from shorelines, while gulls and terns could have been taken from the shoreline or estuary (Hamel 2001a:22). In addition, birds were taken at sea with a notable hunting technique for albatross and mollymawks that involved throwing a gorge on the end of a line as they approached. When the gorge jammed in the bill of the bird, it could then be hauled into the boat and rapidly dispatched (Leach & Hamel, 1978:8).

MARINE RESOURCE EXPLOITATION IN PROTOHISTORY

The arrival of Europeans to the Otago Coast in 1809 saw the introduction of new methods and technologies for the exploitation of local marine resources. These new methods were integrated and worked alongside techniques and traditions established by the Maori inhabitants of the harbour to create a more intensive system for the exploitation of marine resources in and around the harbour.

Historical records suggest that as early as 1791, and certainly by 1792, Europeans had begun sealing in the far south exploiting rookeries around the Fiordland and Stewart Island regions (Smith 2002:11). Unlike the previous subsistence sealing where the seals had been killed for their flesh, Europeans typically sought only the skins for export to the lucrative China trade (Entwisle 1998:11, Smith 2005:11). The first reliable records of this trade dating to 1803, show that catches from a single voyage may have been as many as 15,000 pelts, with an average of 45,000 pelts taken each year between 1803 and 1807 (Smith 2002:13). These sealers required only minimal equipment: an iron hook was used to

hold the seals while a club of hardwood killed them with a blow to the snout and a knife was then used to skin the carcass (Smith 2002:20). This slaughter rapidly depleted the more easily accessible breeding colonies and as such, sealers were forced to look increasingly further afield for suitable sealing grounds (Smith 2005:11). By 1809, sealers were beginning to explore the southern coast of Otago and by the end of the year the schooner Brothers had landed eight sealers on the 'Isle of Wight' (site I44/113) and three on 'Ragged Rock' just south of Otago Harbour (Entwisle 1998:24). The following year, the Sydney Cove was anchored in Otago Harbour with gangs of sealers working at Cape Saunders (Entwisle 2005:70). The seal population around coastal Otago, and especially Otago Harbour, was already severely depleted by the time Europeans arrived and there is no convincing evidence to suggest that the industry was actively pursued in and around the harbour (Smith 2002:53). However, the sheltered waters of the harbour offered an ideal location for vessels engaged in the sealing trade to undergo repairs and take on provisions; and it is in this role that sealing had the greatest impact upon the inhabitants of Otago Harbour before the industry's demise around the 1830s (Smith 2002:14).

The seaward bays of the east coast of the South Island were often frequented by southern right whales (*Eubaleana Australis*) as they provided important breeding grounds and sheltered waters in which to give birth to their calves (McLean 1985:24). In October 1831, Edward and Joseph Weller landed at what is now Weller's Rock and established a shore-based whaling station (site J44/5). This marked the beginning of permanent European occupation in Otago Harbour (Entwisle 1998:84). The Wellers constructed try-works and other infrastructure essential for catching and processing right whales. Consequently, alongside the station grew a considerable village of storehouses, cottages and huts (Campbell 1992:38). As described by McLean (1985:24), by 1834 Weller's whaling station was manned by eleven boat crews who alone, in 1835, killed 103 whales. In 1836 the tryworks at Weller's Rock, the 'Upper Fishery', was complimented by the establishment of another works at Pilot's Beach, the 'Lower Fishery' and, in 1837, another just south of Harrington Point, the 'Middle Fishery' (Entwisle 1998:98). By now the Weller's enterprise was one of the largest and most successful shore whaling stations in the country and through their storehouses and trading networks flowed not only oil and whale by-products, but also large quantities of flax, fish and potatoes for the New South Wales market (McLean 1985:24, Campbell 1994:33). The Wellers had established what was essentially a Company Town, and through this, they dominated the supply of European goods up and

down the coast, placing their station and Otago Harbour as the hub of the south for European and Maori alike (Entwisle 1998:99). Around this time, Otago Harbour was also a major provisioning stop for deep sea whaling vessels. Ships from Denmark, France, Germany, Great Britain and the United States found that they could trade with the Wellers and local Maori for the goods they needed for their long voyages (McLean 1985:25). Church (2002:12) notes that these ships were regular visitors and by the end of 1847, a total of 97 whaling ships had visited the harbour.

The efficiency with which the Weller's stations had exploited their quarry meant that by 1839 shore whaling was in significant decline and by 1841 the Wellers were forced to abandon their station altogether (McLean 1985:25). Interestingly, shortly after the station was abandoned vast amounts of sand, loosened by the clearing of forest behind the station, began to build up over the station buildings and whaler's village, covering the site under a considerable depth (Campbell 1994:35). In 1992 Matthew Campbell undertook a small scale excavation of the try-works from the Lower Fishery (site J44/5) for his Master's thesis and found that considerable archaeological material remained at the site, including numerous bricks and a layer of clay that was interpreted to be the remains of the try-works furnace (Campbell 1992:29). An alignment of bricks was also uncovered and this was thought to have formed the base on which the try-pot would have rested. From this work Campbell noted that the rest of the station is probably well preserved, having been sealed beneath the layer of sand, thus presenting interesting archaeological possibilities for the future.

Contact with sealing gangs and the establishment of Weller's whaling station encouraged and drew Otago Maori into a market economy. This presented a number of opportunities for Maori fishermen as their expertise in the catching and preserving of local species enabled them to trade their surplus catch for European goods or currency. Where it was desired, Maori readily incorporated European technology into their traditional fishing techniques, with iron nails replacing bone fish hooks, and whaleboats and sealboats gradually taking the place of waka (Anderson 1998: 214, Hamel 2001a:33). This trade developed steadily and as a result in April 1834 and again in February 1835, Edward Weller sent a consignment of salted and dried fish to Sydney that had likely been obtained from Otakou Maori (Anderson 1998:173). Although some small scale European fishing was undertaken during this time, Otago Maori continued to dominate the developing fishing industry, supplying the small export market as well as the growing number of European

settlers around the harbour. The arrival of Europeans affected many aspects of life for Otago Maori but during the protohistoric period traditional marine food resources continued to be gathered as subsistence food; an activity that continued into the early twentieth century (Olssen 1984:90).

MARINE RESOURCE EXPLOITATION IN THE HISTORIC PERIOD

Shellfish continued to be collected by Maori and European alike during the historic period, providing an easily gathered source of additional protein. The popularity of oysters meant that for a time, regular shipments were sent to Sydney and Melbourne, originating from the oyster beds around the harbour (Bowman 1948:24). Unfortunately, demand soon outweighed supply and the beds were rapidly depleted, scuttling the industry before it could become properly established (Johnson 2004:32).

The fishing industry in Otago Harbour continued to be dominated by Maori up until the 1850s, when a number of European immigrants began to supplement their subsistence farming activities with small scale fishing (Olssen 1984:74). These men typically lived near the port and would launch their boats and row about the harbour in search of schools of fish (McLean 1985:299). Once such a school was found, a man would be dropped off on the adjacent shore and the boat rowed out in a semicircle, running the seine net off the stern (Anon 1864:5).

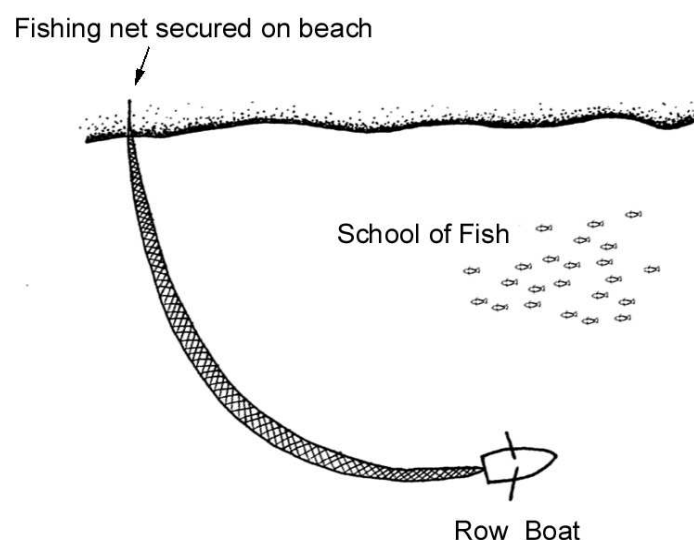


Figure 44: Seine fishing using a net fixed on the beach and a rowboat (Drawing by Jeff How 2007).

The net was then hauled aboard and the catch recovered before being rowed to Port Chalmers or Dunedin for sale. As noted by Thomson (1876), flounders were the target species for these fishermen and considerable numbers could be caught in the many bays around the harbour.

In the 1860s the fishing industry expanded, with the seine netters joined by line fishermen who operated in the open waters outside Taiaroa Head. As noted by Butcher (2008:84), many of these men lived in small huts and shacks near the Maori settlements at the Heads. Whale boats and small cutters were utilised to cross the dangerous bar and reach the fishing grounds where deep-sea lines 80-100 fathoms long were used to catch groper, cod, ling and barracouta (Bowman 1948:114). These fishermen supplied fish for the export trade that was rapidly developing and fish curing works, such as that run by W.M. Innes at Back Beach, began to pop up in various bays around the harbour (Church n.d:17). As described by Church (1994:93), these works employed a number of men and creatively marketed their products for export; “smoked red cod was marketed as ‘haddock’, smoked ling as ‘scotch fillet’, and herrings as ‘kippers’”, all of which were sent aboard ships to Australia, Hong Kong, Singapore and Europe, linking the Otago Harbour fishing industry to the world.

Beam trawling was introduced to Otago Harbour in the 1870s, significantly increasing the supply of fish for the local and export market. Beam trawlers were small sailing vessels fitted with seine nets that were run along the sea floor, catching a wide variety of fish species (Bowman 1948:114). These vessels helped supply what was becoming a considerable industry, with fish curing sheds established at all the bays around Port Chalmers and some of the larger sheds having as many as six fishing vessels working for them (Bowman 1948:115). An interesting development in the Otago Harbour fishing industry at this time was the preservation of fish in tins, mainly for export. As described by Stewart (1973:31), barracouta, moki and flounder were first cured at Innes’ works and then tinned by a local tinsmith, and “on the tins being opened, the contents were as fresh as when cooked”.

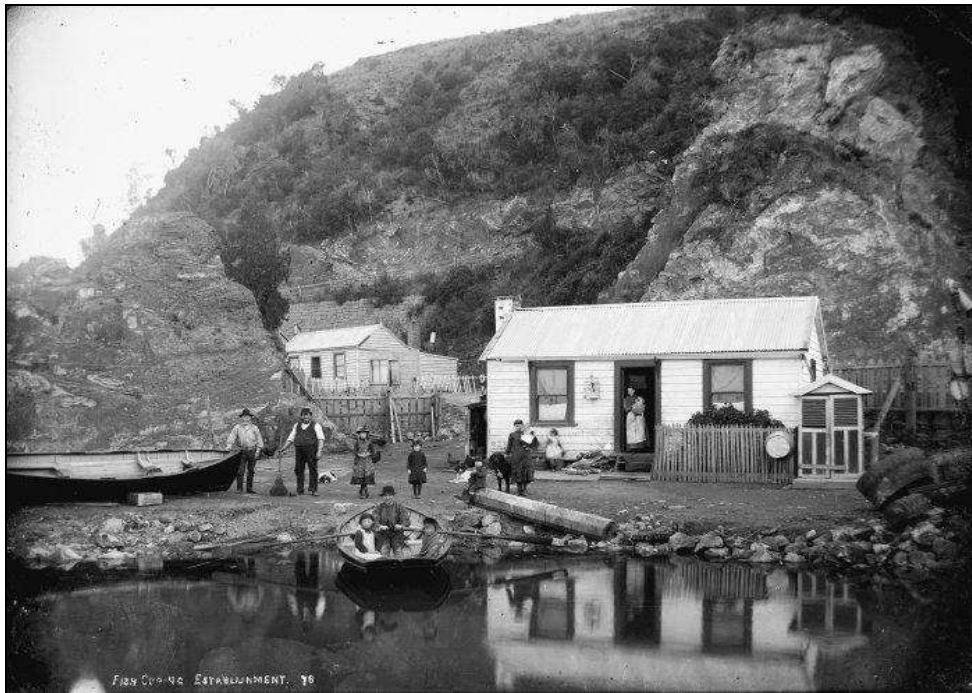


Figure 45: Fish Curing establishment with cottages at Careys Bay, Port Chalmers 1880s (Alexander Turnbull Library (ref. 1/1-002573-G)).

The fishing industry in Otago Harbour continued to go from strength to strength and as the century progressed, the small dinghies of old were replaced with ‘fishing smacks’, allowing the fishermen to look further offshore for productive fishing grounds. In 1898 the Otago Trawling and Distributing Company was established, which purchased the large steam trawler *Express* (53 tons) and chartered the 65 ton *Napier* for the Otago fisheries (McLean 1985:301). These vessels ushered fishing into a new era, with fishing grounds as far away as 18 miles being opened up to these inshore trawlers (McLean 1985:301). Fish curing works continued to play a significant role in the industry, with the historian Bowman (1948:115) noting “in 1900 Otago possessed thirteen of the twenty-eight fish curing works in New Zealand, and most of them were about Port Chalmers”. In an attempt to support the fishing industry and place it on a more scientific footing the Portobello Marine Fish Hatchery was established in 1904 (Olssen 1984:235). This institution greatly aided the understanding of the fisheries resource and helped ensure that the overfishing that had occurred within the harbour would not be repeated with the offshore resource.

By 1920 the Port Chalmers fishing fleet consisted of two steam trawlers, three or four motor trawlers, up to 40 full- and part-time line boats and 29 full- and part-time seine boats (Boyd 2008:10). These vessels worked the grounds outside the Heads providing fish

for both the local and export market. However, as noted by McLean (1985:301), at this time a catch of three dozen grouper was considered a good day's work, reflecting the relatively small scale of the industry.



Figure 46: Small fishing boats at the George Street Wharf ca. 1910 (Alexander Turnbull Library (ref. 1/1-008633-G)).

The long overdue provision of refrigerated storage at Port Chalmers in the early 1920s was another significant milestone for the fishing industry (Church 1994:124). For the first time the Port's fishermen could now store their surplus catch instead of being forced to sell it at lower prices before it spoiled; a development that greatly stabilised fishermen's incomes (McLean 1985:301). These coolstores also enabled wetfish and crayfish to be caught for the export market; an industry that was to become increasingly important over the next few decades.

The development of marine diesel engines had significant repercussions for the fishing fleet of Otago Harbour from around the 1930s onward. These engines were both more powerful and more economical than traditional marine petrol engines and, as described by McLean (1985:301), trawlers fitted with diesel engines were able to exploit fishing grounds further and further offshore. From 1949, fishermen based in Otago Harbour

began travelling as far as Fiordland and the Chatham Islands in order to take advantage of the crayfishing boom, driven by the demand from America (Church & Philp 2008:79). This industry peaked in 1968 with over 40 boats operating out of Otago Harbour and employing a considerable local workforce (Church & Philp 2008:109). In 1962 the Otago Harbour Board began construction works for the new container terminal, removing the fishing boat berths from Port Chalmers to Careys Bay, where a multi-berth wharf was built for the purpose of housing the inshore fleet (McLean 1985:302). This was a significant upgrade as the new wharf was located close to the depots of the various fishing companies and tradesmen who serviced the fleet (Church & Philp 2008:79).

After a number of false starts the deep sea fishing industry in Otago developed in the late 1970s (McLean 1985:302-305). In 1976, the 349 ton Irene M was purchased by Skeggs Food Ltd and was sent down to the southern ocean fishery where she was soon followed by the Waipori, Wanaka and Hawea. This burgeoning industry encouraged large foreign vessels into the fishery. These vessels would range over vast distances in the southern seas before returning to Dunedin to empty their holds of orange roughy, dory and squid. The deep water fleet rapidly increased in number, providing a valuable trade across the wharves of the Upper Harbour and employing locals in the processing and cool storage facilities. By the 1980s the combined number of inshore and deep water commercial fishing vessels operating out of Otago Harbour numbered between 70 and 80 vessels (Boyd 2008:11). Following this peak, the next three decades saw a massive decline in the number of fishing vessels based in Otago Harbour. Rising fuel costs and static fish prices, combined with the establishment of the Quota Management System (QMS) in 1986, has led to a steady attrition of vessels from both the inshore and offshore fishing fleets. The most recent statistics, as quoted by Boyd (2008:11), shows that in 2002 there were only 12 inshore fishing vessels at Port Chalmers and Otakou; two trawling, two set netting, four potting for rock lobster, three lining and one potting for blue cod. In addition, the deep water fishing industry that promised so much has left Otago Harbour with these vessels now operating solely from the ports of Timaru, Nelson and Auckland (Boyd 2008:11).

SITE DISTRIBUTION

The archaeological sites relating to the harvesting of marine food resources around Otago Harbour are illustrated below. The distribution of these sites provides insights into the ways in which people interacted with the marine environment throughout time and how this is evidenced in the maritime cultural landscape.

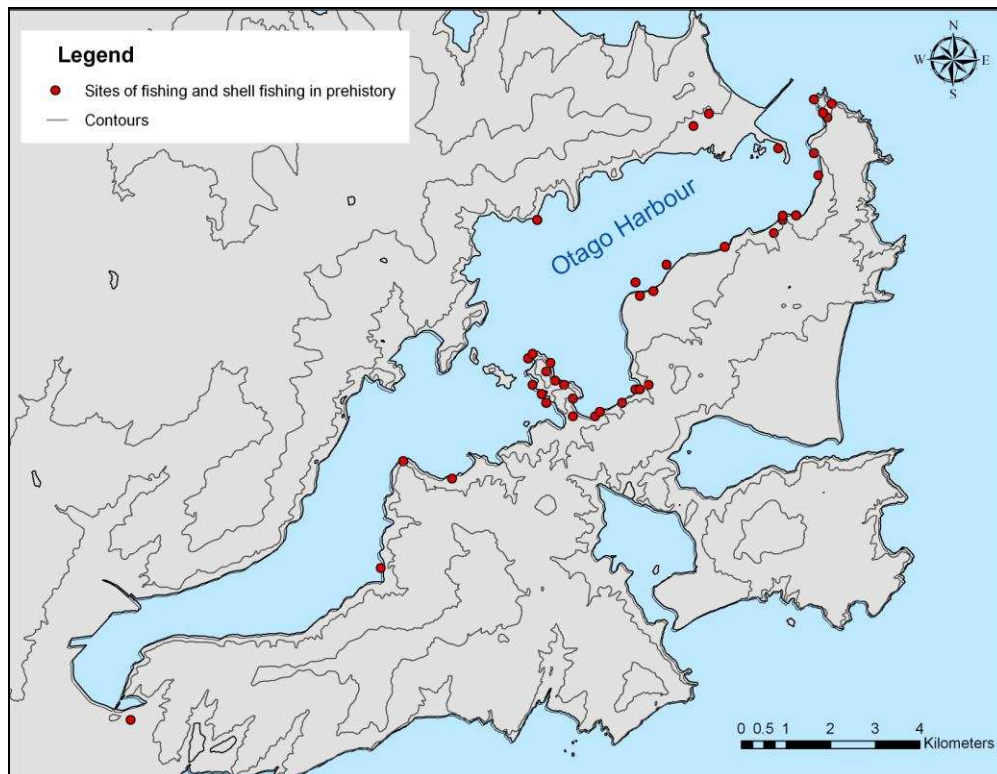


Figure 47: Map of Otago Harbour showing sites related to the harvesting of marine food resources in prehistoric period.

The archaeological evidence shows that in prehistoric coastal Otago, fish, shellfish, sea birds and marine mammals were essential sources of meat and protein in the Maori diet (Anderson 1998:135, Smith 2004a). Reliance on such resources led these people to harvest shellfish, fish, sea birds and marine mammals wherever they could be found around the harbour (Figure 47). The concentrations of midden sites along the Eastern side of the harbour, especially near Otakou and Portobello, reflects the concentration of Maori inhabitants in these areas during prehistory and their heavy reliance on marine food sources for sustenance.

Evidence from archaeological sites of the protohistoric period show that the harvesting of marine food resources continued during this phase. From investigations of these sites it is understood that the patterns of marine food gathering established in the Prehistoric period were somewhat altered by the arrival of Europeans (Figure 48). However, the Maori inhabitants of the harbour rapidly adapted to the new technologies introduced by Europeans and by combining these with traditional methods of fishing and shell fishing, were able to dominate the early domestic and export markets of the harbour.

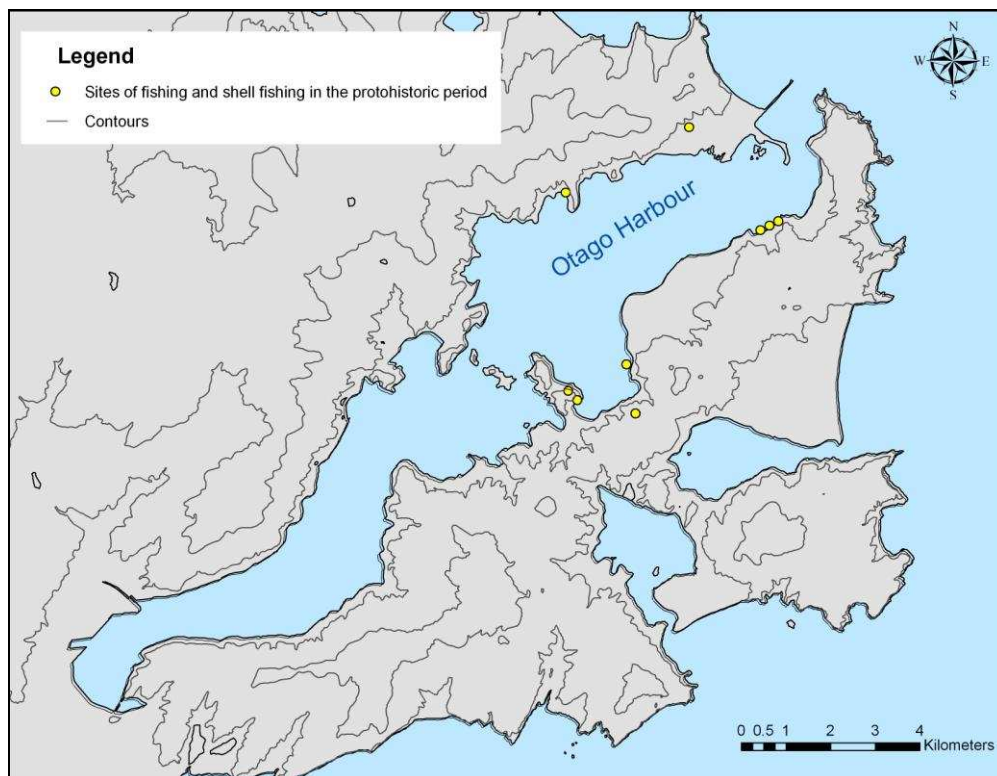


Figure 48: Map of Otago Harbour showing sites related to the harvesting of marine food resources in the proto-historic period.

Despite the importance of the fishing industry in Otago Harbour during the historic period, and the considerable number of fish curing works and other facilities recorded in the historical record, no archaeological evidence for the harvesting of marine food resources in Otago Harbour during the this period has been recorded. However, despite this lack of evidence for the harvesting of marine food, the excavation of two historic sites, I44/324 and I44/469 (Figure 49), has shown that marine food resources, especially fish, continued to play an important role in the diet of the harbour's inhabitants.

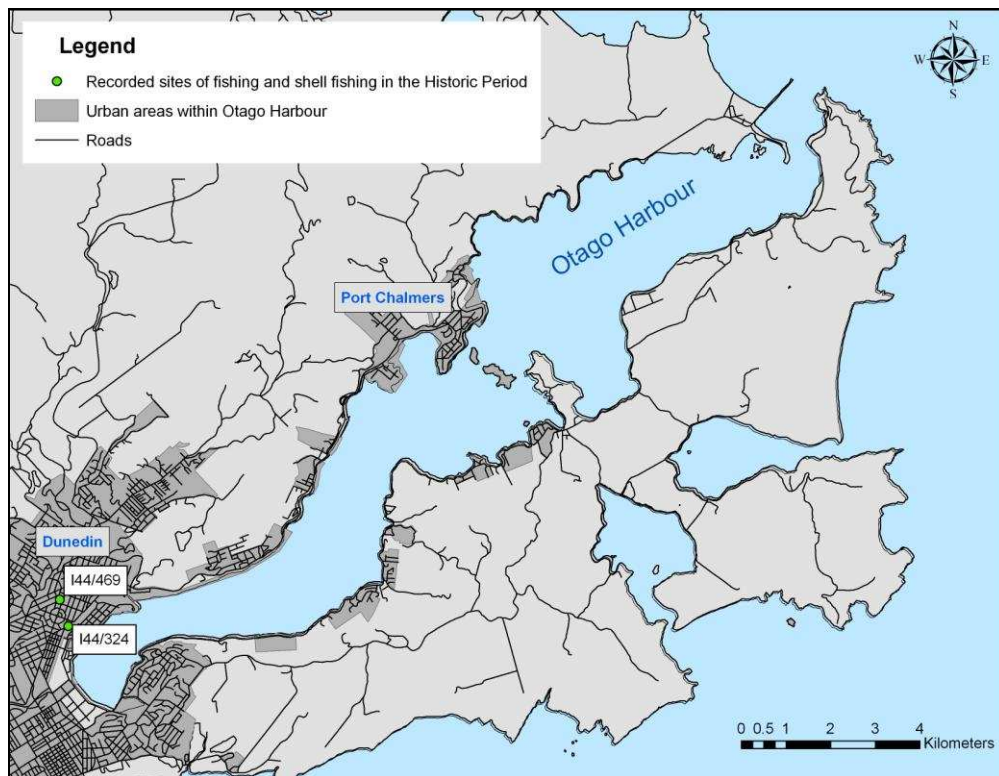


Figure 49: Map of Otago Harbour showing historic period archaeological sites with evidence for the eating of marine food resources.

CONCLUSION

The archaeological and historical record have revealed just how significant the harvesting of marine food resources has been for the inhabitants of Otago Harbour, right from the earliest arrivals until the late twentieth century. This exploitation of the marine environment by the local inhabitants has been a major factor in shaping the maritime cultural landscape of the harbour and is an area where future research has significant potential to assist our understanding of this fascinating area of our collective history. The variable extent to which evidence for harvesting marine resources is reflected in the archaeological and historical records will be examined further in Chapter Seven.

6.2. NAVIGATION AND LANDING PLACES

Throughout history, the fortunes of the people of Otago Harbour have been indelibly linked with the growth, or otherwise, of shipping and trade. This legacy of boom or bust has impacted upon all aspects of the maritime cultural landscape, shaping not only how the people of the harbour viewed their world but also their place within it.

SHIPPING HISTORY

From the earliest days seafaring was an integral part of Maori society. The use of a diverse range of watercraft enabled Maori to obtain marine resources as well as facilitate the trade and exchange of ideas, resources and people both within the harbour and further afield. With the introduction of European technology into the Otago region in the form of whaleboats and square sails, Maori further capitalised on the use of watercraft in the movement of goods such as pigs and potatoes for trade with the new arrivals.

European shipping and trade in Otago Harbour began with visits from vessels engaged in the extractive industries of sealing and whaling. Between 1809 and 1847 these vessels made up the majority of the small number of ships visiting the harbour and included ships from as far away as France and Germany (Bowman 1948:55). The year 1848 saw a significant milestone in shipping in Otago Harbour with the arrival of the immigrant ships John Wickliffe and Phillip Laing. The arrival of these and other immigrants stimulated the fledgling local economy providing a market for imports and also producing exports such as wool for trade. This maritime trade, although modest, provided the inhabitants of the region with their only link to the outside world (Chapman 1975:1).

Trade during this period remained slow but steady, with a total of twenty-seven vessels visiting Otago Harbour in 1858 (McLean 1985: 248). However, with the discovery of gold in 1861, ships carrying budding miners and associated goods and stores flooded into the harbour, forever changing the Port of Otago. This enormous increase in shipping meant that by 1864 the number of vessels entering the harbour per year had increased exponentially to 834, carrying huge volumes of both imports and human cargo (Chapman & Cohen 1934:106). This 'rush' acted as a catalyst for progress and the influx of vessels saw

Otago Harbour linked more and more into the global system of trade with countries as diverse and far away as Mauritius, Canada and China (Chapman 1975:11).

Port Chalmers rapidly became New Zealand's chief maritime port, with all manner of shipbuilding, stevedoring and chandlery businesses supporting the burgeoning trade. However this was an uneven trade as huge volumes of imports crossed the wharves with very few exports sent in return. This often meant that during the 1860s and 1870s, ships, unable to find suitable return cargoes, regularly left Otago carrying little more than stone ballast obtained from the quarries around the harbour (Bowman 1948:40). The opening up of the Otago hinterland during these decades did however pave the way for the export of agricultural produce. The most notable of these was the export of frozen lamb using ships especially fitted out with the latest Bell Colman refrigeration machinery (Church 1994:86). This outward trade further strengthened the Port of Otago's dominance and is even credited with helping New Zealand come out of the 1880s Depression (ibid:87).

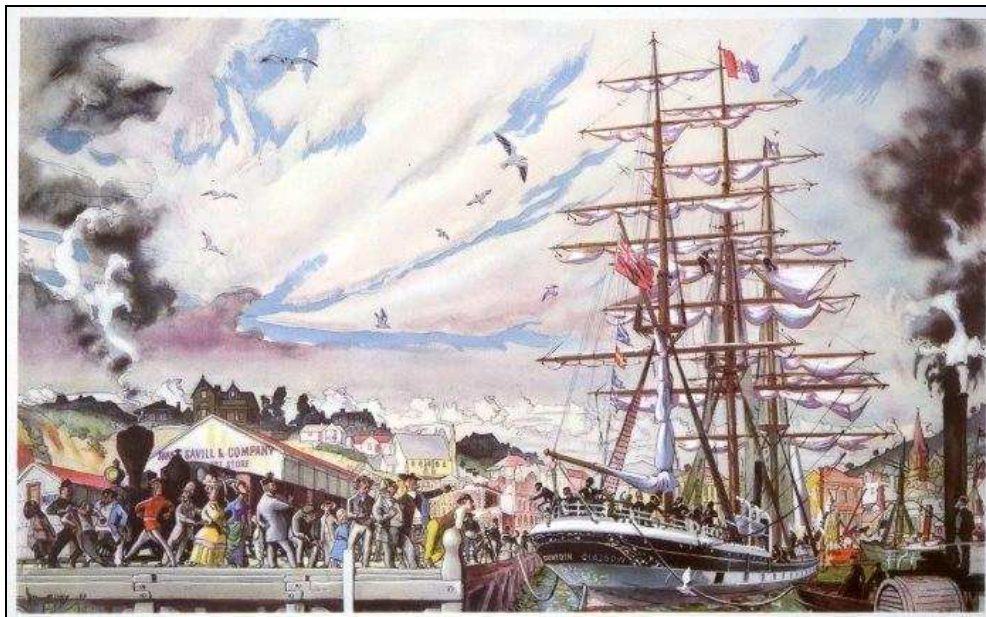


Figure 50: The Dunedin leaving Port Chalmers with the first ever cargo of frozen meat in 1882 (Alexander Turnbull Library (ref. A-017-004)).

The enormous flow of labour and capital into the province encouraged the development of big business in the region and large commercial interests centred on Dunedin and Port Chalmers began to form. One such organisation was the Union Steam Ship Company (U.S.S.Co), which was floated in 1875 and brought together a number of steamship owners under one umbrella (Thompson 1945:19). The success of this company

was such that in just three years, the U.S.S.Co became the dominant force in both the coastal trade and the inter-colonial trade, rapidly becoming the largest employer in Port Chalmers (Olsen 1984:67, Church 1994:91). The U.S.S.Co became so large and powerful that;

by 1904 the Union Steam Ship Company had 43 branches and agencies in Australasia and employed permanently some 460 men ashore and 2200 afloat. Between 1875 and 1913 authorised capital of the company increased from £250,000 to £3 million and from 8 ships and 3,650 gross tons to 76 ships and 232,776 gross tons (Olsen 1984:129).

This phenomenal growth was such that by 1913, the U.S.S.Co was larger than the next five largest New Zealand companies combined, and one of the largest shipping companies in the world (Chapman-Cohen 1934:149). The growth of the U.S.S.Co was linked to the prosperity of the Port of Otago and when the company was sold to P. and O. Line in 1917 and the headquarters moved from Dunedin to Wellington, significant repercussions were felt throughout the region (Church 1994:116).

The loss of the U.S.S.Co headquarters to the north was a symptom of the developing malaise of trade to and from Otago Harbour during this period. Since the late 19th century the economic hegemony of the province and its port had begun to be eroded by the development of the cities in the north. This competition, combined with the newly formed railways, significantly reduced shipping including the coastal trade so vital to the economic wellbeing of the harbour (Olsen 1984:126). With the coming of the great depression in 1929, worldwide sea-borne trade was also significantly reduced, adding to the hardships of the many who relied on it within the harbour. As described by Church (1994:136), this decline continued with the outbreak of the Second World War, which saw the trade of cargo through the Port of Otago decrease by 48 percent between 1937 and 1944.

Fortunately for the people of Otago Harbour, the post-war years saw a gradual increase in imports and exports as New Zealand entered a period of unprecedented economic growth fuelled by the post-war demand for primary resources (McLean 1984:168). Although goods once again flowed across the wharves of the port, the control of this trade was dictated by international forces outside of the hands of the Harbour Board, which was to have significant repercussions in the years to come. The 1960s saw a revolution spread throughout the shipping world with the introduction of unitisation. This

simple idea saw goods pre-packaged into standardised containers which could then be loaded and unloaded from vessels faster and more efficiently than traditional cargoes, thus significantly reducing turnaround times. As described by McLean (ibid:189), in 1966, in response to demands from overseas lines that New Zealand ports enter the container age, the Molyneux Committee was established. After touring the nation's ports the committee decided that Auckland and Wellington would be upgraded to full container port status to serve the needs of the country and that no such container port would be required in the South Island. Outraged, the Harbour Board and the people of Otago railed against this decision which threatened to make obsolete what had taken so much sweat and toil to create. The O.H.B lobbied both the overseas lines and the New Zealand Government and, after almost a decade of uncertainty, in 1975 the fate of the port was finally decided: the go-ahead was given for the construction of the container port infrastructure at Port Chalmers (McLean 1985:194-211).

Today the Port of Otago is the primary export port for the South Island region of New Zealand. Wharf systems operate at both Port Chalmers and Dunedin and shipping and trade continues to play a significant role in the lives of many of those who live within the Harbour.

NAVIGATION

Vessels plying Otago Harbour have long relied on navigation marks and the local knowledge of pilots to aid in their safe passage throughout the harbour and beyond to the Pacific Ocean. The shipwrecks that are found throughout the harbour highlight the need for such aids to navigation in the more dangerous areas of the harbour.

THE ARCHAEOLOGY OF AIDS TO NAVIGATION

The inhabitants of the harbour constructed various types of infrastructure to aid navigation of, and reduce the risk to, vessels entering and leaving the harbour. Although a number of these sites pre-date the year 1900 and fit the definition of an archaeological site, only one, site I44/312, has been included in the NZAA site recording scheme. This site is the remains of a signal flagpole that was built on Quarantine Island to relay signals back and forth between Dunedin and the Heads. Despite being recorded as an archaeological site,

neither this nor any other aid to navigation has been investigated archaeologically in Otago Harbour. As a result, our understanding of this component of the maritime cultural landscape must rely heavily on historical records.

HISTORY OF NAVIGATION

The most notable hazard to navigation is the entrance to Otago Harbour itself, which although significantly modified over the last 150 years, still presents the greatest risk to vessels entering and leaving the harbour. Today vessels approaching the harbour are greeted by the sight of a well defined entrance between “the head of a mole 1.25 miles SSW, and Taiaroa Head, 3.75 cables ESE of the molehead” (Conway 2001:302). This entrance channel is dredged through the outer bar to a depth of 13.7 metres over a width of 1 cable and then continues to Port Chalmers at a depth of 12.2 metres over a width of 1 cable (ibid:302). However, for much of its early history, vessels entering the harbour had to cross both an outer and inner bar before reaching the channel that led to the inner anchorage. When Europeans first visited the harbour they found that the outer bar ran uninterrupted in a north-west direction from Taiaroa Head all the way across to Spit Beach (Figure 51). With a depth of only 15 feet at low tide, the outer bar presented a particular hazard to vessels entering and leaving the harbour. Tilley’s (1886: 174) sailing directions in *Brett’s New Zealand and South Pacific Pilot and Nautical Almanac* describe just how dangerous and difficult running the outer bar could be:

The bar should not be attempted on the ebb tides, unless with a commanding breeze, as it sets strongly towards Hayward Point. Light south easterly winds, which are generally accompanied by a light sea-fog, cause troubled swells at the bar, which is not the case with those from the N.E., to which quarter it is more exposed. A strong north-east wind with the ebb tide makes a broken bar, dangerous for boats (Tilley 1886:174).

These limitations meant that in the early days it was not uncommon for a vessel to sight the entrance but, due to adverse conditions on the bar, be forced to sail away and attempt entry another day (Bowman 1949:27). As described by McLean (1985:28), the inner bar was seen as an even more serious impediment to navigation. This bar was located south of Harrington Point, straddling a sharp bend in the channel with a depth of just 15 feet at low water. This shoal meant that vessels drawing more than 21 feet were unable to proceed any further toward Port Chalmers and would have to anchor off Harrington Point and offload their

cargo to a fleet of lighters. Passing the inner bar, smaller vessels could enter the channel and after sailing a distance of seven miles, arrive at Port Chalmers. This channel had a minimum depth of 23 feet but was narrow with extensive sandbanks filling out either side of the harbour. Extreme caution was required and as described by Tilley (1886:173), “the channel is well marked with a series of beacons and buoys, but a stranger should not proceed without a pilot beyond the first anchorage”. Those intending to travel further up the harbour from Port Chalmers to Dunedin were faced with a shallow estuary extending 8 miles in a south-westerly direction. McLean (1985:30) notes that in the 1850s vessels of lighter draft were able to negotiate this estuary through a passage between the islands and reach Green Point about three miles from Dunedin, but only the smallest of coasting craft drawing 6 or 7 feet could reach Dunedin and then only by taking the longer Eastern Channel. Despite the above hazards to navigation, throughout its history Otago Harbour has always been a welcome safe haven along the rocky and unforgiving South-East Coast.

As discussed by McErlean et al. (2002:360), navigators of every time period have used particular methods to ensure that they arrive at their destination safely. In relation to the enclosed waters of Otago Harbour, the visual observation of islands, headlands and settlements allowed navigators to locate their position relative to their intended destination. This simple form of navigation would have enabled the highly capable Maori sailors to travel throughout the harbour in both northerly and southerly directions along the adjacent coastlines. These sailors were by no means limited to such inshore navigation and by using traditional techniques utilising the position of the sun and stars, the spacing of oceans swells and the feeding habits of land based birds, they were able to venture far offshore (Evans 1998). As described by McLean (1985:21), Otago Maori would use *waka hunua*, large ocean going canoes, to sail beyond the Heads, and he notes that one whaler from the 1830s remembers seeing around twenty of these huge *waka* putting out to sea together.

The first Europeans to enter the harbour brought with them a culture of cartography whereby foreign shores would be charted so that hazards and opportunities could be identified and the region opened up for commercial interests. The early charts of Otago Harbour provide insights into the factors these Europeans deemed important in their interactions with the harbour, both in terms of navigational features, hazards and potential resources for exploitation. The first such chart of Otago Harbour was plotted in 1826 by Captain Herd aboard the *Rosanna* (McLean 1985:22). His chart, although crude by today’s standards, provides the first indication of the depth of water over the bar and into the inner

anchorage. As few Europeans had entered the harbour, and even fewer travelled to its upper reaches, Herd concentrated on the areas that were most commonly visited and the hazards to navigation particular to those regions. Of special interest in terms of navigation is the inclusion of the distinctive landmarks of Howlett Point, Pilot Beach, Harrington Point, Spit Beach and the location of suitable anchorage found off the 'middle bank' (Figure 51). From Herd's chart it is readily apparent that the outer bar was the greatest hazard to navigation at this time.

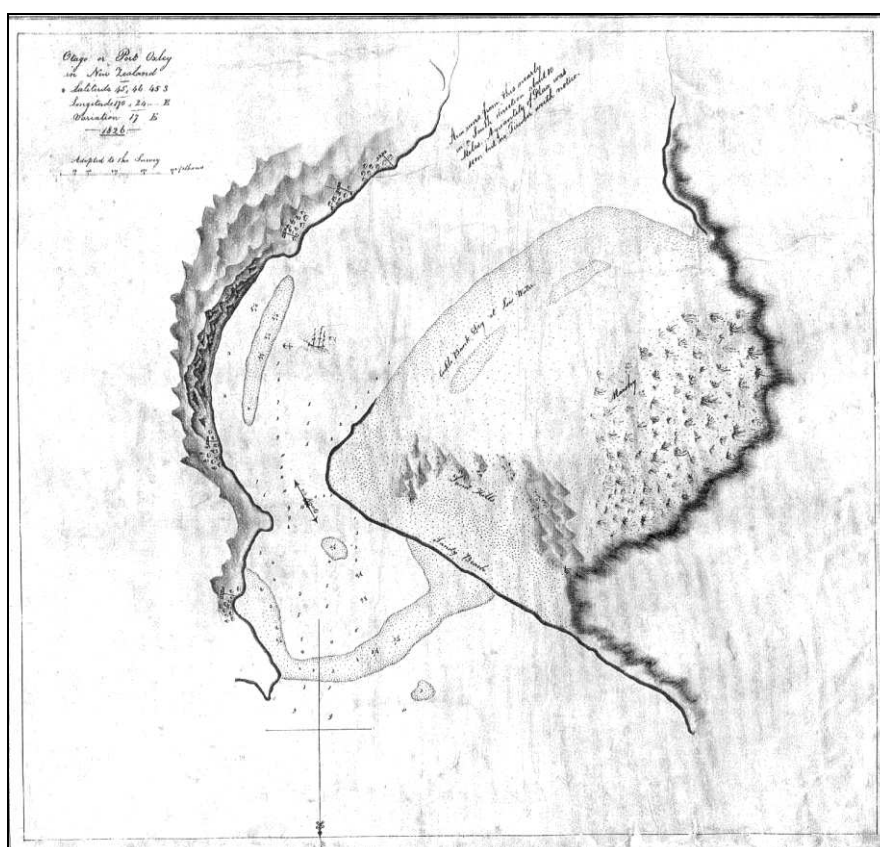


Figure 51: Herd's chart of the entrance to Otago Harbour 1826 (Alexander Turnbull Library (ref. MapColl-832.11aj/1822-27/Acc.384).

Europeans continued to visit the harbour and no doubt would have had firsthand experience with the dangers and difficulties of crossing the outer bar and entering the harbour. Despite these continued visits and the establishment of Weller's whaling station within the harbour, it was not until 1844 that the next official survey of the harbour was undertaken. This survey was necessary to select a site for the planned Scottish settlement of New Edinburgh and was conducted by Frederick Tuckett and Captain Thomas Wing aboard the chartered brig *Deborah*. As noted by McLean (1985:27), while Wing investigated the

bathymetry of the harbour (no doubt including the hazardous outer bar) Tuckett visited the Upper Harbour where he was disappointed to find the extensive shallows throughout the upper reaches. Tuckett and Wing's survey further confirmed the limitations that the outer and inner bars presented to navigation.

In 1846 Charles Kettle, surveyor and civil engineer for the New Zealand Company, arrived in Otago Harbour and over the next two years produced the first reliable map of the entire harbour. Once again, particular interest was paid to charting the hazardous entrance, where he found considerable changes had occurred since Herd's chart 20 years earlier. Kettle noted that the outer bar was influenced by the wind and tides, which under particular conditions could cause further shallowing of the bar and even the creation of new channels (McLean 1985:28).

In 1848 Kettles' survey was supplemented by the Royal Navy, who instigated the next survey of Otago Harbour under Captain John Stokes aboard the 760 ton armed paddle steamer H.M.S Acheron. Very thorough in his work, Stokes chart was not completed until 1850 - a full two years after the first migrant ships arrived in the harbour. In Stokes' chart, the outer bar is clearly delineated extending on a north-west bearing from Taiaroa Head (Figure 52).

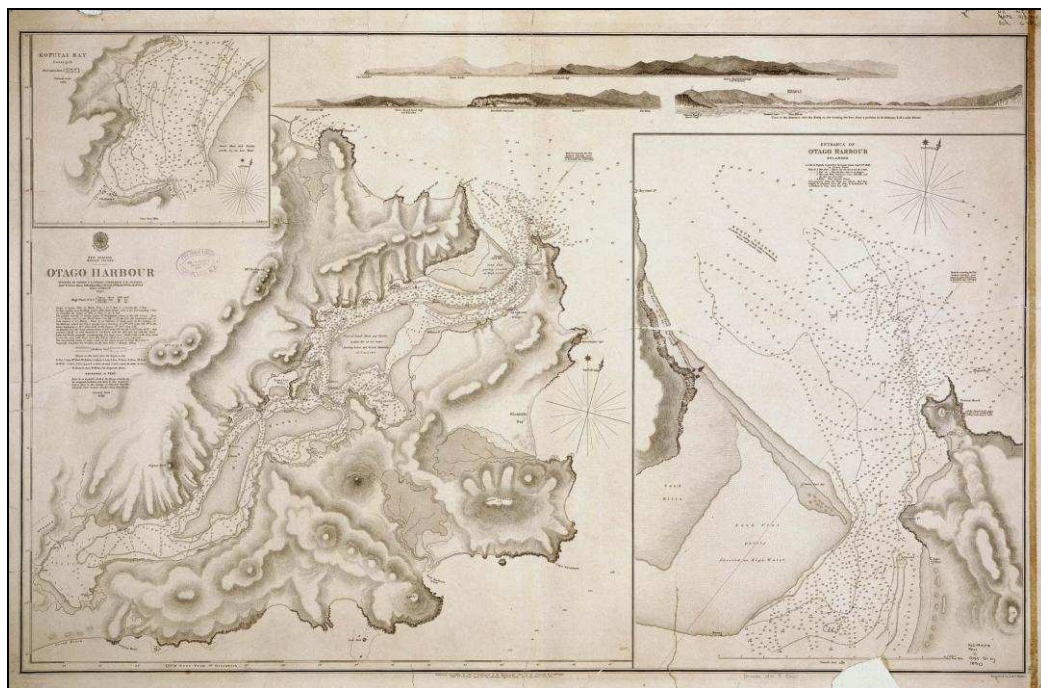


Figure 52: Stokes 1850 Chart of Otago Harbour (Alexander Turnbull Library (ref. MapColl - f830aj [1857-62] 1263)).

Ships crossing the bar usually took the South Channel over the bar; however Stokes included on his chart a previously undiscovered North Channel. This channel had a minimum of 20 feet of water at low tide, as opposed to the South Channel which typically had between 14 feet and 18 feet at low tide (McLean 1985:28). Stokes' chart also included the location of landmarks to aid navigation, namely Taiaroa Head, Hayward Point, Howlett Point, the Pilot Station, Harrington Point, the 'Native Village' and sand hills on the Spit.

In order to reduce the risk that these hazards presented to shipping, various projects were undertaken which ranged from the small scale, to capital schemes requiring the expenditure of vast amounts of capital and manpower. Each of these projects involved the inhabitants of the harbour interacting with the marine environment in such a way so as to reduce the risk that mariners faced when visiting the harbour.

THE 1840S

In 1844 the first modest navigational aids were installed by Tuckett and his men. These buoys: starboard red and port black, marked the channel that led from the entrance of the harbour to Koputai Bay and warned sailors of the hazardous sandspits and shoals (McLean 1985:28). With the increasing number of vessels visiting Otago Harbour, and in lieu of a lighthouse or leading lights to mark the dangerous entrance, John McCarthy the sub-collector of customs erected a signal flagstaff at Taiaroa Head in 1849. As noted by McLean (1985:32), "the first flag, the Blue Peter, warned shipping to 'keep to sea, the bar is not fit to take'; the second, red, advised 'take the bar, there is no danger'; the third a blue flag with a white St Andrew's cross, warned 'ebb tide, the bar is not fit to take'; and the last, a plain white one, 'gave notice of a first quarter flood'. Although simple in design, the flagstaff was of considerable value to vessels approaching the entrance and was subsequently included in the various charts of the harbour.

THE 1850S

In 1850 a beacon light was added to the flagstaff at Taiaroa Head to assist shipping approaching the harbour. However this lamp was rarely lit as the government refused to pay for the oil and the pilot was forced to pay for it out of his own pocket (McLean 1985:35). The reliance of vessels on favourable winds to aid in their crossing of the outer bar remained a significant hindrance to the Port of Otago. In 1858 the introduction of the first

steam ship to Otago Harbour altered this reliance. Sailing vessels could now be towed by steamers such as the *Samson*, over the bar and up the harbour when winds were unsuitable and conditions difficult (Chapman 1975:17).

THE 1860s

The establishment of a pilot station in the 1860s, at what is now known as Pilot Beach, further reduced the risk to mariners entering and leaving the harbour. As described by Tilley (1886:173), “an efficient staff of pilots are stationed at Taiaroa Head, they are at all times ready to push out when the bar is passable and will board vessels within a radius of 3 miles from Taiaroa Head, unless the sea on the bar renders it unsafe”. The pilot would then sail the vessel into the harbour. It is interesting to note that of the 11 ships that have been wrecked entering or leaving the harbour 10 were without the services of a pilot onboard; the other being the pilot boat itself, which collided with one of its customer’s vessels and sank in 1938. Thanks to the navigational aids and the pilot service, by the 1860s vessels drawing up to 16 feet were routinely crossing the outer bar and entering the harbour at any stage of the tide. However, at this time larger vessels, which were visiting the harbour in increasing numbers, were only with great difficulty (if at all) able to bypass the troublesome inner bar. To remedy this situation the steamer *Samson* was contracted in 1862 to perform the first ‘dredging’ of the harbour and by running a set of specially constructed harrows over the inner bar “a moderate and reasonable success was had” (Chapman 1975:15).

The shallows of the Upper Harbour continued to plague the residents of Dunedin, severely limiting the size of shipping that was able reach the newly built Rattray Street Jetty in 1861. Following the success of dredging at the inner bar, it was decided that the approaches and berths of the jetty would be dredged and in 1865 fourteen convict labourers were detailed to the work, manning a travelling crane on the jetty and a small punt (McLean 1985:50). This work deepened a channel 220 feet long by 26 feet wide to a depth of 6 feet, allowing most of the coastal steamers of the time to berth alongside the jetty. The increased volume of shipping entering the harbour in the 1860s provided the impetus and funding for modest improvements to the port’s navigation facilities. In 1864 a signal station was erected in Port Chalmers on what would later become Flagstaff Hill. This signal station provided vessels approaching Port Chalmers, and those anchored in the stream, with important

information. In 1867 a timeball was added to the flagstaff, which was dropped daily at noon (Church 1994:28,180). Another important aid to navigation was the Taiaroa Head lighthouse. As early as 1856, the Provincial Council had voted £56 towards the construction of a lighthouse at the Heads (Knight 1979:30). Despite the desperate need for such a structure, it was not until 1865 that the light was in operation.



Figure 53: Taiaroa Head Lighthouse ca. 1890 (Alexander Turnbull Library (ref. PA1-o-287-47)).

As described by Tilley (1886:172), “the lighthouse is 196 feet above sea level and in clear weather should be seen at a distance of 20 miles. The tower is 39 feet high, white, the lantern dome being dark green, and forms an excellent beacon by day as by night. In foggy weather a gong is sounded every 15 seconds”. The usefulness the new lighthouse was readily apparent and it undoubtedly aided the safe navigation of vessels to and from the Otago Coast.

THE 1870s

In 1868 the Provincial Government finally commissioned the much needed, and loudly demanded for, steam dredge for deepening the upper reaches of the harbour. The *New Era*, as it was called, was a non-propelled bucket dredge and was soon put to work on the channel leading to the Rattray Street jetty. By the end of 1870 the *New Era* had

deepened this channel from 7-8 feet at high water to almost 14 feet deep and 42 feet wide (McLean 1985:54). This deeper channel now allowed larger vessels, which had previously been forced to anchor out in deeper water, to navigate their way right up to the jetty and unload quickly and efficiently. The 1870s saw a new generation of large steamers of up to 3000 tons register visiting the harbour. The size of these ships meant that it was only with great difficulty, and risk to the vessels themselves, that the harbour pilots were able to navigate them past the two bars, which were now casting a shadow on the reputation of the Port of Otago. The expense of removing the bars mechanically meant that cheaper options were explored; the most notable being in 1878 when a charge of 5 cwt of dynamite was detonated on the inner bar (McLean 1985:81). Unfortunately, this explosion, apart from throwing a large column of water into the air, did very little underwater and the hole was filled in with the next flood tide. The 1870s also saw the installation of leading lights and the commissioning of a lightship at the entrance of the harbour. Leading lights were a basic navigational aid for any harbour and they had been requested by the harbour master since 1864, before finally being erected in 1870 on the spit at Aramoana (Knight 1979:30). In 1873 the Provincial Government purchased the side paddle wheel steamer *Clutha* and rebuilt her as a lightship (McLean 1985:288). The lightship was towed out to the entrance and moored over the eastern extent of the spit, marking the edge of the channel. The leading lights and lightship greatly assisted vessels entering the harbour and became vital navigation aids for mariners, being included in all subsequent sailing directions and charts of the harbour (e.g. Tilley 1886:174).

THE 1880S

The shallow depth of the Upper Harbour had long restricted the size of shipping capable of reaching the wharves at Dunedin. With the ever increasing size of steamships visiting the harbour during the 1870s, the Harbour Board, in 1875 decided to remedy this situation by dredging a channel six miles long, 70 feet wide, with a minimum depth of 14 feet at low tide along the shallow western channel (Church 1994:86). This enormous project started in 1876, using the dredges *New Era* and the newly commissioned *Vulcan*. After five years of toil, over 965,000 cubic yards of spoil had been dredged from the channel (McLean 1985:73). In 1881 the Victoria Channel was officially opened and vessels of over 900 tons became a regular sight steaming to and from Dunedin. Although the Victoria Channel had opened up the Upper Harbour to navigation, the outer and inner bar still limited the size of

vessels that could enter the harbour. In 1882 the Harbour Board attempted to remedy this situation with the purchase of a steam bucket dredge, the 222. At this time this was the largest dredge of its type in the world but even so, it was no match for the swells encountered at the Heads (McLean 1985:83). Unable to work in any but the calmest conditions, the dredge made very little headway. Despite regular damage to the dredge the Harbour Board defied commonsense, keeping the 222 in service working on the bar until 1885 (ibid:84). The ‘exceedingly expensive and wholly unsatisfactory’ result of this dredging led the Harbour Board to seek a more permanent solution to the shoaling of the bar in the form of a rubble training wall or ‘mole’, which would direct the force of the tidal scour across the bar and thus deepen the southern channel. Construction began in 1884 with work progressing at a rate of 110 feet per month, until November 1887 when a halt was called with the mole extending a considerable distance of 4,088 feet from the beach (ibid:88). Although the mole had cost some £73,000 by 1887 it had already increased the depth of the southern channel from a mere 7 feet as it was in 1879 to 22 feet, a gain of some 15 feet, thus opening up the harbour for all but the largest vessels of the time (McLean 1985:89).

THE 1900S

The Harbour Board underwent a period of retrenchment during the 1890s as they attempted to juggle not only their balance sheets, but also the interests of both the Upper and Lower Harbour. Much to the Board’s dismay, in 1890 it was found that a shoal was forming at the southern end of Te Rauone beach, threatening to block the channel entering the harbour. Without sufficient funds to remove the shoal, the Board was forced to wait until 1903 before work could be conducted to construct a training wall that would direct the tidal scour. Once completed in 1905, this wall ran 3000 feet along the eastern side of the channel from Harington Point to the Maori Kaik and was soon providing a clear straight channel, removing the shoal (McLean 1985:100,105). This work was supplemented in 1906 by the creation of a training wall on the western side of the channel. The ‘Long Mac’ training wall, as it is known, was built on the eastern extent of the spit to secure the direction of the channel and was raised above high water during 1910-1912, 1929-1935 and 1945-1946 (Bunting et al. 2003). In 1912 the Pilot Station, after many decades of service from Pilot Beach on the eastern side of the peninsula, was moved across the channel to the Spit and remained there until 1923 when the service was centralised to Port Chalmers

(McLean 1985:134). Up until 1931 all of the dredging work that had been undertaken in the harbour had involved the removal of sand, silt or clay materials. However, when the vessel Port Nicholson touched rock in 1930 when passing through the channel between Quarantine and Goat Islands, the Harbour Board took it upon themselves to remove this reef through blasting (McLintock 1951:299). This work was continued between 1950 and 1955 and saw the channel widened by 100 feet and deepened to a depth of 30 feet at low tide (Davis 2009:8).

Many hazards confronted the vital shipping entering and leaving Otago Harbour and attempts to reduce these risks have a long history in the region. Through historical research, evidence of the location and history of a number of navigational aids has been uncovered, allowing the investigation of these sites as components of the maritime cultural landscape.

SITE TYPES

The types of navigational infrastructure that was constructed in Otago Harbour can be divided into several site types (Table 2). These sites range from; small additions of infrastructure such as the signal flagpoles, through to huge projects like the creation of navigation channels such as the Victoria Channel. These different sites reflect the multiple ways in which people interacted with the marine environment to both aid navigation and reduce the risk to shipping, thus creating the maritime cultural landscape of Otago Harbour.

Table 2: Types and numbers of navigational aids built in Otago Harbour.

Site Type	Number
Pilot Station	2
Signal Flagpole	3
Beacon Light	1
Lighthouse	1
Timeball	1
Leading Lights	1
Victoria Channel	1
Aramoana Mole	1
Tidal Training Wall	3
Groynes	2

SITE DISTRIBUTION

The distribution of structures and other sites that have aided navigation to and from the harbour can be viewed as evidence of peoples' actions to mark hazards and reduce the risk of their interactions with the marine environment.

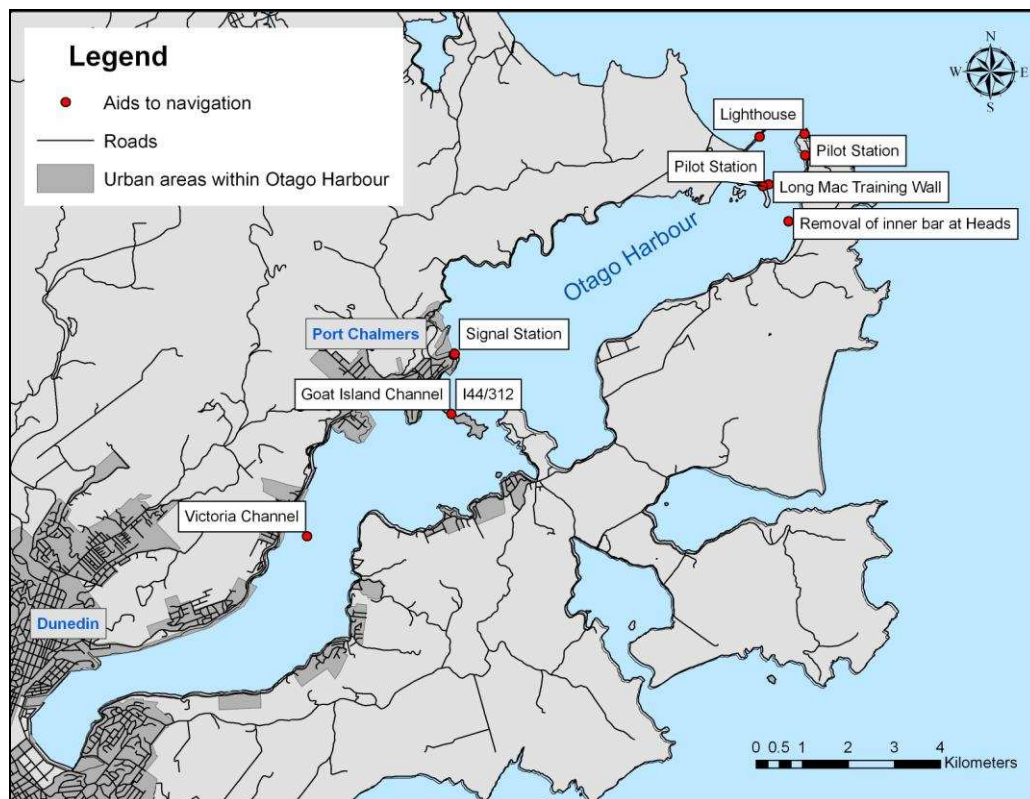


Figure 54: Map of Otago Harbour showing distribution of aids to navigation.

As shown in Figure 54, aids to navigation are concentrated most densely in areas of the harbour that present the most danger to shipping. This is evidenced, firstly, by the number of navigation aids that cluster around the harbour entrance as this is the area that is the most hazardous to both incoming and outgoing shipping. Another notable feature is the Victoria Channel, which is the only major aid to navigation in the Upper Harbour. This is significant as this channel opened up this area of the harbour to shipping by eliminating the shoals and other navigational hazards.

The investigation of navigational infrastructure in Otago Harbour provides insights into the harbour's inhabitant's responses to the various hazards they were confronted with.

By combining locational information with the historical record, a clearer picture emerges of how and why these people interacted with the maritime environment in the manner they did.

LANDING PLACES

Through both historical research and archaeological survey, a large number of landing places have been identified around the shores of Otago Harbour. These sites range from simple canoe haul outs to extensive 20th century waterfront constructions. Following the definition provided by McErlean et al. (2002:306), the term ‘landing place’ is used here in its broadest sense to cover all types of locations on the foreshore that have been used in the past for the launching and landing of cargo and boats.

THE ARCHAEOLOGY OF LANDING PLACES

Investigation of the NZAA site record shows that six sites fitting the definition of a ‘landing place’ have been recorded in Otago Harbour (Table 3).

Table 3: Archaeologically recorded landing sites in Otago Harbour.

Site Number	Description	Location
I44/214	Canoe Landing	Dunedin
I44/311	Quarantine Island Jetty	Quarantine Island
I44/397	Wharf Bulkhead	Dunedin
I44/468	Jetty Street Jetty	Dunedin
I44/473	Portobello Ferry Jetty	Portobello
J44/148	Stone Loading Jetty	Harington Point

Unfortunately, these sites have rarely been the subject of archaeological investigation and our understanding of the role that such sites played in people’s interaction with the marine environment must therefore rely heavily on the historical record.

THE HISTORY OF LANDING PLACES

The numerous sandy beaches and sheltered bays that are spread throughout the harbour would have provided the harbour's first inhabitants with suitable places for landing their canoes in almost any location they desired. As has been described previously, Maori settlements were located throughout the harbour, in Harwood (site I44/76), Kaikai's Beach (site I44/127), Andersons Bay (site I44/172), Pukekura (site J44/77) and Tarewai Point (site J44/3). These sites are all located in close vicinity to beaches that would have been suitable for the landing of watercraft and that can be regarded here as natural landing places. It is also recorded that instead of sailing their canoes outside the Heads and around Cape Saunders, Maori would take their canoes to the Upper Harbour and drag them across the narrow neck of sand to re-launch them at St Clair (Anderson 1998:34). The sandy beaches that were used by Maori to land their canoes were undoubtedly also used by Europeans, and in terms of Otago Harbour, it is likely that all such beaches have been used at certain times for the landing and launching of small watercraft.

The first recorded artificial landing place in Otago Harbour is that of a 'rough' jetty built in Koputai Bay in 1844 as a temporary measure to facilitate the unloading of the brig Deborah (Church 1994:11). This was soon followed by Kettle and his men in 1846, when they built a more permanent structure in Pelichet Bay near the mouth of the Leith River (McLintock 1951:31).



Figure 55: Wickliffe Pier from Bell Hill, 1852 (Alexander Turnbull Library (ref. 1/2-038710; F)).

At this time the jetty in Pelichet Bay could only provide for the smallest of vessels, however in 1848 it was supplemented by the construction of ‘Wickliffe Pier’ which extended from a rocky point not far from where the first immigrants went ashore (McLean 1985:32). A three ton crane completed this jetty; however the structure itself was only usable during high tide. Sometime before 1863 the Wickliffe Pier was joined by another longer structure, the Jetty Street Jetty built just to the south of the original structure.

By 1850 the lack of port facilities at Port Chalmers had spurred local concerns into action constructing two small wharves out into Koputai Bay (McLean 1985:32). These small privately owned wharves were soon swamped by the increasing volume of shipping but it was not until 1858 that the Provincial Council finally acted, voting £500 towards a suitable public wharf at Port Chalmers (Church 1994:22). The George Street Wharf, as it was known, provided the first real deep water berths in the harbour. Despite its utility, the influx of people and cargo associated with the gold rush soon overwhelmed its modest facilities (McLean 1985:43). In 1862 this wharf was lengthened to accommodate the larger steamers arriving from Melbourne, however, other vessels were still often forced to anchor out in the bay waiting for their turn to unload.

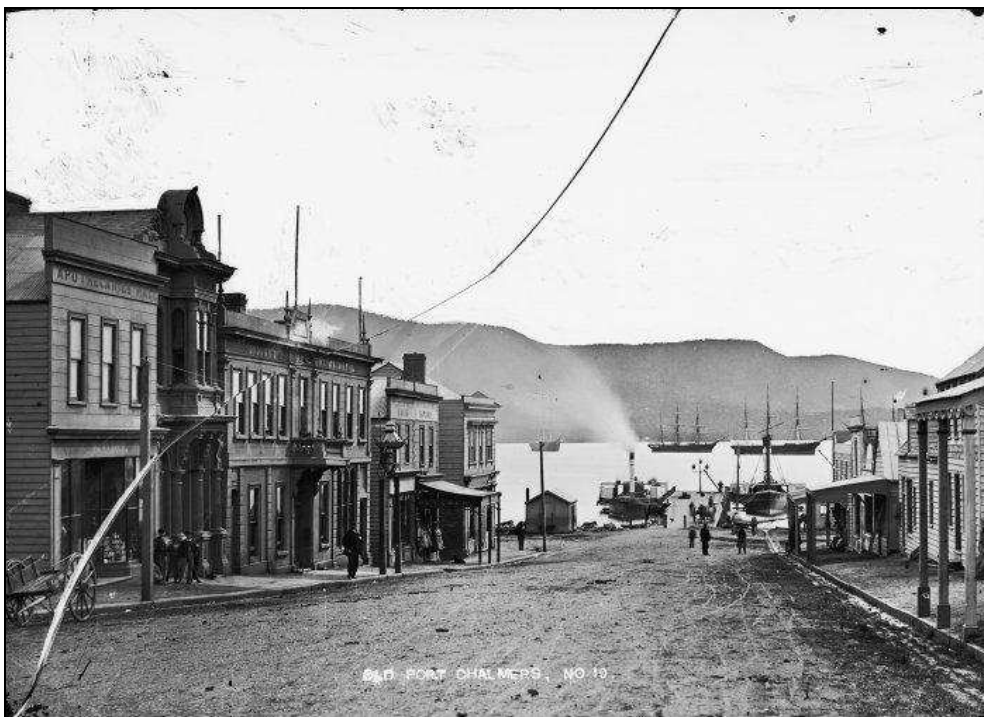


Figure 56: View from Port Chalmers down to the George Street Wharf showing vessels anchored in the stream (Alexander Turnbull Library ca. 1860s (ref. 1/2-003218-G)).

Not to be outdone, and seeking to cash in on the shipping boom, Dunedin undertook a programme of wharf construction beginning in 1861 with the Rattray Street Jetty (550 feet long and £6,914 cost) and the Stuart Street Jetty (550 feet long and £6,500 cost). The former was extended to 1,140 feet in 1874 and widened in 1909 and 1921, while the Stuart Street Jetty remained unchanged until 1887 when it no longer met modern requirements and was broken up (Bauchop 2008: 29-34, McLean 1985:94).

In 1871 work began on the second major wharf at Port Chalmers. Named the Bowen Pier, this provided deep water berths for a number of vessels and also had railway tracks laid along its length to aid in the loading and unloading of ships. However, as noted by Chapman-Cohen (1934:146), by the time the pier was finished in 1872 it was already inadequate to serve the large amount of shipping that was entering the port; a shortcoming that was especially apparent during the busy wool season.

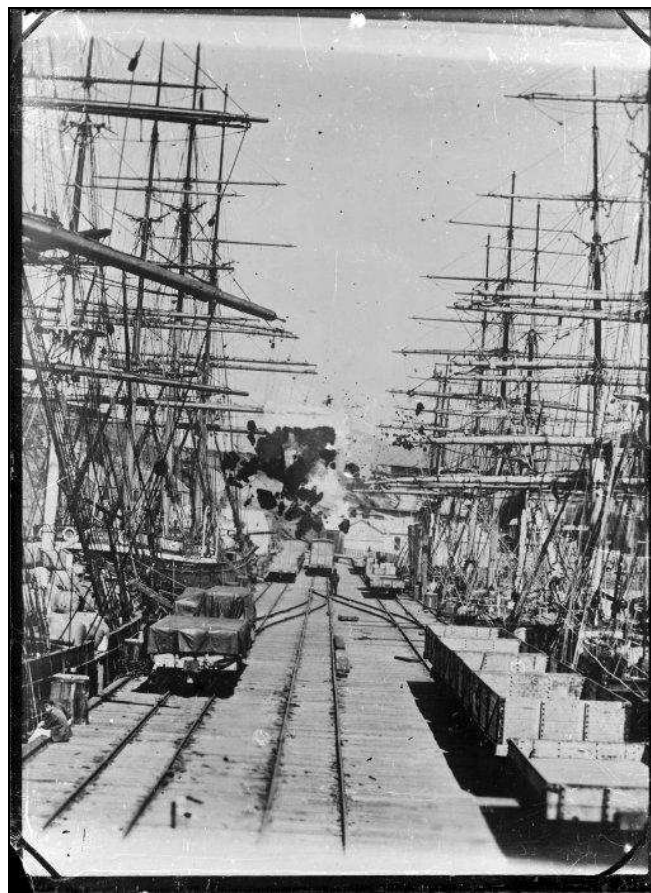


Figure 57: Bowen Pier showing the large number of vessels tied up at the pier ca. 1870s (Alexander Turnbull Library (ref. 1/2-003204-G).

In 1874 work began on another Port Chalmers structure: the much heralded Export Wharf which ran along Beach Street (McLean 1985:76). This wharf complimented the existing infrastructure and provided accommodation for up to four big square-riggers, significantly increasing the capacity of the Port. In the late 1870s a Cross Wharf was built between the Bowen Pier and George Street Wharf, fulfilling the needs of the smaller vessels calling at Port Chalmers (Church 1994:91). The significant investment in infrastructure in the Lower Harbour in the 1870s had come at the expense of that for the Upper Harbour where the wharves built in the previous decades were struggling to keep up with the demands of the larger vessels now frequenting them. In 1878 work began to remedy this situation with the construction of 1,200 feet of wharves at Dunedin (Hamel 2008c:2). This work involved the construction of the Birch Street Wharf (1878), which was built as an extension of, and at a slight angle to, the Jetty Street Jetty, and a new Cross Wharf along the edge of the progressing reclamation (1879). The Birch Street Wharf was modernised in 1900, strengthened in the 1920s and lengthened to 1,100 feet in 1937, while the Cross wharf was widened by 15 feet in 1899 (Hamel 2008c:2-4, McLean 1985:105).



Figure 58: This Plan shows the Dunedin wharves as built by 1890, (DP 860 Otago Harbour Board Plan of Rattray and Stuart Streets Endowment, January 1890, Land Information New Zealand).

To accommodate the expected increase of shipping that would accompany the opening of the Victoria Channel, construction of the Victoria Wharf began in 1880, with 200 feet completed in that year. Work continued in three stages so that by 1904 the wharf was 1,200 feet long and dredged to a depth of 22 feet (McLean 1985:105). In 1887 a Tongue wharf was also added to the port infrastructure in Dunedin extending on an angle 372 feet from the Birch Street Wharf; however it was demolished in 1912 (ibid:94).

The construction of wharves in Port Chalmers continued in the early nineteenth century. In 1898 the Union Steam Ship Company had constructed a ship repair workshop on the newly reclaimed land in Port Chalmers. A decade later the Union Steam Ship Company constructed a wharf adjacent to the workshop allowing greater access for vessels requiring repair (Cotton & White 1998:119).

The final landing place built in Dunedin is the Kitchener Street Wharf, constructed in 1911 (McLean 1985:124). This wharf was built using ferro-concrete and runs south from the seaward end of the Birch Street Wharf along the edge of the reclamation (Hamel 2008d:3). With this final addition of berthage the wharves in Dunedin met the requirements for modern shipping and no new major structures have been built in this area since.

In 1930 work began on a new bulk fertiliser wharf at Ravensbourne for the Dominion Fertiliser Company. This L-shaped wharf (later extended to the present T-shape) could take vessels of over 5000 tons and from 1931 onwards, a steady stream of arrivals contributed to about 7-8% of the port's tonnage figures (McLean 1985:156).

As discussed earlier, the container revolution had enormous repercussions for Otago Harbour, not least in terms of marine infrastructure. Work began in 1958 to bring Port Chalmers up to the required standard, starting with the demolition of the old Export Wharf and the removal of the Bowen Pier (1962). In their place, a new modern wharf was constructed known as the Beach Street wharf, which opened in 1973. This wharf sat adjacent to three and a half acres of newly reclaimed land, providing storage for logs awaiting export to Japan. This was just the beginning. Over the next four years the old George Street Pier was brought up to modern standards and extended 1,000 feet, while the area to the west of the pier was reclaimed to clear 27 acres for the storage of containers (McLean 1985:200). This work meant the loss of berths for the port's fishing fleet; in response, a wharf and other facilities for 35 boats were constructed in 1963 at Careys Bay (Church 1994:159). The conversion to a container terminal completely transformed the Port

Chalmers waterfront; gone were the two dry docks and the Union Steam Ship Company wharf, replaced by acres of storage and the huge cranes required for modern shipping.

Through investigation of the historical record, the important role that landing places have played throughout the history of the harbour is readily apparent. By combining this information with the archaeological record it is possible to identify patterns and trends within the distribution of these sites and, as such, to understand these sites as components of the larger maritime cultural landscape.

SITE TYPES

In Otago Harbour, landing places can be grouped into three major categories: 1) trade wharves constructed for the purpose of loading and unloading commercial shipping; 2) ferry wharves constructed for the purpose of moving goods and people around the harbour; and 3) private jetties and wharves built for small businesses or recreational purposes. The number of each of these site types is shown in Figure 59.

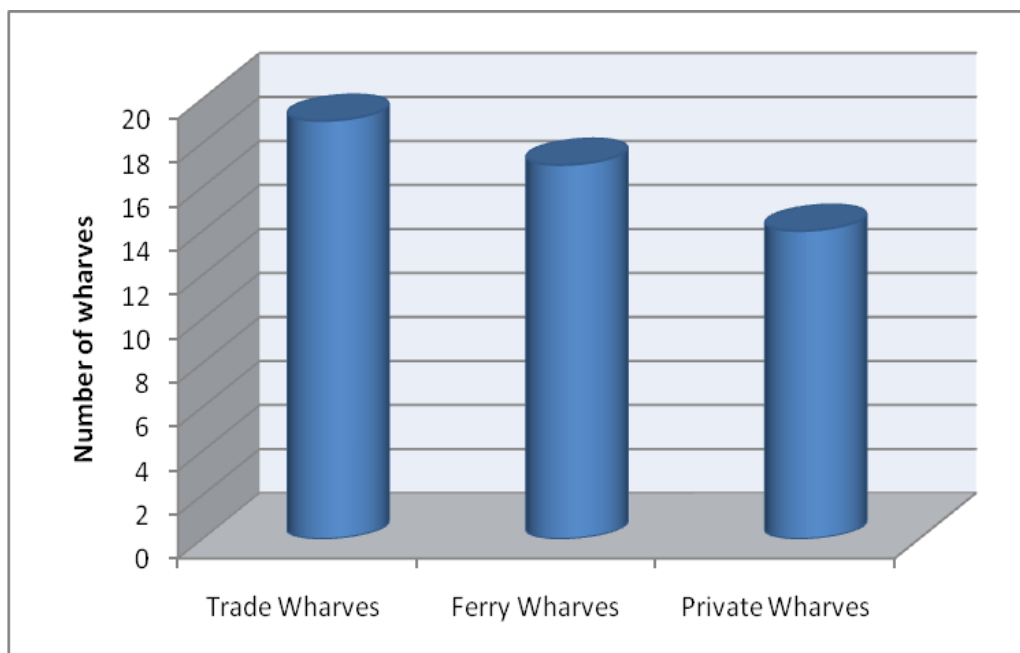


Figure 59: Types of landing places around Otago Harbour.

The large number of recorded landing places above reflects the importance that shipping played in the lives of the harbour's inhabitants, not only for the import and export

of goods but also the movement of people around the harbour and for private enterprise and recreation.

SITE DISTRIBUTION

For a landing place to fulfil its purpose of facilitating the launch and retrieval of cargo and boats it must be situated in a location where there are suitable environmental conditions. These conditions include ready access to deep water, protection from swells and other adverse sea conditions and proximity to population centres. As Figure 60 shows, these requirements were readily met by many of the bays around Otago Harbour and as a result landing places can be found throughout many areas of the harbour.

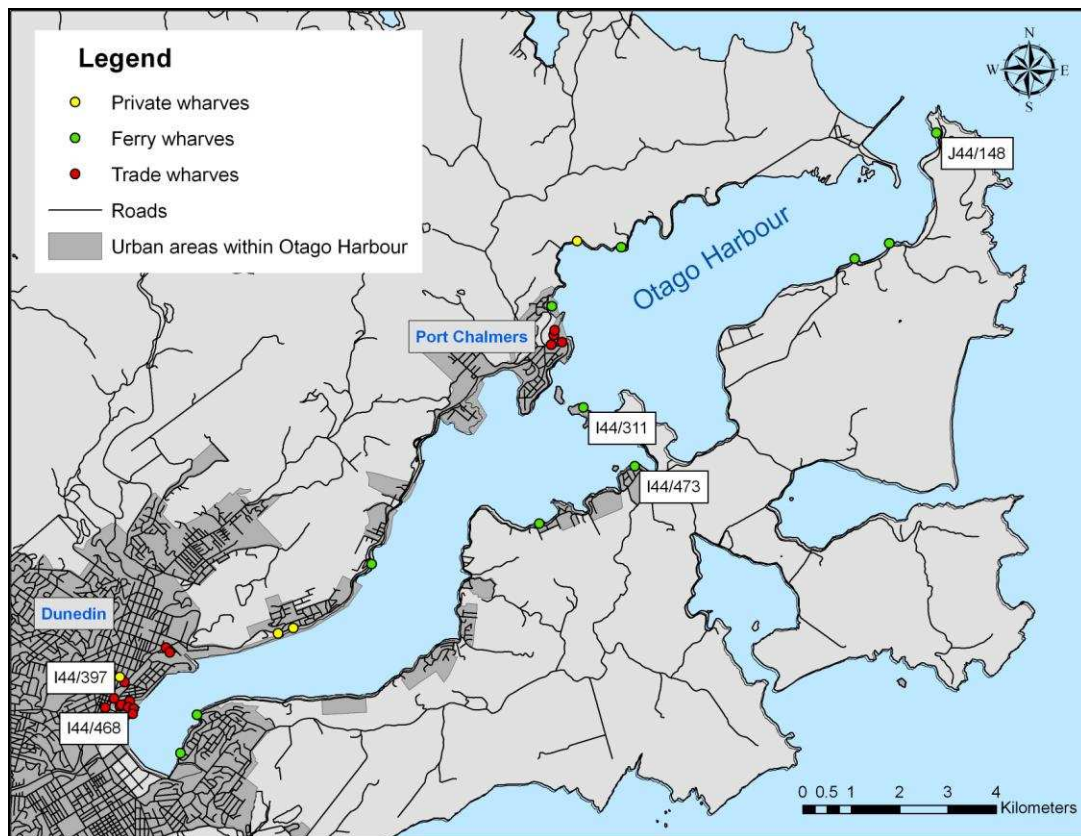


Figure 60: Distribution of historically recorded landing places around Otago Harbour including sites recorded in the NZAA site record.

Further examination also shows the distribution of the types of landing places around the harbour. As expected, trade wharves are situated in those locations around the

harbour which offer deep water berths for the larger vessels engaged in intra-harbour trade. In contrast, ferry wharves and private wharves are spread throughout the harbour, including the shallow reaches of the Upper Harbour, reflecting the differing vessels and requirements of the inter-harbour trade.

CONCLUSIONS

The development of shipping and trade in Otago Harbour has been one of the most significant forces behind the interactions of the harbour's inhabitants and their environment. From crude navigational aids and rickety wooden jetties to the shaping of the harbour sea floor itself, these people modified and shaped their environment to protect the shipping on which their fortunes and wellbeing were so reliant. Today the results of these modifications are clearly evident along the foreshore and under the waters of the harbour. These aids to navigation and landing places combine to create a hugely important component of the maritime cultural landscape and provide a wealth of information about the people who lived and worked within the confines of Otago Harbour. The potential that these sites present for future archaeological research is explored later in chapter seven.

6.3. HULKS AND ABANDONED WATERCRAFT

Within the quieter bays of the harbour can be found the remains of a number of hulks and abandoned watercraft. These vessels, although considerably reduced from their prime, provide insights into a unique form of interaction between the harbour's inhabitants and the maritime cultural landscape.

HULKS

The term 'hulk' as it is applied to shipping, refers to a vessel that is no longer seaworthy but which is still afloat. Most often this term is used to refer to an old ship, long past its prime, which has had its rigging and/or internal equipment removed but still retains its flotational qualities (McLean 1985:328). This removal of surplus equipment provided a large empty space within the vessel which was capable of being utilised in a variety of ways, such as a floating warehouse, storage tank, accommodation ship, or training establishment. The use of hulks as a solution to issues of storage on a large-scale was first implemented in 1775 by the British Government as an 'interim' solution to overcrowding in the nation's prisons (Delgado 2006:62).



Figure 61: Prison Hulks in Portsmouth Harbour, circa 1810, by Ambrose-Louis Garneray (National Maritime Museum, Greenwich, London (ref. BHC1923)).

To this end, retired Royal Navy warships were beached and outfitted with accommodation deemed suitable to hold the ever increasing numbers of thieves, prostitutes and other undesirables of British society (Delgado *ibid*: 62). From these humble beginnings,

the utility of hulks as a cheap and movable form of storage was recognised and thus they became increasingly important components of the maritime landscape of ports and dockyards throughout the British dominated shipping world.

In the early years of European settlement the lack of wharves, warehouses and other maritime infrastructure in Otago Harbour meant that hulks were an integral part of the waterfront scene (McLean 1985:328). These hulks became a part of the everyday landscape of the time and were utilised by the inhabitants of the harbour on a regular basis. These early hulks, such as the William Hyde (hulked 1855), Industry (hulked 1856) and the Tarbot Castle (hulked 1861), took the place of the absent wharves and warehouses, providing both storage spaces for goods and merchandise as well as providing platforms alongside which smaller vessels could moor.

The development of port infrastructure in Port Chalmers and Dunedin in the 1870s did little to stem the need for storage space as the wealth from the gold rush fuelled local consumerism and as a result imports reached ever higher levels (Hamel 2001a:106). The vast amounts of both utilitarian and luxury goods imported by the newly rich of the province needed to be stored upon arrival and the most logical places were within the cavernous holds of numerous hulks such as the Dutch galliot *Reinauw Engelkens* (hulked 1870s), *Cincinnati* (hulked 1862) and the *Thomas and Henry* (temporarily hulked 1860).



Figure 62: Hulk of the Thomas and Henry at Port Chalmers in 1867 (Alexander Turnbull Library (ref. 1/2-003205-G).

In 1858 the arrival of the auxiliary steamers *White Swan* and *Queen* to the harbour ushered Otago into the steam age and over the next few decades steamers both large and small became increasingly important in the harbour, coastal and international trades (Chapman 1975:9). This new reliance on steam once again increased the need for storage as vast amounts of coal were required to power the steam engines of these new technological marvels. Fortunately, coal was a commodity that the hulks were well suited to hold and instead of the need for costly bunkers, a number of old ships found themselves usefully employed as coal hulks. The need for coal hulks was so great that in his history of Otago Harbour, McLean (1985:328) noted that the Union Steam Ship Company alone used eleven hulks: the *Alarm*, *Broxton*, *Cincinnati*, *Delaware*, *Don Juan*, *Empreza*, *Faithful*, *Felicitas*, *Henbury*, *Laira* and *Nonpareil* to store coal for their fleet of steamships.

The life of an Otago Harbour hulk was often diverse. Their storage capacity, and relative mobility, meant that they could be used for multiple purposes throughout their career. Most hulks began their lives as warehouses before progressing to storing coal as they deteriorated. However, a number of Otago Harbour hulks enjoyed a much more varied life, including being used as prison hulks (*Esther* and *Anne*, *Thomas* and *Henry* and the *Sarah* and *Esther*), a powder magazine (*Delaware*), a club house (*Waireka*), a refrigerated store (*Edwin Fox*), two floating docks (*William Hyde* and *Henbury*), two workshops (*Cincinnati* and *Don Juan*), a hospital (*Sarah* and *Esther*) and even a school (*Tarbot Castle*) (McLean 1985:328). Despite the varied and important roles that these hulks played in the harbour, over time the development of the motor vessel and the use of oil as a marine fuel meant their usefulness was greatly reduced. This replacement of coal powered steamships was also coupled with the increasing availability of warehouse space in Port Chalmers and Dunedin, meaning that after the First World War hulks were becoming increasingly rare in the harbour. This decline continued until hulks were completely phased out in 1948 when the last of the harbour hulks, the *Empreza*, was scuttled off Taiaroa Head (ibid:328).

The Otago Harbour hulks were a vital part of the waterfront for almost a century, providing a diverse range of services to the inhabitants of not only Port Chalmers and Dunedin but also some of the smaller bays around the harbour. Figure 63 shows the areas around the harbour where the hulks were most commonly utilised.

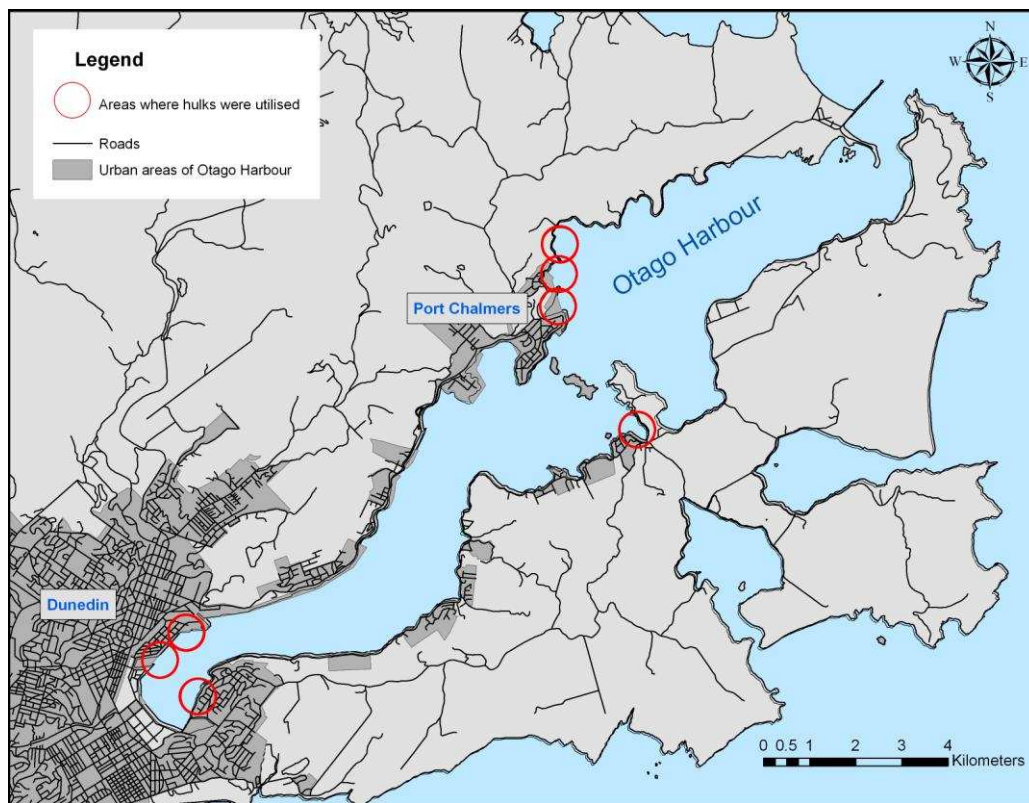


Figure 63: Map of Otago Harbour showing areas where hulks were utilised between 1855 and 1948.

As described above, the historical record provides valuable insights into the important roles that hulks played in the maritime cultural landscape of the harbour. However, when a hulk had deteriorated to the point where it was deemed unfit for its role, be it storage or otherwise, it was removed from the active working landscape. At this stage the vessel often entered the archaeological record and it is to this phase of the vessel's life we now turn.

ABANDONED WATERCRAFT

When a vessel was unable to perform its primary function (i.e. it became unseaworthy) it was often converted for other, secondary, purposes before finally being scrapped and abandoned. Where no suitable secondary purpose could be found these vessels were often scuttled and abandoned outright (Richards 1997:12). Throughout Otago Harbour a number of hulks and other watercraft have been abandoned for a variety of reasons including economic and technological change, disrepair and plain misfortune.

THE ARCHAEOLOGY OF ABANDONED WATERCRAFT

A total of forty-three vessels have been abandoned in the various small bays and coves around Otago Harbour (Appendix 3). Of the forty-three, nine have been recorded in the NZAA site recording scheme: the Alpha (site I44/294), the California (site I44/463), the Don Juan (site I44/303), the Esk (site I44/464), the Moa (site I44/467), the Oreti (site I44/310), the Prince Alfred (site I44/466), the Thomas and Henry (site I44/465) and the Waikana (site I44/310) (Figure 64). Apart from being recorded in the NZAA site recording scheme, no other archaeological investigations have been undertaken on these sites.

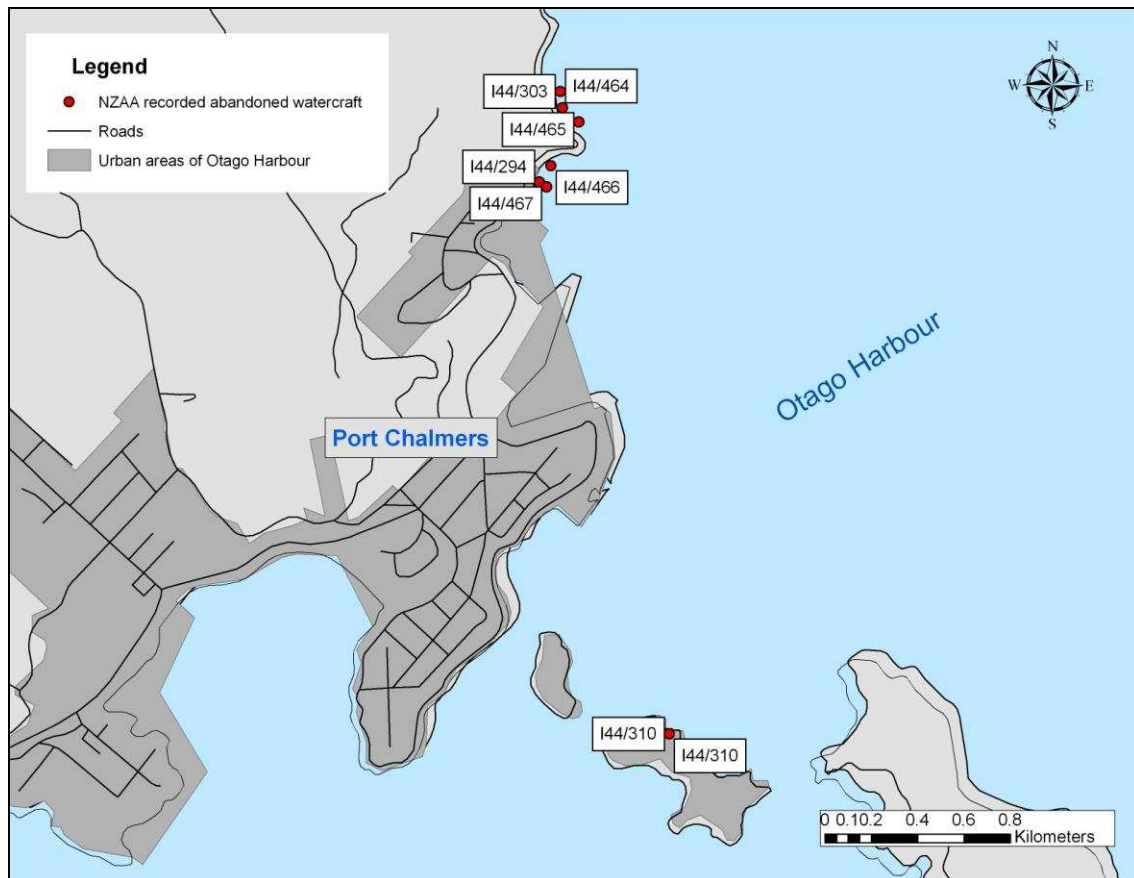


Figure 64: Map of Otago Harbour showing abandoned watercraft that are recorded on the NZAA site record.

SITE DISTRIBUTION

The majority of these vessels, once obsolete, were purposefully beached in specific areas of the harbour, where they were stripped of their fittings and other equipment and finally left to the tides. Such concentrated areas of abandoned watercraft are often termed ‘ships’ graveyards’ and there is evidence for five such areas within Otago Harbour.

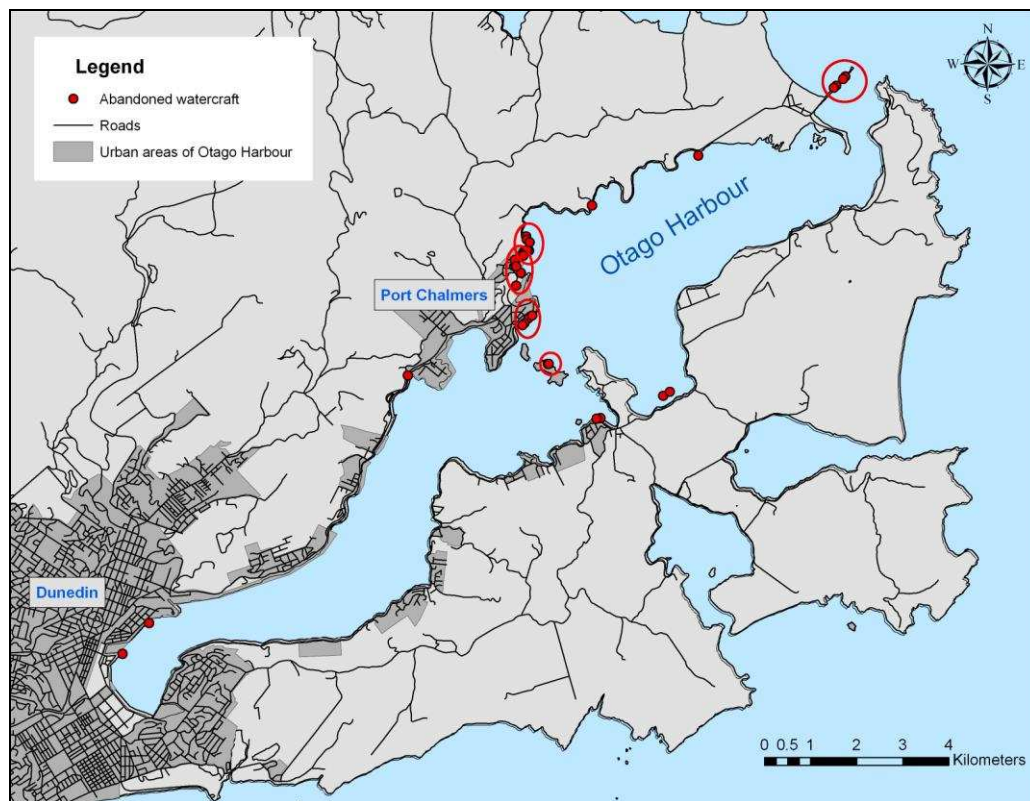


Figure 65: Map of Otago Harbour showing the distribution of abandoned watercraft and ships’ graveyards.

CAREYS BAY

As described by McLean (1985:331), ‘Careys Bay positively reeks of history’. From the earliest days of European settlement this picturesque bay was one of the centres of shipbuilding in the harbour and as a sideline, also operated as a ‘wrecker’s yard’ where fittings were cannibalised from the beached and scuttled watercraft for use on newly built vessels. As a ships’ graveyard, Careys Bay contains the remains of 12 different vessels; largest concentration of abandoned watercraft within the harbour. These are the Annie

Houlan, Alpha (site I44/294), Faithful, Industry (part of), Iron Age, Matariki, Moa (site I44/467), Peninsula, Prince Alfred (site I44/466), Reinauw Engelkens, William Hyde and one unknown vessel (Bowman 1948:224, McLean 1985:331). Between the 1870s and the 1920s these watercraft were pulled up onto the beach and systematically stripped of their equipment and fittings, leaving only their partial hulls spread along the foreshore.

The popularity of Careys Bay as a location for the storage of unwanted shipping tonnage continued into the 1920s and 1930s, earning the area off Athfield's Point in Careys Bay the unenviable name of 'Rotten Row' (Church & Philp 2008:71). During this time the Union Steam Ship Company found itself with a surplus of ships and saw Careys Bay as a suitable location for mooring such vessels while they awaited a buyer or to be scrapped.



Figure 66: SS Stella and SS Broxton in Rotten Row, Careys Bay (Alexander Turnbull Library (ref. APG-0877-1/2-G)).

The first such vessel was moored off Athfield's Point in 1925. This was the 3,585 ton Broxton, which, although stripped of all her fittings, still dominated the surrounding landscape, being one of the largest wooden steamers in the world (Bowman 1948:87). The Broxton was soon joined by other surplus Union Steam Ship Company vessels which were moored along each side of the wooden steamer, providing a spectacle in the quiet bay. According to Church and Philp (2008:72), the vessels which may have at one time or

another berthed with the Broxton in Rotten Row included the Atua and the Navua. However their stay in Rotten Row was short lived as they were both sold and removed on 14 December 1926. The year 1926 saw another six ships laid up in Port Chalmers and these vessels; the Moana, Mokoia, Monowai, Paloona, Stella, and Tarawera, were all at various times residents of Rotten Row. However, when the Mokoia sank at her moorings in 1931 emphatic protests from residents of Careys Bay forced the Union Steam Ship Company to remove all of their remaining vessels and find an alternative method for ridding themselves of surplus shipping. This spelt the end of Rotten Row and with it, a unique chapter in the history of Careys Bay (Church & Philp 2008:74).

DEBORAH BAY

Like Careys Bay, Deborah Bay has a long history of ship-breaking and is also home to a number of abandoned ships. In the early 1900s, five vessels: the California (site I44/463), Esk (site I44/464), Thomas and Henry (site I44/465), the stern of the Industry and the infamous Don Juan (site I44/303), a former slave runner, were deposited in the southern part of the bay. These vessels were broken up by the shipbreakers J. Crammond and E. Nelson to recover the copper, brass, iron and reusable timbers, and it was these workmen who found the several hundred pairs of wrist and ankle shackles in the hold of the Don Juan (McLean 1985:331, Ledgerwood 2006:95).



Figure 67: Don Juan, Cincinnati and California abandoned in Deborah Bay (Alexander Turnbull Library (ref. 1/2-003210-G).

In 1950 the remains of these vessels were joined by the Maroro, which was beached in the centre of the bay, becoming an unofficial playground for local children before she was broken up where she lay in the 1960s (Ledgerwood 2006:100). Today the only evidence of the ships' graveyard at Deborah Bay is revealed at low tide when the remains of the Don Juan, California, Thomas and Henry and the Esk can be seen marking what was once a highly evident component of the maritime cultural landscape.

QUARANTINE ISLAND

Propped up alongside the old stone jetty on the eastern side of Quarantine Island are the remains of two vessels: the 174 ton coaster Oreti (site I44/310) and the harbour ferry Waikana (site I44/310). The Oreti, a 100 foot long wooden vessel, was built in 1900 and ran the timber trade until 1932 when she was acquired by Robert Miller, the lessee of Quarantine Island, and beached to protect the western side of the jetty (McLean 1985:332). In contrast, the Waikana was a steel-hulled screw steamer built in 1909 for use as a harbour ferry capable of carrying 750 passengers. She was finally removed from service in 1931 (ibid:313). Between 1931 and 1939 she was partly dismantled and proceeded to languish in Lower Portobello Bay before the protests of residents and the Harbour Board's insistence forced her to be moved to her final resting place flanking the eastern side of the jetty at Quarantine Island.



Figure 68: The Oreti and Waikana from the air (photograph courtesy of Kevin Jones 2000).

Although smaller than the other ships' graveyards in the harbour, the Quarantine Island vessels are significant in that they are the most intact examples of abandoned watercraft within Otago Harbour.

BACK BEACH

The ships' graveyard that was established at Back Beach was a major aspect of the waterfront environment of the area from the early 1900s until the 1960s. During this time Back Beach was home to five abandoned watercraft: the *Defiance*, *Express*, *Iona*, *Lizzie* and a punt (McLean 1985:331). Each of these vessels was beached and dismantled, and lay in various states of disrepair until the 1960s when the Harbour Board decided to remove what was deemed as a 'hazard to young swimmers' (ibid:329). The removal process was far easier said than done as Stewart (1973:55) notes "it took eight men, a mobile crane, a punt, and a lorry nearly five days to dispose of just one of the five hulks". The Harbour Board persevered and today no physical evidence of this ships' graveyard remains. However, the recording of this area as a past ships' graveyard is still pertinent to archaeological investigation as it reveals an area of interaction between people and the marine environment and as such, is vital to our understanding of the maritime cultural landscape.

ARAMOANA MOLE

Beneath the kelp forests that grow along the eastern flank of the Aramoana mole lie the remnants of a number of unwanted vessels that were sunk to protect the storm-ravaged mole, and which today constitute the harbour's most recent ships' graveyard. In 1884 work began on the Aramoana mole as a mechanism for directing the tidal scour of the harbour channel in a manner that would increase both its depth and width (McLean 1985:86). The exposed nature of the mole meant that it often suffered storm damage, so in the late 1920s the Harbour Board's Marine Engineer Wilkie decided to remedy this situation by sinking unwanted tonnage alongside it. The first was the Union Steam Ship Company's *Pateena* (1,212 tons, built 1883), put in place on 27 May 1926. Following the loss of *Rotten Row* as a viable dumping place, four more U.S.S. Co vessels were available for scuttling at the mole. These included the *Moana* (3,915 tons, built 1897), sunk in 1927; the *Kahika* (1,148 tons built 1902), sunk in 1933; *Paloona* (2,771 tons, built 1899), sunk in 1928; and the *Mokoia* (3,502 tons, built 1897), which went down in November 1945 after being stripped

of steel for the war effort (McLean 1985:329). Other ships at the mole include the coaster Gertie (269 tons) and the O.H.B. vessels Plucky, 222 the Priestman (ex-New Era) pontoon, as well as the remains of the Otago Dock gate.

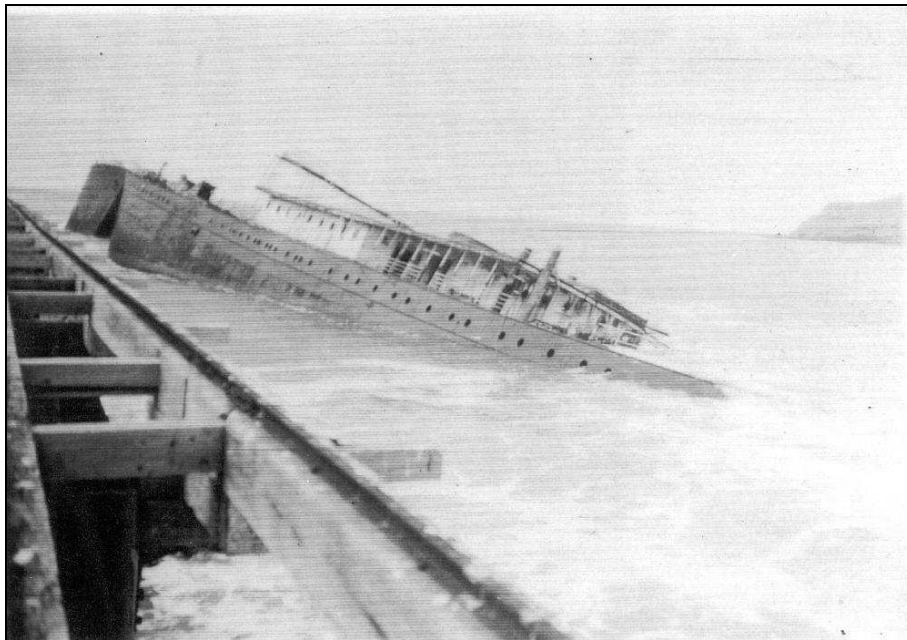


Figure 69: The Paloona and Mokoia scuttled alongside the mole (photograph courtesy of Port Chalmers Maritime Museum).

The collection of scuttled watercraft at the Aramoana Mole represent a unique form of ships' graveyard in that these vessels, although obsolete at their time of deposition, still perform a secondary function in protecting the mole from storm-damage. This continuing usefulness means that this ships' graveyard must be viewed as distinct from the majority of other ships' graveyards in Otago Harbour.

OTHER ABANDONED WATERCRAFT

Not all of the vessels abandoned in Otago Harbour were deposited in ships' graveyards as, before regulations were established, virtually any quiet backwater was deemed suitable for the disposing of unwanted vessels. Thus vessels were abandoned in Dowling Bay (Mermaid), Hamilton Bay (Samuel Careys Firewood Lighter), Blanket Bay (wreckage of the Pride of the Yarra), Port of Dunedin (Waireka, Ocean Ranger, Frederick Basil), Latham Bay (Clyde, Amateur) and Portobello Bay (Henbury, Alarm). These areas are distinct from the five ship's graveyards around the harbour (Figure 65) in that the

vessels were either deposited individually, or else multiple vessels were spread throughout a particular bay but not concentrated in a single area.

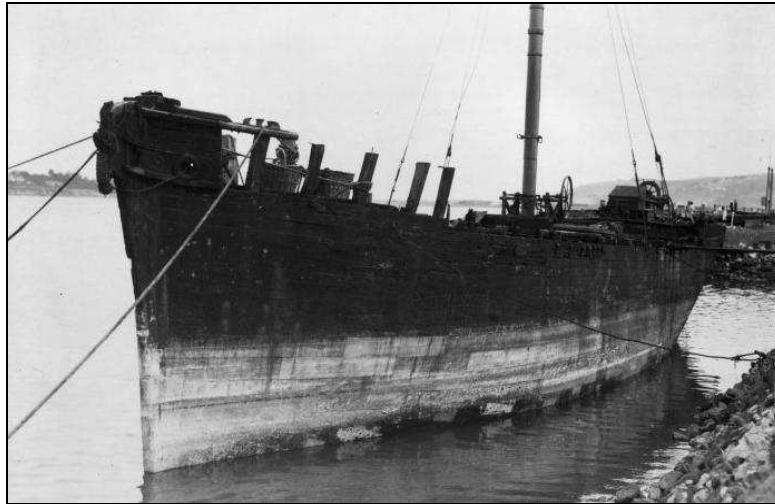


Figure 70: Ocean Wave abandoned off Dunedin (Alexander Turnbull Library (ref. PAColl-6407-02)).

PATTERNS IN WATERCRAFT ABANDONMENT

By combining the above historical research with the archaeological record, a number of patterns relating to the abandonment of watercraft become apparent. When vessels had come to the end of their working life they were abandoned in a number of locations around the harbour, shown graphically in Figure 71.

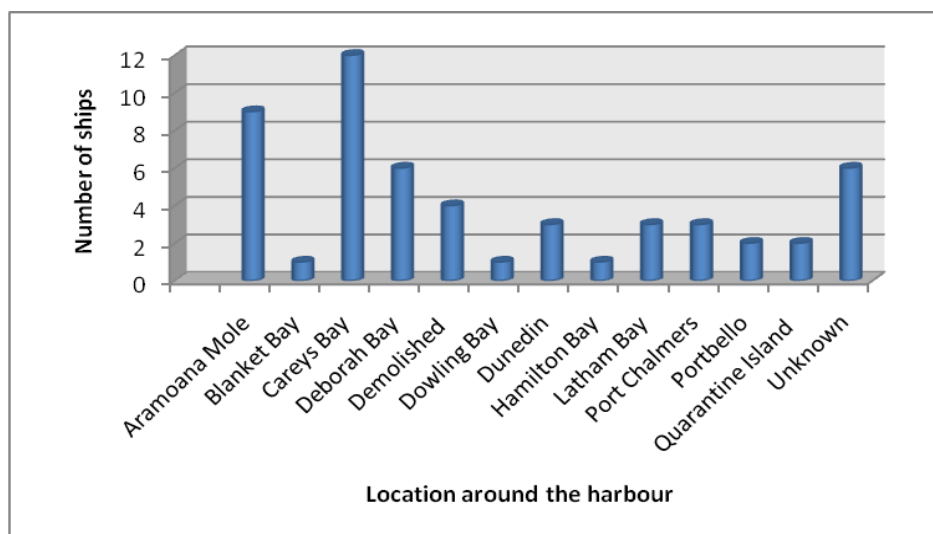


Figure 71: Number of watercraft disposed in areas around Otago Harbour.

Areas where vessels were abandoned in the greatest concentrations were Careys Bay (12 vessels), Aramoana Mole (9 vessels), and Deborah Bay (6 vessels). The reason for the disposal of vessels in these areas is that in Careys Bay and Deborah Bay, the shallow water meant that vessels could be run aground close to shore in order to facilitate the stripping and salvage of valuable materials. Aramoana Mole was also a convenient location as the surplus shipping could be easily disposed here, and the mole strengthened in the process.

Additionally, investigation of the abandonment of watercraft by decade provides insights into what periods of time this form of interaction with the maritime cultural landscape was at its peak.

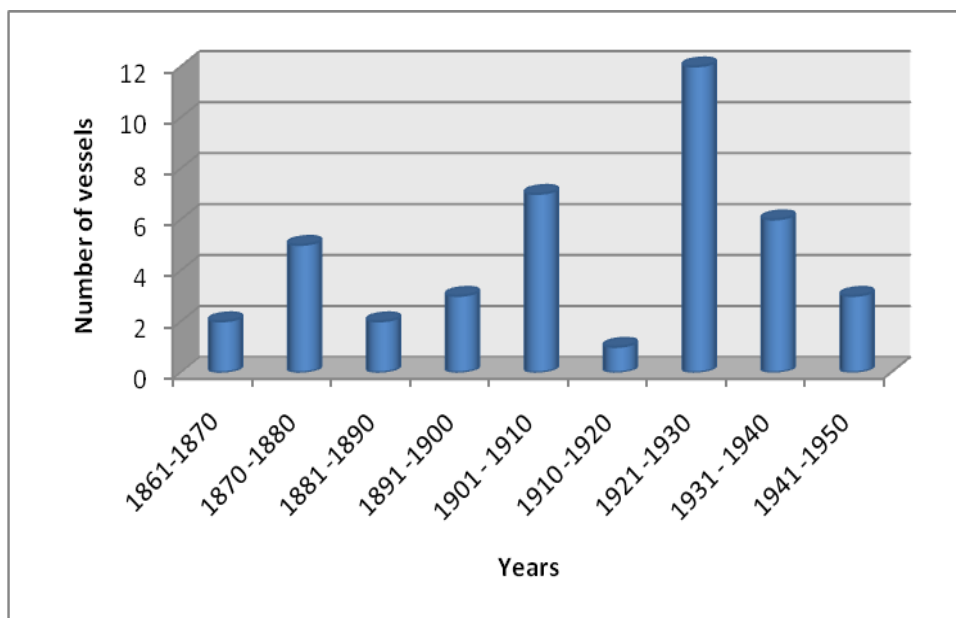


Figure 72: Abandonment of watercraft in Otago Harbour by decade.

As Figure 72 shows, between 1861 and 1900 the number of vessels abandoned in the harbour remained relatively constant. This is likely due to the lack of storage at both Port Chalmers and Dunedin during this time period. Consequently, during this period hulks were used far beyond what would normally be considered their useful working life and as such, were kept in service instead of being abandoned.

Between 1901 and 1910 a total of seven vessels were abandoned around the harbour. This significant increase from the previous decades may be a result of the

increasing harbour infrastructure that was constructed during this period, which, as noted by Ledgerwood (2006: 95), made some of the harbour hulks redundant.

By 1911 a total of 17 vessels had already been abandoned throughout the harbour. The fact that only one further vessel was abandoned between 1911 and 1920 may be due to the fact that the majority of hulks and other vessels that were no longer capable of performing their duties were abandoned in the preceding decades. In addition, with the outbreak of the First World War, shipping was in high demand throughout the world and as such, vessels that may have been scrapped in peacetime had their working lives extended.

The periods between 1921 and 1940 show the highest number of vessels abandoned throughout the harbour with a total of 18 during this time. By the 1920s the utility of hulks for storing coal was becoming increasingly outdated with the rise of the use of oil for marine fuel. As a result, a number of hulks were no longer needed and so were abandoned. Another factor was the trade depressions that culminated in the Great Depression, significantly reducing the market for ageing vessels worldwide. As such, where previously vessels may have found new owners, a number were now unsellable and the unwanted tonnage could only be got rid of by abandoning it in places like the mole.

The last time period vessels were abandoned in Otago Harbour was between 1941 and 1950, when three vessels were abandoned. This period is notable for the abandonment of the last hulks that served the harbour and for further sinking of unwanted vessels at the mole. It is likely that no vessels were scrapped in the harbour after this time as the abandonment of vessels was becoming increasingly regulated and the post war prices for scrap metal made it more economic to take the vessels further afield to be scrapped professionally as opposed to being abandoned within the harbour.

CONCLUSION

The use of hulks in Otago Harbour was an integral feature of the waterfront from the early days of European settlement until after the First World War. These hulks were utilised for a diverse range of purposes and ‘plugged-the-gaps’ presented by the lack of marine infrastructure within the Port of Otago. This utility meant that harbour hulks played a pivotal role in the maritime history of the harbour and as such, are duly recognised here as significant components of the maritime cultural landscape. As discussed above, abandoned watercraft are found throughout the harbour, including the five areas which can be deemed

ships' graveyards. These areas provide ample evidence for the practice of vessel abandonment once they became obsolete and, furthermore, shows that this was an accepted form of interaction between the harbour's inhabitants and the marine environment. Today the remains of these abandoned watercraft (many of them former hulks) provide a view into the past, with each vessel having a unique story to tell about the relationship between people and the waters of Otago Harbour.

6.4. SHIPBUILDING AND REPAIR

On a global scale, the construction of watercraft has a history that dates back thousands of years into remote human prehistory. Since this time, ships have evolved into huge and enormously complex machines and the practice of building them has become a specialised field with its own unique tools, traditions and even its own language (McGrail 2001:439). As the only naturally sheltered harbour on the east coast of the South Island between Banks Peninsula and Bluff, Otago Harbour was an ideal location for the construction and repair of watercraft (McLean 1985:26). The importance of shipbuilding and repair to the history of the harbour is such that it is a vital component to our understanding of the maritime cultural landscape.

THE ARCHAEOLOGY OF SHIPBUILDING AND REPAIR

The industries of shipbuilding and repair have a long and remarkable history within Otago Harbour. Unfortunately, however, our knowledge of these formative industries relies almost completely on historical sources, with only one shipbuilding site within the harbour recorded in the NZAA site recording scheme. This site I44/294 is described as a shipyard, specifically that of William Isbister and the site of ‘Isbister’s Patent Slip’ (Figure 73).

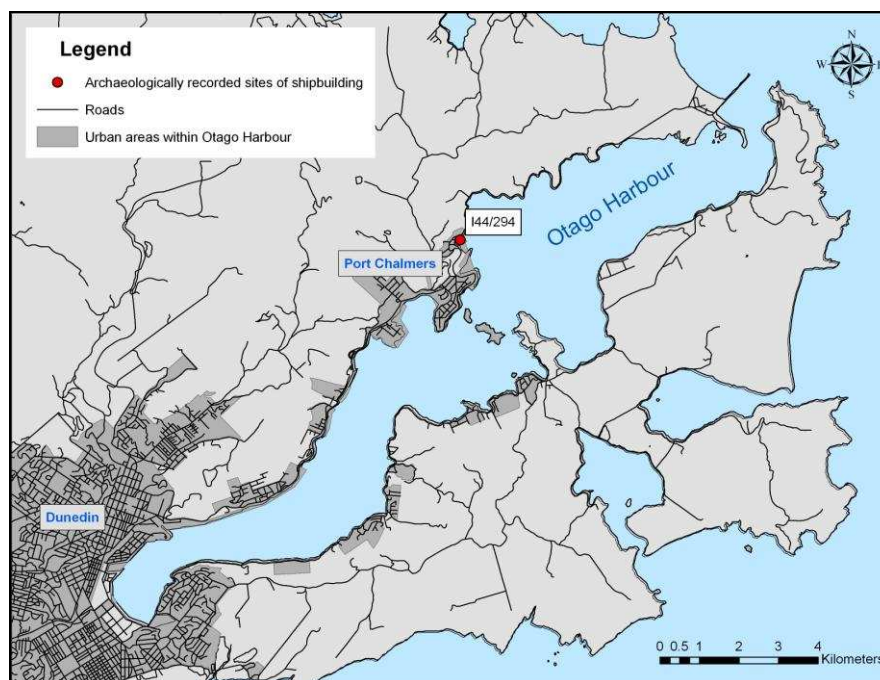


Figure 73: Map of Otago Harbour showing NZAA site I44/294.

This site was the subject of a comprehensive non-disturbance survey by undergraduate student Joss Debreceeny in 1993. In his report 'Shipyards in Careys Bay', Debreceeny (1993:12) described the main features of the site, notably the concentrations of scrap metal, the location of numerous nearby hulks, and the artificially built gradient on which Isbister's slipway was built. He also describes the artefactual material found throughout the area. From these observations and measurements, Debreceeny produced three informative maps of the site. In addition to the survey and accompanying report, Debreceeny used his findings to predict what type of archaeological remains would be characteristic of a shipbuilding yard in Otago Harbour:

Shipyards seem to be characterised by a number of things. In terms of portable artefacts, we should look for a large amount of metal, in absolute and in relative amounts. Domestic items will probably not occur, unless one part of the site is used for living.....shipyard sites may also produce metal scrap, which has rusted together. Shipyards also typically need sufficient area for buildings and for storage, and an easy gradient to the water, which may be natural or artificial. Access to good deep water is also helpful though not essential (Debreceeny 1993:14).

This predictive model has a number of strengths and its utilisation during the survey of the harbour in this thesis allowed the identification of two sites as potential shipbuilding sites (Chapter Five). However, in critically assessing this model one major shortcoming became apparent. Many of the vessels built in Otago Harbour were of wooden construction with metal fastenings. In absolute terms, these metal fastening would have made up only a fraction of the resources utilised in the construction of such a vessel and the scarcity of metal, especially in the early days of shipbuilding, would have meant that it was reused and recycled whenever possible. As such, the reliance of Debreceeny's model on the presence of metal artefacts and scrap to define a shipbuilding site is only of limited use when searching for sites in which wooden shipbuilding was the primary activity. A more fitting model for finding this type of shipyard may be to search suitable areas in the proximity of good timber, which was scarce except for in a small number of bays around the harbour (Church pers. comm. 2011). Despite this criticism Debreceeny's research still provides a tantalising glimpse into the type of information that an archaeological investigation of shipbuilding and repair sites can reveal. By combining the information obtained from this archaeological survey with the historical record we are able to gain a better understanding of the

shipbuilding and repair industries as components of the maritime cultural landscape of the harbour.

SHIPBUILDING AND REPAIR IN PREHISTORY

Otago Harbour was a busy place during prehistory, with the Maori inhabitants frequently crisscrossing its reaches in a variety of watercraft from mokihi (simple reed boats) to waka taua (impressive war canoes) (Anderson 1998:124). As noted by McLean (1985:21), these watercraft played a central role in Otago Maori society as they were used in vital areas such as food gathering, commerce and warfare. This heavy reliance on watercraft meant that the building of waka (canoes) and their repair would have taken up a considerable amount of the local inhabitants time and energy and it is no surprise that they utilised the sheltered beaches and surrounding podocarp forests of the harbour for these tasks (Hamel 2001a:43).



Figure 74: A Maori waka taua being constructed, by Walter & Frank Wright – Auckland Art Gallery, Auckland (Accession No 1915/5).

As with all other watercraft, Maori canoes faced considerable stresses and strains during their day-to-day working lives. As such, these vessels often required repairs to maintain and ensure their seaworthiness. Best (1925:185), notes that small splits in Maori canoes were plugged with raupo down, but more serious splits required holes bored either side of the damaged area and a batten lashed on to cover the caulked flaw. The utility of this

repair work was such that an abandoned and apparently condemned canoe could often be refitted and repaired to active service if required (ibid:187).

With the arrival of Europeans to the region in the early 1800s, Otago Maori were introduced to new ideas and technologies, including a number relating to ship construction. This interaction resulted in a form of hybridisation whereby Maori modified their traditional waka by fitting a square sail and equipping the crew with oars instead of paddles (McLean 1985:76). The introduction of European whaleboats into the harbour was another opportunity for Otago Maori who recognised the sturdy construction and seaworthiness of these vessels. With the decline of sealing and whaling after the 1830s a surplus of these whaleboats was available and they were rapidly incorporated into Maori society (Anderson 1998:125). The arrival of Europeans also introduced Otago Maori to the beginnings of a cash economy whereby goods could be purchased instead of bartered or built by oneself. In terms of shipping, this allowed Maori to purchase European vessels without having to build them. One such example is the Maori Chief Tuhawaiki who purchased the small schooner *Leven* with the proceeds from the sale of the Otago Block in 1844 (Church pers. comm. 2011). Although the building of traditional waka and their repair continued after the arrival of Europeans, by the 1830s shipbuilding and repair in the harbour was increasingly taken up by European shipwrights in the employ of the Weller Brothers.

THE SEALERS AND WHALERS

The arrival of the first Europeans to Otago Harbour around 1809 saw the next phase of shipbuilding and repair in the harbour's history (McLean 1985:21). Unlike much of the rugged Otago Coastline, the harbour contained numerous sheltered bays which were surrounded by dense forest; an ideal situation for visiting whaling and sealing vessels in need of refitting or repair (ibid:291). To this end, these European whalers and sealers often careened their vessels on the beaches off Otakou and further up the harbour at Deborah Bay, utilising the abundant wood and sheltered anchorages (Chapman 1975:5). In his history of the harbour, Bowman (1948:117) notes that the best timber in the region for ship repair was found at Sawyers Bay; whaling ships in need of spars, and at least one in need of a mast, took timber from there in the 1830s. In 1831 the Weller Brothers established a shore-based whaling station at Otakou in the Lower Harbour. This station marked the first permanent European occupation of the harbour, and also the creation of a European factory,

port and trading post. As described by Entwisle (1998:87), this whaling station was supported by blacksmiths, coopers, and, notably, sailmakers and boat repairers, making Otakou the first location in the harbour to have European ship repair activities taking place on a permanent scale. Some notable repair works undertaken in Otago Harbour during this time include those to the barque Governor Bourke, which went ashore at Moeraki in 1836 and was sent to Otago for repairs; the French whaler Faune, which had its rudder repaired in 1838; and the Dublin Packet, which sent a mast and yard ashore to be repaired in that same year.

SHIPBUILDING IN THE 1840S

By the early 1840s, the whaling and sealing industries that had once been so important to the region had all but collapsed, leaving Otago Harbour with few remaining European inhabitants. According to McLean (1985:291), some of these inhabitants, the remnant Otakou whalers, had a sawmill and ‘shipyard’ in Sawyers Bay. From this enterprise they built the 20 ton schooner Anne, the first European trading vessel to be built in Otago Harbour, and launched on the 4 March 1841. The “rough and ready” nature of these early shipbuilding attempts is illustrated by Bowman’s (1948:98) description of the construction of the 20 ton ketch Mercury, constructed at Otakou by David Carey and Charles Roebuck during the early ‘forties’:

She was built with timber cut from the banks of the Upper Harbour and rafted to Otakou, and nails got by barter from whalers. Roebuck being a coach builder by trade, worked up the iron required out of old harpoons and old iron found about the whaling station. The Mercury as she was known was a very lively craft in the sea, causing injuries to some of the crew and damage to her timbers, and was dubbed the “Jumping Jackass”.

Apart from the construction of the Mercury no other progress was made in the shipbuilding industry in the 1840s, however Otago Harbour still remained a suitable location for the refit and repair of larger vessels and they continued to call at the port. With the arrival of the first of the New Zealand Company’s settlers in 1848, activity in the harbour was greatly stimulated as shipping began to make more regular appearances in Otago (Chapman 1975:6). In addition to this, with the arrival of settlers the demand for small craft increased exponentially - a trend that continued into the next decade.

THE 1850S

After enduring the long and arduous voyage from England, immigrants arrived in Port Chalmers only to find that they could sail no further up the shallow harbour and that the “road” connecting the port to Dunedin was only a bullock track. The logistics of this situation significantly increased the demand for small vessels that were capable of taking passengers and cargo ‘up the harbour’ (Chapman 1975:6). In response to this demand, local boatbuilders began constructing small craft for both lightering and the coastal trade. McLean (1985:291), notes that during this time Anderson’s Bay became the first important site of shipbuilding in the harbour, with James Adams using the columns of the Otago News to advertise his willingness to ‘build boats of any burthen’ at his Anderson’s Bay boatyard. In 1851 he launched the schooner Barracouta, and followed this in 1852 with the 50 foot long schooner Bon Accord (Church 2002).

The ship repair industry also expanded during this time with increased demand due to the larger numbers of ocean going vessels visiting the port and the increasing numbers of small lighters and coasters that traded along the inshore waters of the region. Repair work during this time included work on the ship *Rajah*, which suffered damage in high seas in 1853; repair to the bulwarks of the *Thomas and Henry*, damaged during bad weather in 1855; and replacement of the *James Daly’s* jibboom after it was carried away in a gale in 1858 (Church 2002). The lack of port infrastructure at this time meant that the repair industry was limited to relatively minor refitting and repair, with work of any extent, such as painting or cleaning, required to be carried out while the vessels were careened on the beaches of the local bays (Chapman 1975:31). As noted by Church and Philp (2008:11), the lack of repair facilities in the harbour, such as slipways and docks, meant that it was impossible to repair underwater damage to ships’ hulls, which sometimes resulted in vessels being condemned for relatively minor mishaps.

THE SPECTACULAR 1860S

The discovery of gold by Gabriel Read in the hinterlands of Central Otago in 1861 and the resulting rush transformed Otago from a small settlement into a thriving province. The gold rush generated not only new wealth for the region but also attracted thousands of migrants. This combination of capital and labour provided a ‘spark’ for many of the

region's industries, including that of shipbuilding and repair (McLean 1985:292). Read's discovery soon saw an unprecedented influx of shipping into the harbour with ships arriving from all over the globe. This massive convergence of people and products into the harbour, also significantly increased the demand for small vessels capable of transporting cargo quickly and efficiently from the large vessels lying in the stream at Port Chalmers. As a result of this demand, shipbuilding yards sprang up in several of the sheltered bays of the harbour, from Deborah Bay in the north right round to the Dunedin foreshore in the South (Olssen 1984:110).

The majority of the watercraft built at these new yards were reasonably simple sailing vessels such as schooners, ketches and cutters, a typical example being the 26 ton schooner Otago built at Blanket Bay by Madams and Rees and launched on 26 July 1865 (Bowman 1948:98). Otago shipwrights were also involved in the reconstruction of larger vessels, such as the 139 ton brigantine Hercules, which at 80 feet in length and with a 20 foot beam, was the largest vessel rebuilt in the Port at that time (Chapman 1975:18, Church 2002:221). A number of steamers were also assembled during the 1860s, marking a major milestone in shipbuilding on the harbour. The first of these was the 27 ton paddle-steamer Betsey Douglas launched on 14 June 1862. Described by Chapman (1975:18):

she was built with remarkable speed, showing the availability of a work force skilled in this work; her keel was felled on Pine Hill behind Dunedin, only eight weeks before she was launched. She was built entirely out of native timbers, black pine being used for the framing and planking. The engine was imported from England and was of sixteen horsepower, the paddles were designed to be shipped or unshipped at pleasure, and she was fitted with two rudders.

The gold rush also stimulated the metal and engineering trades in the Otago region. Firms such as A. & T. Burt, Kincaid and McQueen, and the Carron Iron Works experimented with new processes and materials (Olssen 1984:66). This innovation and a close working relationship with the shipbuilding industry of the region meant that local shipbuilders were able to make the transition from wood to iron and steel construction more smoothly than their northern counterparts (McLean 1985:293). This transfer of knowledge was such that in 1863, when James Arnett built Otago's first iron steamship, the 37 ton Peninsula, he utilised iron casting techniques that had been perfected by the Carron Iron Works only one year previously (ibid:292). The shipbuilding boom associated with the gold

rush reached its peak in 1864, with 567 tons of shipping being constructed in the myriad of small shipbuilding yards around the harbour (Chapman 1975:49).

The exponential growth of shipbuilding in the harbour during the 1860s was paralleled by a dramatic increase in the ship-repair industry. By the start of the decade the need for suitable repair infrastructure such as docks and slips was already well established (Bowman 1948:100). The demand for repair facilities and the potential profits that could be made in this industry were recognised by a number of entrepreneurs and they began to use private funds to construct repair infrastructure. The first such project was undertaken in 1861 by William Isbister, a shipwright from Melbourne who constructed the grandly named 'Isbister's Patent Slip' in Careys Bay. As described by Bowman (*ibid*:100), Isbister's innovative slip was "the first of its kind in the colony which utilised pulleys, wheels and rails to considerably lighten the task of bringing ships from the water onto the dry slip". Although only built to take vessels of less than 400 tons, Isbister's slip was the first decisive step in the history of Port Chalmers as a ship-repairing port, as the slip not only allowed for the comparatively easy repair of Otago Harbour's 'mosquito fleet' but also larger vessels from across the seas (Chapman-Cohen 1934:106, Church & Philp 2008:17). By the mid 1860s the quality of repairs undertaken by Port Chalmers shipwrights like Isbister and others had earned the port a reputation for excellence. In response to this acclaim the shipping community and the inhabitants of the harbour sought to expand the port's repair facilities (McLean 1985:293). The major shortcoming of the ship-repair industry in the harbour at this time was the lack of a dock or slipway large enough to facilitate repairs on vessels over 400 tons (Chapman 1975:11). In order to fill this void a syndicate of shipbuilders from Port Chalmers took it upon themselves to build a floating dock. In 1868 they launched the Alpha, a 500 ton floating dock, the first of its kind in New Zealand and, according to McLean (1985:332), the largest marine structure in Australasia at the time. At 170 feet long, 42 feet wide and 16 feet deep, the floating dock was capable of accommodating not only local harbour and coastal vessels but also seagoing ships with draughts of up to 13 feet (McLintock 1951:72). The success of the floating dock greatly increased the capacity for ship-repair in the region. By the end of the 1860s a greater amount of tonnage entered Otago Harbour than any other in New Zealand, and within the port there were greater facilities for shipbuilding and repair than any other harbour in the country (Chapman-Cohen 1934:128).



Figure 75: The floating dock Alpha De Maus Collection, Alexander Turnbull Library (Ref. 1/1-002539-G).

THE 1870S

With the wealth accumulated from the gold rush during the 1860s and a large and capable workforce, shipbuilding and repair continued to flourish in Otago harbour during the 1870s. Although the demand for schooners and ketches was not as frenetic as it was in the mid 1860s, shipyards continued to operate in the sheltered bays of the harbour to meet the demand for vessels in the lightering and coastal trades. One yard that was particularly active during this period was that of Sutherland and McKay at Port Chalmers, who in the space of only two years (1873-75) launched the schooners *Bencleugh*, *Isabella Anderson*, *Wanganui*, and the ketch *Palmerston* from their Boiler Point yard (McLean 1985:292). During this period these small-scale traditional shipyards were increasingly joined by larger and more capital intensive shipbuilding operations. The local heavy engineering industry in the region had gone from strength-to-strength over the preceding decades and by the 1870s Dunedin held the unrivalled position of principal manufacturing centre in New Zealand (ibid:293). This heavy industry base encouraged Otago shipwrights to utilise new technologies and materials and, from the 1870s, local companies such as Kincaid and McQueen and R.S. Sparrow and Company began to specialise in the construction of iron

and steel-hulled ships (McLean *ibid*:293). The building of such vessels required not only expensive machinery but also a specialised workforce; however this was no disincentive to local shipwrights, and in 1873 Kincaid and McQueen exhibited the engineering prowess of the province by constructing an iron vessel, machinery and all, from materials made entirely in Dunedin (McLean 1985:292). This ship, the 30 ton steamer *Fairy*, was another milestone for shipbuilding in the harbour and reflected the confidence and expertise held by Otago shipwrights in the 1870s. Despite the considerable successes of shipbuilders during this period, it was almost inevitable that some construction projects would go slightly askew considering the innovative and experimental work that was being undertaken. One particularly noteworthy ‘botch-up’ was the Dunedin Ironworks submarine dredge *Platypus*, which was built in 1873 - a period when submarine design worldwide was still in its infancy (Heslop 2003:8). This peculiar craft was 10.7 metres long and 2.2 metres in diameter with interior dredging equipment powered by paddle wheels (*ibid*:8). During her testing phase she was launched from the Rattray Street wharf and descended into the harbour. However, she failed to surface within the allotted time and her eight man crew were only saved by hauling the vessel into the shallows (Olssen 1984:65). This was the first and last venture of the *Platypus*, and after years of sitting on the beach at Pelichet Bay she was cut into sections for scrap and now sits outside the Middlemarch Museum, a rather ignoble end to such an ambitious project.

As with shipbuilding, the ship-repair industry in the harbour continued to expand in the 1870s with a number of shipwrights employed fulltime on the repair of local and international vessels (Stewart 1973:36). Despite the much improved capabilities offered by Isbister’s slip and the floating dock, the ever increasing size and sophistication of shipping entering the harbour meant that many vessels were now being forced to look elsewhere for repairs and refitting. This situation was such that not only were vessels being unnecessarily condemned in the harbour but also thousands of pounds of potential revenue was being lost to competing ports (Chapman-Cohen 1934:12). In order to overcome this situation the Provincial Government, following local demands, moved to construct a graving dock and thus ensure the supremacy of Otago Harbour’s ship-repair facilities within the colony (Chapman 1975:50).

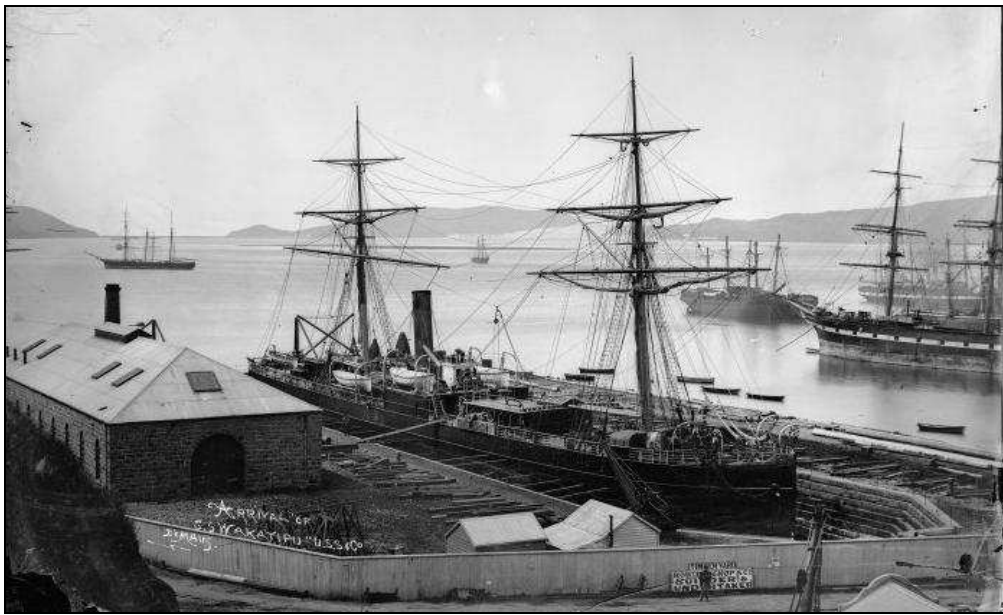


Figure 76: Steamship Wakatipu in the Port Chalmers graving dock. De Maus Collection, Alexander Turnbull Library (Ref. 1/1-002480-G).

As described by McLintock (1951:72), the construction of the Port Chalmers dock was a major engineering feat for the region, costing close to £50,000 and requiring 1,400 tons of best Portland cement and 90,000 cubic feet of stone. When completed in 1872 the dock was 330 feet in length, 41 feet wide and, with 17.5 ft of water on the sill, it was capable of accommodating the largest vessels entering the harbour at that time (ibid:72). The provision of the Port Chalmers graving dock meant that ship-repair work in the harbour was no longer limited to those vessels that could fit in the floating dock and repair work assumed ever larger proportions (Bowman 1948:106).

THE 1880S

The phenomenal growth the province of Otago had experienced in the 1860s and 1870s created vast amounts of wealth throughout many parts of the region. However, in the early 1880s a recession hit the New Zealand economy which resulted in long-term and far reaching changes to the region's industries - not least to shipbuilding and repair. In the years preceding the recession, and during the recession itself, Otago Harbour saw an aggressive struggle between the small schooners and steamers of the region for the harbour and coastal trades (McLean 1985:293). In addition, these small vessels were also increasingly forced into competition with the big steamers, owned by large concerns such as

the Union Steam Ship Company. As small coastal vessels were unable to compete with the larger and faster steam vessels, demand plummeted, leaving many of the smaller shipwrights around the harbour without work and forcing many to seek employment in the larger shipyards and engineering works of the region. Despite the recession, many of the heavy engineering firms of the region continued to expand and as a result so did their interest and involvement in the shipbuilding industry (Olssen 1984:91). Many of these businesses realised that the construction of traditional small wooden vessels was proving uneconomical and sought better returns on their investments through new forms and methods of vessel construction. One such company was the engineering firm of Morgan and Cable, who took the initiative of importing prefabricated steamers from Britain and assembling them in their yard at Port Chalmers. This innovative scheme enabled the company to build four steam vessels the Boojum (1880), Waihi (1882) and Snark (1882) for the U.S.S. Co's feeder services, and the Oamaru Harbour dredge Progress (1883), in the span of only three years - quite a remarkable feat for the company (Bowman 1948:107). The firm of R.S. Sparrow and Company based in Dunedin was also using their heavy engineering capabilities for ship construction, and in 1884 they built the 108 ton steamer Port Jackson, which, as noted by McLean (1985:293), was reputedly the first steel vessel built in New Zealand.

The economic recession had a noticeable impact upon the ship-repair industry in the 1880s. As noted above, the demand for small wooden vessels for the harbour and coastal trades had decreased significantly due to the recession and the intense competition from large steamers on these routes. In terms of ship-repair this meant that fewer and fewer of these small vessels were engaged in this trade and, as such, there were fewer small vessels in need of repair and maintenance. This decline was felt most sharply by small shipyards, which already faced a decrease in demand for the construction of new vessels were now also experiencing the loss of the repair side of their business as well. Despite the economic slowdown, vessels still required maintenance and repair and as noted by McLean (1985:294), the newly dominant steam ships required "more frequent and more extensive maintenance than their sailing counterparts". This captured market meant that during the 1880s the large ship-repair facilities such as Isbister's slip, the floating dock and the graving dock continued and even expanded the scale and complexity of their work.

THE 1890S

The shipbuilding and repair industries had faced considerable challenges during the 1880s. However, those individuals and firms that had been able to ride out the economic storm were now well placed to take advantage of the opportunities of the 1890s. As the country dug itself out of the economic slump, trade began to return and merchants and other businessmen sought vessels to transport their goods throughout the harbour and beyond. This demand stimulated the building of vessels by local shipwrights and once again, the 1890s saw small vessels being built upon the shores of Otago Harbour (Bowman 1948:100). A number of shipbuilding and engineering firms had actually managed to expand during the 1880s; firms such as Sutherland and McKay, Morgan and Cable, and Knewstubb Brothers entered the 1890s with state-of-the-art workshops and a skilled and capable workforce (Church 1994:99). This heavy engineering and shipbuilding pedigree meant that these firms were well placed to take advantage of the gold dredging boom that occurred during the 1890s. These firms, instead of competing against one another, joined forces to build the dredges with Morgan and Cable in charge of design, planning and machinery and the Knewstubb brothers constructing the wooden hulls.

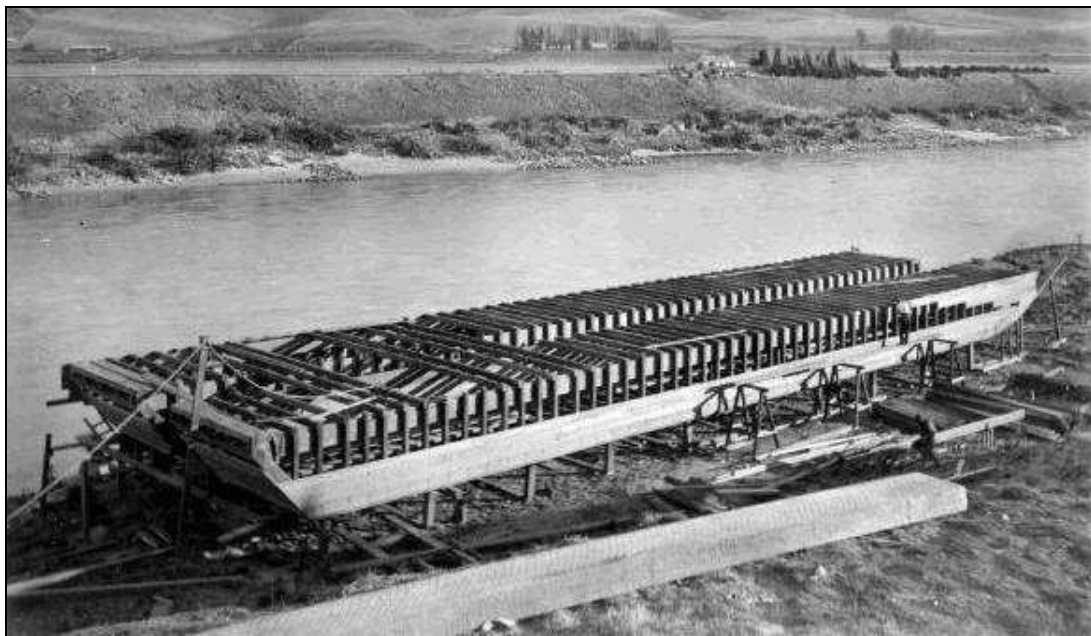


Figure 77: Clutha No.2. Dredge under construction around 1890 (Alexander Turnbull Library, Wellington, (Ref. PA1-q-105-062)).

The success of this coordinated construction was such that from a modest 13 dredges at work in Otago in 1893, the number increased exponentially to a peak of 201 dredges a mere decade later (Church 1994:99). By the end of the 1890s, dredges that had been built in Otago Harbour were operating on all the major gold fields in New Zealand and Australia, with some being sent as far away as Borneo and even Canada (Bowman 1948:107). The success of these building projects further expanded the capabilities and reputations of these engineering and shipbuilding firms and as a result of their work Dunedin became the world centre of gold dredge design and construction (Church 2006).

As the economy improved in the 1890s so did the demand for ship-repair facilities. In 1897 the Union Steam Ship Company added to the repair facilities of the port by building a new marine repair works beside the graving dock (Church 1994:91). This new building, as described by Cotton and White (1998:131), housed the company's shipwright, carpentry, engineering, painting and fitting shops, and were the chief workshops for the company in New Zealand.

The complexity and magnitude of the repair work that these firms were capable of undertaking at this time is evident by alterations made to the Union Steam Ship Company's trans-Tasman liner *Wakatipu* in 1891:

quaduple expansion machinery and boilers replaced the original compound engine, alterations were made to the masts and superstructure and the passenger accommodation was thoroughly refurbished. These alterations increased gross and net tonnages from 1,797 and 1,157 tons to 1,944 and 1,528 tons respectively and transformed her virtually into a new ship (McLean 1985: 294).

Despite the skill and innovative techniques utilised by these shipwrights, the ship-repair facilities of the port were struggling to keep pace with the increasing size of the shipping visiting the harbour (Church 1994:102). As an interim solution sheerlegs were erected at Port Chalmers. Costing only £5,000 and capable of lifting 81 tons, these were seen as a suitable short-term solution and, as noted by Chapman (1975:161), "they were of a great help to the ship repairing industry".

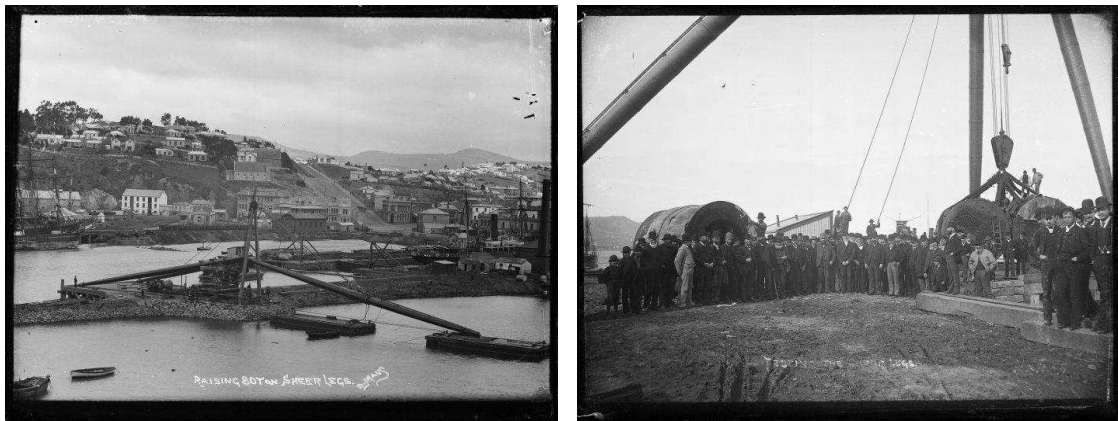


Figure 78: Sheer-legs at Port Chalmers, De Maus Collection, Alexander Turnbull Library (ref. 1/1-002550-G).

THE YEARS 1900-1909

The shipbuilding industry continued to expand in the years between 1900 and 1909 with a number of firms involved in the construction of vessels for the harbour and coastal trades. During this time the smaller shipyards of the harbour were mostly employed in the building of small runabouts and fishing vessels for local trade, while the gold-dredging boom was still creating work for the large engineering and shipbuilding yards (Bowman 1948:107). The larger yards were also active in meeting local demand for ferry steamers, with the *Tarewai II* (Knewstubbs) and *Waikana* (McGregor and Company) gracing the waters of the harbour in 1905 and 1909, respectively. One of the most significant advances in shipbuilding during this time was the inclusion of large oil-engines as propulsion in new vessels. The use of these engines in Otago was pioneered by the Miller Brothers and their ‘oil-engine launches’ soon took over from the former rowing and sailing craft, especially in terms of the fishing industry (Church & Philp 2008:49).

Ship-repair continued to be an important industry within the harbour, with the repair and maintenance needs of small vessel owners catered for by the smaller shipyards, and larger vessels accommodated at the larger slips and docks. However, the early 1900s saw progressively larger vessels frequenting the harbour and as a result, the ship-repair facilities were becoming increasingly obsolete. The shortcomings of these facilities were lamented by the harbour community and in response to this outcry, the year 1909 saw the construction of two major ship-repair facilities in the harbour. Firstly, the Union Steam Ship Company built a deep water wharf next to their marine repair works (Church 1994:102).

This wharf enabled large vessels to berth in much closer proximity to the repair works than was previously possible and greatly facilitated the Company's repair work. Also in 1909, the much anticipated Otago Graving Dock was finally completed. Although work had begun on the dock in 1905, disputes with contractors slowed progress and it was not until 1909 that the 500 foot long and 56 foot wide dock was finally opened (McLean 1985:113).



**Figure 79: S.S Waipahi in the Otago Dock 1926. Alexander Turnbull Library
(ref. APG-1328-1/2-G).**

As described by McLintock (1951:229), although enormously expensive (its construction had cost £85,000) this engineering marvel was capable of accommodating vessels of up to 530 feet in length and 21 feet in draught, making it the second largest graving dock in Australasia at the time. Upon its completion, the Otago Dock provided Otago Harbour with unparalleled facilities for ship repair and this enormous investment saw a dramatic increase in the complexity and scale of repair projects that could be undertaken in the harbour.

THE 1910S

The demand for schooners and other vessels for the harbour trade had dwindled ever since the construction of the railway between Port Chalmers and Dunedin in the 1870s (Bowman 1948:132). By 1910 there was so little demand for locally built small watercraft that a number of the smaller yards were forced to close. The larger yards, however, fared much better during this period. A case in point being the Dunedin firm of John McGregor and Company who built the steamers *Clutha* (1910), *Earnslaw* (1912), *Waipu* (1916), the harbour ferry *Waireka* (1910) and the dredge *Wallace* (1913) in just six highly productive years (McLean 1985: 295). However, the largest project undertaken during this period was the construction of the 345 ton tug *Dunedin*. In 1911, as a sign of their support for the local shipbuilding industry, the Otago Harbour Board awarded this contract to Stevenson and Cook's Maori Iron Works, and in 1914 this powerful salvage steamer and tug was launched in front of a large crowd of spectators (Bowman 1948:108). The declaration of war in Europe in 1914 saw ship construction in the harbour take on a new path with the need to fit out and modify vessels for wartime duties as hospital and troop ships. The harbour's two dry docks and the extensive engineering facilities of Stevenson and Cook and the Union Steam Ship Company were ideal for this kind of work and a large proportion of the local population were gainfully employed in this wartime industry (McLean 1985:295).

With the provision of the Otago Dock in the previous decade, ship repair had progressed in leaps and bounds, enabling projects to be undertaken between 1910 and 1919 that would previously have been unthinkable. One such venture was the repair of the 6,689 ton steamship *Knight of the Garter*, which had severely damaged her hull and stern post after grounding near Bluff in 1911. After entering the harbour under tow she was placed in the Otago Dock where, as noted by Church (1994:100), the firm of Stevenson and Cook engineered and fitted not only a new 10 ton post and a 9-ton rudder, but also replaced the buckled and damaged plates, frames and floors. The scale and complexity of this work was such that it was regarded as the greatest feat in ship repair ever to have been carried out in the Southern Hemisphere up to that time (McLean 1985:295).

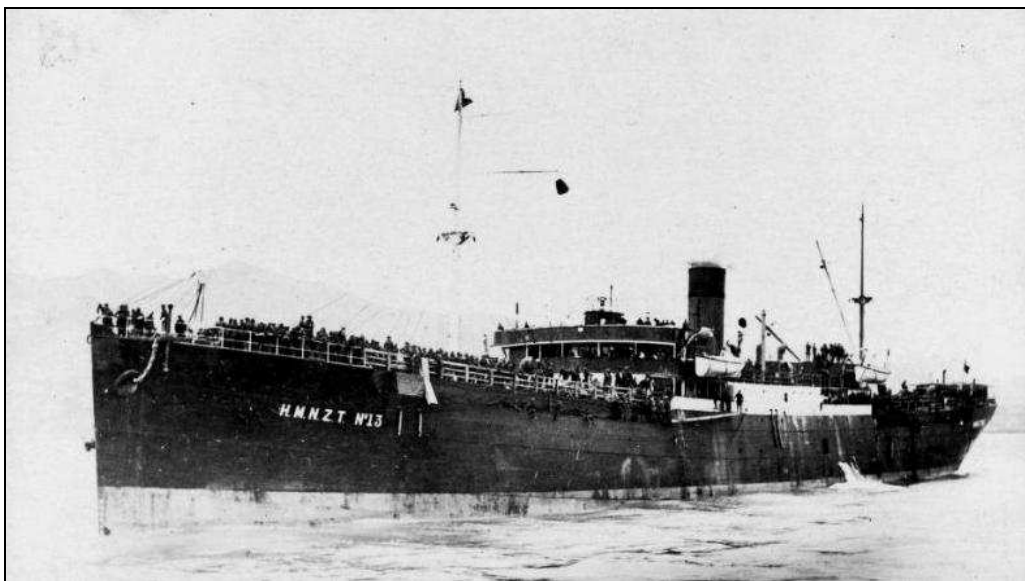


Figure 80: The 6,689 ton S.S Knight of the Garter Alexander Turnbull Library (ref. 1/4-009738-F).

Another notable project undertaken during this time was the Miller Brothers repair of Ernest Shackleton's support ship the *Aurora*. On the 3rd of April 1916 this vessel limped into Otago Harbour after sustaining damage in the Ross Sea off the coast of Antarctica. Upon arrival she was entered into the Port Chalmers dock and the Miller Brothers were awarded the highly desired contract to repair and recondition her for the return voyage to Antarctica (Church & Philp 2008:51). The success of such high profile projects during this period meant that the ship-repair industry of Otago Harbour gained a reputation for quality workmanship which rivalled that of any other port in the Southern Hemisphere and indeed as noted by Bowman (1948:108), "was comparable to the standard of the best yards of the Mother Country".

THE 1920S

Ever since the early days, fishing had been an important industry to the harbour and by the 1920s Port Chalmers was the largest wet-fishing port in the South Island (Church & Philp 2008:90). The continued expansion of this industry meant that fishing boats were in short supply in the 1920s and shipwrights in the harbour moved quickly to take advantage of this demand. During this time, three new shipyards were opened and these firms: Miller and Tunnage (1922), Stephen Carey (1923) and the Port Chalmers Shipwright Company (1926), constructed a number of fishing boats and other small vessels. These firms became

renowned for their fishing and pleasure craft, with orders for these vessels coming from all over the South Island (McLean 1985:297). One interesting aspect of shipbuilding in Otago Harbour during the 1920s was the fact that no large seagoing vessels were constructed, with firms instead concentrating on small vessels and other manufacturing projects.

The ship-repair industry continued to grow during the 1920s. The ever growing number of fishing boats that operated out of the harbour were in almost constant need of repair and maintenance, and this work provided the smaller shipyards with a welcome trade. The graving docks continued to accommodate the larger and more complex repair work, enhancing their already well established reputation for excellence. However, some projects presented considerable challenges; the most notable of this period being the repair of the whaling factory ship the C.A. Larsen. While steaming off Stewart Island in 1928 this vessel suffered serious damage and was forced to sail for Otago Harbour in order to undergo repairs. However, at 527 feet in length and over 13,000 tons, this monster of a ship was too large for even the Otago Dock (Bowman 1948:106). Undaunted, the various contractors of the port rallied together and had the Dock lengthened 30 foot by blowing out the shore end with explosives to accommodate the repair of the troubled vessel.

THE 1930S

As with the recession of the 1880s, the great depression of the 1930s impacted upon the shipbuilding industry of Otago Harbour. The demand for fishing boats and other small vessels which had supported the various shipyards of the harbour in the 1920s was significantly reduced by the lack of money now available for investment. Instead of purchasing new boats, fishermen were holding onto their old vessels for longer periods of time and as a result, shipyards were forced to reduce their production to meet the decreasing demand. However despite the relative decline of the industry, one major development did occur in the 1930s, namely the fitting of large diesel engines into newly built fishing boats. The building of these new diesel powered vessels was pioneered in the harbour by Miller and Tunnage around 1938, and these engines allowed vessels to work fishing grounds further afield, and to stay away from port for longer, thus increasing their profitability (Church 1994:126). As had occurred in the previous decade, no large sea going vessels were built in the harbour during the 1930s. However, the heavy engineering firms of the harbour continued to use their shipbuilding expertise. For example the firm of Stevenson &

Cook Engineering Co. built the gold dredge Molyneux in 1936, which was the largest dredge that had been built in New Zealand to that date (Bowman 1948:109).

Much as it had in the 1920s, the 1930s saw ship-repair in Otago Harbour continue and expand. Even with the depression, vessels of all sizes and shapes still required repair and maintenance. As noted by McLean (1985:295), the port's repair infrastructure and reputation for quality meant that by the 1930s ship repairing was a major business for the Port of Otago. Fortunately, during this time of hardship the ship-repair industry employed a considerable number of people and also brought much needed income into the community.

THE 1940S

The 1940s once again saw the world embroiled in armed conflict and although the theatres of war were far from the shores of the harbour, it was to have a significant impact upon the port and its people. With the outbreak of hostilities, the Government sought to utilise the nation's shipbuilding capacity to construct naval support vessels for the war effort. The shipbuilding and engineering facilities of Otago Harbour made it a logical choice for such work and it was decided that a new shipyard would be built at Boiler Point for this purpose. The vessels chosen for construction at this yard were Castle class anti-submarine minesweeping trawlers, as well as cargo lighters for the Pacific (Church 1994:135). These vessels had the advantage of being easy to build, and so between 1942 and 1944 seven of the nine minesweepers built in New Zealand slid down the slipway at Boiler Point in Port Chalmers (McLean 1985:296). In addition to building naval support vessels, shipbuilders in the harbour were also employed in converting small coasters into auxiliary warships for the recently established Royal New Zealand Navy (ibid:295). However, with Japan's surrender in August 1945 the Government shipbuilding programme came to an abrupt halt and the Boiler Point shipyards were closed that same year. Despite this setback, shipbuilding continued in the harbour as there remained considerable demand for fishing vessels and the year 1945 saw Miller and Tunnage with eight trawlers under order for owners from Napier to Bluff (Church & Philp 2008:99).

The war years of 1939-45 were especially busy for the ship-repair industry of the harbour. During this time the Port Chalmers and Otago graving docks played host to numerous vessels that had suffered damage from enemy action. These ships from various allied nations often required major repairs and the Otago shipwrights became renowned for

the quality and speed of their repairs. This reputation was such that between March 1943 and April 1945, 43 United States vessels alone were sent to Otago Harbour for repair and/or overhaul (Church 1994:136). One of the most notable repair jobs of the war was that of the liberty ship John Deere in 1945. After being involved in two collisions near Noumea she was towed to Port Chalmers where, according to waterfront gossip, she was so badly damaged that her crewmen were able to fish in her submerged engine room (McLean 1985:295). Contractors entered her into the Otago Dock in March 1945 and by July she was repaired and fit for sea (Church 1994:136). With the end of the war, fewer ships from abroad required repair in Otago Harbour, however the local vessels that served the region still required repair and maintenance and the workforce of the ship-repair industry were more highly skilled than ever before.

THE 1950S

Demand for fishing vessels continued into the 1950s, providing Otago Harbour shipbuilders with a steady market for their craft. The firm of Miller and Tunnage took full advantage of this demand, building a number of fishing vessels during this decade, including the 72 foot oyster trawler Ariel, which was the largest wooden boat built at Port Chalmers to that date (Stewart 1973:74). As before the war, the 1950s saw shipwrights concentrate on building fishing and pleasure craft at the expense of larger seagoing vessels; a trend that continued into the next decade. Another notable feature of this period was the closure of the long established shipbuilding and repair firm Stevenson and Cook, who by 1958 had too small a volume of business to justify continuing operations (ibid:74).

The ongoing maintenance and repair of local shipping continued to dominate the ship-repair industry in the 1950s. However, the dry docks continued a steady trade in the repair of not only local but also foreign craft that continued to visit the harbour in significant numbers. The year 1950 also saw the establishment of a new ship-repair yard in Dunedin by Sims engineering (McLean 1985:298). Over the decade, Sims established itself as a capable and ambitious repair yard - traits that were put to good use in the 1960s.

THE 1960S

After a decade of relative decline, shipbuilding made a resurgence in Otago Harbour during the 1960s. This revival was led by the shipbuilding firm Mason Brothers, who in 1960 purchased the vacant shipyards at Boiler Point. Over the next three years this firm undertook a number of diverse projects, including building penstocks for the Benmore Hydro project and the construction of two steel trawlers and a tug (Church 1994:158). In 1964 Sims engineering expanded from their Dunedin premises, purchasing Stevenson and Cook's old foundry and the following year, the Mason Brothers yard at Boiler Point. Armed with this industrial base, Sims moved into shipbuilding. Their early projects included the tug Hustler, barges for the Manapouri power scheme, and five fishing boats (McLean 1985:298, Church 1994:158). The 1960s also saw Miller and Tunnage continuing to turn out fishing boats and pleasure craft, and in 1964 they expanded their operation, building a new slipway at their yard to enable larger boats to be drawn up (Church & Philp 2008:108).

The fishing boats and other local vessels that utilised the harbour continued to require the services of the ship-repair industry, providing work and employment for shipwrights in the 1960s. In addition to these local vessels, the location of Otago Harbour and the quality of its ship-repair facilities made it an ideal location for the docking and repair of vessels involved in the scientific study of Antarctica during the 1960s. A number of vessels involved in Operation Deepfreeze were docked and repaired in the port. Two particular vessels the HMNZS Endeavour II and the US supply ship Alatna became regular clients, returning each January from 1967 to 1969 (Church 1994:158). Despite repeated visits from these vessels, the number of ships using the Port Chalmers and Otago dry docks decreased during the 1960s, from 41 ships in 1961 to only 28 in 1966. This decrease negatively impacted the ship-repair industry of the harbour and was to have significant repercussions in the following decade.

THE 1970S

By the 1970s only three main yards were still involved in ship construction in Otago Harbour. Sims Engineering continued their shipbuilding enterprise, constructing a number of vessels. These included the trawlers Marine Countess (129 tons, 1970) and Marine Star II (111 tons, 1971), and the tugs W.H. Parr (112 tons, 1972) and Godley (210 tons, 1977)

(McLean 1985:298). At Port Chalmers, Miller and Tunnage were also still active, building fishing and pleasure boats for orders throughout the country. During this time the Otago Harbour Board also took part in ship construction, building the tugs Rangi (1974) and Karetai (1975) in their old workshops in Pelichet Bay.

The ship-repair industry in Otago Harbour underwent radical changes in the 1970s. Increasing competition from Hong Kong and Singapore based yards saw a declining number of vessels utilising the dry docks in the harbour, meaning these facilities were no longer profitable (Church pers. comm. 2011). As a result, in 1973 both docks were decommissioned and filled with spoil to make way for the new container terminal (McLean 1985:200). In 1978, in an attempt to regain some of this lost capability, the Otago Harbour Board built a 500 ton capacity slipway at the head of the Kitchener Street Wharf (ibid:298). This project was soon followed by the establishment of an engineering works at the Birch Street Wharf by Sims Engineering, who with one of their first projects being the overhaul of the Cook Strait rail ferry Aranui in 1978. These two repair facilities meant that the Upper Harbour was now the repair hub of the region; however the industry's capabilities had now greatly diminished from their earlier pre-eminence.

THE DEMISE: 1980 TO 2010

The 30 years between 1980 and 2010 saw the shipbuilding industry in Otago Harbour decline to the point of collapse. In the 1980s, a number of vessels were built by Sims Engineering including the New Era dredge, which at 1056 ton is the largest powered vessel ever to be built on Otago Harbour (McLean 1985:298). However, over the next twenty years, decreasing demand and a declining workforce eventually forced Sims to close their workshops and become mobile contractors, building and repairing vessels throughout the country on a case by case basis. Miller and Tunnage continued to operate out of their yard at Port Chalmers but with the decline of the wooden boat industry they were at times forced to commence work on speculation just to keep their workforce intact. With the decline of Sims, a firm called Ferrum Engineering took over the lease of the slipway at the Birch Street wharf. Today this firm performs a range of ship-repair and maintenance services for vessels of any size capable that are of being berthed in Otago Harbour, and is now one of the only firms still engaged in what was once a major industry of the harbour.

Clearly, shipbuilding and repair has a long and varied history in Otago Harbour. In light of the evidence described above, we can now investigate sites of shipbuilding and repair as components of the larger maritime cultural landscape.

TYPES OF SITES

Between 1809 and 2010 there have been a range of site types associated with shipbuilding and repair in Otago Harbour, and these are shown in the table below.

Table 4: Types of shipbuilding and repair sites and number in Otago Harbour.

Site Type	Number
Graving Docks	2
Boatbuilding Yard	35
Ship Building Yard	22
Sheerlegs	1
Slipways	11
Marine Repair Works	1
Careening Sites	3

These site types reflect not only what types of archaeological remains could possibly be found throughout the harbour but also what activities were being undertaken within its protective shores. In terms of the maritime cultural landscape, these sites illustrate the diversity of ways in which humans interacted with the marine environment of the harbour through their involvement with the shipbuilding and repair industry.

SITE DISTRIBUTION

Combining the results of the archaeological survey presented in Chapter Five with historical research has revealed the locations of a number of shipbuilding and repair sites within Otago Harbour. Investigation into the distribution of these sites facilitates greater understanding of such sites as components of the changing maritime cultural landscape.

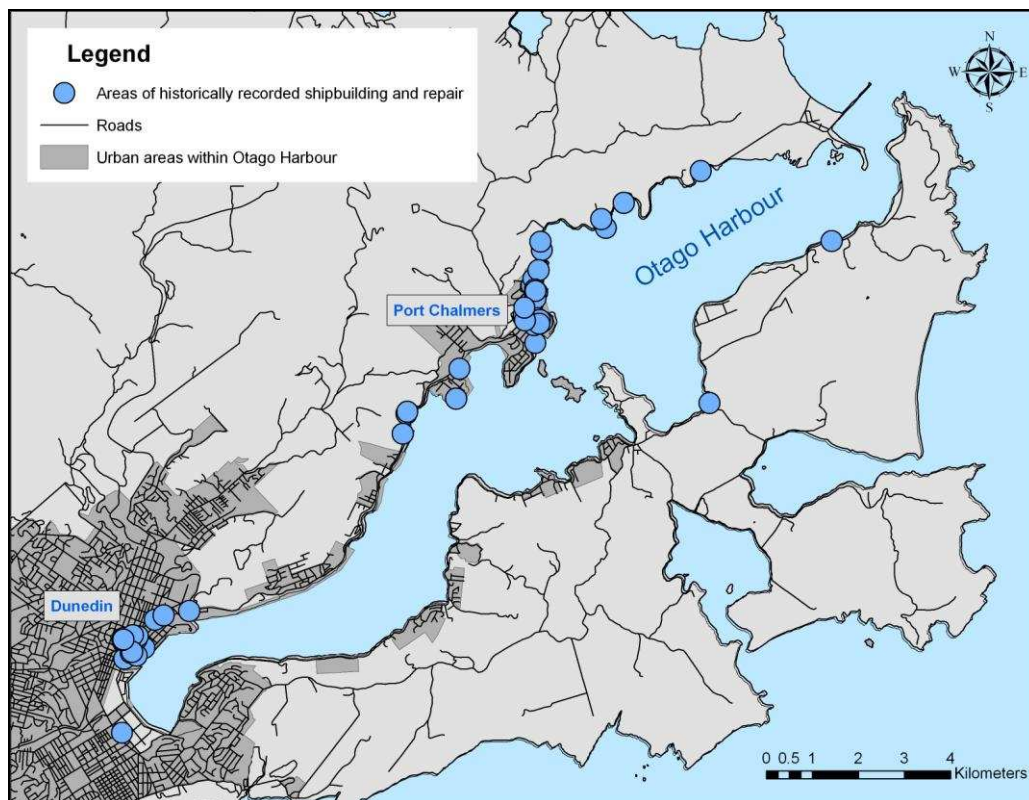


Figure 81: Areas of historically recorded shipbuilding and repair in Otago Harbour.

As shown in the map above, shipbuilding and repair was undertaken within many of the bays of Otago Harbour. The use of these areas for such activities is not surprising. Compared to much of the surrounding coastline, Otago Harbour has an enviable reputation for its sheltered bays and deep-water frontages (Chapman 1975:20). The distribution of these sites is particularly interesting when the location of shipbuilding and repair sites at different stages in the harbour's history are investigated.

Between 1830 and 1879, numerous small shipyards were active in the building and repair of vessels for the harbour and coastal trades. These yards were usually small-scale operations only capable of building and repairing vessels of low tonnage. The demands of this work were such that these yards typically only required a shallow waterfront and as a result, could utilise those bays which, due to a lack of depth, were not suitable for the construction of larger craft. In addition, the workforce of these yards was generally small and lived locally and as such, was able to be situated in the more remote bays of the harbour. These factors combined to produce the distribution pattern of shipyards spread throughout various bays of the harbour, as illustrated in Figure 82.

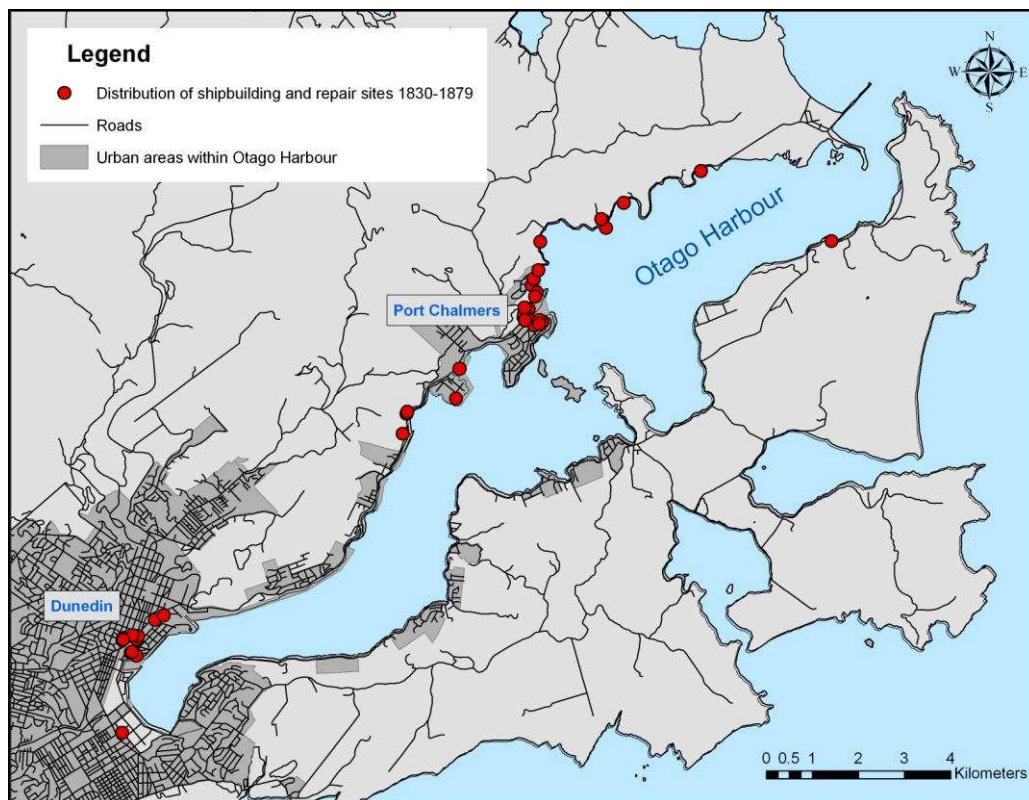


Figure 82: Distribution of shipbuilding and repair sites in Otago Harbour 1830-1879.

After 1880 this pattern changed considerably, with the location of shipbuilding and repair sites now dependant on a different set of variables. As discussed above, the establishment of the Port Chalmers to Dunedin railway, the economic recession of the 1880s and increasing competition from large steamers meant that demand for locally built wooden vessels significantly decreased towards the end of the nineteenth century. This decrease meant that many of the smaller yards found throughout the bays and backwaters of the harbour were now uneconomic and were forced to close. In contrast, while the smaller operations of the harbour were failing, shipbuilding and repair on an industrial scale actually expanded after 1880 at Port Chalmers and Dunedin. The needs of these large-scale yards differed from their smaller-scale counterparts in that they required heavy industrial machinery in the form of lathes, presses and forges, a large and highly skilled workforce and a sufficiently deep waterfrontage to launch the products of their work. In terms of site distribution, these attributes could not easily be provided in the smaller bays of the harbour, thus these larger yards tended to cluster in the industrial hubs of the harbour, namely Port Chalmers and Dunedin, where these resources were most available (Figure 83).

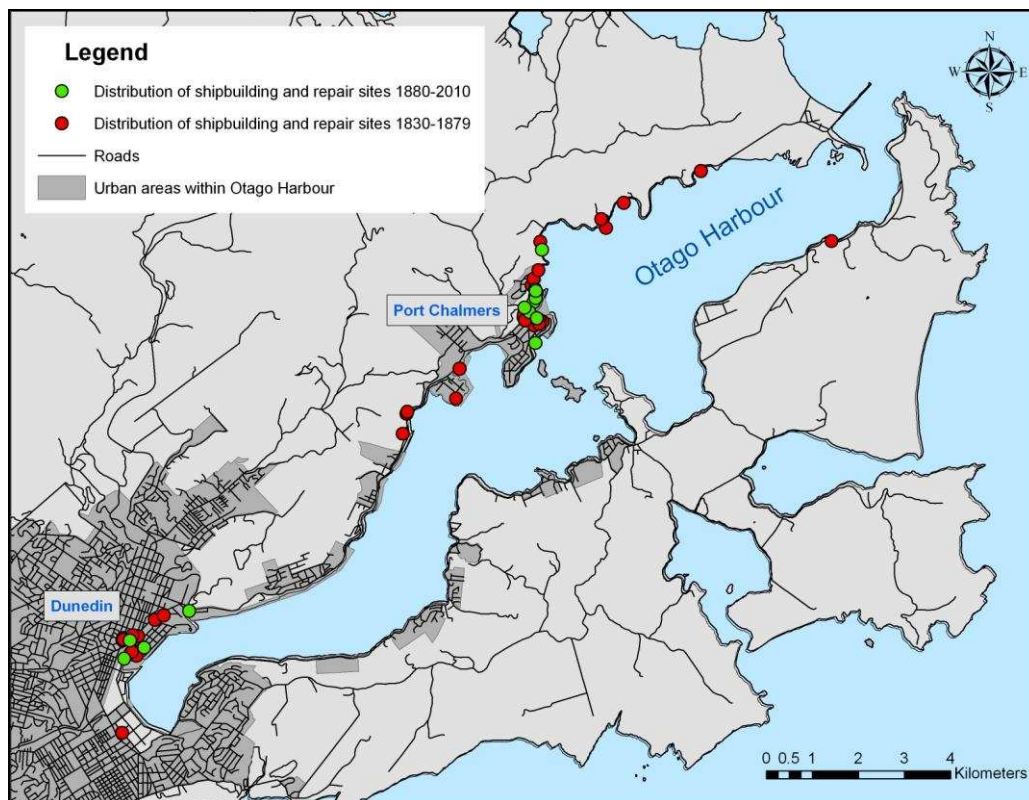


Figure 83: Distribution of shipbuilding and repair sites in Otago Harbour 1880-2010.

This distribution and pattern of shipbuilding and repair sites provides valuable insights into how people interacted with the marine environment. This interaction was, and still is, highly dependent on a complex range of natural and cultural variables.

PATTERNS IN SHIPBUILDING AND REPAIR

Historical records provide unique insights into the maritime cultural landscape of Otago Harbour by documenting the times during which the construction of new shipyards and repair facilities was greatest and thus at what periods of time this form of interaction with the marine environment was at its peak. As is illustrated in Figure 84 the 1860s and 1870s constituted periods of intense shipbuilding and repair activity in the harbour. From this information one could predict that the archaeological landscape in Otago Harbour would be biased towards shipyards and repair facilities constructed during these two decades.

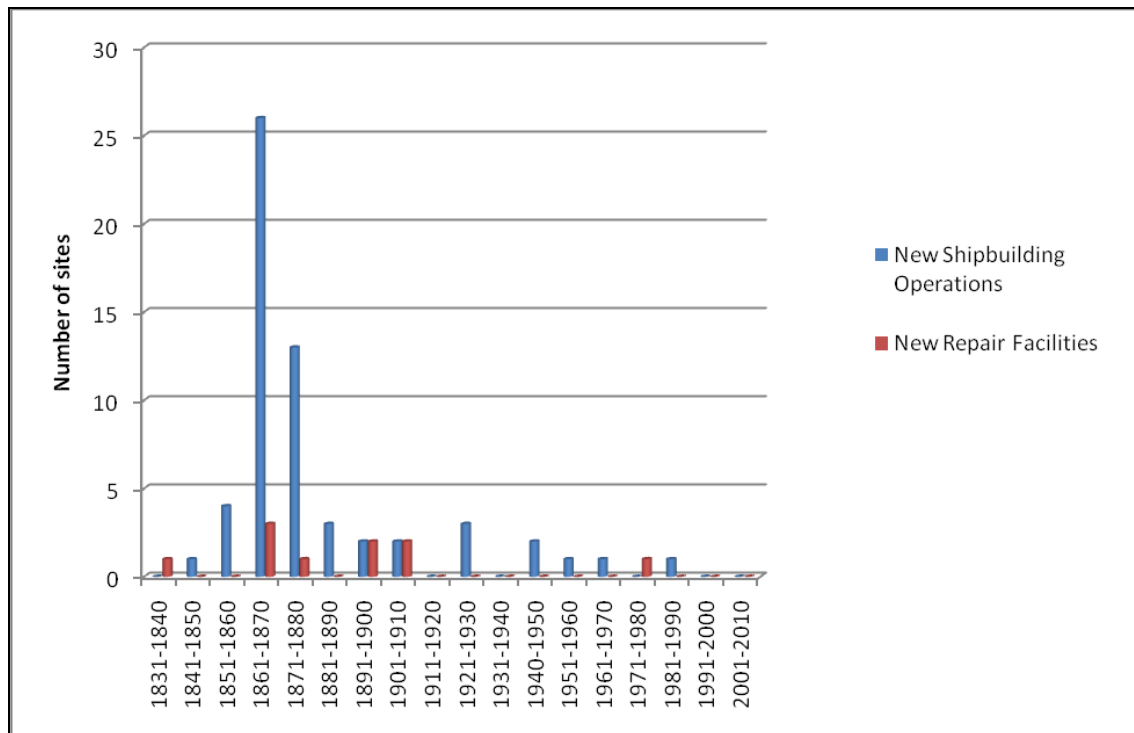


Figure 84: Number of new shipyards and repair facilities by decade.

Interestingly, as described above sites from these periods are more likely to be found in the bays away from Port Chalmers and Dunedin and are therefore less likely to have suffered from the developmental pressures associated with these areas. However, these were typically small-scale operations and as such, the material footprint they made on the landscape is likely to be harder to find than their larger counterparts.

CONCLUSION

By combining archaeological and historical sources of information it is evident that shipbuilding and repair have been major industries within Otago Harbour throughout its history. These sources have shown that there are a number of site types involved in these industries and that their locations throughout the harbour were dependant on a number of natural and cultural variables. This investigation of the maritime cultural landscape has shown that shipbuilding and repair sites are an extremely useful resource in aiding our understanding of the ways in which humans interacted with the marine environment of Otago Harbour. The significant potential for archaeological research into shipbuilding and repair is discussed in chapter seven.

6.5. OTAGO HARBOUR SHIPWRECKS

The narrow entrance to Otago Harbour and the shallow channels that snake their way along its flanks have always presented mariners with a myriad of challenges, some of which have caused unsuspecting vessels to become stranded and even wrecked. The importance of water travel to the inhabitants of Otago Harbour for trade and communication meant that for many decades the loss of shipping was by no means an uncommon event in the region (Collins 1995:7). The archaeological patterning of such shipwrecks discussed by McErlean et al. (2002:377) highlights issues such as the ports of origin and destinations of the stricken vessels, and the distribution of incidents around natural hazards and ports. As such, Otago shipwrecks have become part of the maritime cultural landscape of the harbour and offer valuable insights into the interaction between both the sailors and residents of the harbour and the marine environment.

THE ARCHAEOLOGY OF OTAGO HARBOUR SHIPWRECKS

A total of 20 ships are known to have been wrecked in Otago Harbour and its environs (Table 5). These wrecks range from small fishing ketches to massive iron steamers; offering archaeologists a unique resource with which to investigate a hugely important part of our collective history.

Unfortunately, despite the archaeological value of these sites, none of the 20 have been investigated using archaeological methods and only two wrecks, the James Paxton (site J44/149) and the Victory (site J44/88), are recorded in the NZAA site recording scheme. Although undeniably important, the lack of archaeological interest in these sites has meant that these wrecks are omitted from management and protection schedules, and continue to be damaged through the actions of fossicking divers. The lack of archaeological information from these sites means that we must rely exclusively on the historical record for our understanding of this vital component of the maritime cultural landscape.

Table 5: Shipwrecks recorded in Otago Harbour and its environs.

Name	Date of Loss	Type of Vessel
Alice Jane	1893	Ketch Wood 27 tons
Blanche Barkley	1869	Fishing Ketch Wood
Bruce	1875	Screw Steamer Barque Rigged 340 tons
Christina	1863	Schooner Wood 21 tons
Genevieve	1862	Barque Wood 271 tons
Henbury	1859	Ship Wood 473 tons
James Paxton	1876	Schooner Wood 61 tons
Jane Scollay	1890	Schooner Wood 50 tons
Kohinoor	1925	Schooner-rigged motor vessel 5 tons
Madame Mim	1977	Fishing vessel
Matanaka	1908	Oil Launch 5 tons
Matariki	1909	Ferry steamer 98 tons
Munford	1860	Brigantine Wood 169 tons
Perseverance	1847	Schooner Wood 19 tons
Pilot	1938	Pilot launch Wood 6 tons
Pride of the Yarra	1863	Steamer Iron 24 tons
Revival	1859	Barque Wood 452 tons
Tamar	1862	Schooner Wood 109 tons
Tyrone	1913	Steamer Iron 6,664 tons
Victory	1861	Steamer Iron 426 tons

SHIPWRECKS IN PREHISTORY

The earliest tales of shipwrecks on the Otago coast are described in the Maori traditions of the great canoes Takitimu of Southland and Arai Te Uru of Otago. Atholl Anderson (1998:14), in his ethnohistory of southern Maori, relates how the Takitimu, while travelling off the coast of Dunedin, was broached by a huge wave called Maunga-atua (the range overlooking Taieri Plain) causing her to lose a man overboard, before she was finally capsized and wrecked by another great wave in Foveaux Strait. The canoe Arai Te Uru

fared no better; becoming waterlogged in heavy seas off the Waitaki River mouth and spilling its precious cargo of kumara onto the shore of Moeraki and Katiki beaches before becoming a total wreck at Shag Point (Anderson 1998:16). These legends highlight the unforgiving nature of the sea and suggest that seafaring in the Otago region in prehistory (as it was in later periods) was a hazardous undertaking. However, despite evidence attesting to the importance of watercraft within Otago Harbour for food gathering, commerce and warfare in prehistory (e.g. Hamel 2001a), no archaeological remains of any such vessels have been found, wrecked or otherwise, within the harbour. One possible exception to this may be a chance discovery made in 2005 by the crew of the Otago Harbour Board's dredge, who, during routine operations, raised a basalt adze from the seabed of the harbour (Figure 85) (Briden pers. comm. 2006). Although **purely speculative**, such a find could be indicative of a capsized and sunken waka, which presents intriguing possibilities for maritime archaeology in the region.

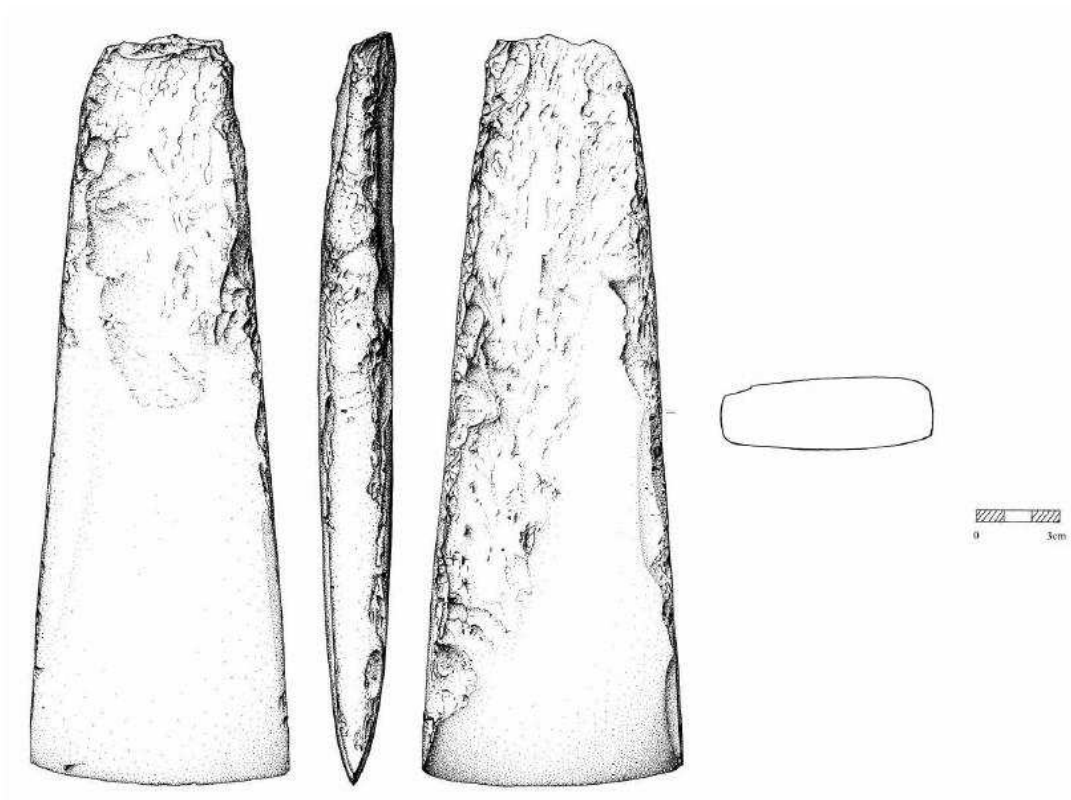


Figure 85: Adze recovered by Otago Harbour dredge 2005, drawn By Shar Briden.

HISTORIC SHIPWRECKS

Historical records show that 20 vessels have been wrecked in Otago Harbour since the first recorded loss in 1847 (Ingram et al. 2007, Collins 1995). These wrecks are significant components of the maritime cultural landscape of Otago Harbour and are discussed in detail below.

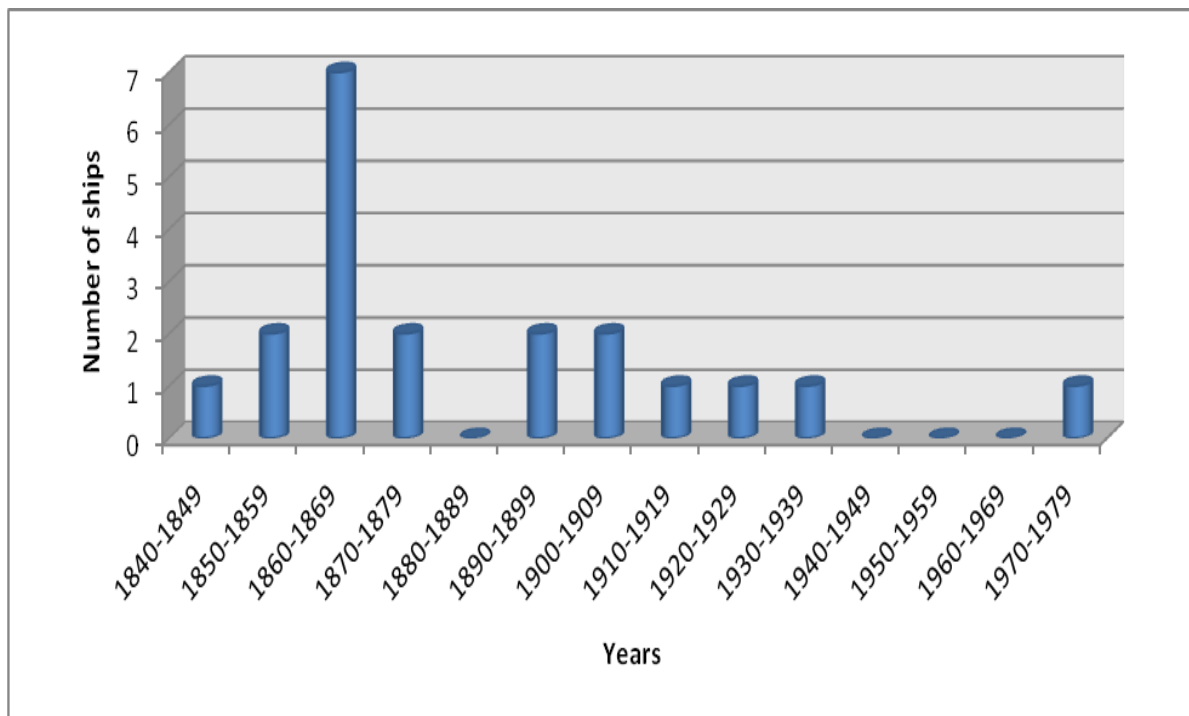


Figure 86: Chronological distribution of recorded Otago Harbour shipwrecks.

1847-1859

In the early nineteenth century, sealers and whalers from the Australian colonies had begun to visit the unexplored coastlines and bays of New Zealand, searching for untapped resources that they could exploit for easy profit. Unfortunately for most, they instead found hard work and a hazardous lifestyle which saw many of them wrecked on an uncharted and unfamiliar coast. The earliest European shipwrecks in the Otago region were small schooners employed in servicing the sealers and whalers scattered along the rugged coastline. As these industries declined and were slowly replaced by the start of European

emigration and settlement, the small schooners were soon joined by barques and fully rigged ships as casualties of the unforgiving Otago coastline. Between 1847 and 1859 three ships were wrecked within the study area of Otago Harbour: the *Perseverance* (1847), *Revival* (1859), and the *Henbury* (1859).

Perseverance

The *Perseverance* was a small schooner of 19 tons owned by the Maori Chief Tuhawaiki (Ingram et al. 2007:45). According to Collins (1995:12), Tuhawaiki was a respected seaman who used the schooner for trading in and along the Otago and Southland coast. In July 1847 the *Perseverance* was anchored off Otakou Beach in Otago Harbour when a gale began to blow, causing the anchors of the vessel to drag, and eventually driving the schooner onto the beach (Bowman 1948:80). Although there were no casualties, the vessel soon broke up and she became a total wreck (Collins 1995:12). Today the only remaining evidence of the vessel is the ships' bell which is housed in the tower of the church on the Otakou Marae (Ingram et al. 2007:34).

Revival

As described by Ingram et al. (2007:74), the loss of the 452 ton barque *Revival* in 1859 is considered the first serious shipping casualty at the Port of Otago. Prior to her demise, the *Revival* had visited the Port of Bluff to unload a shipment of livestock. However, once the discharging was complete a number of the crew deserted, leaving the barque short-handed (Collins 1995:15). Unable to recruit new sailors in Bluff, the skipper John Ferguson sailed for Port Chalmers, arriving at the Otago Heads on 31 March 1859 (ibid:15). Already hampered by a shortage of crew, Ferguson attempted to enter the harbour at night without prior knowledge of the port and without a harbour pilot. Almost inevitably, the *Revival* went ashore on the spit and although no lives were lost, she was left high and dry at low water (Ingram et al. 2007:74). With the onset of a north-east wind the *Revival* became a total wreck and her 'chains, sails, cables, rigging and surplus stores were auctioned at Dunedin on 26 April, and the hull and spars at the beach site the same day' (Collins 1995:16). What was left of the barque was eventually buried by the tide on the spit.

Henbury

The *Henbury* left Gravesend, England on 23 April 1859 with a complement of 20 passengers, their personal possessions and a cargo of general merchandise, bound for the fledgling colony of Dunedin (Collins 1995:16). After a relatively uneventful passage, the *Henbury* arrived in Port Chalmers on 20 August 1859, at which point Captain Robinson proceeded to Dunedin to complete the required customs formalities (Ingram et al. 2007:75). Collins (1995:16) describes how, with the captain occupied elsewhere, the crew got hold of the vessel's grog and began an orgy of fighting and drinking, forcing the passengers to beat a hasty retreat to a neighbouring vessel, the *Avondale*. At about 3am on Monday 22 August, the Chief Officer awoke to find the sails and stores in the sail room on fire. The fire quickly spread and was of such ferocity that the ship was soon engulfed in flames (Ingram et al. 2007:75). All efforts to scuttle the vessel in deeper water were unsuccessful as the stern had already grounded in the shallows, and by 10am the vessel was a charred ruin. Although there were no deaths or injuries, the possessions that the passengers had brought with them to start their new lives were almost all destroyed, as was much of the cargo consigned to the colony of Otago. The charred remains of the *Henbury* were later raised and converted into a floating dock by the Jackson Brothers. This venture proved to be uneconomic and she later became a coal hulk; first under Mr and Mrs East and later under Charles Leijon (McLean 1985: 60, Church 1994: 21). When she was finally of no longer of use, the once proud *Henbury* was finally stripped and scuttled at Granton, Lower Portobello (Bowman 1948:80).

THE 1860S

In 1860 the Port of Otago was a sleepy backwater whose only break in monotony was the occasional visit of an immigrant ship from the 'old-country'. However, the discovery of gold by Gabriel Read in June of 1861 completely transformed, almost overnight, the province and its harbour into a thriving hive of activity. The decade 1850-59 had seen the arrival of only 189 vessels, but with the discovery of gold this number skyrocketed to 6,650 in the decade 1860-69 (Collins 1995:19). As noted by McLean (1985:306), with so many vessels plying the waters of the harbour, accidents were inevitable. During this period, seven wrecks occurred within Otago Harbour: Munford

(1861), Victory (1861), Genevieve (1862), Tamar (1862), Christina (1863), Pride of the Yarra (1863) and Blanche Barkly (1869).

Munford

Details relating to the Munford and how she came to be wrecked in Otago Harbour are relatively sketchy and in some places downright contradictory. What we do know is that the Munford was a small wooden schooner of around 168 tons that was built in Suffolk in 1835, and that she sailed from Hobart into Otago Harbour with two passengers; Messrs Manning and Rogers (Ingram et al. 2007:79, Collins 1995:19). However, the timing, cause and location of the wrecking are of some dispute. Ingram et al. (2007:79) states that the Munford became ‘a total loss when she sat upon her anchors while anchored off Port Chalmers, 5 January 1861’. In contrast, Collins (1995:19) includes the Munford in his discussion of vessels being ‘abandoned due to their unseaworthy condition’ and he goes on to note that the *Munford* ‘sank in the Upper Harbour in December 1860’. Unfortunately, on top of these discrepancies, neither author provides much information on what happened to the Munford after she sank; Collins (1995:19) only making the passing comment that she ‘was later put up for auction’.

Victory

The Victory was an iron steamer of 426 tons which operated the Melbourne – Otago – Canterbury run for the Royal Mail Packet Company. On the 3rd of July 1861, only 6 months after she was first put on this run, she was wrecked in Wickliffe Bay on the south side of Otago Heads. As described by Ingram et al. (2007:81), the inquiry into the wrecking found that the chief officer was drunk at the time he took charge of the vessel. However it was also found that at that point in time, only seven minutes before she went ashore, the third mate had already placed the vessel in an irremediable position. Fortunately upon stranding the passengers and mails were landed safely, but the steamer was left high up on the beach and after failing to refloat her in the subsequent days she was sold by auction on the spot with her fittings and equipment stripped. Today the fly wheel from the steamers machinery sits upright and intact in the surf zone of what is now known as Victory beach.

Genevieve

The treacherous nature of the harbour entrance once again proved true on 17 January 1862, when the French barque *Genevieve* went aground on the spit, not far from where the *Revival* was wrecked in 1859 (Ingram et al. 2007:83). The *Genevieve* of 271 tons was on her way from Mauritius to Port Chalmers with a full cargo of sugar and coffee when she came to grief outside the Heads. Collins (1995:28) describes how around 4pm the wind being fair and the weather clear, Captain Francis Turpie signalled the pilot and ran for the bar. However, the pilot was already aboard another vessel and the *Genevieve* continued running and sounding along the North Channel unaided, until around 9pm when she struck the bar and shortly afterwards bilged (Ingram et al. 2007:83). Considerable efforts were made to save the ship and its cargo but with eight feet of water in her hold she was destined to become a total wreck. Only 80 tons of cargo could be saved and this was put up for auction by R.B. Martin and Co. and included one chain (180 fathoms), one bower anchor, one lower yards, two top gallants masts and quantities of sugar and coffee (Collins 1995:29).

Tamar

The 109 ton schooner *Tamar* was a well-known trader between Hobart Town and Port Chalmers in the late 1850s and early 1860s. She sailed from the Tasmanian Port on 22 October 1862 deeply laden with 29 passengers, 20,000 ft of sawn timber and 50 tons of stone for the new custom house which was to be built in Dunedin (Collins 1995:30). Ingram et al. (2007:88) describes how on 8 November the *Tamar* arrived off Taiaroa Head and attempted to beat in against the ebb tide when she unfortunately missed stays, and while wearing around, was hit by a heavy squall sending her onto the rocks below the lighthouse and pilot station. Fortunately for the passengers and crew the *Tamar* struck a low ledge of rock and no lives were lost, as all aboard were able to scramble off the vessel and await rescue on the nearby rocks. Records show that the vessel broke up and sank very quickly, taking with it the passengers' possessions and the ship's cargo (Collins 1995:30). However, over the next couple of days the captain and crew returned to the partly submerged wreck and were able to salvage topmasts, spars, sails, rigging and other articles from the wreck (ibid:31).

Christina

The first of the two shipwrecks that occurred in the harbour in 1863 was the 21 ton schooner Christina. This vessel was a regular in the Waikouaiti trade and on 30 April 1863 she was attempting to leave the harbour with a cargo of timber and flour (Ingram et al. 2007:93). On approaching the Heads her master Joseph Jones found the wind baffling and a heavy swell from the north east which caused the vessel to miss stays (Collins 1995:33). As a precaution he let the anchor go, but it failed to hold and she went ashore between Taiaroa Head and the wrecks of the barques Revival and Genevieve (Ingram et al. 2007:93). The crew remained on board the grounded vessel until low tide when they were able to unload the cargo on the spit but were unable to save the vessel, which became a total loss.

Pride of the Yarra

The sinking of the Pride of the Yarra saw the loss of 12 lives and, as noted by McLean (1985:307), is the worst shipping tragedy to have ever occurred in Otago Harbour. On 4 July 1863 the small harbour steamer departed Port Chalmers for Dunedin with a complement of 50 passengers, most of whom crowded into the small cabin as the night was cold and foggy (Collins 1995:35). As the ferry rounded the headland towards Blanket Bay the lights of another steamer were observed through the fog bearing directly towards the small vessel. The Pride of the Yarra immediately altered course but it was too late and the oncoming vessel, the powerful paddle steamer Favourite, ploughed into the port bow of the Pride of the Yarra, cutting deep into her (Bowman 1948:81). Initially the two vessels clung together, allowing some of those on deck to climb aboard the Favourite. But the Pride of the Yarra was mortally wounded and rapidly filled with water, trapping some of the passengers in the cabin, before turning on her side and sinking to the bottom of the harbour. The next day, two divers were brought in to search for those trapped in the hull and they ultimately recovered 12 bodies. The vessel was drawn up on the beach and found to be beyond repair and, as such, was condemned as unseaworthy. The public funeral for the victims was attended by nearly 2000 people - almost the whole population of Dunedin at the time (Ingram et al. 2007:95).

Blanche Barkly

The small cutter *Blanche Barkly* has the dubious distinction of becoming the first vessel employed in the fishing trade to be wrecked in Otago waters (Collins 1995:56). On 13 December 1869 the *Blanche Barkley* was attempting to leave the harbour on a fishing cruise when she ran into heavy seas crossing the bar at the Heads. Although the crew had been warned of the dangers of taking such a small vessel outside the Heads in such dangerous conditions they continued on until she was struck by a sudden squall which overturned the cutter and sent her to the bottom (Ledgerwood 2006:35). The signal master at the Heads had watched the drama unfold and with the pilot crew, rushed to the spot where the cutter had sunk but no sign of the vessel or her crew could be found (Ingram et al. 2007:165).

1870s

The gold-rush years had seen an enormous injection of capital into the Otago region, stimulating both commercial and industrial development. As a result of this new-found affluence, the Harbour Board was finally able to invest in infrastructure around the harbour, making it not only more efficient but also safer (Collins 1995:57). This translated into a significant decline in the number of strandings and shipwrecks in the harbour, with only two vessels, the *Bruce* (1875) and the *James Paxton* (1876), being wrecked during this decade.

Bruce

Built in 1874 in Glasgow, the screw steamer *Bruce* was one of the newly formed Union Steam Ship Company's prize vessels (Collins 1995:79). The 334 ton ship was purchased in 1874 for £19,000 and was employed on the run between Timaru and Dunedin (Ingram et al. 2007:193). On 16 October 1875 she arrived off Taiaroa Head in very thick fog and thinking that she had run the required distance and was some distance offshore, the captain decided to steam inshore and wait for daylight (Bowman 1948:81). Unbeknown to the captain and crew, this set the *Bruce* on a collision course with the coast and at around 3am she struck the rocks 400 metres south of the harbour entrance, becoming stuck hard and fast with the tide receding. As the tide ebbed, holes were made on the starboard side

and the vessel took on an alarming list, prompting the passengers and crew to abandon ship. Although no lives were lost, the vessel became a total wreck and its loss was a heavy blow to the young Union Steam Ship Company (Collins 1995:57). Today the remains of the vessel are very broken up and are mainly buried in the bottom sand with only a small boiler and a few pieces of iron and woodwork visible. However, storms sometimes clear the wreckage, leaving it relatively exposed (ibid:80).

James Paxton

Despite the improved harbour facilities, the year 1876 saw the James Paxton added to the list of vessels that had come to grief on the Spit near Taiaroa Head. On 2 April 1876 the 61 ton schooner was bound from Dunedin to Riverton and, while attempting to work out through the Heads she missed stays and was stranded on the Spit between the wreck of the Revival and the lighthouse (Ingram et al. 2007:195). Despite numerous attempts to refloat the schooner, she had struck at the top of high tide and remained grounded. She was eventually abandoned where she lay and became a total wreck (Collins 1995:82). Although stripped of all her fittings and broken up by waves and fossickers, evidence of the James Paxton still exists today in the form of timbers exposed after heavy seas.

1880-1909

The decline in the number of shipwrecks witnessed in Otago Harbour in the 1870s continued into the next decade. In his history of Otago shipwrecks, Collins (1995:92) builds on this evidence by noting that from 1880 onwards the relative occurrence of shipwrecks in the whole Otago region begins to markedly decline. This statement is backed up by the fact that in the 1880s there were no shipwrecks recorded in Otago Harbour. However the 1890s saw two wrecks within the harbour: the Jane Scollay (1890) and Alice Jane (1893), and these were followed by the Matakana and Matariki in 1908 and 1909, respectively.

Jane Scollay

What little is known about the Jane Scollay is recorded by Ingram et al. (2007:273). He notes that she was a wooden schooner of around 50 tons and was registered in Invercargill. He goes on to record that she ‘drifted over Grant Braes, Dunedin, about nine years ago and became a total wreck’; her register being closed in 1890 (ibid:273).

Alice Jane

On 26 October 1893 the 27 ton ketch Alice Jane was on her way from one of the southern ports to Lyttleton with a cargo of sawn timber (Collins 1995:97). Off the coast of Dunedin she ran into a very strong gale and decided to run into Otago Harbour for shelter. However, in the heavy seas the master of the vessel either mistook the harbour beacon lights (or was unable to see them) and ended up grounding the vessel on the sandspit inside Taiaaroa Head (Ingram et al. 2007:283). The vessel rapidly took on water and became waterlogged, frustrating all attempts to refloat her. The crew were taken off by the pilot boats crew but the uninsured Alice Jane and her timber became a total loss (Collins 1995:97).

Matakana

The Matakana was a whaleboat of about five tons that had been fitted with an oil engine and was principally used for fishing. On the night of 18 April 1908 she left Port Chalmers with 13 naval volunteers destined for the Heads, while at around the same time the Defence Department's steamer Lady Roberts was returning up the channel to Port Chalmers after taking part in Easter manoeuvres (Ingram et al. 2007:340). The master of the Lady Roberts saw the Matakana when she was about 65 metres away and judging that they would pass each other with a distance of some 50 metres maintained his course and speed of around eight knots (Collins 1995:117). However, for some unknown reason, the master of the Matakana unexpectedly altered his course directly across the bow of the Lady Roberts and before evasive actions could be undertaken the Lady Roberts collided with the Matakana amidships, cutting her in two (Ingram et al. 2007:340). The passengers of the Matakana were thrown overboard and despite the best efforts of the crew of the Lady Roberts only nine of the thirteen were saved, the other four drowning in the harbour. The remains of the Matakana were recovered, and the oil engine, shaft and propeller blades were found to be intact; however the rest of the vessel was a total loss (Collins 1995:119).

Matariki

The Matariki was a 98 ton steamer built in 1908 and employed as a harbour ferry between Dunedin and Portobello (Ingram et al. 2007:347). On 15 April 1909 she was at her berth in Portobello, when at around 1am her crew awoke to find the vessel well ablaze

(Collins 1995:120). They attempted to bring the fire under control by towing her into deeper water and sinking her but the vessel held fast in the shallows and they could do nothing more than watch as she burnt to the waterline. The Matariki became only the second vessel to be destroyed by fire in Otago Harbour, the first being the Henbury 50 years earlier (ibid:119). No definitive cause was found for the fire and the remains of the Matariki were converted into a barge before being scuttled beside Miller and Tunnage's building at Port Chalmers (Bowman 1948:87).

1910-1959

The decreasing number of shipwrecks witnessed within Otago Harbour over the previous two decades continued between 1910 and 1959 with only three vessels wrecked over this 50 year period: the Tyrone (1913), Kohinoor (1925) and the Pilot (1938).

Tyrone

On 27 September 1913, the 6,664 ton steamer Tyrone became the largest vessel to be wrecked on the coast of the South Island to that date (Ingram et al. 2007:358). She was owned by the now powerful Union Steam Ship Company and was travelling from Lyttelton to Dunedin when she was wrecked near Taiaroa Head. After an uneventful voyage south along the coast, the Tyrone was approaching Taiaroa Head when a thick layer of fog descended, obscuring the Taiaroa Head lighthouse and making it impossible to determine the direction of the fog signals (Collins 1995:124). Ingram et al. (2007:359) describes how, to make matters worse, a navigational error was made by the captain who confused the distance from the Akaroa light to Taiaroa Head (147 miles) with the distance from Lyttelton to Taiaroa Head (155.7 miles). As such, he believed the steamer still had around nine miles to run. About 4am a loud bump was heard as the Tyrone ran aground on the exposed rocks of Taiaroa Head and despite efforts to free her, she remained grounded broadside on to the crashing waves (Collins 1995:126). Around midday the passengers and crew abandoned the vessel by extending a ladder from the stern of the vessel to the adjacent cliffs allowing the entire complement of 68 to reach land safely (ibid:126).



Figure 87: Tyrone wrecked on Taiaroa Head (photograph courtesy of Port Chalmers maritime museum).

Hopes of refloating the vessel were entertained, but within days she took on a large seaward list and began to break up, resulting in her becoming a total wreck. Various parts of the vessel have been salvaged over the years and today recreational divers continue to visit the wreck (ibid:130).

Kohinoor

The Kohinoor was a small, five ton schooner rigged motor vessel which sank in 1925 after a collision with the steam trawler Black Cat (Collins 1995:131). Just before dawn on 12 August 1925 the Kohinoor was coming into port and was just off Pulling Point when she struck the much larger Black Cat amidships as the latter was outward bound. The collision stove in the bow of the Kohinoor, sending water rushing in and causing the small vessel to rapidly sink while the Black Cat remained afloat. Fortunately, the two crewmen of the Kohinoor were thrown overboard and were picked up by a passing fishing boat. The collision occurred because the Kohinoor was not showing regulation lights. After the wreck, the Kohinoor was salvaged and the sunken vessel was removed (ibid:132).

Pilot

As the name suggests, the Pilot was the small launch used by the Otago Harbour Board to ferry the harbour pilot to and from vessels that were entering and leaving the harbour. On the 2nd of February 1938, the Pilot was preparing to transfer the harbour pilot onto the incoming steamer the City of Baghdad when, upon coming alongside, she was caught by an unusual current and fouled the larger vessel's propeller (Ingram et al. 2007:414). The screw of the steamer cut the small vessel from the gunwale to below the waterline and caused her to rapidly fill with water and sink. The crew of the City of Baghdad were quick to react and launched a boat to collect the crew of the Pilot who were swimming in the cold water. The vessel disappeared beneath the waves and was a total loss (Collins 1995:143).

1960S-PRESENT

The second half of the twentieth century saw a heavy reduction in coastal shipping in the Otago region as railways and motor transport increasingly took over the role of transporting goods (Collins 1995:153). This decline in the coastal trade was paralleled by a decrease in the number of large shipwrecks along the coast. However, the growth of the fishing industry during this time meant that an increasing number of fishing vessels were wrecked in the Otago region but only one such vessel, the Madame Mim (1977), has been wrecked within Otago Harbour (Ingram et al. 2007).

Madame Mim

On 27 July 1977, while on her way from Nelson to Riverton, the new fibreglass fishing vessel Madame Mim ran into trouble off the coast of Otago. Collins (1995:175) notes that around midday the vessel was spotted on the rocks at Aramoana by the lighthouse keeper at Taiaroa Head. By all accounts she was in a very badly damaged state and no sign of the crew could be found. The previous night had seen heavy rain and high seas and although search and rescue and civilian volunteers scoured the area, the two crewmen were never found. The vessel was deemed a total loss and her fixtures and fittings were salvaged for use in the construction of a new vessel (ibid:176).

DISTRIBUTION OF SHIPWRECKS

Predictably, most of the recorded shipwrecks in Otago Harbour lie in the most dangerous part of the harbour: the entrance (Figure 88). Notable concentrations occur on both sides of the harbour entrance with four wrecks recorded around Taiaroa Head and another six on the sandspit at Aramoana.

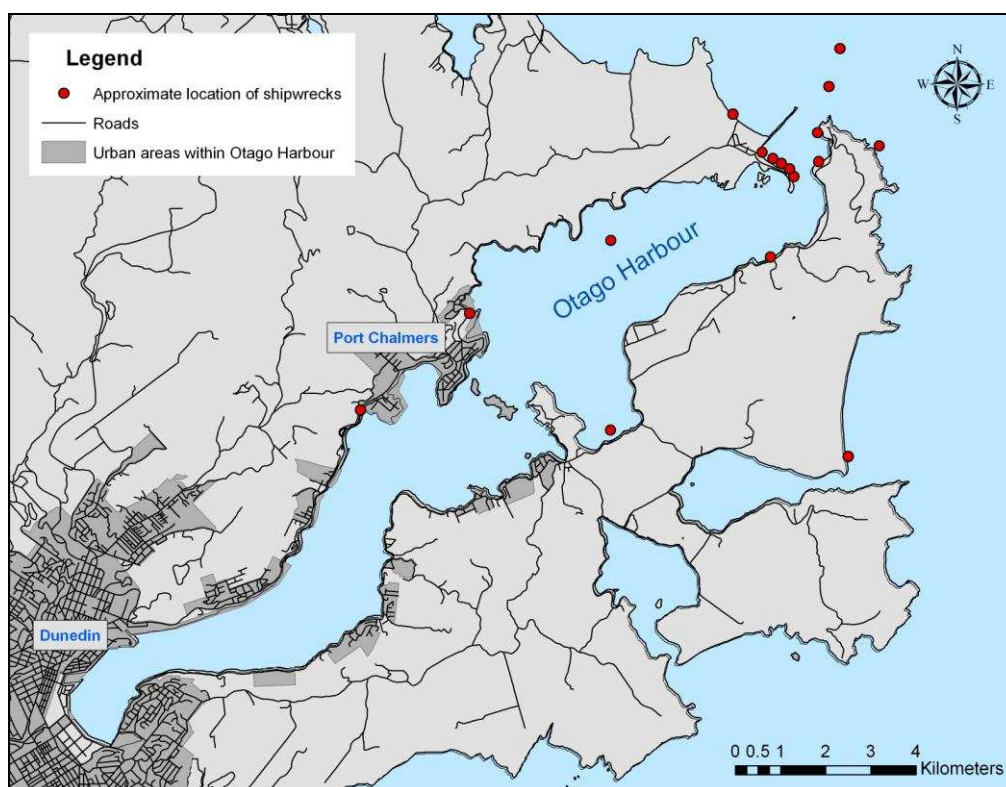


Figure 88: Otago Harbour showing distribution of shipwrecks.

Otago shipping casualties in and around the entrance to the harbour occurred for a variety of reasons, one of which was the narrowness of the opening that vessels were required to sail through in order to enter the harbour; this was especially true in the days of sailing ships. The danger that the narrow entrance presented to ships was greatly enhanced with the onset of adverse weather, with seven of the 11 ships wrecked at the entrance claiming bad weather as a factor in their loss. Even in favourable conditions vessels have been wrecked at the entrance, notably the *Genevieve* and *Revival* being punished for attempting to enter the harbour without a pilot, and the *James Paxton* and *Pilot* sunk as a result of human error.

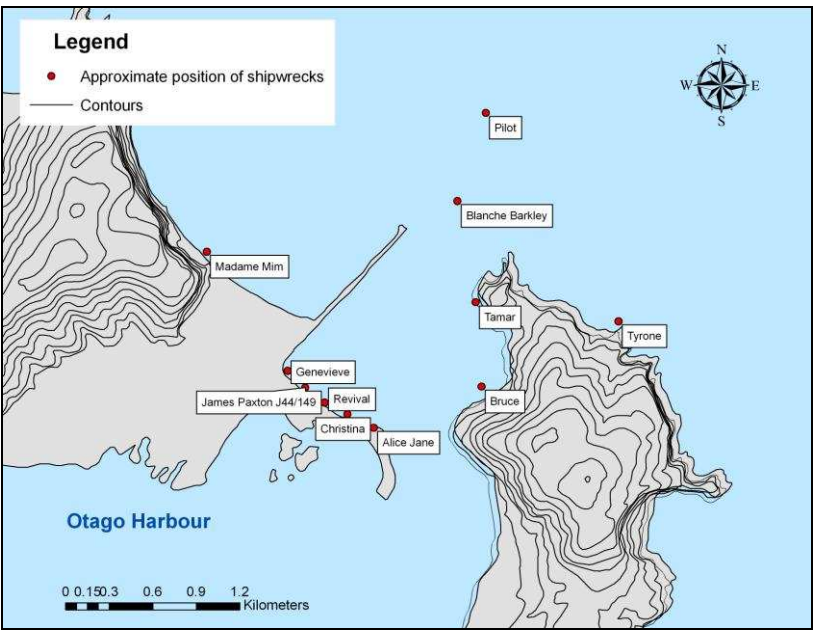


Figure 89: Otago entrance to Otago Harbour showing distribution of shipwrecks.

As is illustrated in Figures 88 and 90, the relatively small number of shipwrecks within the Otago Harbour itself attests to the very good shelter provided to vessels by the local topography and the construction of port infrastructure in favourable locations i.e. Port Chalmers and the Port of Dunedin. Nevertheless, the pattern of shipwrecks within the harbour reveals that maritime travel even in a confined and ‘safe’ environment has its hazards, with three vessels wrecked in collisions and two completely gutted by fire.

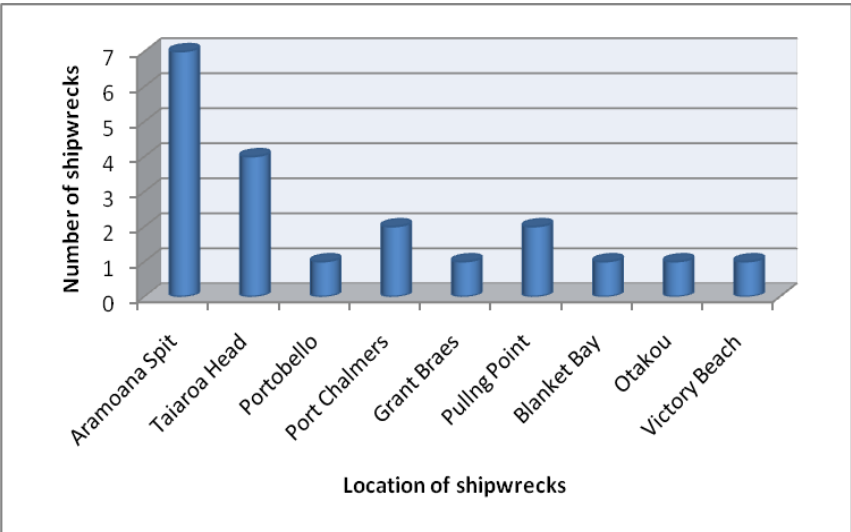


Figure 90: Numbers of vessels lost at various locations around Otago Harbour.

VESSEL TYPE

Of the 20 vessels wrecked in the vicinity of Otago Harbour there were six schooners, five steamers, two ketches, two barques, two launches, one brigantine, one fishing vessel and one fully rigged ship. The majority of the vessels (13) were relatively small, under 100 tons, revealing the important role that small vessel played in the harbour, especially in the regions formative years. However, the diverse types of vessels wrecked reveals that the dangers of entering the harbour and navigating its narrow channels did not discriminate, with everything from 20 ton schooners to 6,664 ton steamers suffering the same fate and becoming wrecked upon the waters of the harbour.

PORTS OF ORIGIN AND DESTINATION

The circumstances of the final voyages of all 20 vessels shipwrecked in Otago Harbour are known and described above. From these records, the ports of origin and destinations of the vessels are known and, as such, what type of trade (harbour, coastal or international) they were involved in becomes clear.

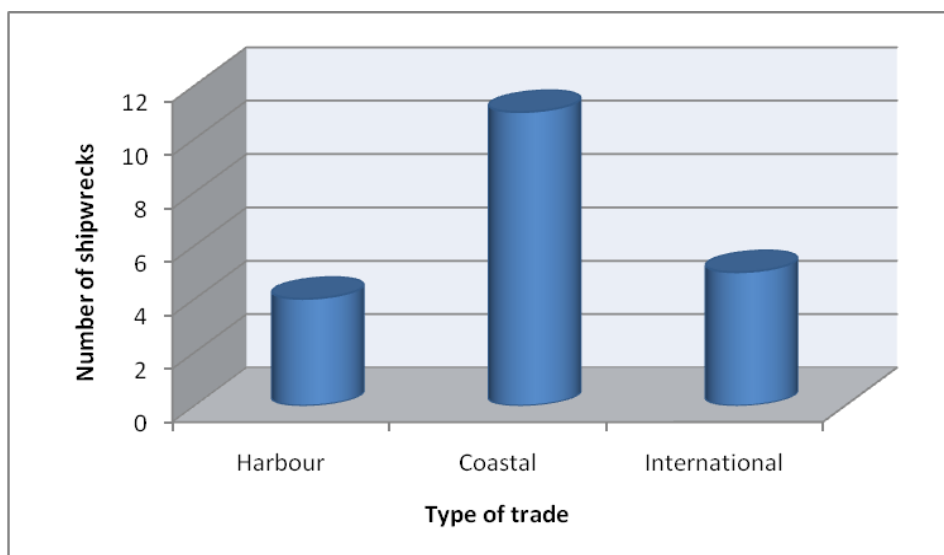


Figure 91: The number of shipwrecks associated with different types of trade.

The most commonly wrecked vessels in the study area were those involved in the coastal trade between various other South Island Ports and Otago Harbour. Eleven such vessels were wrecked, reflecting the dangers associated with entering and leaving the

harbour - especially for those who were unfamiliar with its hazards. The coastal trade played a major role in the development of the Port of Otago, with the vessels involved consistently providing the greatest tonnage of shipping entering and leaving the port (McLean 1985:248-250). As such, it is no real surprise that vessels involved in the coastal trade make up the bulk of shipwrecks within the study area. The second most commonly wrecked vessels were those involved in the Harbour trade, including those vessels that spent their days within the confines of the harbour and those that ventured past the Heads but always returned at night. These six vessels reflect the high proportion of local craft that plied the waters of the harbour, servicing the needs of its inhabitants for over a century, whether as harbour ferries, fishing ketches or pilot launches. The smallest and final category of vessels wrecked were those involved in trade between various ports around the globe and Otago Harbour. Five vessels involved in this International trade were wrecked within the study area and this highlights the fact that Otago Harbour was part of the global system of commerce from an early date. These vessels brought not only merchandise and products from distant countries (e.g. Mauritius), but also brought colonists to the newly established city of Dunedin. Such vessels also highlight the close ties that existed between Otago Harbour and our Australian neighbours.

CARGOES

Unfortunately, little is recorded about the cargoes that many of the shipwrecked vessels were carrying. However, where this information does exist it provides a tantalizing insight into the economy of Otago Harbour and the hinterland that it served. The cargoes of three such wrecks, the *Alice Jane* (1893), *Christina* (1863) and *Tamar* (1862), reveal that one important commodity being traded to and from Otago Harbour was sawn timber. Interestingly, in 1862 the *Tamar* was wrecked while bringing a cargo of sawn timber to Otago from Hobart, suggesting that either there was a shortage of sawn timber in the region, or that native timber was considered inferior to imported timber. However only a year later, in 1863, the *Christina*, a small coastal trader, was wrecked while leaving the harbour for Waikouaiti with a cargo of timber. Might this reflect the transshipment of imported timber to local interests? Or the possibility that the timber industry in Otago had developed rapidly and could now provide for local demand? Either way, the timber trade appears to have been an important part of the early Otago economy. Another wreck, that of the *Genevieve* also

provides insights into the economy of Otago. As noted earlier, the gold rush that had begun in 1861 propelled many of the region's citizens into a position which allowed them to purchase goods and services of better quality and in larger quantities than ever before. The *Genevieve* is an example of this consumerism in action as she was wrecked in 1862 on a voyage from Mauritius to Otago Harbour with a cargo of coffee and sugar; both of which would have been desired by the newly rich of the colony. Another cargo that was commonly carried on Otago Harbour was passengers, who travelled aboard ferries to and from various locations around the harbour and the South Island. Three such vessels were wrecked within the study area: the *Bruce* (1875), *Matariki* (1909) and the *Pride of the Yarra* (1863), and these reflect the reality that it was far easier for Otagoites to travel by water than by land up until the early twentieth century (Hamel 2001a:106).

CONCLUSION

As components of the maritime cultural landscape, shipwrecks reveal a unique form of interaction between humans and the marine environment, showing us the difficult relationship between sailors and the waters they travelled upon. The often tragic circumstances of such wrecks leaves a mark on any maritime society and although no shipwrecks have occurred within Otago Harbour in the last 30 years, the horror of boating accidents remains in the forefront of the minds of those who continue to ply the waterways of the region. The variable extent of which the historical and archaeological record have contributed towards our understanding of shipwrecks as components of the maritime cultural landscape will be examined further in Chapter Seven.

6.6. OTAGO HARBOUR WARFARE & DEFENCE

Otago Harbour's location midway along the exposed coastline of the lower South Island offered major strategic value for the maritime peoples who colonised and controlled the region. Abundant marine food resources made the harbour an ideal location for Maori settlement, and later its protection from the elements, made it a rare safe haven along the coast for European shipping. The need to protect such a valuable location from outsiders led to the expenditure of vast amounts of resources in the construction of defensive positions, which today make up some of the most massive archaeological sites within the harbour (Hamel 2001a:115).

THE ARCHAEOLOGY OF WARFARE AND DEFENCE

From the earliest days of Maori settlement to the present day, numerous conflicts have left their mark on Otago Harbour, its people and its surrounds. However, despite the important role that defence has played in shaping the maritime cultural landscape of the harbour our knowledge of these sites and events relies heavily on historical sources. One of the reasons for this is explained by Anderson (1998:48), as he notes that in prehistory “many of the insults and killings took place away from the pa sites in short fights rather than prepared battles”. As a result, battles and even actions associated with combat such as making weapons or training are often archaeologically invisible (Walton 2001). Although such episodes of conflict may have left no physical remains, Otago Harbour does have a number of archaeological sites relating to warfare and defence (Table 6).

Table 6: Archaeologically recorded sites of warfare and defence around Otago Harbour.

Site Type	Location	NZAA Site
Pa	Taiaroa Head	J44/4
Torpedo Boat Mole	Deborah Bay	I44/340
Fort Wharf	Harington Point	J44/148
Rifle Butts	Back Beach	I44/359
Fort	Taiaroa Head	J44/151
Artillery Batteries	Taiaroa Head	J44/155
WWII Trench	Otago Peninsula	I44/151

Unfortunately, these sites have not been investigated archaeologically, apart from their location being recorded on the NZAA site recording scheme.

These sites reflect the importance that the harbour's inhabitants placed on security, initially against internal threats, and in later years from external aggression. In terms of the maritime cultural landscape, these sites are some of the most massive and obvious examples of how the people of the harbour interacted with and shaped their environment to fulfil their needs - in this case their need for security. In order to understand the role that such sites played in the history of the harbour it is necessary to interrogate the historical record to provide the background and context as to why these sites were constructed.

WARFARE AND DEFENCE IN PREHISTORY

The earliest human arrivals to the harbour entered a pristine environment which provided an abundance of natural resources. In order to exploit this wealth, settlements were strategically sited near the coast to allow the harvesting of both forest and marine resources. As described by Anderson (1998:23), these arrivals the Waitaha, were numerous and inhabited a 'food-abounding island', in which they lived in peace and plenty. However, around the late sixteenth century, this all changed with the migration south of the various Ngati Mamoe hapu. Around 1500 AD the population of the North Island was placing considerable pressure on land and resources and in response to this the first pa were built and warfare became increasingly widespread (Schmidt 1996). As a result of this 'demographic imperative' Ngati Mamoe, who were based in the lower North Island and with nowhere else to go, began to expand southward across Cook Strait and eventually into the far south (ibid:23). This phase of tribal movement brought Ngati Mamoe into direct competition with Waitaha for the resources of the south, including those of Otago Harbour. However, according to Hamel (2001a:86), instead of displacing the earlier inhabitants Ngati Mamoe established their dominance through strategic intermarriage more than through warfare. In this manner Ngati Mamoe settled amongst the Waitaha people, and by the mid seventeenth century they could claim hegemony over most of the South Island (Anderson 1998:57).

Ngati Mamoe were not the only group with an interest in the resources of the South Island. As early as the start of the seventeenth century small numbers of Ngai Tahu from the Wellington district began to migrate across Cook Strait (ibid:27). Although this movement

occurred in an unplanned and piecemeal fashion over time the influx of Ngai Tahu, especially men of fighting age, eventually formed a force sufficient to defeat the already established Ngati Mamoe in a series of pitched battles that took place far south as Bank Peninsula. At this point, however, Anderson (ibid:40) notes that Ngai Tahu did not have the strength of numbers needed for a concerted push further south to unseat Ngati Mamoe and instead they arrived behind a series of smaller incursions.

The complex nature of Maori society meant that although Ngai Tahu had gained possession of much land by conquest, they also had kinship links with Ngati Mamoe which they used to legitimise their residency. These links were especially important in the south, where Ngai Tahu, unable to subjugate the previous inhabitants, were forced to interact with Ngati Mamoe on more equal terms. This continued hostility and the desire to further cement their position in the south resulted in Ngai Tahu establishing a fortification at the entrance to Otago Harbour. This site, known as Pukekura Pa (site J44/4), was established around 1650 AD, shortly after Ngai Tahu arrived, and it became an important fortification and refuge during the conflicts that occurred over the next century or more (Leach 1978:5, Anderson 1998).

With the arrival of Ngai Tahu in the south, sporadic fighting erupted between Ngai Tahu and Ngati Mamoe; a number of episodes of which were played out within Otago Harbour and its surrounds. One such flaring of hostilities occurred sometime between 1760 AD and 1780 AD and pitched the Ngai Tahu residents of Pukekura Pa against their Ngati Mamoe neighbours, becoming what is now known as the infamous 'Otago feud' (Anderson 1998:48). This outburst of violence was sparked by the untimely death of a Ngai Tahu boy at Pukekura Pa that was deemed to have been caused by witchcraft attributed to the Ngati Mamoe Chief Te Wera (Anderson 1998:50). This death set off a cycle of retribution, or *utu*, in which Ngai Tahu lay siege to Te Wera's Pa at Karitane (site I43/1) and sacked the Pa of his supporters at Mapoutahi (site I44/17) (ibid:50). This bloodshed spread throughout the district until around 1780 A.D when both groups finally sought an end to the conflict with a peace treaty. The resulting arrangement saw the Clutha River chosen as the boundary between areas of Ngai Tahu and Ngati Mamoe influence (ibid:51). For Ngai Tahu this was an expansion of their control in the South, and as such, it was not widely accepted by Ngati Mamoe and may have even sown the seeds for the next outbreak of violence.

As described by Anderson (1998:54), sometime after the peace treaty a dispute arose over fishing rights between the Ngai Tahu residents of Pukekura Pa and the Ngati Mamoe of Papanui inlet. Using the ruse of needing help in constructing a house, Ngati Mamoe drew a number of Ngai Tahu away from their protective Pa, captured and killed them. One of the men who was captured was a Ngai Tahu Chief Tarewai, but before he could be killed he managed to escape and fled into the bush. Watching from his hideout Tarewai saw the Ngati Mamoe move up and besiege Pukekura Pa, trapping the remaining Ngai Tahu inside. Tarewai waited until the Ngati Mamoe warriors were distracted, and sprinting, swung himself up into a tree and leapt into the Pa rejoining his Ngai Tahu kin. Reunited with their leader, Tarewai led a war party against the besiegers, destroying their fortifications and pushing them south along the peninsula to Portobello. Suffering a number of casualties, many of the now demoralised Ngati Mamoe made a hasty retreat as far south as Fiordland. This attack by Ngati Mamoe was the tribe's last significant revolt against Ngai Tahu influence in the Otago Harbour region. Following their triumph, Ngai Tahu's dominance continued to spread throughout the South (ibid:54).

WARFARE AND DEFENCE IN THE PROTOHISTORIC PERIOD

When Europeans arrived in the South at the end of the eighteenth century Ngai Tahu were able to lay claim to political dominance over much of the South Island. These Europeans sought seals and other extractive industries from which they could profit and they were aided by willing trade partners among the Maori. Upon arrival these Europeans inadvertently became a part of the dominant Maori society, and as such, subject to their traditions of mana (prestige), tapu (sacredness) and utu (revenge) (Entwisle 1998:36).

Early interactions between Europeans and Maori in the south were generally peaceful and this remained the status quo for almost 20 years. However, in 1810 dramatic events unfolded in Otago Harbour that would have significant repercussions for Maori-Pakeha relations for the next 25 years (Entwisle 1998:5). In 1809, Captain Daniel Cooper of the schooner *Unity* extended the frontier of European exploration in the south into Otago Harbour, modestly naming it 'Port Daniel' after himself (McLean 1985:21). Although Cooper and his men were the first Europeans to enter the harbour, Ngai Tahu in the region would have already known about Europeans from their kin in the far south, and as noted by Cooper, 'the natives were particularly friendly' (Entwisle 1998:22). With the European

discovery of Port Daniel the race was on to exploit the seals which frequented the region's coast, and in early 1810 the Sydney Cove, with her motley crew of sealers and sailors anchored in Otago Harbour. It appears that at first, relations were good with the local Maori. However, as described by Entwisle (2005:70), later, while entertaining a local Chief onboard, a red shirt, a knife and other trivial things went missing from the vessel. In order to gain satisfaction for this theft it appears that the sealers landed at the settlement of Whareakeake (site I44/20) and in the ensuing argument the Chief who had stolen the items was killed, as was one of the sealers. The Sydney Cove hastily left the harbour and sailed to Molyneux, where the sealers once again attacked local Maori, killing yet another Chief. From here, the Sydney Cove sailed to Stewart Island, leaving behind one of her boats to further attack southern Maori. The boat's crew landed at Waipapa intending to go overland and attack Maori at a place called Oue. However, soon after landing, the sealers were ambushed and killed (ibid:70). At this time another group of sealers were working on an offshore Island near Otago Harbour, having been dropped off by the schooner Brothers. In December 1810, fearing they had been abandoned, these men sailed for Foveaux Strait, unwittingly following the path of destruction left behind by the marauding crew of the Sydney Cove. Stopping at Molyneux Harbour, these men were attacked and killed by the local Maori as *utu* for their countrymen's actions (Anderson 1998:66).

Despite reports of the brutal killings of European sealers filtering across to Sydney ships continued to visit the region albeit with a great deal more caution. In 1814 the brig *Matilda* entered Otago Harbour to repair the considerable storm damage she had received during her crossing of the Tasman (McLean 1985:21). By all accounts, regardless of earlier hostilities, the harbour Maori were extremely forthcoming, trading fish and potatoes with their European visitors. However, as described by Entwisle (1998:45), despite this apparent amicability one of the ship's boats was stolen and another taken by six of the lascar crew as they deserted the vessel. A search for the absconding crew was launched in another ship's boat, but when this failed to return the *Matilda* set sail unaware as to exactly what had happened to so many of her crew. With the benefit of history behind us, we now know that three of the six lascars that had deserted were killed and eaten by Maori, and only one man from the eight in the subsequent search party was spared the same fate (ibid:45).

The next episode of Maori-Pakeha conflict in the Otago region occurred in 1817 and saw the violence escalate to an unprecedented level. In this year, while embarking upon

a sealing voyage, Captain James Kelly entered Otago Harbour in his brig *Sophia*. After anchoring in the harbour it was decided that Kelly, along with six of his crew would visit the nearby settlement of Whareakeake (site I44/20) only a short boat trip away (Entwisle 2005:95-96). Upon arrival, the sealers offered the local Chief a gift of iron and were shown into the settlement. Unexpectedly, the Chief grabbed Kelly and called for his men to do the same to the rest of the crew. Two of the men were grabbed and killed outright but Kelly and the others managed to escape to the beach. In the process of launching their boat to flee, the men were set upon again and one of their number, Tucker, was killed in the surf as the others escaped. Kelly and his remaining men made for the *Sophia* but upon arrival they found a large number of Maori aboard; although control of the vessel was still in the hands of the very nervous European crew. Reboarding his vessel, Kelly questioned the Maori who professed to no knowledge of the ambush. Unsatisfied, Kelly and his men drew their sealing knives and cleared the decks of the intruders, killing sixteen and forcing the rest to jump overboard. During the skirmish the Maori Chief Korako was captured by the sealers and when he attempted to escape he was shot and killed, further flaming the violence (Anderson 1998: 71). The next day the Europeans, fearful of another attack, landed amongst the Maori canoes inside the harbour. Using cross-cut saws, and under the protective cover of muskets, they cut up a great number of canoes, possibly as many as 42 (Entwisle 1998:53). Kelly and his crew were not yet satisfied and the next day they went ashore again. Using the strong wind to their advantage, they fired ‘the beautiful city of Otago’; probably the considerable village that extended along Te Rauone beach (site J44/144) (Hamel 2001a:76). After this last act of retribution Kelly and his men sailed from the harbour and returned to Hobart where they reported the attack, but conveniently left out the details of their burning of the village.

The events of 1817 made Europeans wary of what was now being called the ‘cannibal coast’ (Entwisle 1998:5). However, the allure of vast profits continued to draw sealers to the south and it is no real surprise that it was these men who suffered the wrath of the aggrieved southern Maori for the attack in Otago Harbour. In late 1821, Captain Riggs, aboard the *General Gates* dropped five sealing gangs along the southern coast and leaving them to their task, sailed on to Canton (ibid:57). When Riggs returned in early 1823 to collect his men and their seals skins he was unable to find them, and after exhausting his search he sailed away later that year. Soon after arrival the sealing gangs had been attacked by Maori and many of their number killed. The few that survived managed to escape back

to Australia aboard other European ships. In all, it is thought that 14 sealers from the General Gates were killed and these deaths must have provided southern Maori with a degree of satisfaction for their grievances (ibid:57).

The next decade saw an uneasy peace prevail in the south. Although there was considerable mistrust on both sides, each desired the resources of the other and this economic imperative saw Europeans and Maori interacting peacefully. This amicable trade between Maori and Europeans even extended to within Otago Harbour, as evidenced by peaceful visits from various ships, including the *Mermaid* (1823), *Samuel* (1823), *Elizabeth Henrietta* (1823), *Rosanne* (1826), *Lambton* (1826) and *Elizabeth* (1826) (McLean 1985:21,22). However, Kelly's retribution in 1817 had not been forgotten, so in May 1833 when his ship *Amity* entered the harbour it was quickly seized by local Maori. During the ordeal three of the crew deserted but the Captain of the vessel, Lovett, was able to regain control and got clear without loss of life on either side (Entwisle 2005:100). In July 1834 Kelly once again tried his luck by sending his ship the *Mary* and *Elizabeth* with Lovett in command, back to Otago. As noted by Entwisle (ibid:100), upon arrival Lovett was met by a Maori war party returning from the north, the vessel was promptly attacked and Maori made off with boats, gear and some whale carcasses that had been moored alongside. Unsatisfied, the war party then commenced to ransack Weller's whaling station before threatening the other ships in the harbour. In response, Captain Anglem of the Weller's vessel *Lucy Ann*, kidnapped a number of Otago Chiefs as hostages and threatened to hang them if there was an all out attack on the Europeans on shore (Entwisle 2005:93). Fortunately, the tension defused with no lives lost and Lovett once again left Otago. In response to the attack on their whaling station the Wellers were provided with six swivel guns and a long gun from the colonial Government, which they mounted on their vessels in order to protect the station from further attack (Entwisle 1998:94). The final incident in this period occurred in September the same year, when the sailing vessel *Joseph Weller* entered the harbour and was boarded by Maori. Alarmed for the safety of their relatives who were still being held hostage in Sydney, local Chiefs intervened and the vessel was soon returned to European control.

WARFARE AND DEFENCE IN THE HISTORIC PERIOD

The sale of the Otago Block by Maori in 1844 and the beginning of planned European settlement in 1848 forever changed the dynamics of Otago Harbour. In just a few short decades the harbour was transformed from a far-flung outpost of the British Empire to a thriving port with permanent buildings and burgeoning maritime infrastructure. However, the newly arrived colonists were still fearful of the increasingly disillusioned Maori tribes throughout the country. With the outbreak of the Land Wars in the 1860s it was feared that the fighting would spread to the south and in response, volunteers banded together to form the Port Chalmers Naval Brigade in 1864 (Cotton & White 1998:33). This Brigade was popular with the young men of the port who undertook drills and parades but as the conflict did not extend to the South, they were fortunate in never having to fight. As the Land Wars were suppressed, the threats to New Zealand's security changed from internal to external, and this was to have significant repercussions for the people of Otago Harbour.

As early as 1854, when Britain went to war in the Crimea, the New Zealand Colonial government, as a member of the British Empire, began to fear attack from marauding Russian warships with ports as "the centres of trade and industry, considered to be under the greatest threat" (Cooke 2000:6). New Zealand's isolation meant that the traditional colonial reliance on the British Fleet for protection was impracticable and as such, it was deemed essential that the four major harbours be fortified to protect the commerce of the nation. In 1871, after considerable consultation, the Colonial Government decided that gun batteries should be erected at the entrances to the Auckland, Wellington, Lyttleton and Otago Harbours. However, issues soon arose over where the estimated £44,000 would come from and the plans languished (Cooke 2000:39). Unhappy with this situation, the inhabitants of Otago Harbour took matters into their own hands and established a volunteer artillery unit "L" Battery in 1879. As described by Church (1994:74), these men trained with two 32-pound Armstrong guns which were mounted at what became Battery Point, providing the local populace with a sense of security against the Russian threat.

The global events of the 1880s, especially the threat of another Anglo-Russian war in 1885, spurred the New Zealand Government into action. Funding was made available for the purchase of four Thornycroft torpedo boats and associated Submarine mining depots for the nation's major ports. To this end the torpedo boat *Taiaroa* (Figure 92) arrived in Otago

Harbour in 1884. The vessel was 63 feet long, 7 feet 6 inches wide, and capable of steaming at 17 knots, while armed with one Nordenfeldt gun and spar 'torpedo' (McLean 1985:98).

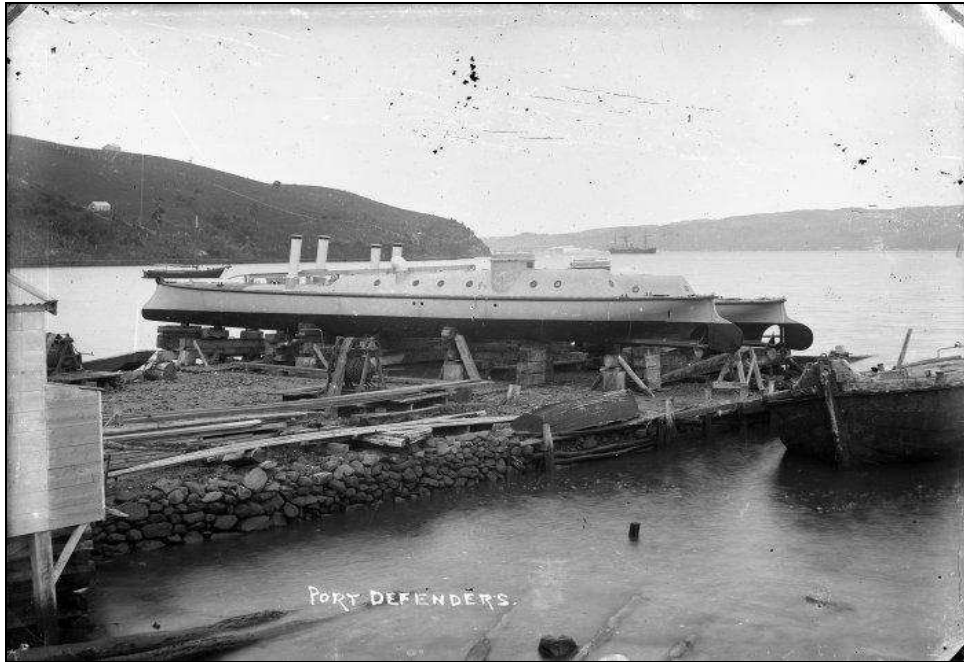


Figure 92: The Taiaroa at the specially built torpedo boat mole in Deborah Bay (Alexander Turnbull Library (PAColl-3037-1-06)).

This boat was operated by the newly formed Torpedo Corp (1885) based out of Deborah Bay, where a Submarine mining depot/torpedo boat station (site I44/340) had been especially constructed for the purpose of training the Torpedo Corp in defence techniques against naval attack and in the use of submarine explosives. At this time it was claimed that Dunedin was the most important town in New Zealand, while at the same time being the most expensive to defend from the open sea (Cooke 2000:33). This difficulty meant that in addition to the Torpedo Boat, artillery batteries were established at Taiaroa Head, at what was previously Pukekura Pa, and also at St Kilda to prevent bombardment from the sea. The four Batteries at Taiaroa Head; Howlett Point Battery, Channel Battery, Lighthouse Battery and Saddle Battery, as well as the St Kilda battery, were all built between 1885 and 1888 and included a range of different artillery pieces and associated infrastructure. These guns included 6-inch disappearing Armstrong guns which were protected below ground level (except during moments of firing), making them virtually invulnerable (Knight 1979:30). The multi-battery establishment at the Heads with its hundreds of yards of underground tunnels, magazines and storage facilities became known as Fort Taiaroa and was

permanently manned by a mixture of professional and volunteer soldiers to counter the perceived Russian threat (McLean 1985: 97). Between 1888 and 1913 further work was carried out to strengthen the fort, including the construction of a 300 foot rubble wharf in 1896 (site J44/148), the extension of the Harrington point battery in 1906 and the addition of two twelve pound guns in 1913 (Cooke 2000: 84).

The early 1900s also saw Otago Harbour being visited by Royal Navy warships, including H.M.S Powerful, H.M.S Challenger and H.M.S Pegasus in 1908 and H.M.S New Zealand in 1913. However, much to the anger of the local populace, the largest of these vessels, H.M.S Powerful and H.M.S New Zealand, were forced to anchor outside the protective waters of the harbour as they were both well outside the limits of the channel (McLean 1985:127). Despite the rareness of such visits, it was decided that the Lower Harbour would be modified to create a sub-naval base with the entrance channel being significantly deepened and berthage built at Port Chalmers that would be capable of handling 1000 foot ships. In addition, reclamations works were to be undertaken to create 41 acres for shipyards and dockyards in Deborah Bay. The estimated cost of such work was a huge £220,900 which, surprisingly, was approved by the Harbour Board. However, the outbreak of the First World War meant that these audacious plans were scrapped (ibid:127).

As part of the Empire, New Zealand entered the Great War soon after Britain, with over 100,000 New Zealanders from a total population of just 1,000,000 serving overseas. With such a large proportion of the population abroad, defence at home once again became a significant issue. In Otago Harbour defence again was based on Fort Taiaroa, with No.2 Company New Zealand Garrison Artillery (formerly the Port Chalmers Navals) called up for active service at the Fort. This service involved 40 to 50 men manning the 6-inch guns and carrying out general fortress duties, including the inspection of all vessels approaching the harbour for the duration of the war (Bowman 1948:184). Fortunately the devastation and carnage of the war was not directly brought to the Port and apart from the test firing of the batteries the guns were never fired in anger. The outbreak of war also saw the shipyards of the harbour contributing to the war effort through the fitting out and modifying of vessels for wartime duties as hospital and troop ships (McLean 1985:295).

The years between 1918 and 1939 saw the harbour defences mothballed, with some of the now obsolete guns removed altogether. This gradual decline was accepted in 1936 by the Chiefs of Staff who agreed that as Otago Harbour had received no modern armaments in

the First World War, the cost of upgrading the harbour to a defended Port was unjustified (Cooke 2000:249). However, with the outbreak of war in 1939 the people of Otago petitioned against this decision, seeking protection from enemy aircraft and shipping that could threaten the harbour and its inhabitants. In 1940 the Inspector General decided that a raid could be attempted against Port Chalmers, and as such, Fort Taiaroa should be outfitted to protect against such aggression. To this end, the Harrington Point battery was supplied with anti-motor torpedo boat guns, rangefinders and searchlights, the 50 year old 6-inch disappearing Armstrong gun was reconditioned and two modern 6-inch gun emplacements were established at Rerewahine (ibid:251). To man these defences permanent quarters were built at Pilot Beach and Harrington Point and the troops stationed there armed with: 10 Bren LMG for anti-aircraft use, 108 .303 MkIII rifles, four pistols and five signal pistols (ibid:116). Once again the shipyards were placed on a war footing and these yards busied themselves, building Castle class anti-submarine minesweeping trawlers as well as cargo lighters for the Pacific. As well as building ships, numerous Allied vessels called at the harbour for repairs from enemy action, keeping a substantial proportion of the local inhabitants gainfully employed (Church 1994:136). The defence of the harbour was also taken up by volunteers who joined the Home Guard and the Naval Auxiliary Patrol Scheme. Fortunately, the American naval successes in 1942 in the Battles for the Coral Sea and Midway removed the threat of Japanese attack from Otago.

From the wood and earth fortifications to high explosive artillery batteries, warfare and defence in Otago Harbour has undergone significant transformations over its long history. By combining the archaeological and historical records we now have the raw data necessary to investigate these sites as components of the maritime cultural landscape.

SITE DISTRIBUTION

From the time of earliest occupation until 1945, sites of warfare and defence in the harbour have been concentrated in only a small number of areas (Figure 93). The use of these areas as sites for warfare and defence structures is due to their highly strategic nature, especially when compared to other areas of the harbour. The distribution of these sites is particularly interesting when investigated in terms of the history of the harbour and its inhabitant's changing security requirements.

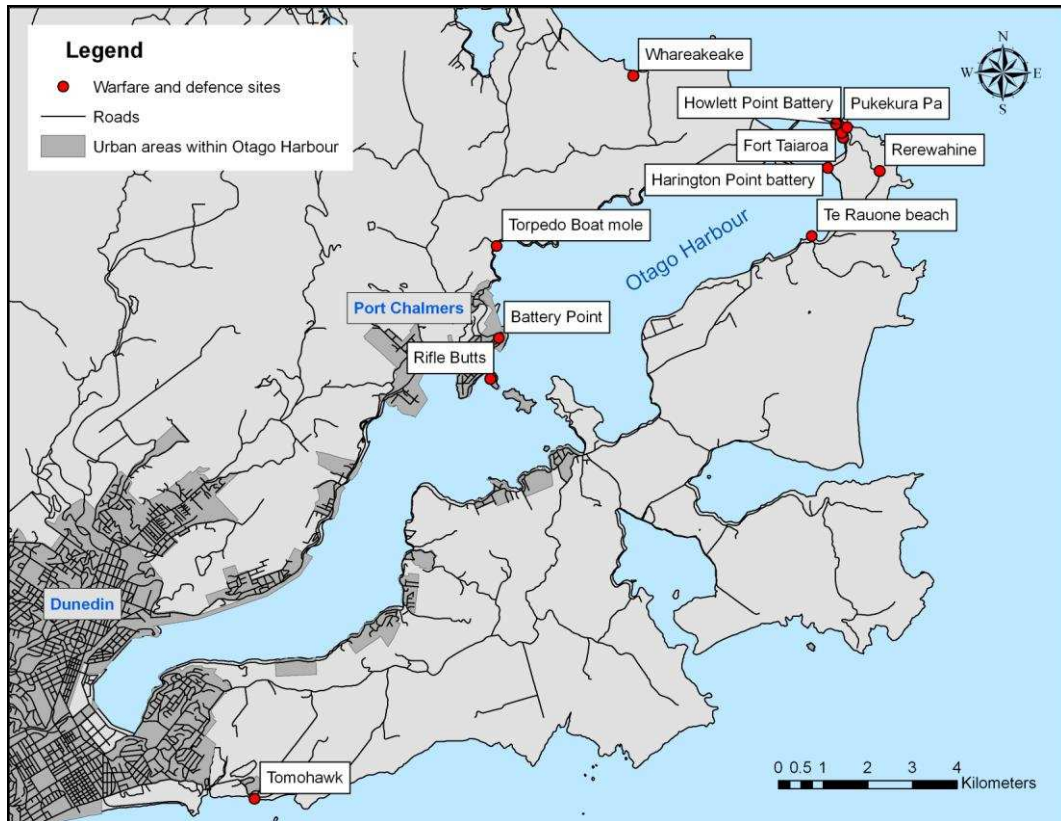


Figure 93: Map of Otago Harbour showing the location of warfare and defence sites.

Throughout prehistory the control of Otago Harbour, and the resources contained within it were highly sought after. As described above, the first people to enter the harbour were the Waitaha, who were subsumed by Ngati Mamoe sometime after 1500 AD and they, in turn, by Ngai Tahu in the late 1700s (Anderson 1998). These conflicts were typically settled with small scale raids and outbursts of violence, however the arrival of Ngai Tahu in the south and, in particular, the establishment of Pukekura Pa (site J44/4) around 1650 AD, forever changed this dynamic. After this time, much of the conflict between Ngati Mamoe and Ngai Tahu within the Otago Harbour region was played out by the besiegement and sacking of enemy Pa sites. These Pa were built in highly strategic areas, providing the defenders with elevated positions from which they could easily spot the approaching enemy (Figure 94).

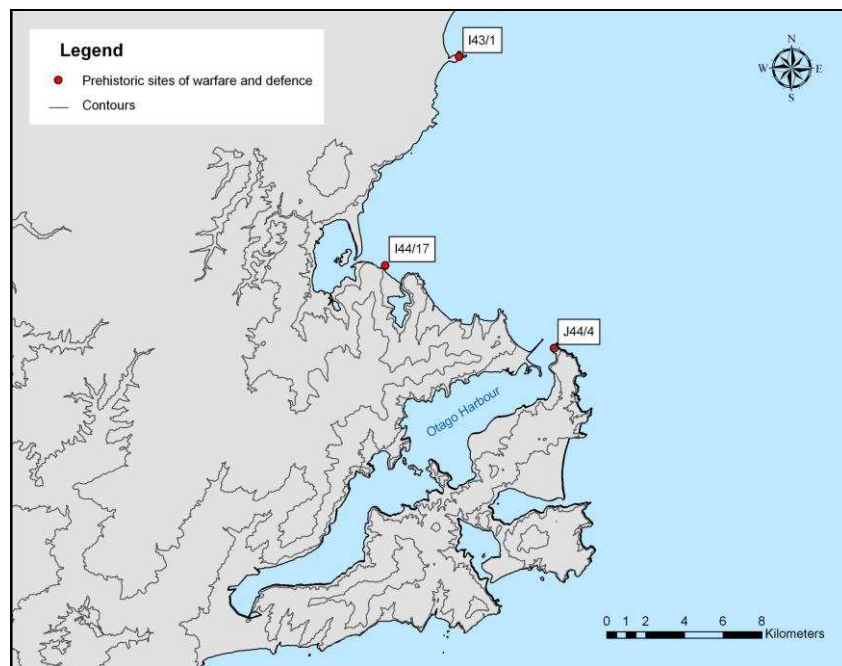


Figure 94: Distribution of warfare and defence sites in Otago Harbour and environs in prehistory.

Although, there was considerable conflict between Europeans and Maori in the Otago Harbour region during the protohistoric period, archaeological evidence of these clashes is unlikely to have survived.

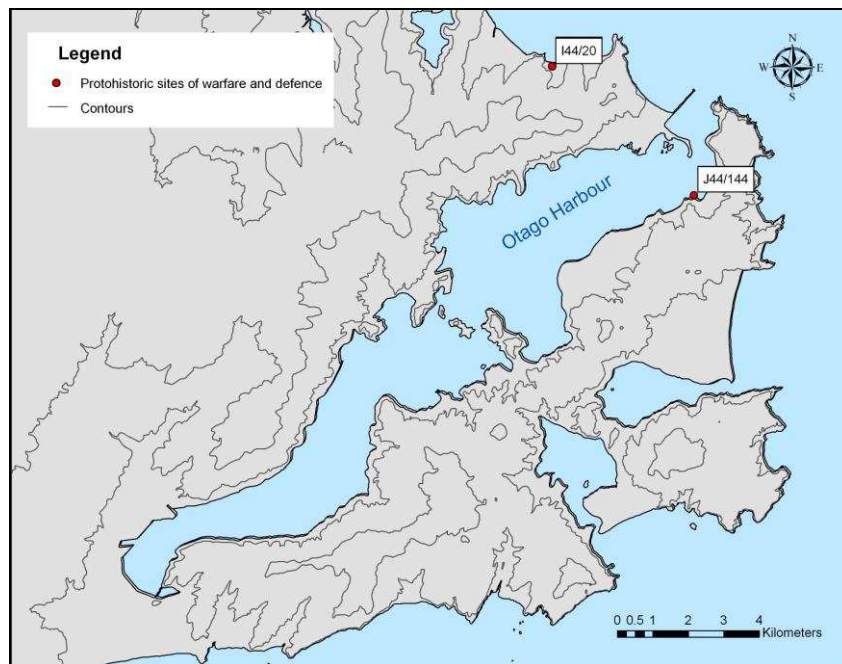


Figure 95: Distribution of warfare and defence sites in Otago Harbour and environs in the protohistoric period.

A major reason for this is the ephemeral nature of these clashes, with neither side constructing defences; nor did their clashes result in all out warfare. One possible exception to this lack of archaeological evidence may be found at Te Rauone beach (site J44/144) (Figure 95), the probable location of Kelly's burning of the 'the beautiful city of Otago' (Anderson 1998:71). However, due to the considerable movement of sand which has been recorded historically, in this area the evidence may either be deeply buried or have eroded away completely.

During the historic period, warfare and defence within Otago Harbour turned from internal to external threats to security. The perceived threat of Russian attack and the outbreak of the two World Wars saw the construction of numerous defensive structures designed to protect the harbour and its inhabitants (Figure 96).

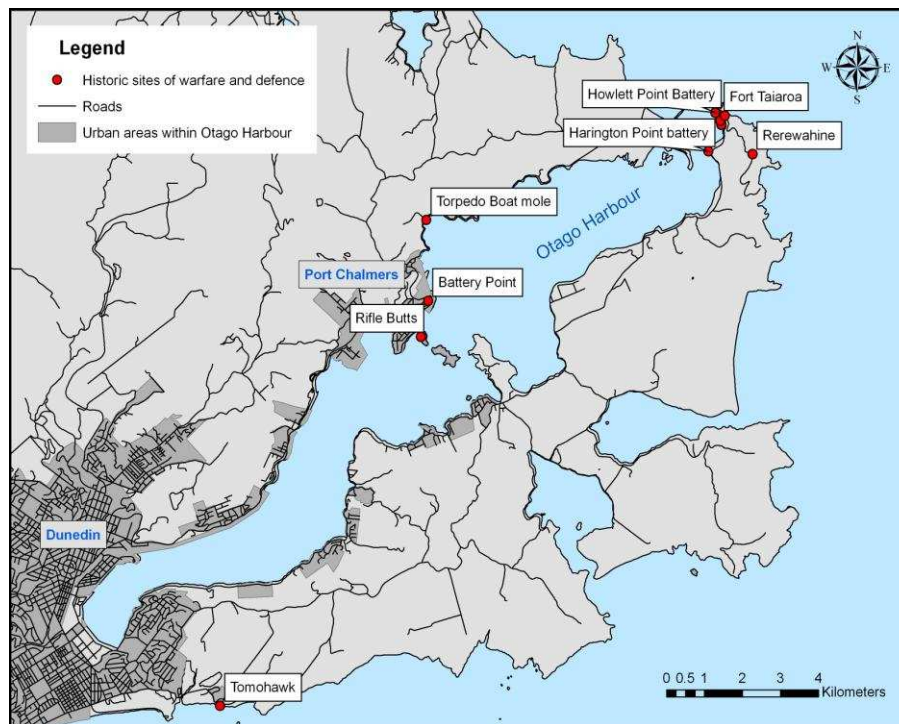


Figure 96: Distribution of warfare and defence sites in Otago Harbour and environs in the historic period.

Fortunately due to their massive size, and construction of concrete and steel, many of these sites remain largely intact and as such are highly visible components of the maritime cultural landscape. Just as in the prehistoric period these sites were typically built in elevated positions from which the defenders could see the approaching enemy and react accordingly.

PATTERNS IN WARFARE AND DEFENCE

From the above research of warfare and defence in Otago Harbour, we can begin to see patterns of how people interacted with the marine environment and how this, in turn, formed the maritime cultural landscape.

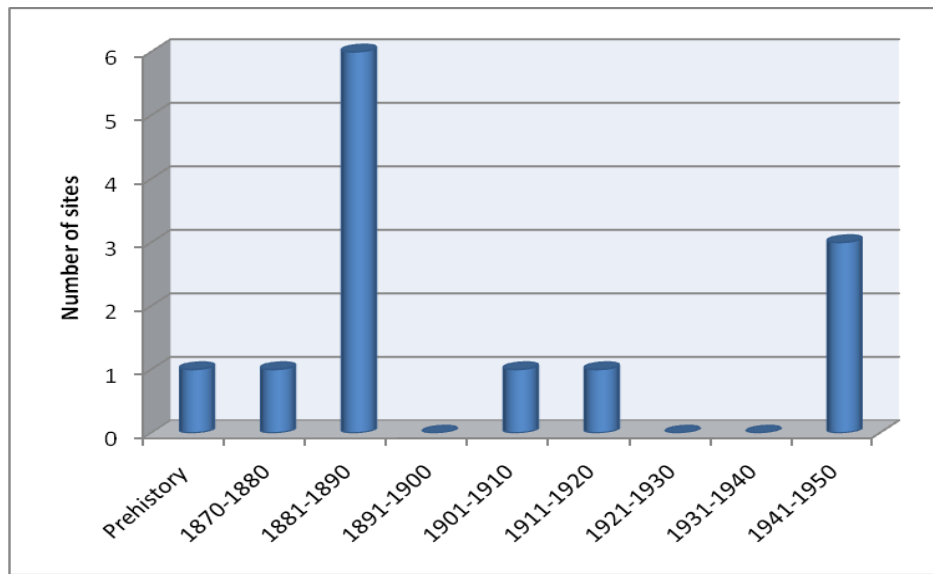


Figure 97: Number of new warfare and defence sites constructed by decade.

One such pattern is seen when the construction of defensive sites is examined over time (Figure 98). Evidently, the construction of warfare and defence sites is directly related to the level of perceived threat. Between 1870 and 1890 there was considerable fear among New Zealanders of an attack by Russian warships and this period saw the greatest number of defensive installations constructed. The next threat came during the First World War and actions were taken to supplement the defences that were established between 1870 and 1890. A period of decline is apparent between 1920 and 1940, when many of the defensive sites were mothballed due to the lack of any credible threat to the security of the harbour. However the outbreak of World War Two saw another period of considerable action with the construction of defensive sites in the harbour mainly due to the need to upgrade the now obsolete earlier defences. From this analysis it is readily apparent during which periods of time the construction of sites for warfare and defence were built and as such, which periods of time this form of interaction with the marine environment was at its peak.

The distribution of sites of warfare and defence in Otago Harbour shown in Figure 93 indicate that throughout all time periods these sites were concentrated in only a few highly strategic areas. The major reason for this is that during the time periods described above, the major threats to the people of Otago Harbour were all seaborne. To counter this threat, be it from enemy waka or warship, it was necessary to control access to the harbour. As such, defensive sites were built at locations that provided the defenders with long range visibility and the advantage of elevation. As the capability of military equipment increased, it became necessary to upgrade these defensive sites accordingly and this resulted in the acquisition of larger, more powerful guns at the Heads, as well as the positioning of a battery at St Kilda to prevent bombardment of the city.

CONCLUSION

By combining historical and archaeological sources it is evident that the construction of defensive sites to protect against both internal and external threats has played a significant role in the creation of the maritime cultural landscape of Otago Harbour. This search for security has led the inhabitants of the harbour to create some of the most massive and highly visible components of the maritime cultural landscape. This investigation has also shown the validity of using such a landscape approach to try to understand the ways in which people modified their environment in order to protect themselves from ever changing threats to their wellbeing and security. The potential for further historical archaeological research of sites of warfare and defence is explored in the discussion chapter of this thesis.

6.7. ANTHROPOGENIC CHANGE

The maritime cultural landscape of Otago Harbour is the product of more than 750 years of interaction between the harbour's inhabitants and their surrounding marine environment. Nowhere is this interaction more evident than in the anthropogenic modification of the harbour, which has seen huge areas of the foreshore reclaimed and the construction of numerous sea walls. These reclamations and sea walls make up some of the largest and most intact archaeological sites within the harbour, providing a unique opportunity to investigate large scale anthropogenic change to the marine environment.

THE ARCHAEOLOGY OF RECLAMATIONS

Since the first reclamation project was undertaken in Otago Harbour in 1862, over 850 acres of foreshore has been reclaimed (Thompson 1945:122, McLean 1985:200). These reclamations have significantly altered the shape of the harbour and are shown in Figure 98.

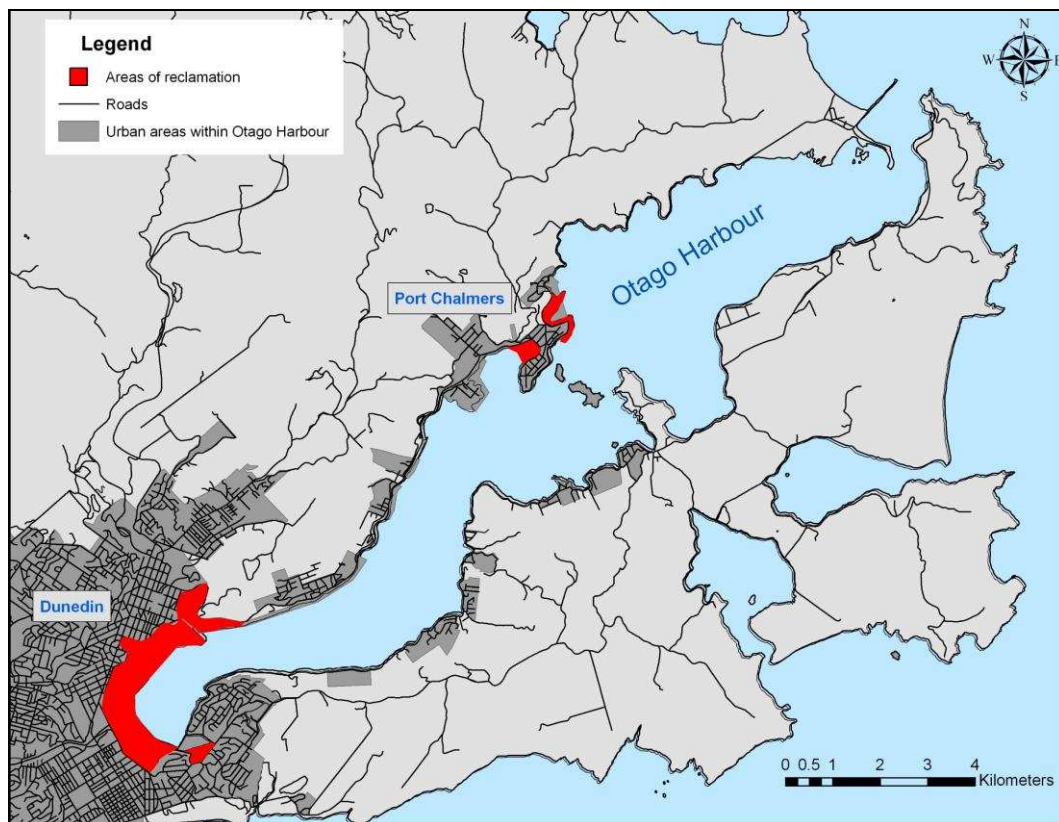


Figure 98: Map of Otago Harbour showing areas of reclamation.

Within the study area, six sites relating to the reclamation of the harbour have been investigated archaeologically, providing insights into the reclamation process. These investigations include:

- The excavation of the old Dunedin jail, constructed in 1855 (site I44/324; Petchey 2002)
- The excavation undertaken at Queen's Gardens (site no. I44/370; Hamel 2001c)
- The excavation at the site of the Dunedin Chinese Gardens (site no. I44/388; Middleton 2007)
- The excavation at Riego Street for the new Art School building, Otago Polytechnic (site no. I44/404; Middleton 2008a, 2008b)
- Reclamation at the Birch and Kitchener Street wharves (site no. I44/468; Hamel, 2008c, 2009)
- The excavation at the Great King Street Countdown supermarket site, (site no. I44/397; Hamel 2008d).

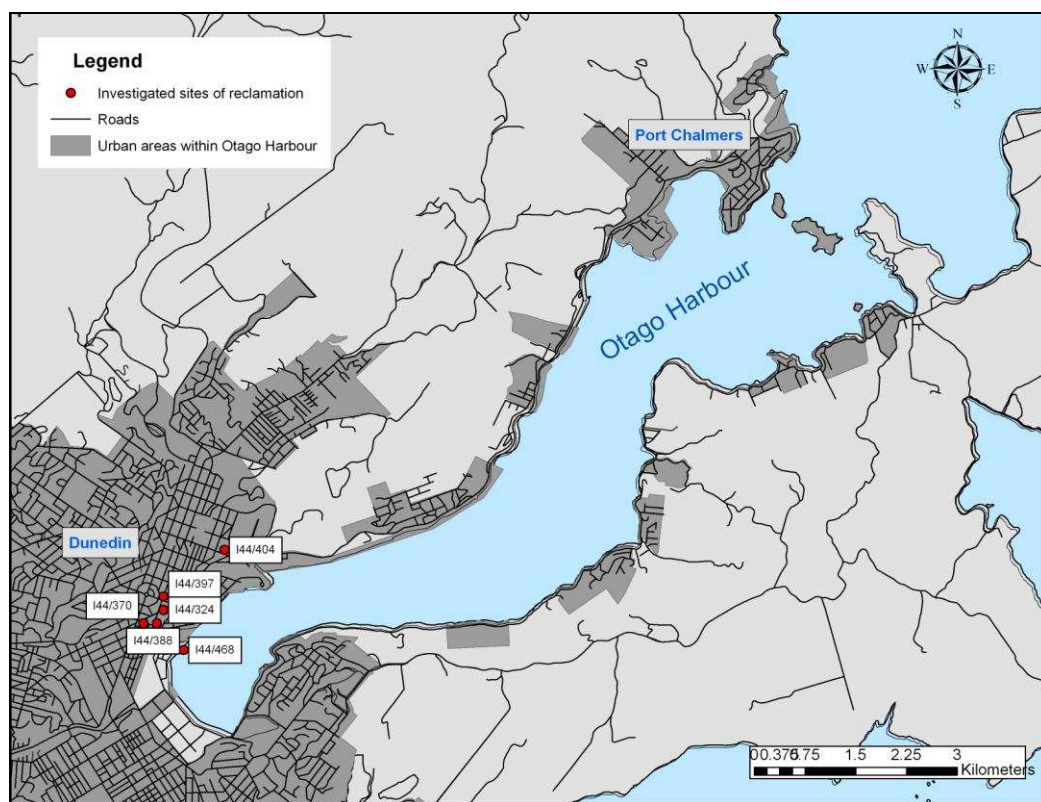


Figure 99: Map of Otago Harbour showing reclamation sites that have been investigated archaeologically.

Petchey's (2002) excavation of the site of the old Dunedin jail (site I44/324), revealed not only a considerable amount of information about the structure itself, but also provided insights into the process of reclamation in this area. The jail was built in 1855 on what was, at the time, the extreme foreshore of the Upper Harbour (Petchey 2002:16). At the base of the site the excavation uncovered the original pre-settlement shoreline, which was found to slope gently down to the east (i.e. towards the harbour). This layer was comprised of mudflat sediments, "confirming that this area had originally been the tidal mudflats at the head of the harbour" (ibid:12). Overlying this layer there was between 0.6 and 1.4 metres of clay and rubble fill that had been brought in to raise the shoreline above the level of mean high water spring (ibid:8). The materials used for this reclamation are described as "mixed clay", "yellow clay", "hard mottled clay", "grey/brown clay", "dark clay", and "brick and rock rubble", interspersed with lenses of mixed fill with some artefacts (ibid:11-12). Despite the raising of this foreshore through reclamation, contemporary accounts referred to the wet nature of the exercise yard, suggesting that reclamations in other areas of the harbour may also have remained somewhat soggy, especially in winter (Petchey 2002:25).

Hamel's (2001c) excavation in Queens Gardens (site I44/370), although much more modest in scope than Petchey's, also provides valuable insights into the process of reclamation in this area. In the course of building the foundations for a large ornamental Celtic Cross, an 800 mm deep trench was excavated revealing the stratigraphy of reclamation in this area. Interestingly, the location of this site, which was on the low tide line of the day and near the base of what was Bell Hill, suggests this area would have been one of the first to be reclaimed on the Dunedin foreshore (Hamel 2001c:2). The excavation revealed fill comprised of "well-compacted clay, with some demolition material, quarried rock and very sparse sherds of glass and crockery" (ibid:3). Based on the finds from the excavation, and the height of the recorded 1860s low tide mark, Hamel (ibid:3) postulated "that the reclamation in this area comprises up to 2 metres of rock fill and about a metre of strong clay". This investigation shows just how much fill was required to raise even a small area of the foreshore and such feats are even more impressive due to the fact that all reclamation in this area would have been undertaken without motorised transport or spreaders.

The earthworks associated with building the Dunedin Chinese Gardens (site I44/388) provided another opportunity to further our understanding of reclamation in this area. As described by Middleton (2007:3-4), reclamation of this area of Dunedin began with the construction of the Rattray Street Pier and its associated access ways in 1863. However, reclamation of the land behind the waterfront went ahead slowly, and the site of the Chinese Gardens was under water until around 1884 (ibid:3). The earthworks at the site in 2007 saw the entire section excavated to a depth of approximately 1.8 metres below the modern surface level (ibid:1). Monitoring of the earthworks revealed that two distinct layers were deposited during the reclamation of the site. The first, consisted of “several discrete dumps of rubbish, including industrial material deposited on the seabed”. This was followed by a second layer of “other hard fill material such as grey and yellow clay, a single area of hard red rock, and hard grey stone” (ibid:12). In addition to the reclamation fill, large quantities of artefacts were found in-situ at the base of the excavation, including leather, ceramics and glass. Another notable feature of this site was the presence of a “large wooden pile, approximately 35 cm in diameter encased with a metal ring at the top” (Middleton 2007:11). This has been interpreted as a mooring pile that may have been in use prior to the building of the Rattray Street Pier in 1863.

Middleton’s (2008) monitoring of earthworks on the site of the Otago Polytechnic School of Art Building (site I44/404) uncovered evidence from a reclamation distinct from those previously discussed. This reclamation was undertaken at a later date ca. 1894, and as shown in Figure 99, was much further to the north than the others previously investigated (Middleton 2008:8). A test pit was mechanically excavated to a depth of around 3 metres, at which point the original sea bed was reached (ibid:4). The stratigraphy of the reclamation (Figure 100-101) revealed an upper layer 25 cm thick, consisting of asphalt, gravel and concrete, which was underlain by 75 cm to 1 metre of yellow clay fill. Below this, “a dark deposit of material like charcoal and / or coal dust was revealed, mixed with artefacts”, continuous to a depth of 2.5 metres (Middleton 2008:4). Below the charcoal / coal dust fill, a thick deposit of wood shavings sat on top off the relic seabed, which provided the base onto which the other reclamation material was later deposited.

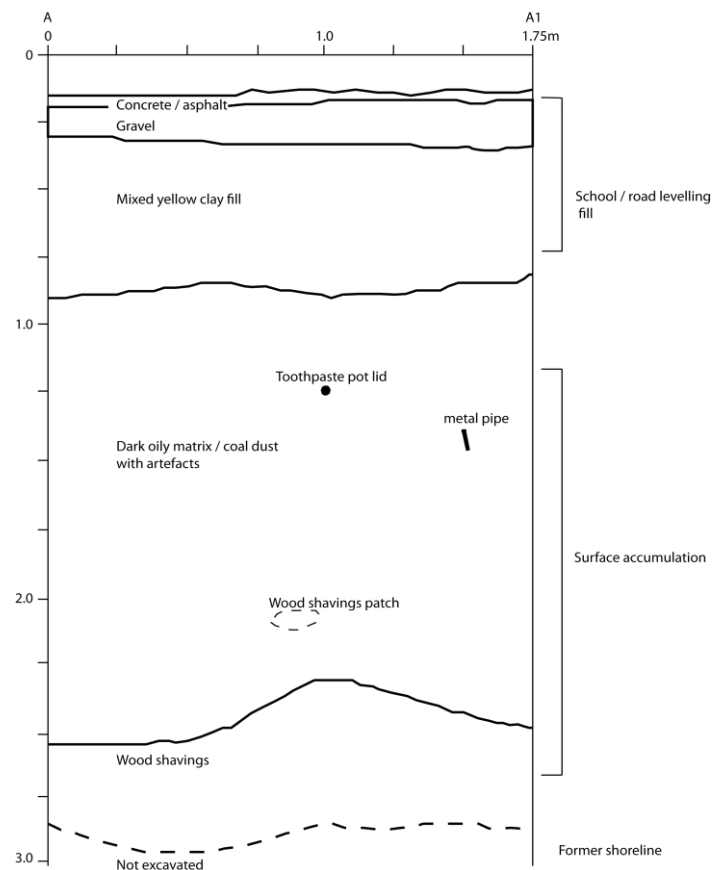


Figure 100: Stratigraphic drawing of test pit from site 144/404. (Source: Figure 3 Middleton 2008).

This reclamation is notable in that the fill material used to raise the shoreline differs from that found in investigations elsewhere in the harbour. This difference is most likely due to the later date of the reclamation, which saw the old method of laying down fill by the dray load replaced by the pumping of spoil directly onto the area to be reclaimed, as described by McLintock (1951:246).

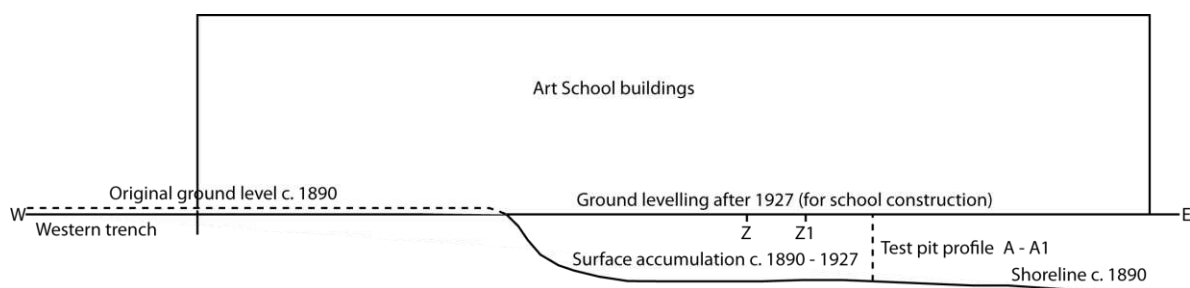


Figure 101: Figurative ground surface profile, showing original level and shoreline ca. 1890. (Source Figure 3. Middleton 2008).

Geotechnical investigations on the Birch Street and Kitchener Street wharves (site I44/468) provided Hamel (2008c) with the opportunity to investigate reclamation in this area. This work saw three boreholes driven into the fill which had been laid down in 1890-1898, and two in the 1905-1911 fill. Information obtained from the cores revealed that the bed of the harbour in this area was around 3 meters below mean sea level, and that reclamation required the dumping of some 4.4 metres deep of fill. The cores revealed that the reclamation fill was largely composed of “clay, rock and broken brick” mixed with “dredged slurry from the harbour floor” (Hamel 2009:1). Interestingly, much more land-sourced fill, as opposed to dredgings, was used in the reclamation in this area. As noted by Hamel (2008c:9), this would have had to have been “laboriously dug and carted out onto the tidal flats, in contrast to the marine sediments more easily won with the steam powered dredges of the time”.

The excavation at the site of the Great King Street Countdown supermarket (site I44/397) added to our knowledge of both the pre-reclamation landscape of Dunedin and the reclamation process in this area. In 2008, a 2 metre wide hole was mechanically excavated through reclamation fill to a depth of 2.7 metres below the current surface level of the site. At the bottom of the excavation a number of massive timbers were uncovered relating to the use of the area prior to reclamation. As described by Hamel (2008d:1,3), the timbers were found on the edge of what was once a tidal lagoon and had been stacked to form a retaining wall around 1 metre high, 0.30 metres wide and 4.67 metres long. Hamel’s (ibid:5-6) investigation revealed that the timbers had been recycled from a previous structure (hypothesised to be a slipway) and had then been utilised to form the bulkhead for a small wharf, which was likely in use in the 1850s. Sometime around 1860 a causeway was built across the mouth of the lagoon, closing it off from the waters of the harbour. The stratigraphy of the site reveals that 300 mm of black harbour silt then built up over the site, which was followed sometime later by the laying down of 890 mm of disturbed orange clay, raising the site to around 2.2 metres above mean sea level. On top of this, a layer of around 1.5 metres consisting of rock and gravel fill with broken bricks and concrete was later deposited, most likely in the early twentieth century. One of the notable features of this site was the amazing level of preservation of the timbers buried beneath the reclamation fill. This suggests that other pre-reclamation structures likely exist along the earlier foreshores

of the harbour, thus presenting archaeologists with a unique form of evidence into this aspect of the past.

Although a number of sites of reclamation in Otago Harbour have been archaeologically investigated, in order to understand the full extent to which these works have shaped the maritime cultural landscape it is necessary to combine both the archaeological and historical records.

THE HISTORY OF OTAGO HARBOUR RECLAMATIONS

The first European colonists to arrive in Otago Harbour under the New Edinburgh scheme in 1848 would have found a harbour that differed greatly from that which exists today. In early Dunedin, the lack of suitable flat land meant that houses were built on the steep hills which ringed the narrow shoreline, while the muddy shallows extended far out into the harbour itself. Adding to these limitations, the considerable bulk of Bell Hill sat prominently in the middle of what scarce flat land there was available, virtually cutting the town in two (McLean 1985:47). The scene at Port Chalmers was much the same, with little flat land available for the requirements of a first class port; a shortcoming that was readily commented upon by the harbour's northern rivals.

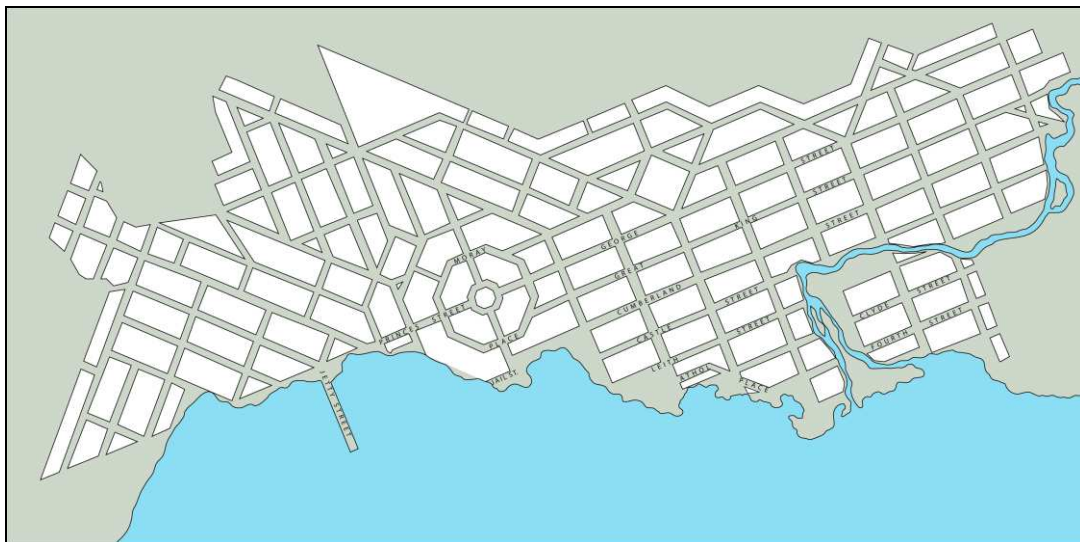


Figure 102: 1864 map of Dunedin showing pre-reclamation shoreline. Digitised from ‘Dunedin Advertising Map & Almanac For 1864, Leap Year.’ (Original held at the McNab Room, Dunedin Public Library).

In 1854 the Provincial Council of Otago set aside 450 acres of tidal land along the Dunedin foreshore for harbour development purposes (McLintock 1951:48). Although it was worthless tidal mud flats at the time, once reclaimed, this land would provide valuable space for the city to expand, and the lease of which would also provide a much needed source of income for the Council (McLean 1985:36). The discovery of gold in the Otago region in 1861 saw both labour and capital flowing into the province at an amazing rate, stimulating industry and creating even greater demand for suitable flat land (Bowman 1948:17). In response, local authorities sought to reclaim 137 acres of foreshore, including the land between the Stuart Street and Rattray Street jetties, and a further 15.5 acres south from the Old Jetty towards Andersons Bay Road (McLintock 1951:49-51). This ambitious project began with the removal of Bell Hill in 1862, which saw 500 men using picks and shovels to dislodge rock and rubble and discharge it by chutes onto the tidal flats from where it was spread laboriously by hand (Olssen 1984:101). The hard physical nature of the work and the lure of the goldfields made attracting suitable labour difficult, so as described by McIntock (1951:50), authorities advanced the rate of demolition through “the judicious application of prison labour’. The removal of Bell Hill took over ten years to complete and, as shown in Figure 103, by 1875 the Dunedin foreshore had been considerably altered from its original form.

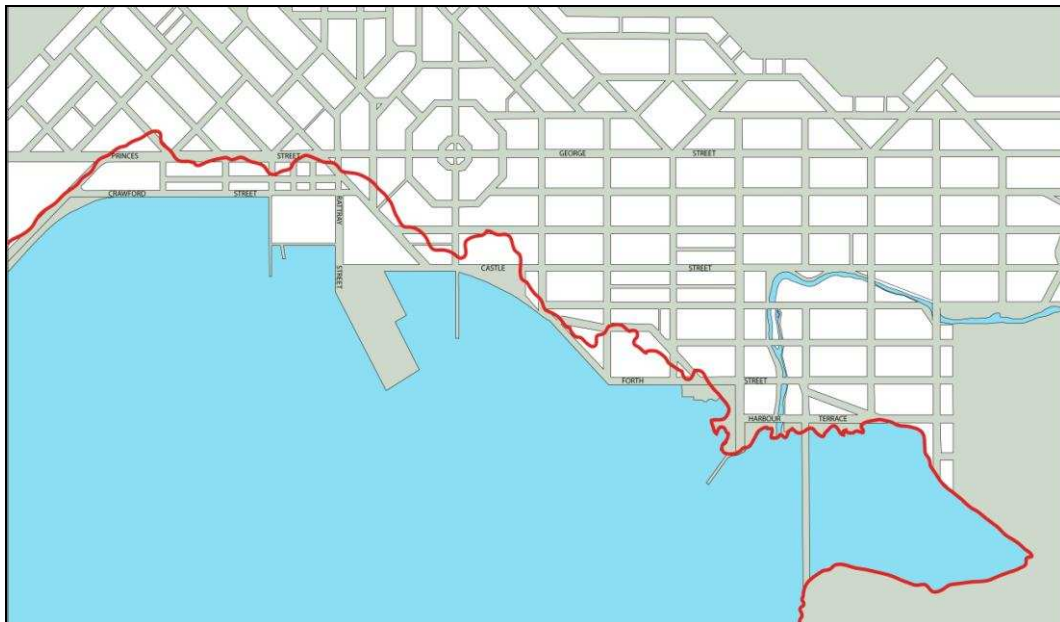


Figure 103: This 1875 map shows the original pre-reclamation shoreline and the extensive area reclaimed from the demolition of Bell Hill (digitised from *Wise's New Zealand Directory Map of the City of Dunedin, N.Z. 1875*).

Reclamation was also seen as a solution to the lack of flat land at Port Chalmers, with the first project being undertaken there in the early 1860s. Although much more modest in scope than the work undertaken in Dunedin, spoil from the widening of George Street, and that obtained from sections cut into the hillsides above, was dumped onto the beach behind a retaining wall to form a road along the foreshore, now known as Beach Street (Church 1994:26). In 1868 further reclamation work was required for the construction of the Port Chalmers graving dock and as noted by Bowman (1948:36), the removal of the spoil from the bank and the reclamation of the site by hand took over three and a half years to complete.

With the demolition of Bell Hill reaching completion in the early 1870s reclamation continued along the Dunedin foreshore, most notably along the Crawford Street reserve; a 67.5 acre block of land that stretched from Anderson's Bay Road almost as far as Lake Logan, also including the area that was to become the steamer basin (McLean 1985:118). As reclamation pushed the foreshore further and further out into the harbour, the wharves that had been built in the previous decades had to be lengthened to reach a suitable depth of water, and new wharves were built to provide for the ever growing number of vessels frequenting the Upper Harbour. As a result, the Rattray Street Wharf was extended in 1874, while a new wharf, the Birch Street Wharf, was built in 1878. This was followed in 1879 by the new Cross Wharf which was built along the edge of the progressing reclamation, creating the steamer basin (Hamel 2008c:9). However, a lack of funding meant that infilling behind the wharves only went ahead in stops and starts and the occupation of sections on reclaimed land remained limited during this time (Bauchop 2008:12).

In conjunction with the reclamation of areas in the Upper Harbour, in 1876 the Otago Harbour Board began dredging the much heralded Victoria Channel from Port Chalmers to Dunedin. This enormous undertaking saw the removal of 965,000 cubic yards of spoil from the harbour floor, providing a deep channel into the Upper Harbour, but also presenting the Harbour Board with a logistical nightmare (McLean 1985:73). It was decided that the spoil from the dredging would be used to reclaim the foreshore at Ravensbourne, filling in what was previously Winton's Bay (Cotton & White 1998:7). In 1877 a retaining wall was built between the two headlands and large 'derricks' 150 feet wide and powered by donkey engines were constructed on the site (ibid:105). In 1880 the actual reclaiming began with the dredge Vulcan emptying spoil into large boxes on punts which were then

towed by small tugs to the rock wall next to the derricks. As described by Cotton & White (2002:39), from there, the process did not get any more efficient:

the derricks lifted the boxes off the punts travelled around the rails, and emptied them out onto a ramp. From here the sand was loaded by hand onto horse-drawn trucks and taken to the area currently being filled. This was a modern technique at the time.

The many demands on the Otago Harbour Board's limited funds meant that work on various reclamation projects was significantly scaled back between the years of 1880 and 1913. One exception to this was the reclamation of the island at the mouth of the Leith River, which by 1888 was the location of the Milburn Lime and Cement Company's works, the first "commercial buildings on the new ground" (McDonald 1965:295). During this time, the Board attempted to concentrate their finite resources on finishing those reclamations they had started in the previous century, especially those along the Crawford Reserve and in Ravensbourne (Cotton & White 2002:39).

The next major project saw the reclamation of Lake Logan, a 60 acre expanse of brackish water, described by many as a stinking cesspool (McLean 1985:134). Work began in 1913 on what was predicted to be a four year project with the dredge Vulcan pumping spoil on to the area (McLintock 1951:246) However, a lack of funds meant that work was suspended in 1916 and not recommenced until 1918, and it was still a further six years before the Lake was fully reclaimed, finally becoming what is known today as Logan Park (McLean 1985:147).

The lack of flat land continued to plague the residents of Port Chalmers. As early as 1863, calls were made for 30 acres of Mussel Bay to be reclaimed to provide for the building of shipyards (McLean 1985:146). This work began in 1873 and continued in an ad hoc manner, until by 1879 around seven acres had been reclaimed (McLintock 1951:119). The reclamation then stalled until the 1920s when a new approach was tried with a tunnel cut through the adjacent headland allowing spoil to be pumped through to the areas to be reclaimed (Church 1994:119). Work began again in earnest in 1932 and by 1939 the full 30 acres of Mussel Bay had been reclaimed (ibid:119). Before the dredging plant was removed, further reclamation was undertaken with sand being pumped onto the foreshore on the harbour side of the headland between Wisemans and Watsons Point to create Back Beach (Church n.d:19).

The record for the longest running reclamation project goes to the Southern Endowment, which took a staggering 59 years to complete. Following years of debate over the advisability of further reducing the tidal compartment of the harbour, a decision was made to go ahead with the reclamation, and in 1914 a training wall was run across the harbour from the southern end of the Anderson's Bay inlet to the Kitchener Street wharf, enclosing an area of 180 acres (McLintock 1951:245). The outbreak of the First World War and a lack of funds following the war meant that the actual work of reclamation did not begin until 1930, when the ageing Vulcan was once again pressed into service. The slow progress of the ancient machinery, combined with resources being reallocated to other projects, saw the reclamation develop in fits and starts until it was finally finished in 1973 (McLean 1985:218).

As has been described previously, the 1960s and 1970s saw the Port of Otago caught up in the container revolution that was sweeping through the shipping world. In order to take advantage of the opportunities that containerisation presented, Port Chalmers underwent a programme of massive harbour works, which included considerable reclamation. The first of these reclamation works began in 1968 and saw 3.5 acres of foreshore adjacent to the new Beach Street Wharf reclaimed to provide storage for logs awaiting export to Japan (Stewart 1973:75). Between 1973 and 1975 another 5.5 acres of foreshore was reclaimed, providing a total of nine acres of storage for the burgeoning timber trade (McLean 1985:201). Also beginning in 1973, reclamation of the foreshore to the west of the George Street Pier saw the terminal area increase from a mere 4.2 acres to over 27 acres, this work being completed by 1977 (McLean 1985:200).

Over a period of 115 years, the inhabitants of the harbour modified the marine landscape through the reclamation of some 850 acres of foreshore. This work not only radically altered the shape of the harbour but also had a far reaching impact on the overall tidal compartment of the harbour, a factor that was hotly debated whenever a new reclamation project was proposed. Today these reclamations are readily recognisable features of anthropogenic change to the harbour and as such, they are essential to our understanding of the maritime cultural landscape.

THE ARCHAEOLOGY OF OTAGO HARBOUR SEA WALLS

Between 1865 and 1948 over 40 kilometres of sea walls were constructed along the shoreline of Otago Harbour creating, the footing on which both roadways and railways were subsequently built. These drystone revetments were built with trimmed and untrimmed local volcanic rock to a height of between 2 and 3 metres and, as described by Hamel (2004c:36), “are by far, the longest structure of its type in the country”. Archaeologically, both the sea walls and associated infrastructure have been recorded on the NZAA site recording scheme. These 17 sites are classified into three different groups, as shown in Table 7 below.

Table 7: Site record numbers of archaeological sites related to Otago Harbour sea walls.

Site Record Number	Site Type
I44/296	Seawall
I44/302	Seawall
I44/349	Seawall
I44/350	Seawall
I44/352	Seawall
I44/372	Seawall
I44/385	Seawall
J44/146	Seawall
J44/148	Seawall
I44/401	Seawall and culvert
I44/407	Seawall and culvert
I44/408	Seawall and culvert
I44/409	Seawall and culvert
I44/398	Seawall and culvert
I44/399	Seawall and culvert
I44/342	Seawall and culvert
I44/400	Railway formation

The sea walls have been the subject of a number of archaeological investigations - most notably those carried out by Jill Hamel.

- Hamel, G.E. 1988. Survey of the Otago Harbour Wall. Report to the New Zealand Historic Places Trust.
- Hamel, G.E. 1997. Otago Harbour Sea Walls, Vauxhall. Report to the Dunedin City Council.
- Hamel, G.E. 1998. Andersons Bay Causeway. Report to the Dunedin City Council.
- Hamel, G.E. 2001b. Historic sea walls and State Highway 88. Report to Montgomery Watson for Transit New Zealand
- Hamel, G.E. 2004a. Omate sea wall and ramp. Report to the New Zealand Historic Places Trust
- Hamel, G.E. 2004b. A retrospective report on the seas walls at Vauxhall Otago Harbour. Report to the New Zealand Historic Places Trust
- Hamel, G.E. 2004c. Draft Conservation Plan for Otago Harbour Sea Walls. Report for the Dunedin City Council
- Hamel, G.E. 2005. Harwood sea walls and Maori sites. Report to the Dunedin City Council.
- Hamel, G.E. 2006. Archaeological assessment of sections of old sea wall, Ravensbourne I44/372. Report to the New Zealand Historic Places Trust.
- Hamel, G.E. 2007a. Lower Portobello sea walls, Harington Point road: Tily Street to Weir Road. Otago Peninsula Roading Improvements. Report to the N Z Historic Places Trust.
- Hamel, G.E. 2007. The causeway for the Southern Endowment Reclamation under Portsmouth Drive. Report to the New Zealand Historic Places Trust.

- Hamel, G.E. 2008a. The 1870 rail formation. The shared cycle and pedestrian path from Adderly Terrace to De Lacy Street. Report to the New Zealand Historic Places Trust.
- Hamel, G.E. 2008b. Company Bay sea walls, Otago Peninsula Road Improvements. Report to the New Zealand Historic Places Trust.
- Hamel, G.E. 2010a. Macandrew Bay South sea walls. Otago Peninsula Road Improvements. Report to the New Zealand Historic Places Trust.
- Hamel, G.E. 2010b. Otago Peninsula Roading Improvements. Macandrew Bay sea walls. Report to the New Zealand Historic Places Trust.
- Hamel, G.E. 2010c. Otago Peninsula Roading Improvements. Ohinetu sea walls. Report to the New Zealand Historic Places Trust.

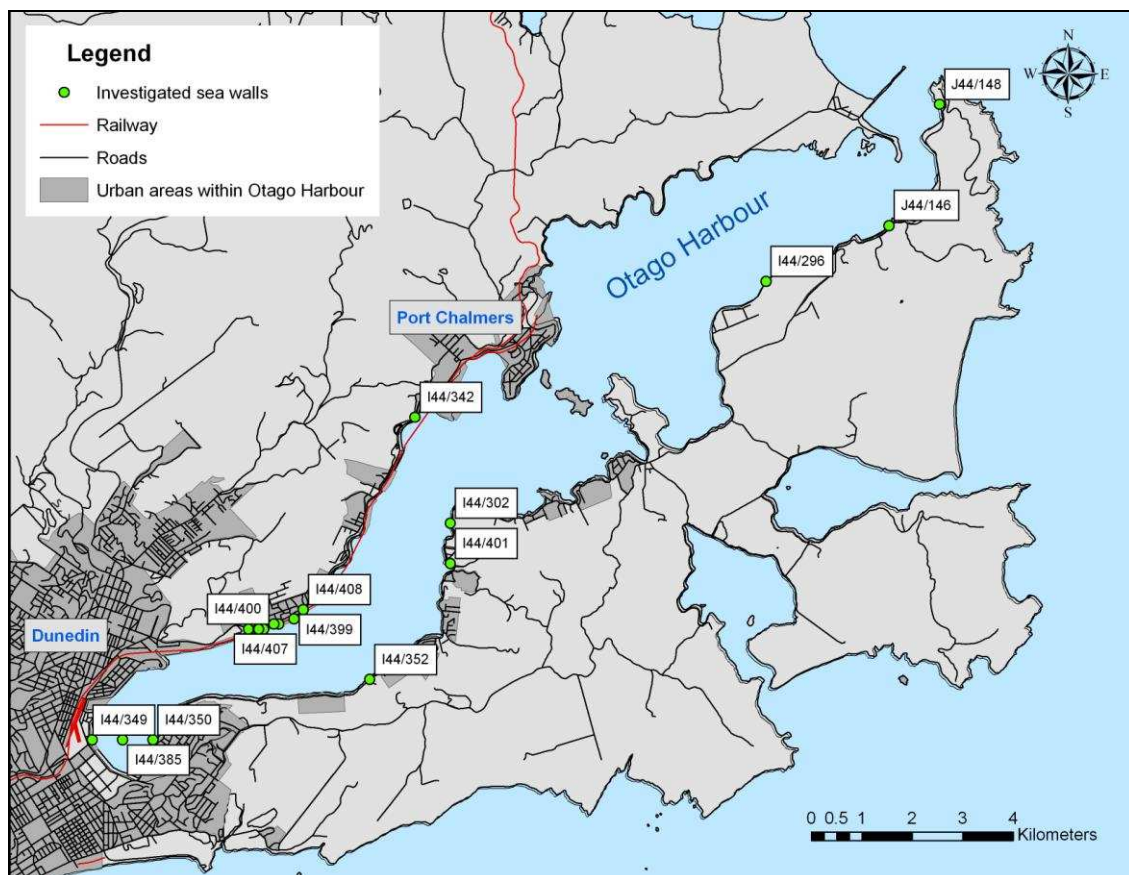


Figure 104: Location of archaeologically recorded sea walls and associated infrastructure.

Hamel's research carried out over a period of almost 25 years, has provided a considerable amount of information about the sea walls and has not only seen the 17 sites recorded in the NZAA site record scheme, but also the sea wall classified as a Category I Historic Place (register number: 4726). As Figure 104 shows, the sea walls and their related infrastructure have been archaeologically investigated on both sides of the harbour, offering insights into the construction of this unique site type. From Hamel's research the following construction techniques can be surmised.

The Otago Harbour sea walls were constructed to support the shoreline edge of the various roads that were built around the harbour from 1865 onwards (Hamel 2004c:4). These walls run from Andersons Bay to Harington Point, and from Ravensbourne to Te Ngaru, as well as along Peninsula Beach Road in Port Chalmers (ibid:3). Similar but more massive walls were also built to support the railway causeways from Ravensbourne to Roseneath (ibid:3). The sea walls themselves vary from around 1.5 to 3 metres in height, with a pitch of between 45 and 80 degrees, which is usually even from the base to the top (ORC 1991:32). The railway causeways are larger with a height of between 3 and 4 metres and a steeper pitch, typically of 60-70 degrees (ibid:32). To obtain a stable footing for the walls, a trench was dug 18 inches down into the foreshore with the heaviest stones available then placed along the base (ibid:32). The wall was then built up using angular rocks usually around 50-20 cm long and 10-20 cm high, which were backed by around 60 cm of smaller stone rubble (ibid:32). A range of rock types were used in construction of the sea walls, including basalts, tuffs and breccias. Wherever possible, the rocks were sourced from the cliffs adjacent to the shoreline where the wall was being constructed. However, as described by Hamel (2004c:51), when this was not possible, rock was obtained from the small quarries that lined the harbour; namely at Turnball Bay, on the end of the Portobello Peninsula, at Deborah Bay and at the east end of Dowling Bay. Interestingly, through Hamel's research it is apparent that the walls from the major construction periods of 1865-1900 and 1920-1940 differ from one another in distinctive ways. The sea walls from the earliest period, designated Cohort One by Hamel, are characterised as "very well built of trimmed rock, very carefully fitted and very smooth faced", while the 1920-1940 walls, Cohort Two, are "less well-fitted but relatively tight, often with dressed faces, and even faced with a straight pitch" (Hamel 2004:37, Hamel pers. comm. 2010). Hamel (ibid:37) also notes that although different from one another, each cohort constructed is uniform in

terms of rock source, colour and building style, also with rock size relatively consistent throughout.

In order to build on the information obtained from this archaeological study of the sea walls, it is also necessary to investigate the historical record relating to this unique site type.

THE HISTORY OF OTAGO HARBOUR SEA WALLS

In 1865, construction began on a dray road that would eventually stretch the 19.4 kilometres from Dunedin around the eastern edge of the harbour to Taiaroa Head (Hamel 2004a:1). Before this road, travel was by either by boat or along the beach during low tide using the foreshore as a path. The planned roadway comprised of a 14-foot-bench to be built around the cliffs along the foreshore, and edged with stone walling. Different sections of this road and it's associated walling were built concurrently along the eastern foreshore by local farmers and labourers on a tender system for the road boards (Hamel 2004c:51).



Figure 105: Wall built of trimmed breccia blocks by prisoners working on the fortifications at Taiaroa Head (photograph courtesy of Jill Hamel).

In the early 1870s, as work progressed prison labour, including Maori political prisoners from Taranaki, were brought in to supplement the other workers (ibid:10). One of the most notable achievements of this work was the construction of the Anderson Bay causeway which was built almost entirely with prison labour and, as described by Knight (1979:45), “knocked the best part of a mile off the lower road”. The work progressed steadily over the next few decades with the road and associated walling completed in the early 1890s (ORC 1991:31, Hamel 2004a:1).

The original dray track that wound its way from Port Chalmers to Dunedin was built high up on the hillsides above the harbour and, therefore, it was not until the construction of the Port Chalmers to Dunedin railway in the 1870s that sea walls were first built on the western side of the harbour. Beginning in early 1870, George Proudfoot’s contractors cut benches into the cliffs along the tidal edge of the harbour (McLintock 1949:537). This work extended from Dunedin to Blanket Bay and would provide the foundation on which the tracks could later be laid. In order to maintain a level track, and to avoid the steep unstable hillsides, the railway also required the construction of a number of causeways across the small bays and inlets of the harbour (Hamel 2004c:16). As with the road on the eastern side of the harbour, the railway was edged with stone walling, although the railway formations were much larger than the previously built roadways. Once completed in 1872, this railway added another 19 kilometres of sea wall to the total found around the harbour (ORC 1991:31).

In 1870 funds were raised to begin work on the formation of Beach Road from Port Chalmers to Aramoana (Hamel 2004c:17). Once again this work utilised prison labour, with the men being transported daily by train from Dunedin prison to the work site (ORC 1991:32). As described by Hamel (2004c:17), this work progressed steadily and by 1873 a fully benched road had been built half way across the back of Careys Bay. The use of prison labour on the Aramoana Beach Road continued until the mid 1880s when the road reached Te Ngaru (near Aramoana), its furthest extent on the western side of the harbour.

By the 1890s much of the Otago Harbour foreshore was ringed by roads and railways, supported by vast stretches of drystone sea walls. However, with the introduction of the automobile these roads were becoming increasingly inadequate and works were undertaken to widen and straighten the former dray roads (Hamel 2004c:12). The first of these remedial works dates to 1920 and involved the widening of Beach Road from

Andersons Bay to Portobello (ibid:12). Hamel (2004a:1) notes that during this work the original sea wall was removed, and the harbour edge of the road widened. Once this was completed, the sea wall was rebuilt on the outside of the now wider roadway using the blocks of masonry from the earlier formation. By the end of the 1920s this road had been widened all the way out to Taiaroa Head (ibid:1). A similar situation existed on the other side of the harbour along the road from Port Chalmers to Aramoana. In 1926 it was decided that this road would be widened and metalled, a job that involved “taking land to widen the carriageway, the building of a new stone wall and some reclamation” (Church & Philp 2008:61). This work continued into the 1930s and was bolstered by the labour of the unemployed who were put to work on the road as part of a Government-funded employment scheme (Hamel 2004c:19).



Figure 106: 1920s seawall built of slabby basalt later repaired in the 1950-70 period (photograph courtesy of Jill Hamel).

During this time, an altogether larger project was being undertaken on the stretch of sea wall that ran from Dunedin to Port Chalmers. As early as the 1890s, it was decided that the railway was to be shifted from its current formation out onto causeways located further out on the tidal flats (Hamel 2004c:16). This had the advantage of providing a straighter and

less steep route for the trains and would also allow a new road to be built along the old railway corridor. Work progressed slowly and it was not until 1925 that the Dunedin to Ravensbourne section of the rail causeway was completed, and eventually the Ravensbourne to St Leonards section by 1931 (ibid:16). With the outbreak of the Second World War, work on the Blanket Bay causeway and the tunnel under Roseneath had to be abandoned and this section was not completed until 1948 (ORC 1991:31). With the completion of the new railway the Dunedin-Port Chalmers road was realigned along the old railway embankment (ibid:32). The larger width required for the new road meant that, in places, substantial lengths of the original 1870s railway were buried under the new formations. As a result of this changed alignment, new sea walls had to be constructed to support the new roadway and this added considerable length to those which had been built previously (Hamel 2008a:2).

The realignment of the Port Chalmers to Dunedin railway and the building of the new Dunedin to Port Chalmers highway in the late 1940s were the last major episodes of “Cohort Two” sea wall construction in Otago Harbour. However, since this time, considerable lengths of the sea wall throughout the harbour have undergone repair. Unfortunately, the quality of these repairs over a period of between 30 and 40 years has been extremely variable, ranging from the careful reconstruction of the wall, through to the dumping of demolition material on top of the damaged sections (Hamel 2004c:24). Public concern over this practice has seen a move towards repairing the walls by hand, and since the early 1990s, long sections of the wall have been repaired and rebuilt using Blackhead honeycomb. This “Third Cohort” of construction began initially as repairs to the second cohort wall along the road edges, but from the summer of 1999-2000 progressed to include sections of road widening. Once this work has been completed on both sides of the harbour, 75 % of the walls will belong to the third cohort, providing the latest evolution of the Otago Harbour sea wall (Hamel pers. comm. 2011).

CONCLUSION

The reclamation of considerable areas of the foreshore, combined with the building of vast sea walls, has played a significant role in the creation of the maritime cultural landscape of Otago Harbour. This anthropogenic change, evidenced in both the archaeological and historical record, has significantly altered the harbour, with these sites

becoming some of the most massive and highly visible components of the marine environment. Such investigations of these reclamations and sea walls, provides a broader understanding of how people modified their environment to meet their needs and how these sites relate to each other as components of the larger maritime cultural landscape.

7.

DISCUSSION

By combining the archaeological and historical records of Otago Harbour into the seven themes discussed in the previous chapter, the maritime cultural landscape of the harbour has been revealed. This research has shown the validity of using such a landscape approach to investigate the interactions between people and the marine environment, offering considerable insights into this unique but hugely important area of our past. In order to fully understand the maritime cultural landscape of Otago Harbour it is necessary to investigate and evaluate both the archaeological and historical records utilised in its creation. In addition, by comparing the work contained in this thesis with that undertaken both nationally and internationally, the maritime cultural landscape of Otago Harbour can be understood in relation to the other harbours of New Zealand and also to seminal studies of maritime cultural landscapes undertaken abroad. A final point of discussion in this chapter is the role of the maritime cultural landscape approach in heritage management and the possibilities that this thesis presents for the protection and management of archaeological sites in Otago Harbour.

EVALUATION OF THE ARCHAEOLOGY

This investigation of the maritime cultural landscape of Otago Harbour began with the 124 archaeological sites with maritime associations that were recorded in the NZAA site record for the harbour and which represent 23 different site types (Table 8). These archaeological sites, as components of the maritime cultural landscape, have revealed much

about the lifeways of the past inhabitants of the harbour. As the primary evidence in the thematic research sections of this thesis, these 124 archaeological sites reveal not only the great time depth and importance of such coastal activities, but also the multitude of ways in which the inhabitants of the harbour have interacted with the marine environment to form the maritime cultural landscape that is evident today.

Table 8: Different types of archaeological sites with maritime associations recorded in the NZAA site record for Otago Harbour.

Site Type	Number
Artillery Battery	1
Bond Store	1
Customs House	1
Fort	1
Hulk	8
Jetty	3
Landing place	1
Lime Burning	1
Midden	51
Pa	1
Quarantine Station	3
Reclamation	6
Rifle Butts	1
Sea wall	19
Settlement	11
Shipwreck	2
Signal Flagpole	1
Slipway	2
Stone Ramps	6
Torpedo Boat Mole	1
Warehouse	1
Whaling station	1
WWII Trench	1

The research outlined in the thematic narrative chapter reveals a number of interesting factors about the archaeological sites with maritime associations which are recorded in the NZAA site recording scheme for Otago Harbour. Firstly, the majority of these sites are from the Archaic and Classic Phases of occupation as opposed to the more recent Protohistoric and Colonial periods. This bias towards prehistoric sites is contrary to that which should be expected from the information revealed in the previous chapter; which describes a landscape that has been intensely modified, especially since the arrival of Europeans in the protohistoric period. An explanation for this bias can be seen in the type of archaeological research that has been undertaken in the Coastal Otago region during the last century. Early archaeological investigations such as the work of Teviotdale (1939) Lockerbie (1940) and Skinner (1959) concentrated on Archaic and Classic archaeological sites such as Tarewai Point, Kings Rock and Murdering Beach and set the foundation for other studies of prehistoric sites in the region. The investigation of such sites continued throughout the twentieth century and was joined in the 1970s by historical archaeology which was becoming accepted as a valid form of archaeological inquiry (Smith 1990). In terms of Otago Harbour, the excavation of the Weller's Whaling station by Matthew Campbell in 1992 was the first large-scale historical archaeological project undertaken and contributed to the popularity of the approach in the region (Campbell 1994). Since 1995, site assessment and monitoring of earthworks by private archaeological consultants has surpassed traditional archaeological research as the method of recording new archaeological sites (Smith 2004b). In Otago such contract archaeology has been based predominantly on historical sites and as a result, many more historic than prehistoric sites have been added to the NZAA site record over the last two decades (<http://www.archsite.org.nz>). However, the majority of the historic sites that have been investigated are within urban and rural environments and, as such, this work has added little to the inventory of sites with maritime associations. From this overview it is apparent that for the majority of the time that archaeology has been practised in Otago it has concentrated on the investigation of Archaic and Classic sites and despite a rise in the popularity of historical archaeology, there is still a bias towards prehistoric sites recorded in the NZAA site record for Otago Harbour.

Another interesting pattern seen in the previous chapter is the types of historic archaeological sites that have been recorded. Typically, historic archaeological sites with maritime associations that are recorded in the NZAA site record for Otago Harbour are

highly visible and largely intact, for example Fort Taiaroa, the various hulks, Isbisters Slipway and the Torpedo Boat Mole. These sites have been recorded not as part of a systematic research process, but in an ad hoc manner in which the ‘best’ sites have been selected and recorded while the vast majority of less glamorous sites are ignored. As a result, the historical archaeological sites recorded in Otago Harbour must be viewed as representing only a selective range of past interactions between the harbour’s inhabitants and the marine environment.

The research contained in this thesis has revealed the incomplete nature of the recording of sites with maritime associations within the NZAA site recording scheme for Otago Harbour. Prior to this study there were 124 NZAA archaeological sites with maritime associations recorded in Otago Harbour. However, from the research described in the previous two chapters it is evident that there are a large number of sites of archaeological interest that are not recorded in the NZAA site recording scheme. Through the investigation of local histories, historic maps and photographs this thesis has identified an additional 309 sites relating to the interactions between people and the marine environment of Otago Harbour (Figure 107). These sites (Appendix 2) range from small wooden jetties to massive stone dry docks and cover a wide range of activities undertaken by the people of the harbour. In addition to the 309 sites identified above, the archaeological survey component of this thesis found 25 previously unrecorded sites of archaeological interest, which were identified, photographed and recorded. This survey covered a length of foreshore some 19 kilometres long and incorporated areas with both high and low densities of recorded maritime activities. In contrast to the historical archaeological sites described previously, these sites of archaeological interest were found during a systematic survey that recorded all archaeological evidence within the foreshore of the survey area, not just those sites which were highly visible and intact. The results of this survey suggest that if the survey was to be expanded to the other areas of the harbour it is highly likely that additional unrecorded sites would be found, with the potential to add significantly to our archaeological knowledge of the harbour. Collectively, the investigation of the historical record and the archaeological survey of the harbour uncovered an additional 335 sites of interaction between people and the marine environment. The sheer number, and diverse range, of these unrecorded sites means that they have made a vital contribution to the thematic synthesis of the maritime cultural landscape of Otago Harbour described in the previous chapter. It is clear that

without the inclusion of these sites any understanding of the interaction between the inhabitants of the harbour and the marine environment would be woefully incomplete.

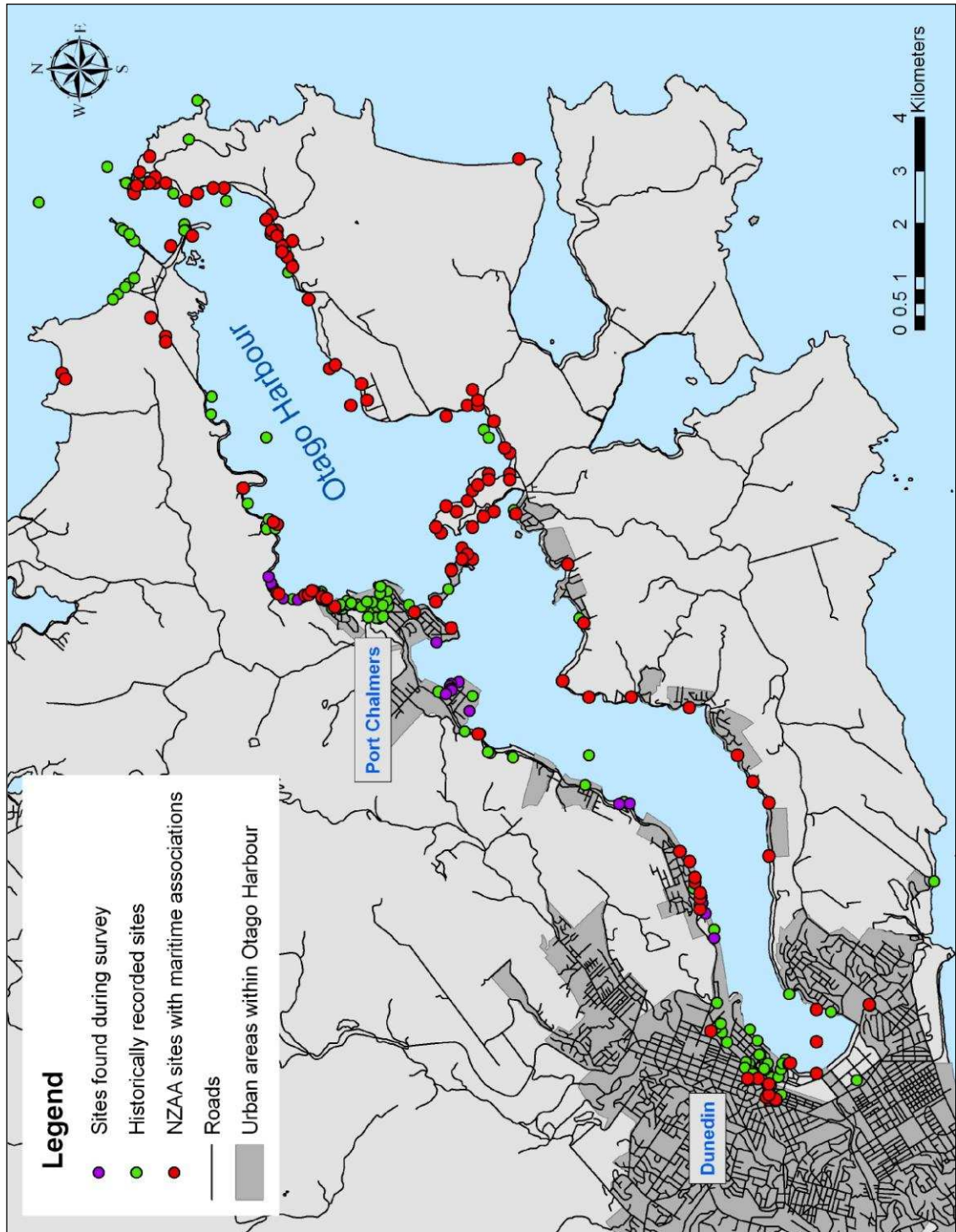


Figure 107: Map of Otago Harbour showing the inventory of sites with maritime associations identified in the present study.

DISTRIBUTION OF RECORDED ARCHAEOLOGICAL SITES

Throughout its history Otago Harbour has been significantly modified by both natural and anthropogenic forces. This evolution of the harbour has played a major part in shaping the distribution of archaeological sites with maritime associations which have been recorded within the harbour (Figure 108) (Appendix 1).

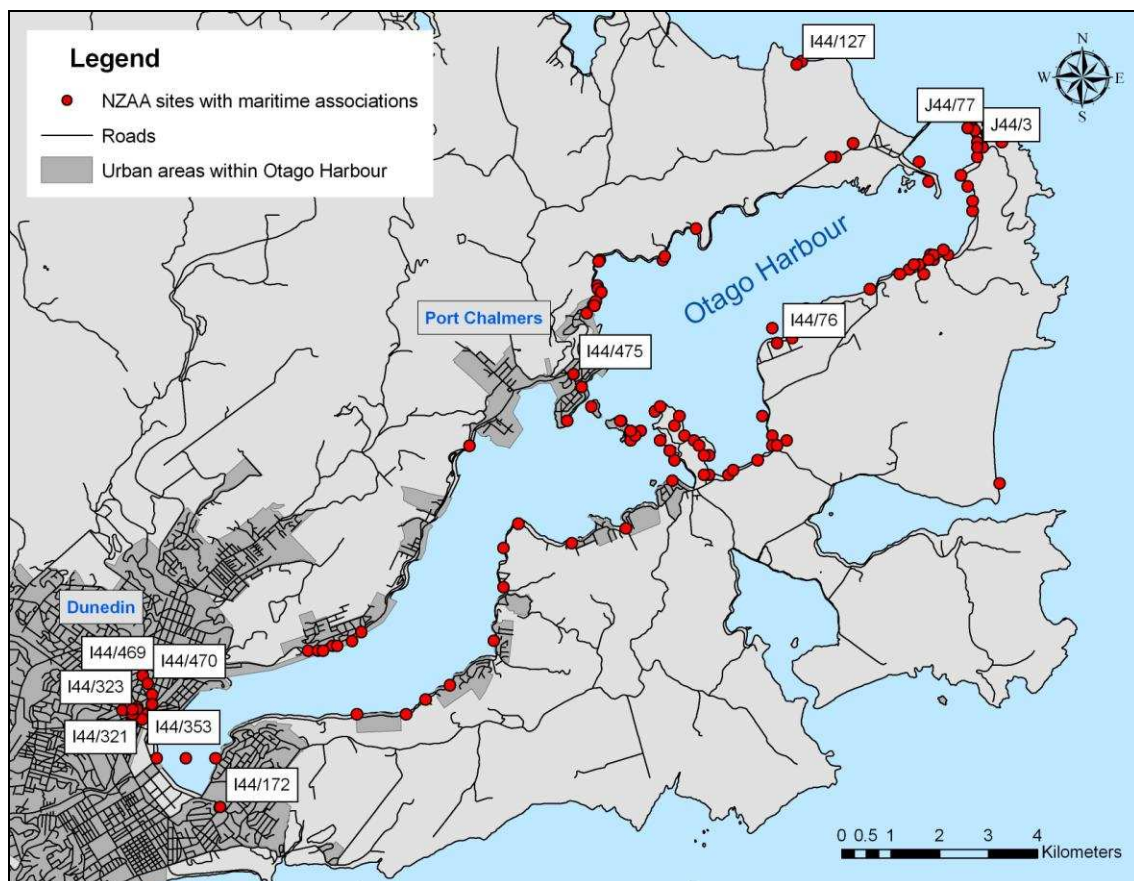


Figure 108: Map of Otago Harbour showing previously recorded NZAA archaeological sites with maritime associations and sites mentioned in text.

The natural attributes of the harbour presented its' inhabitants with many opportunities such as resource exploitation and settlement, and these interactions with the marine environment are evidenced in the archaeological record today. The earliest arrivals to the harbour built their settlements in close proximity to the foreshore providing ready access to marine food resources and also the harbour itself which facilitated waterborne transport (sites I44/76, I44/127, I44/172, J44/3 and J44/77). The arrival of Europeans saw a demand for deep water and flat land and subsequent settlements grew along the edge of the

harbour, particularly around Port Chalmers and Dunedin (sites I44/321, I44/323, I44/353 I44/469, I44/470 and I44/475). However, as described in the previous chapter, the reclamation of the harbour and building of various sea walls drastically altered the shape of the harbour and it is these anthropogenic changes that have played the greatest role in shaping the distribution of archaeological sites with maritime associations that have been recorded. The first reclamation project in the harbour began in 1862 and over the next 115 years, more than 850 acres of foreshore was reclaimed (Thompson 1945:122, McLean 1985:200). Each subsequent reclamation pushed the edge of the foreshore further into the harbour, burying the previous shoreline and the structures that had been built upon it. As a result, unlike the more visible and more easily recorded archaeological sites around the harbour, the locations of many of these early sites remain unknown. Thus, until they are found, typically by chance during earthworks, they remain unrecorded. The building of sea walls around the edge of the harbour from 1865 to 1948 had a similar effect as the reclamations. Many of the sites that were built along the foreshore prior to the construction of the sea walls would have been either destroyed or buried beneath these extensive construction projects. When we consider that the sea walls and associated roading cover over 40 kilometres of the harbour foreshore and are at least the width of a double lane road, a significant proportion of the harbour is affected and undoubtedly underrepresented in terms of archaeological sites recorded in the NZAA site recording scheme.

The distribution of recorded archaeological sites within Otago Harbour is also a product of the recording bias mentioned previously. As is apparent in Figure 108 the archaeological sites recorded within Otago Harbour tend to cluster around particular areas such as Dunedin, Port Chalmers, Portobello and Otakou, simply because these are the areas that have been investigated most intensively. In comparison to these areas, the stretch of foreshore on the south east side of the harbour from Vauxhall to Macandrew Bay has virtually no recorded sites as very little archaeological work has been done in this area. Such gaps in the archaeological data reflect the significant potential for archaeological research in Otago Harbour and it is to this potential that we now turn.

ARCHAEOLOGICAL POTENTIAL OF OTAGO HARBOUR

The great time depth of occupation and the intensive interaction between people and the marine environment means that the archaeological potential of Otago Harbour is practically limitless. As described above, prior to this thesis there were 124 archaeological sites with maritime associations recorded in the NZAA site record for the harbour. Interestingly, only 36 of these sites have been investigated in any detail while archaeological information about the other 88 sites is typically limited to its location and a brief description of the site, if at all (e.g. Figure 109).

SITE REFERENCE FORM		SITE NUMBER S.164/38	
Map number S.164 Map name Dunedin Grid reference 277765		SITE TYPE Occupation	
1. Aids to relocation of site E 427700 N276500		100' S.S.L.	
2. State of site; possibility of damage or destruction			
3. Owner Address Attitude		Tenant Address Attitude	
4. Name of site Source of name			
5. Date recorded		Details of investigation; methods and equipment used	
6. Aerial photograph numbers		Site shows: clearly/badly/not at all	
7. Reported by H. Knight Public Hospital Dunedin		Filekeeper S. Park, Otago Museum Dunedin	
Date		Date 11.9.68.	

Figure 109: NZAA site record form of site I44/38.

This discrepancy presents an opportunity for research to be undertaken on these 88 sites for which so little is currently known. Such research could provide background information as to how and when a site was formed, a detailed description of the site including sketch maps, and an assessment of its state of preservation and any likely causes of future damage. By gathering this basic information our understanding of these sites

would be greatly increased and the sites themselves would be of much greater value for archaeological research.

The archaeological survey described in Chapter Five of this thesis revealed the utility of a systematic survey of the foreshore to locate previously unrecorded archaeological sites with maritime associations. As is typically the nature of such an archaeological survey, the limited time available within which to conduct the survey meant that located sites were only briefly described and photographed before moving on to the next site. From this work it was apparent that a number of these sites contained information that would benefit from more intensive forms of archaeological investigation. Such investigation may include the detailed recording of surface features using a total station and even the excavation of parts of sites or even in their entirety.

The 309 sites of interaction between people and the marine environment identified during the research for the ‘themes in the maritime cultural landscape’ chapter of this thesis also present considerable opportunities for archaeological research. The locating and detailed description of these sites would pave the way for their investigation using archaeological methods, which would greatly add to our understanding of the many ways in which people interacted with the marine environment. Investigation of these sites would also significantly increase the number of archaeological sites with maritime association in the NZAA site record database for Otago Harbour.

Research into the themes in the maritime cultural landscape of Otago Harbour, described under several sections in the thesis, has revealed areas in which the potential for future archaeological investigation is readily apparent. In terms of marine resource exploitation, archaeology has revealed much about these practices during the prehistoric occupation of the harbour. Conversely, archaeology’s contribution to our understanding of fishing and shell fishing in the harbour during the historic period has been negligible, thus presenting significant opportunities for archaeological research. One particularly interesting area of research would be the archaeological investigation of one of the numerous fish curing works that operated around the harbour. Such research would provide insights into one of the major industries of the historic period allowing comparison to be made between sites within Otago Harbour and those found in other harbours throughout the New Zealand.

No navigational aids have been investigated archaeologically within Otago Harbour and, as such, this site type offers considerable archaeological potential. Of interest would be

an archaeological investigation of the pilot station at Taiaroa Head, which is recorded historically but not archaeologically, and which has the potential to provide information about this essential service. Another site of interest is the Aramoana Mole which, through archaeological investigation, has the potential to reveal insights into the construction and maintenance of this important piece of marine infrastructure.

Within Otago Harbour, two landing places have been investigated archaeologically: the Jetty Street Jetty (site no. I44/468; Hamel 2009, 2008-a) and the wharf bulkhead found at Countdown (site no. I44/397; Hamel 2008-b). Investigation of these sites revealed considerable information relating to the construction and use of these wharves and also their relationship with the reclamation processes along this stretch of shoreline. Both of these sites were investigated in a terrestrial context and as such, there exists the potential to compare the results from these terrestrial investigations to those from an underwater investigation of one of the many jetties that are found around the harbour. Such an investigation would also allow comparisons to be made with investigations of piers and jetties that have been conducted overseas (e.g. Barnard 2008).

The abandonment of watercraft is a notable component of the archaeological record of Otago Harbour with 38 such vessels recorded within the harbour. The archaeological potential of these vessels is remarkably high, offering insights into not only propulsion and shipbuilding technologies from the 19th and 20th centuries but also the diversity of craft that plied the harbour and its surrounds. Such archaeological investigation would facilitate the comparison and contrast of abandonment processes in relation to other ships graveyards around New Zealand and also with such work undertaken internationally (e.g. Richards 2008).

Unique insights into the archaeological remains of a small-scale shipbuilding and repair business in Otago Harbour comes from an investigation of Isbister's slipway (site I44 297) by Joss Debreceeny. This work has provided a solid base on which future archaeological studies of shipbuilding and repair within Otago Harbour can be built upon. In Australia, the archaeological study of Colonial shipbuilding has been a major area of research within the field of maritime archaeology (see Coroneos 1991, Bullers 2006, and O'Reilly 2007). This research has provided a great deal of information about the construction of early Australian built wooden sailing vessels and the role of shipbuilding in Colonial society. Like Australia, the archaeological investigation of shipbuilding yards

around Otago Harbour has the potential to significantly increase our understanding of this formative industry and could include the investigations of both small-scale and industrial shipbuilding yards from around the harbour.

Maritime archaeological investigations of shipwrecks from around the world have shown the enormous potential that this site type has for contributing to our understanding of the past. Despite such value, none of the 19 shipwreck sites in Otago Harbour have ever been investigated archaeologically. This presents considerable opportunity for archaeological research, as even small-scale projects have the potential to reveal much about these sites; such information can range from how the ships were constructed to what the lives of the people who sailed aboard them were like. Archaeological investigation of these wrecks could range from non-disturbance mapping to full excavation, with each step providing previously unknown information about the shipwreck resource of Otago Harbour.

The practice of warfare and defence in Otago Harbour is represented by a number of archaeological sites dating from ca.1650 AD to the 1940s. Significant potential for future archaeological research exists for these sites, especially in relation to the submarine mining station associated with the torpedo boat mole (site I44/340) and the site of ‘the beautiful city of Otago’ that was burnt by Kelly in 1817, in the vicinity of site J44/144 on Te Rauone Beach. Investigation of the submarine mining station would complement work currently being undertaken in Australia by PhD student James Hunter (2009), who is investigating the responses of the Australian and New Zealand Colonial Governments to the perceived Russian threat in the late 1800s. An archaeological investigation of Te Rauone Beach also has significant potential, as the rapid build up of sand in the area has buried all of the archaeological remains along the beach - possibly including the site of Kelly’s retribution. Thus there is a unique opportunity to resolve the debate over the actual location of this site.

As described in the previous chapter, the various reclamations and seawalls throughout the harbour have been the subject of a number of archaeological investigations. These investigations have revealed much about these sites and have also opened up new areas for further study. In terms of reclamations, all six of the sites that have been investigated archaeologically are within the vicinity of the city of Dunedin (Figure 99). As such, the archaeological excavation of reclamations in other areas of the harbour, such as Ravensbourne and Port Chalmers, would enable comparisons to be made between the different reclamations. Such an investigation would provide a great deal of information

about the methods of reclamation used in different areas of the harbour over time and the significant changes such reclamations have had on the surrounding foreshore. The considerable areas of reclamation around the harbour also provide significant potential for archaeological research in terms of the numerous archaeological sites that remain buried under reclamations along the earlier shorelines. As shown by previous excavations, the archaeological material buried under the reclamations can be amazingly well preserved due to the anaerobic conditions. As such, these buried sites have the potential to provide enormous amounts of archaeological information in the form of artefacts, features and structures that would further our understanding about the lives of those who lived and worked in these areas of the harbour. Although a considerable amount of archaeological research has already been undertaken on the various sea walls around the harbour, there is still significant potential for future studies. Such work could involve archival research combined with the precise recording and excavation of different sections of the seawall to investigate the changes in construction technique and materials over time (Hamel pers. comm. 2011).

From the investigations described in the previous chapters and the discussion above, it is readily apparent that the archaeological record of Otago Harbour provides a unique form of evidence into the multitude of ways in which the inhabitants of the harbour have interacted with the marine environment over time. The potential for further archaeological research in the harbour is enormous; such research will not only increase the number of recorded archaeological sites but will also greatly enhance our understanding of the ways in which people shaped, and were shaped, by the marine environment to form the maritime cultural landscape in which we interact today.

EVALUATION OF THE HISTORICAL RECORD

This investigation of the maritime cultural landscape of Otago Harbour has revealed a number of interesting factors about the relationship between the archaeological and historical records of the harbour. During the background research for Chapter Six, it became apparent that the information gained from the archaeological investigations that had been undertaken throughout the harbour did not comprehensively cover all of the themes pertinent to this thesis. Although archaeology was the preferred source material, it was clear that the archaeological information would have to be supplemented in part by the historical

record. This was achieved through the investigation of a number of historical sources which, when combined with the archaeology provided a historical archaeological perspective, to create a thematic narrative charting the formation and evolution of the maritime cultural landscape over time.

One of the strengths of historical archaeology is its ability to test and revise the historical record. Creation of the thematic narrative in Chapter Six involved the consultation of a considerable number of historical sources. Interestingly, the vast majority of these histories date to the last century and although well written and researched for their time, they have typically been written as supplements to earlier histories as more information has become available (e.g. Bowman 1948, McLintock 1951, Olssen 1984). At times this has led to secondary information being used almost verbatim and, as such, this offers considerable scope for testing the historical record using the archaeological record as the primary data.

From historical sources 309 sites with maritime associations are recorded as existing at one time or another around the harbour (Figure 110).

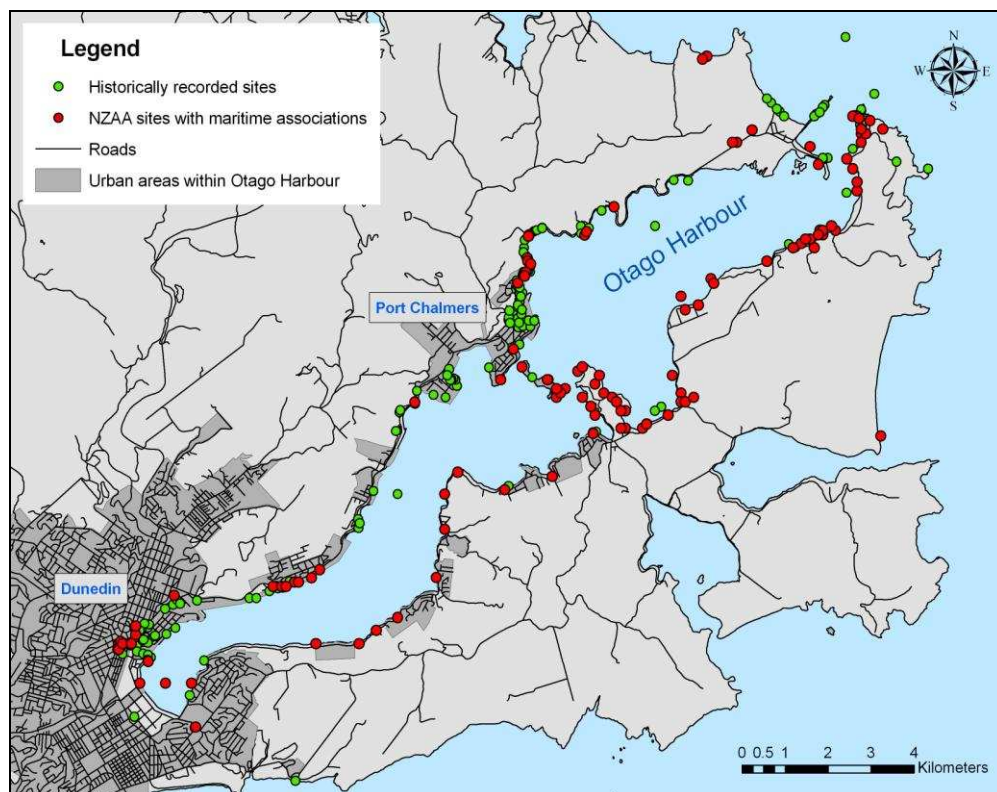


Figure 110: Map showing historically recorded sites with maritime associations and NZAA recorded sites in Otago Harbour.

These sites as components of the archaeological record potentially contain a huge amount of information relating to the interaction between humans and the marine environment. However, it was also evident that investigations of this archaeological record have only started to scratch the surface of this potential.

From the results of this thesis it is evident that when combined the historical and archaeological record of the harbour can be utilised to great effect to provide significant insights into the past. In addition, the considerable number of historical sources relating to the harbour provides the opportunity for archaeological research to investigate and interrogate the historical record providing us with a greater and more accurate view of the maritime cultural landscape.

NATIONAL AND INTERNATIONAL COMPARISONS

The research contained in this thesis has revealed a great deal of information about the ways in which the people of Otago Harbour have interacted with the marine environment through time. The investigation of the various themes in the previous chapter has provided insights into the specific kinds of activities the inhabitants of the harbour were engaged in and, when combined these themes have provided a holistic understanding of the maritime cultural landscape of Otago Harbour. While conducting this research it became apparent that the themes investigated in the previous chapter were equally applicable to other harbours around the country and that such a landscape approach could significantly increase our understanding about the ways in which past peoples have interacted with their marine environment. However, with the exception of the current investigation of Otago Harbour and Katharine Watson's (2004) archaeological assessment of the Oamaru Harbour, there have been no investigations of maritime cultural landscapes undertaken in any of the major harbours of New Zealand.

Regarding Lyttelton Harbour, another influential South Island port, a total of 86 archaeological sites with maritime associations have been recorded in the NZAA site recording scheme (<http://www.archsite.org.nz>). However as with Otago Harbour, neither the regional council nor the Historic Places Trust have established systematic surveys for Lyttelton Harbour and, as such, these sites have been recorded in an ad hoc manner, typically with only the most visible and intact sites recorded. The result of this passive management also means that although a number of archaeological sites with maritime

associations have been investigated archaeologically, no official inventory of such sites exists for Lyttelton Harbour (Katharine Watson pers. comm. 2011). Such lack of recognition of marine related archaeological sites was shown clearly in 2009 when the Historic Places Trust registered Lyttelton Township as a Historic Area but failed to include the port area for assessment, thus excluding it from registration (NZHPT 2009:7).

Like Otago and Lyttelton Harbours, Wellington Harbour has not been systematically surveyed for maritime sites nor has an official inventory of such sites been created by the Wellington Regional Council or the Historic Places Trust (Mary O’Keefe pers. comm. 2011). Although a search of the NZAA site record database shows that 130 archaeological sites with maritime associations have been recorded in the NZAA site recording scheme for Wellington Harbour, few of these sites have been investigated archaeologically in any detail (<http://www.archsite.org.nz>). The Wellington Regional Council has composed lists of sites with corresponding significance statements for regional parks, including the East Harbour Regional Park, but include only land-based sites and completely overlook maritime sites (Mary O’Keefe pers. comm. 2011). Interestingly, the Maritime Archaeological Association of New Zealand (MAANZ) has created an unofficial inventory of shipwreck sites located in the Wellington area, thus providing a useful resource for researchers and the public alike, while also alluding to the significant potential that such an inventory has for heritage management.

In contrast to the other statutory organisations around the country, the Auckland Regional Council (ARC) has shown its initiative by undertaking systematic surveys of the coastline under its jurisdiction, while also to creating an inventory of sites recorded in the coastal environment. As described by Brassey (2010:2), in 1994 there were 1,041 places with maritime associations recorded in the ARC’s Cultural Heritage Inventory (CHI). However, at this time only 1% of the regions coastline had been systematically surveyed and this was deemed an inadequate basis for implementing the ARC’s objectives and policies (ibid:2). In 2000 the ARC responded by establishing a programme involving systematic area surveys of the coastline, thematic studies of particular types of marine heritage places and targeted searches for sites that were deemed of high significance. Between 2000 and 2010 fieldwork was undertaken each summer, which resulted in the inspection of hundreds of kilometres of coastline and the recording of 1300 new sites within the coastal environment. As of September 2010, a total of 2584 sites with maritime

associations have now been recorded in the ARC's cultural heritage inventory (Rachel Ford pers. comm. 2011).

Clearly the systematic survey of areas containing archaeological sites with maritime associations and the compilation of inventories of such sites has not been a priority for the majority of statutory authorities throughout New Zealand. The previous two chapters of this thesis and the work done by the ARC have shown that through both historical research and systematic survey, the number of archaeological sites with maritime associations recorded in a specific area greatly increases, thus reflecting the necessity of such work for both Lyttelton and Wellington Harbours. This thesis has also shown the considerable potential a landscape approach holds for the investigation of such locations and its ability to provide insights into the different ways in which people have interacted with the marine environment over time.

On an international stage the investigation of maritime cultural landscapes has proven a highly useful and popular way of exploring human society. As described previously, the work of McErlean et al (2002) is recognised as the seminal text in maritime cultural landscape studies. This work has become the benchmark for such investigations and although Strangford Lough and Otago Harbour differ both geographically and archaeologically, it is still pertinent to compare the results of this thesis with their work. The investigation of the maritime cultural landscape of Strangford Lough was a large-scale project involving a number of researchers who undertook a comprehensive survey and description of sites and places within the Lough over a five year period. The results of this survey were discussed in relation to a number of themes, including fish and fishing, ports and towns, landing places, navigation and pilotage, and shipwrecks and marine casualties. By discussing individual sites as components of a broader theme the context of each site as part of the larger maritime cultural landscape could be readily understood. In addition, the investigation of such a diverse range of themes allowed the authors to gain a holistic understanding of the ways in which inhabitants of the Lough interacted with the marine environment in which they lived.

In contrast to the Strangford Lough study, this investigation of the maritime cultural landscape of Otago Harbour was on a smaller scale involving a single researcher and only the period of time required to complete this thesis. Despite these differences, systematic survey and the description of sites and places were also a vital component of the current

study. The quality of the Strangford Lough investigation supported the use of a similar structure for this publication and as such, individual sites from around the harbour were considered together and their combined relationships examined within a number of selected themes, including those discussed in the Strangford Lough investigation. In addition to those themes discussed by McErlean et al. (2002), a number of others were selected for this study that were specific to the archaeology and history of Otago Harbour; namely shipbuilding and repair, hulks and abandoned watercraft, harbour warfare and defence, and anthropogenic change to the harbour itself. Investigation of these additional themes allowed the incorporation of the many forms of specific interaction between the people and the marine environment of Otago Harbour providing insights into the unique nature of the maritime cultural landscape of this harbour. As with the work in Strangford Lough, the study of the maritime cultural landscape of Otago Harbour has revealed a picture of just how central this environment was to the lives of those who lived upon its shores. By investigating the archaeology of the harbour through the themes of marine resource exploitation, navigation and landing places, hulks and abandoned watercraft, shipbuilding and repair, shipwrecks, harbour warfare and defence and anthropogenic change, this thesis has illustrated the dynamic nature of the interaction between past peoples and the marine environment. In this way, maritime cultural landscape studies have provided a highly useful framework for investigating the ways in which our ancestors shaped and were shaped by the marine environment regardless of whether they were in the North of Ireland or the South of New Zealand.

MARITIME CULTURAL LANDSCAPES AND CULTURAL HERITAGE MANAGEMENT

The theoretical framework of a ‘maritime cultural landscape’ was initially developed as a heritage management tool that would allow the remnants of maritime culture, both on land and underwater, to be investigated and understood in a holistic way. The development and use of this approach by Christopher Westerdahl (1992) during the maritime archaeological survey of the Coast of Swedish Norrland showed the potential of this approach for heritage management. From these beginnings, maritime cultural landscapes have been utilised as heritage management tools in a number of places around the globe including the United States of America (Vrana & Vander Stoep 2003), England

(Aberg & Lewis 2000), Australia (Kenderdine 1993) and Ireland (McErlean et al. 2002). As demonstrated in each of these studies one of the major contributions of the maritime cultural landscape approach to heritage management is the requirement for the creation of an inventory of sites within the study area. In the present study, the creation of an inventory of sites with maritime associations in Otago Harbour involved the accessing of the NZAA site record database of sites within the harbour, considerable archival research, and the systematic survey of a 19 km length of shoreline. From this research an inventory of 458 sites with maritime associations was produced, 124 from the NZAA site recording scheme, 309 from historical research and 25 sites recorded during the survey of the foreshore (Figure 107). The creation of such an inventory of sites is one of the most fundamental components of any heritage management programme (ICOMOS 1990). Armed with information about the number and type of sites within a given area, heritage managers are better able to understand the archaeological resource they are ultimately responsible for. The archaeological inventory of sites with maritime associations resulting from the present study will be made available to the NZHPT, the Otago Regional Council and also the Dunedin City Council. Dissemination of this information to such organisations will substantially increase their knowledge of sites with maritime associations located throughout the harbour and will allow informed decisions to be made, which will ultimately affect the protection, or otherwise, of this important non-renewable resource.

From the investigation of maritime cultural landscape studies conducted overseas it is readily apparent that sites with maritime associations are not distributed evenly throughout the landscape rather they instead tend to cluster around particular locales, such as ports and anchorages (e.g. Westerdahl (1994), McErlean et al. (2002:212-305). From the sites discussed in Chapter Six this pattern is also clearly evident in Otago Harbour with sites clustering around Dunedin, Port Chalmers, Portobello, Otakou and the entrance to the harbour (Figure 111). Such clustering presents an opportunity to create predictive models from which the management of this heritage resource may benefit. Although a considerable number of sites have been recorded in the inventory created from this study, there are undoubtedly numerous sites with maritime associations for which there is currently no record. As with recorded sites, these unknown sites are highly likely to cluster around these areas with high concentrations of sites and as such, heritage managers need to be aware of this patterning when approving any potentially damaging activities in these areas of known

and predicted sites. One such tool that heritage managers could utilise to deal with this issue is to designate these five areas as of ‘high archaeological interest’. Such a designation would allow heritage managers to administer these areas more effectively under the Historic Places Act 1993, which requires an authority be obtained “to destroy, damage or modify an archaeological site”. Any earthworks in the environs of these areas whether in the vicinity of a recorded site or not, would automatically require investigation by an archaeologist, thus ensuring these unknown sites are either protected from destruction or recorded archaeologically for posterity.

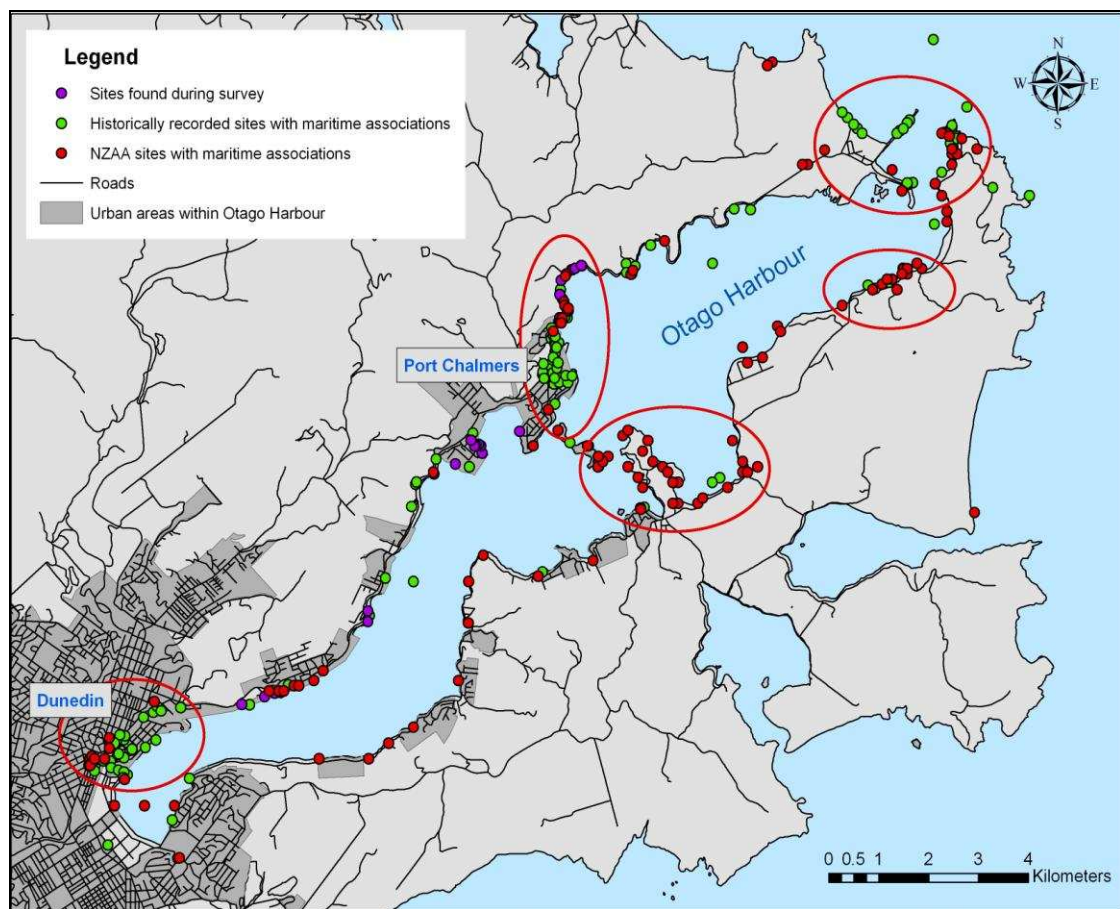


Figure 111: Map of Otago Harbour showing clustering of archaeological sites around Dunedin and Port Chalmers.

In addition to these five areas, this thesis has revealed the high archaeological value of sites that have been buried through the processes of reclamation and the building of sea walls. Typically earthworks on these sites have been archaeologically monitored but by also designating them as of ‘high archaeological interest’ these sites may be afforded a greater

level of protection ensuring that their significance is recognised by all levels of heritage management.

The work of archaeologists such as Westerdahl (1992, 1994), Kenderdine (1993) and McErlean et al. (2002) has encouraged heritage managers to view the archaeological resource at a broad level and thus to utilise a landscape approach in their management of maritime cultural resources. The advantage of this approach is that individual sites are recognised as components of the larger cultural landscape and, as such, their significance is much greater than when each is viewed in isolation (Kenderdine 1993). Regarding Otago Harbour the management of sites with maritime association currently occurs in an ad hoc manner with the NZHPT, Otago Regional Council and Dunedin City Council each with overlapping responsibilities for the management of the resource. However as described by Carter (2006), apart from scheduling a small number of significant archaeological sites, these organisations passively manage - almost to the extent of ignoring - the vast majority of sites with maritime associations within the harbour. In contrast to this 'management', the present study investigated the many different types of sites associated with the marine environment as components of the maritime cultural landscape. In this way, sites with maritime associations, whether they are scatters of historic artefacts or sites of prehistoric occupation are viewed holistically and as a result their significance relates not simply to the site themselves but to their relationship with each of the other sites, which collectively make up the maritime cultural landscape. In this way, the present study has provided an alternate way of viewing these archaeological sites, one in which their significance is greatly enhanced and as such, has shown the value of the maritime cultural landscape as a method for managing sites with maritime associations around Otago Harbour.

The investigation of the maritime cultural landscape of Otago Harbour has revealed not only the considerable number of sites with maritime associations spread throughout the harbour but also just how central the harbour was to the lives of the people who lived there. Unfortunately, this connection has, to a large extent been forgotten and as such, sites with maritime associations are undervalued by the public, which leads to only limited pressure for these sites to be protected. One method that has been utilised to effectively increase awareness of maritime heritage is the creation of maritime heritage trails to aid in the public interpretation of archaeological sites (Thomsen 2006:26-37). These trails typically involve marking a number of related maritime sites with information boards that describe the

history of the site, along with historic photographs. In terms of Otago Harbour, the present study has investigated a number of themes that would be ideal for the creation of maritime trails. For example, shipbuilding and repair was once a major industry within the harbour and an informative maritime trail could include sites of old shipyards, viewpoints overlooking Port Chalmers with historic photographs showing the dry docks, and could even include visits to wooden boat yards still in action. The creation of such maritime trails based on any number of the themes investigated in this thesis has the potential to increase public awareness of the significance of the harbour's maritime heritage. Over time, this may increase the value the general public places on such heritage and thus may aid in the protection of all archaeological sites into the future.

The numerous sites investigated in this thesis have provided a considerable amount of information pertaining to the archaeological resource of Otago Harbour. From this baseline of information the inventory of archaeological information could be modified to include information on the current condition and possible threats to sites. In this way a ranking system could be formulated so that sites currently suffering damage or those facing future damage could be prioritised for investigation over sites with maritime associations that are more static. Investigating these sites at a landscape level would also allow specific areas of the harbour to be targeted for research if it was discovered that some areas were facing a higher level of threat than others.

From the above discussion it is readily apparent that the investigation of maritime cultural landscapes has significant potential to aid in the management of heritage. The present study has revealed much about the archaeology of Otago Harbour and how sites with maritime associations combine to create the maritime cultural landscape. It is the author's hope that the information contained within this thesis will be incorporated into the future management of these sites and that it will contribute to the research and protection of these sites into the future.

CONCLUSION

This investigation of the maritime cultural landscape of Otago Harbour utilised both archaeological and historical sources to provide an understanding of the interactions between the people who lived in the harbour and the marine environment. Evaluating both archaeological and historical sources has enabled a broader understanding of the inherent

strengths and weaknesses associated with the use of each source for the investigation of the past. Comparisons between the current research in the maritime cultural landscape of Otago Harbour and research conducted nationally, or lack thereof, clearly shows the potential for the utilisation of such landscape studies elsewhere throughout the country. In addition, comparisons with similar studies conducted overseas, allows this investigation to be understood within the context of maritime cultural landscape studies as they are practised internationally. Finally, by investigating the role that maritime cultural landscape studies can play in heritage management, the present investigation has shown the merit in adopting a landscape approach for such a purpose and how the results can gainfully contribute to the management and protection of maritime heritage resources within not only Otago Harbour, but also other maritime cultural landscapes around New Zealand.

8.

CONCLUSIONS

The investigation of the maritime cultural landscape of Otago Harbour has provided a new and greater understanding of the many ways in which the inhabitants of the harbour have interacted with the marine environment over the last 750 years. In order to constructively investigate this relationship, this thesis was built around a number of core aims. The primary aim of this thesis was to utilise the theories and methodology of the maritime cultural landscape approach to investigate the history of Otago Harbour. Firstly this required an assessment of the validity of applying such an approach to the harbour through the review of international studies of maritime cultural landscapes in light of each of their individual strengths and weaknesses. The investigation of the environmental variables of Otago Harbour was also a vital component of this study. This research created an understanding of the factors that have influenced the formation and evolution of the marine environment of the harbour over time. This study also aimed to create a comprehensive inventory of the archaeological sites with maritime associations throughout the harbour. Using both site survey and historical lines of enquiry, the resulting inventory of 458 sites provided the primary evidence for the thematic analysis of the maritime cultural landscape of Otago Harbour as well as presenting considerable new and valuable information for the future management of these unique sites. The creation of a thematic framework was another major goal of this study. The success of this approach enabled the various activities that were performed by the inhabitants of the harbour to be understood

holistically as components of the overarching maritime cultural landscape. Evaluating both archaeological and historical sources of evidence and comparing the findings with work undertaken both nationally and internationally constituted additional important objectives. This discussion provided a greater understanding of the strengths and weaknesses of the various sources of archaeological and historical evidence and their combined utility within a landscape approach. Comparisons with other studies allowed this research to be understood within the context of work previously undertaken nationally and, more broadly, with numerous maritime cultural landscape studies conducted internationally. Finally, this study aimed to examine and assess the value of maritime cultural landscape investigations for heritage management. This discussion revealed the strength and effectiveness of using the maritime cultural landscape approach to create inventories and investigate the distribution and significance of sites, all of which are valuable tools for heritage management. This thesis has brought together a multitude of archaeological, historical and ecological information and combined it to form a powerful analysis of the ways in which the inhabitants of the harbour have interacted with the marine environment, resulting in the formation of Otago Harbour's unique maritime cultural landscape.

HISTORY, ARCHAEOLOGY AND THE MARITIME CULTURAL LANDSCAPE

In researching the maritime cultural landscape of Otago Harbour this thesis utilised a range of evidence sources including site survey, previously recorded archaeological sites and local histories. Each of these lines of evidence has several strengths and weaknesses that must be recognised in order to create the best possible interpretation of the maritime cultural landscape. As an archaeological thesis, the archaeology of the harbour was the primary evidence utilised whenever possible throughout this study. One of the strengths of the archaeological record in Otago Harbour is that it provides evidence from each of the time periods investigated; from the arrival of the first colonists from Eastern Polynesia to structures built during the Second World War. Another strength, as evidenced during the site survey of a 19km stretch of the harbour, is the archaeological presence of sites of all sizes, such as artefact scatters and metal concretions, which may not be recorded in the historical record of the area. However, as described previously, for various reasons the recording of archaeological sites with maritime associations throughout the harbour is

incomplete, providing only a partial picture of the numerous activities that have taken place in the harbour over time. Fortunately, this is also one of the areas where the historical record is most useful in such an archaeological study. The historical record, when applied critically can provide additional information about archaeological sites and can also be used to identify the location of previously unrecorded archaeological sites. This thesis has utilised the historical record in both of these ways to support and strengthen the archaeological interpretations and also to provide background information on the activities to which these individual sites relate. Although archaeological in nature, this thesis utilised a range of different evidence types and has thus revealed that it is only by combining these multiple lines of evidence that a true understanding of the maritime cultural landscape can be achieved.

THE THEMATIC APPROACH

In order for the individual archaeological sites with maritime associations to be understood as components of the maritime cultural landscape they were placed within a number of themes: marine resource exploitation; navigation and landing places; hulks and abandoned watercraft; shipbuilding and repair; shipwrecks; harbour warfare and defence; and anthropogenic change to the harbour. These themes were selected to cover some of the major activities that the inhabitants of the harbour were known to have engaged in within the marine environment. It should be noted however, that although these themes cover a wide range of activities a number of other themes such as rest and recreation or hygiene and drainage could have been alternatively selected in order to profitably explore the maritime cultural landscape. As such, this investigation of the maritime cultural landscape of Otago Harbour, although comprehensive, is not the only way in which the maritime cultural landscape of Otago Harbour could be explored.

CONTRIBUTIONS TO THE FIELD

This investigation has made a number of important contributions to the study of archaeology in New Zealand and also, more broadly, to maritime cultural landscapes studies in general. As described previously, this study is the first academic investigation of a maritime cultural landscape in New Zealand. As a result, this thesis has introduced a new theoretical approach to the investigation of archaeological sites with maritime associations

in New Zealand and has laid the foundations on which future studies can be profitably built. As described by Dodd (2003), the study of maritime archaeology in New Zealand is desperately underdeveloped and is likely to remain that way until a critical mass of support is gained. As one of only a very small number of Masters Theses in New Zealand based on the investigation of maritime archaeological sites, this thesis is a decisive step towards establishing this critical mass. This thesis has also shown that archaeological sites with maritime associations in Otago Harbour are hugely underrepresented in terms of those actually recorded on the NZAA site recording scheme. The recognition of the large number of unrecorded sites and the inventory compiled during the research for this thesis have major potential to aid in the management of these sites within the harbour. This underrepresentation of sites with maritime associations also reflects the considerable archaeological potential that exists within the harbours of New Zealand - most notably through the investigation of such unrecorded archaeological sites.

Within the field of maritime cultural landscape studies, this thesis has made significant contributions in a number of ways. Firstly, this thesis has applied the theory and method of the maritime cultural landscape approach to a new environment, namely that of Otago Harbour. This enabled the approach to be tested against a new set of both environmental and cultural variables, thus providing further evidence of the utility of the maritime cultural landscape approach to investigate interactions between people and the marine environment. This thesis incorporated evidence of human interaction with the marine environment from both the prehistoric and historic phases of occupation within Otago Harbour. Although the strength of using such a holistic range of evidence is clear from the research undertaken by McErlean et al. (2002), this is not typical in maritime cultural landscape studies (for example see Parker (1999), Kenderdine (1993), Ash (2004) and Duncan (2001). As such, this thesis can be seen as a further endorsement of the landscape approach, reflecting the power of such analysis when it incorporates evidence from the widest range of time frames possible.

FUTURE STUDIES

This investigation of the maritime cultural landscape of Otago Harbour is the latest in a line of studies which date back to the formation of the approach by Westerdahl in 1992. Building on the theories and methods established in these previous studies this investigation

has shown the utility of this approach for revealing a great deal of information about the lives of those who inhabited Otago Harbour and their relationship with the marine environment. From the research contained in this thesis it is clear that if this approach was to be applied to other harbours around the country a similar level of success is likely to be encountered. In addition, by investigating the maritime cultural landscapes of these other harbours it would be possible to compare and contrast the results of these analyses providing further insights into the interaction between people and the marine environment throughout New Zealand. Another possible avenue of future research would be to compare and contrast the maritime cultural landscapes from the harbours of New Zealand with those investigated overseas. Such analysis may allow us to see if there is a particular national signature evident in the maritime cultural landscapes investigated and if so to assess the major economic, social and cultural factors behind such patterning.

CONCLUSION

The history and archaeology of Otago Harbour is the product of over 700 years of occupation by maritime peoples. With such a rich maritime heritage Otago Harbour is an ideal case study for investigating the interactions between the harbour's inhabitants and the surrounding marine environment. By combining archaeology with the evidence contained in the historical record a thematic narrative was created providing insights into the relationship between these people and the sea and ultimately revealing the many components that make up the maritime cultural landscape of the harbour. It is hoped that this study will be one of the first of many to investigate the maritime archaeology of New Zealand ensuring that this crucial area of our past is not lost beneath the tides of history.

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APPENDICES

APPENDIX 1: Archaeological sites with maritime associations recorded in the NZAA site recording scheme for Otago Harbour.

APPENDIX 2: Historically recorded sites with maritime associations in Otago Harbour.

APPENDIX 3: Abandoned watercraft recorded in Otago Harbour.