

# *Early Port-Related Structure Studies*

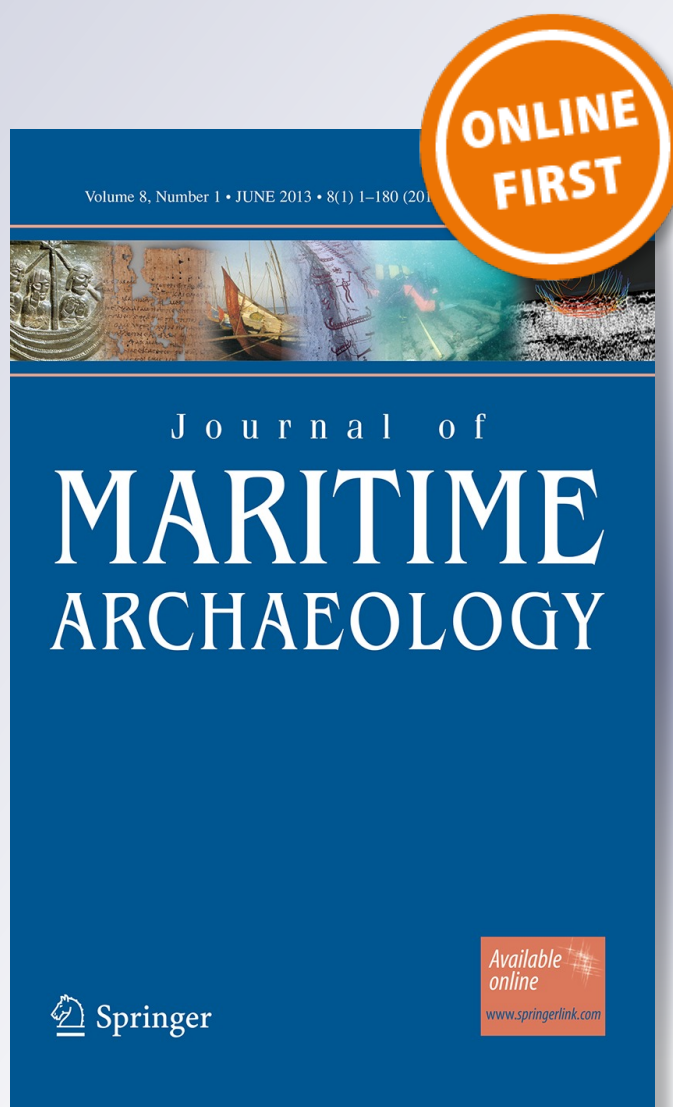
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## Early Port-Related Structure Studies

Michael McCarthy

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**Abstract** This paper examines three of Australia's earliest port-related structure studies. Excavations conducted in 1984 and 1994 in vastly different circumstances, with markedly different oceanographic conditions, progressing through quite different substrates, were joined with 1993–1994 overview of all the port structures along the coast of Western Australia. Providing a better appreciation of submerged port-related structure studies as a bona fide part of maritime archaeology, these three studies and have ramifications for future work both in Australia and overseas.

**Keywords** Maritime archaeology · Jetties · Port-related structures

### Introduction

Though formed in 1971 primarily to excavate and protect the wrecks of five pre-colonial East Indiamen, the Department of Maritime Archaeology at the Western Australian Museum soon became involved in a much wider range of sites. These studies eventually came to include colonial shipping, explorers' depositions, fishing, whaling, pearling and other maritime industries, survivor's camps, submarines, submerged aircraft, shore-based whaling stations, coastal settlements and maritime structures, including lighthouses, harbours and their associated infrastructure. Characterised as a 'holistic approach' to the maritime cultural heritage (McCarthy 2003), the phenomenon was arguably a precursor to the recent maritime 'cultural landscape' movement in Australia (Duncan 2011)—itself an offshoot of earlier developments elsewhere across the globe (e.g. Ford 2011; Westerdahl 1992).

Being early research, most of the non-shipwreck research and fieldwork was conducted without the benefit of prior experience, earlier studies and comparative data on which to

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build. Without a theoretical and practical framework and without the now-obligatory interdisciplinary links that characterise much of modern maritime archaeology, the methods used were experimental adaptations of traditional wreck-related technique. The research was also conducted in a vacuum, and in the absence of comparative data, the conclusions reached were generally intuitive. One example appears in the manner in which the large number of complete alcohol containers and thousands of alcohol bottle sherds found under the seafloor at Fremantle's first major port related structure was seen to mirror the social habits of those using it for work and recreation. This resulted in an article published in a terrestrial archaeological journal entitled 'The Ocean Jetty: Colonial Beer Garden?' (McCarthy 1987). It was a question put partly in the context of Fremantle being especially noted for its unsuitability as a port and the near collapse of its early European society (see following).

### Background to the Long Jetty Study

Despite the self-serving claims of Captain James Stirling RN and contrary to his 'glowing' reports, there was no safe haven at the Swan River on the south-west shores of New Holland (Statham-Drew 2003). The hinterland of what became the port of Fremantle, which served the colony's capital Perth was barren and incapable of supporting much in the way of imported plants and livestock. As a result the hundreds of British hopefuls who landed after the founding of the colony in 1829 as part of a much-publicised private settlement scheme were effectively duped. Both the historical and terrestrial archaeological records show that the Swan River speculation inevitably went into resource stress and quickly dissolved into ruin (Burke et al. 2010). Of the first eight vessels into Fremantle five were wrecked or went aground (Henderson 2011). Discontent, rancour, thievery and, as ever when society fails, recourse to drink, was endemic (Fig. 1).

The colony's near-demise became so widely-known that Karl Marx made reference to its failings in a chapter on colonisation in his famous *Das Capital* (1867). In the context of what appears to be the economic and social chaos and disorder dominating Fremantle life in this era, it is pertinent to note that its first official building was a gaol and that convicts (a feature of the colony from 1850 to 1868) built the next official building, yet another gaol.

Being only around 150 m long with only c. 3 m of water at its head, Fremantle's first landing, the 'South Jetty' was mainly used for loading and offloading 'lighters' (small vessels that transited passengers and goods to and from their ocean-going counterparts which anchored offshore). With offshore waters too shallow to allow the jetty to be lengthened, in 1872 another was built close by but in a north westerly direction, towards deeper water. It also shared the light rail link joining the South Jetty to a commissariat (customs) building, also built by convicts. Initially only around 200 m long and with only 4 m of water at its head, the Ocean Jetty, as it was called, was progressively extended into deeper water. By the early 1890s the jetty was able to take eight vessels berthed alongside, with the outermost berth in 7 m of water. Unlike its predecessor, which had some shelter from the north-west, the Ocean Jetty was totally exposed to the elements. Its only saving grace was its size and the depth of water at its head. By virtue of its increasing length, the Ocean Jetty became known as the 'Long Jetty'.

Despite this improvement the economy stagnated, the European population remained dangerously low, expertise and labour were difficult to obtain and even then the supply was often of a very poor quality, with profound and apparently long-lasting social effects. That drunkenness continued on the shores of the Swan River Colony and at the port of Fremantle,



**Fig. 1** A contemporary cartoon: 'The flourishing state of the Swan River thing' (with permission from the National Library of Australia)

despite the colony entering a new economic era subsequent to the 1890s gold rushes, is perhaps best illustrated in excerpts of letters of Captain D.B. Shaw of American Barque *Saranac*. These were penned to his owners in 1892, providing some explanation of the problems he was experiencing while trapped alongside during a series of seemingly endless storms.

October 27: My crew are half drunk. Some of them have cleared out and the others too drunk to work.

November 8: It is impossible to hold her. She would tear herself all to pieces. She has done considerable damage to herself. ... no place to send a ship of this size.

November 11: It is now blowing heavy from the S.W....Can't get clear of the wharf until it moderates. No steam power that can tow her, It is a bad job coming here.

Gentlemen, I have been in a good many places in my time, but this is the worst damn hole I ever saw. [The stevedores] are half drunk all the time and don't care what they do. The ship has to feed them and give them al [I] the money and tobacco they want or they will make trouble. They are a dirty lot.

November 19: I was never so sick of a place in my life, and may the curse of Christ rest on Fremantle and every son of a bitch in it. God damn them all. I remain Gentlemen, your Obedient servant.

D.B. Shaw.

P.S. Any man that would send a ship here a second time is a damned ass. Still blowing a heavy gale.

(Captain D.B. Shaw to the owners of the American Barque *Saranac* October/ November 1892).



**Fig. 2** Contemporary 1887 watercolour by J.R. Ashton showing the two Fremantle jetties in heavy weather. A steamer and sailing ships appear berthed alongside and another vessel is at anchor (WA Museum)

The letter also shows that vessels could be severely damaged by negligence, poor handling and the weather, even while secured alongside a jetty (Fig. 2).

The situation apparently changed in 1897 with the completion of an inner harbour at the mouth of the Swan River that was protected from the elements by two artificial rock groynes called the North Mole and South Mole, respectively. Inside were land backed wharves and quays, with cranes, heavy rail to dockside and warehouses serving visiting ships. By then the Long Jetty was just over a kilometre long, its final extension being required for the large vessels importing the materials and machines required to develop its successor, the inner harbour.

The Long Jetty remained useful to society as a fishing platform and as a promenade in a manner similar to the well-known British sea-side resorts (e.g. the famous Brighton pier) of the time. A sea baths was erected at its base together with other amenities along its length. Buoyed by these social purposes the structure remained in use until the early 1920s when all bar parts of the original Ocean Jetty section were demolished. Inexorably the Ocean Jetty itself also slowly fell into disrepair. By the 1970s all that remained visible was a line of piles close to shore and just visible at low water in the swells. The outer parts of the jetty were invisible from the surface, appearing as a line of timbers protruding only a few centimetres above the sea-bed.

### **The Long Jetty Excavation**

In 1983 Australia won the coveted America's Cup requiring Fremantle, then a quiet, rundown port and fishing town, to upgrade its yachting facilities. A new marina was required and the design for its protective groynes impinged directly on the jetty site. Though there was no legislation covering the remains, heritage-conscious elements in the Fremantle city council and its administration sought to ascertain the value, if any, of what lay in the path of the encroaching development. At the time there was no institution with legislative responsibility for the remains and no group of heritage professionals with the

required knowledge or experience in dealing with the remains. In being considered the de facto custodian of all things maritime, eyes turned to the Department of Maritime Archaeology at the maritime museum, which was housed in the old commissariat adjacent the jetty. A budget of AUD \$2,000 was provided to the museum with the advice that construction was to begin within 4 weeks and all fieldwork had to be completed by then. The author, the then Inspector of Wrecks—charged with examining all new sites and with all of the department's salvage archaeological projects—was requested to lead the assessment with the following aims: (1) to map the remaining structure; (2) to ascertain the spread of cultural material on and under the sea-bed; and, (3) to gauge the extent to which the development would impinge upon it.

With both the departments of maritime archaeology and materials conservation committed to a number of shipwreck projects, at the time only three experienced staff were able to be freed for the project: Bob Richards, a diver and boat skipper, Jon Carpenter, a specialist on-site diving conservator and the author. Other expertise was provided by volunteer bottle and ceramic specialist Dr James Boow. Seen as a potential training exercise for graduates and participants in the museum's diploma courses in maritime archaeology, those who participated were also invited to contribute to the final report, and to publish their research work as part of their training. The museum's avocational arm, the Maritime Archaeological Association of Western Australia (MAAWA) also assisted. Of those involved, diving history enthusiast Denis Robinson, and newly-qualified, or emerging maritime archaeologists Nuala Randall, Brad Duncan and Dena Garratt, were prominent. The most experienced of the group, Ms Garratt was also tasked with the compilation of the final report. With a week lost in gearing up, and only 3 weeks remaining before the limestone boulders were to be pushed out and over the remaining jetty piles, all phases of the study, including the archival search, were conducted simultaneously (Fig. 3).

### Archaeological Considerations

The first dives and the associated 'desktop study' revealed that there were a number of elements comprising the Long Jetty site:

1. The fabric of the structure itself, i.e. jetty supports (piles) projecting above the sea-bed.
2. The archaeological deposit related to the structure (its timbers, fastenings, and fittings) lying on and under the sea-bed.
3. The archaeological deposit related to wharfage, the handling of ships and lost cargo.
4. The remains of associated port infrastructure e.g. anchors, navigation aids, shore-based storage, and their archaeological record.
5. The archaeological remains related to recreation activities conducted on the jetty. This included the accidental and deliberate discard of materials, fishing gear, including drink containers and other objects.

The archival and oral history survey also showed that there had been extensive collecting by bottle and souvenir hunters soon after the advent of SCUBA gear. It also became known from anecdotal sources that following severe storms and the associated heavy swells, materials would appear newly exposed on the sea-bed. When this occurred a host of divers would descend on the area seeking attractive and sometimes valuable nineteenth century bottles and ceramics. There were also indications that not only had bottle collectors scoured the surface of the sea-bed at regular intervals, but in studying the museum's own methods, some had constructed and utilised airlifts and other excavation tools in the search of collectible objects (Fig. 4).



**Fig. 3** The remains of the Ocean Jetty (the original part of the Long Jetty) with the development occurring alongside. The museum's team had left the water at this stage (WA Museum)

Over the course of 106 h spent under water and 12 days fieldwork, each jetty pile was fixed by triangulation and photography, some aerial. Traditional excavation, using airlifts, though reasonably effective, soon proved too slow given the time constraints. Additionally, the well-known 'coning effect' that occurs during undersea excavations in soft sediments precluded the maintenance of a vertical excavation 'face' preventing divers recognising any layers in the sediment, as was hoped might be the case. In a 2 m × 2 m square excavation of a grid frame lying flat on the sea floor, the 'coning effect' produced a very small c. 50 cm diameter aperture at a depth of 2 m in the sand, for example. Sediments constantly cascaded down the cone, serving to obstruct the archaeological process.

With the cranes, trucks and bulldozers, operating literally metres away from the dive team, it had been quickly realised that a representative sample of what lay beneath the seabed would not be obtained before the area was covered in rocks if 'accepted' excavation and recording method were persisted with. As a result—and with some reluctance given its connotations with treasure hunting—it was decided to utilise a 'gross' excavation tool, the 'propeller wash'. This decision was part-based on the knowledge that the area had already been heavily affected by not only the late twentieth century sports divers, but also the propellers of nineteenth century steamships. These two gross 'cultural transformation' processes would have especially evident in the shallow water in which the team was operating, again making the decision to use the propeller wash method less philosophically problematic.

Utilizing a system hastily constructed and fixed to the stern of the museum workboat, the propeller wash was diverted aft through a curved tube down to the sea-bed. The divers (who after some familiarization) were able to safely operate within the blast, and when well-weighted could remain stationary, or rotate slowly in order to examine objects that





**Fig. 4** Museum diver with bottles and other objects exposed by sports divers using an airlift (WA Museum)

became visible in the exposed 'face'. Flow strength (a factor of engine speed and water depth) and position (altered by the three-point mooring system for the boat above) were also able to be controlled. By this means it was possible to excavate a crater approximately 5 m in diameter at the seafloor by 1.5–2 m deep, sloping to around half the surface diameter in around 20 min. Surprisingly, visibility within the 'wash' was very good and the slopes proved quite stable, allowing fragile items such as leather shoes to be recovered intact. In areas difficult to access, e.g. where the museum workboat could not be safely secured amongst the piles, the excavation was continued utilizing an airlift, albeit unsatisfactorily as described above. By these various means a 7,500 m<sup>2</sup> area inside the estimated total area of 50,000 m<sup>2</sup> destined to be buried by the rocks was sampled via 70 'test holes'.

Objects were chosen for recovery on the basis of their representing a larger sample of others that were similar, their unique or special nature, their perceived archaeological value and/or their attraction to the public as potential exhibition pieces. The information was recorded on the artefact registration book and on the site plan itself.

The position of each test hole was plotted and each excavation, together with the artefacts recovered from it were assigned an identifying number. A total of 1,143 artefact numbers were allocated to the materials recovered. Identical artefacts from the same test were allocated the same number. At the end of the excavation the assemblage was

processed for cataloguing, rudimentary conservation and exhibition. In this manner a representative sample comprising clothing items, ivory, pearl and brass buttons and buckles, coins and personal items such as shoes, a tooth-brushes, a signet ring, hair fasteners, toys and costume jewellery, smoking pipes, munitions (some of WWII origin), ship's fittings, tools, large quantities of bunkering coal, ballast stones, building materials and fishing sinkers and other items notably bottles and ceramics was raised and recorded. Vast amounts of sherds, bottles, unidentified concretions and organic materials such as scraps of leather, wood and rigging were left in situ.

Though contrary to accepted museological practice—after being rinsed, though otherwise remaining totally unconserved—many objects were sent straight to the exhibition gallery with the intention they would remain there solely for the duration of the excavation. Albeit low-cost and rudimentary, the public exhibition was constantly being added to and was in effect a 'living' display with its curators often present. As a result it proved so popular and of lasting interest that some objects (mainly concretions, bottles and ceramics) remained there for well over a year subsequent. While the alcohol and soft drink containers reflected the discard habits of those serving the ships, promenading and fishing, the 'ills' of colonial society and the short-term remedies then being sought for illness or other maladies were also occasionally evident in the deposit. A bottle of the opium-based Mrs Winslow's Soothing Syrup for infants was recovered, for example. While most likely having the desired effect in calming the affected child, Mrs Winslow's elixir became infamous in that it also evinced heroin withdrawal symptoms occasionally resulting in death if used too frequently. While this item proved especially poignant, the feature most commented on by the visitors was the range and extent of the alcohol and soft drink bottles.

While a great deal was learnt about the archaeological signature of the Fremantle jetty in the process, the question whether the situation there was unique and what contrast there might be at other sites remained untested by maritime archaeologists for nearly a decade. Thus the hypothesis inherent in the question, 'The Ocean Jetty: Colonial Beer Garden?' remained untested for over a decade.

## Results: Understanding the Vast Extent of the Deposit at Port-Related Sites

While the surface of the sea-bed at the Long Jetty was generally sterile, apparently as a result of the activities of the bottle collectors, a distinct grey-black band of cultural material was found beneath the clean layer of sand on sea-bed to a depth of c. 2 m, filling an area 15–20+ m on either side when measured from the centre of the jetty. The lateral spread appeared to reflect the beam of large vessels moored alongside. The area immediately underneath the jetty was especially rich and discoloured.

The majority of the ceramic and glass were of Australian and British origin. All bottles raised were dated between 1840 and 1920, the earliest possibly from vessels moored close to shore, or wrecked nearby before the jetty was constructed, as was the colonial transport *Marquis of Anglesea* in 1829. While pickle, sauce and medicines were common, 279 alcohol and 66 soft drink bottles predominated amongst the containers raised on the basis of numbers alone. Though some was from domestic use, the crockery and cutlery were mainly of shipping company origin, some bearing the markings of well-known companies such as the Adelaide Steamship Company, the Australian Steam Navigation Company, Howard Smith, and Huddart Parker. A number of Asian pottery sherds reflected the presence of pearling vessels with Asian crew. Sometimes crockery and other items that were damaged while at sea were jettisoned in the clean up of the galley and holds after the ship

was secured at port, for until recently the sea was for all societies a convenient 'rubbish bin'. Then there were tools and other materials lost or discarded by people transiting the structures to work the ships, or lost by those about to embark and disembark. While the deposit generally reflected losses or discard overboard and the use of the jetty as a cargo and passenger handling facility, it also reflected its unsuitability for those purposes in that an unexpectedly large amount of material from the jetty structure and from the ships moored alongside appeared. This included bollards, fittings and fixtures and fragments of ships' timbers.

The presence of such a deep, rich and extensive layer of cultural material was completely unexpected. If projections are accurate—for there was no attempt to sample the seabed adjacent to those parts of the jetty external to the proposed development—the remains at the Fremantle Long Jetty comprise a rich deposit of cultural material in a layer around 40 m wide by c. 1–2 m deep by just over 1 km long. Given that a very short period of activity (1872–1920) resulted in such a vast deposit at what was essentially an ill-frequented port serving a small population, this realisation has ramifications in understanding port-related structures across the globe, especially those servicing large communities for many centuries.

A large anchor with the upper fluke removed was brought to the team's attention soon after the study finished. Set not far from the jetty and with its upper fluke and arm removed to avoid entangling lines, it appeared too close to the structure to be a mooring for vessels waiting to access the facility. In being in relatively shallow water, it also appeared not to be a mooring for deep-draught vessels forced to transfer their passengers and cargo by lighters because they could not come alongside. In not being a 'mooring anchor', it appeared to be a 'warping anchor', i.e. one set in a strategic location allowing a ship's master to attach to it via a buoy on the surface and then use his capstan or windlass, to hold his vessel off the structure in adverse winds, and/or to 'warp' or pull the vessel's head around and away from the jetty. When the angles were right, this manoeuvre allowed the sails to fill, the ropes were dropped and the vessel could then safely sail away. Steamers were not similarly constrained, but occasionally they too used 'warping anchors' when the prevailing winds proved adverse. While most of these 'warping anchors' would have been recovered for use elsewhere when the jetty fell into disuse, this one appears to have been forgotten. In being recognised as part of the workings of the Long Jetty it was later presented to the museum for conservation and exhibition.

### The Advent of Protective Legislation

The publicity surrounding the results of the museum's salvage archaeological program and the numbers of visitors flowing through the 'temporary' exhibition resulted in considerable lobbying from concerned heritage interests. This proved sufficient to cause the marina wall to be realigned such that existing piles remained intact and are still visible in the swells today. Large sections of sea-bed to the south of the jetty (mainly the original Ocean Jetty) were covered by the rocks nonetheless. Despite this, none of the sea-bed adjacent the jetty was subject to dredging and the deposit is thereby preserved for the future, albeit with those parts under the groyne inaccessible. As part of the interpretive process the exhibition continued for well over a year, and a large scale representation of the original beach end of the jetty was developed by a prominent local potter as a focus point and beach playground. She also affixed illustrated ceramic plaques detailing the history of the structure with images and excerpts from the museum's archaeological report. Today it is a popular recreational facility visited by thousands annually.

A substantial report, numerous articles and an information sheet were also produced (e.g. Carpenter 1984; Garratt 1984). As a result of the realisation that it contained materials lost overboard from nineteenth century vessels the sea-bed around Long Jetty was declared a maritime archaeological site under the terms of the 1973 Maritime Archaeology Act. With a 'cut-off' date of 1900 providing wrecked vessels and/or objects lost from ships before that date with an historic status, this established a precedent for the declaration of the sea-bed around all pre-1900 jetties and port-related structures in Western Australian waters.

### **Port-Related Structures: 'jetties' as a Class of Historical and Archaeological Site**

A nil-visibility examination and surface recovery of deposits at a wharf in South Australia's Murray River by the Society for Underwater Historical Research (1978) and a salvage archaeological program at the Holdfast Bay Jetty at Adelaide in South Australia, by avocational diving enthusiasts (Drew 1983) were the antecedents to the 1984 Long Jetty excavation in Australia. Both the former, which was conducted in nil visibility and the latter, a salvage archaeological program, are characterised as a subjectively raised, unprovenanced (in all but their location) collection (Rodrigues 2002a, b), thereby mirroring the Long Jetty study in that acknowledged deficiency. As a result there remained the need to study a suite of Australian port-related sites before valid conclusions could be made as to the importance and social ramifications of these studies and of the archaeological potential of jetties and port-related structures in general. An opportunity to do so arose in the period 1993–1994 with comparative studies funded by the Heritage Council of Western Australia. Because their interests at the time were in built structures (i.e. the infrastructure and the jetties and not what lay beneath them), the Heritage Council study entailed a non-disturbance survey of all the known port-related structures along the coast of Western Australia. Supervised and—on the occasion of the death of the chief consultant Denis Cumming, a heritage engineer mid-study—completed by the author, just over 30 structures were examined. (Cumming et al. 1995). The vast majority were the so-called 'finger jetties' (i.e. a colloquial term meaning like a finger projecting from one's palm). These ubiquitous wooden structures were found adjacent to most settlements and in sometimes very rudimentary form at many isolated pastoral establishments along the coast. The majority were a 100 m or so in length at most, rudimentary, frail and with relatively shallow water at their head. This required that visiting ships stayed well out to sea, requiring goods and passengers to be ferried back and forth in lighters or other small vessels. Where traffic warranted the additional expense, a light rail (with hand or horse-drawn trolleys) extended over the timber deck, and a short rock groyne appeared at their base, stabilising the structure and the rail line against erosion. While in some cases the jetties had a 'head' at the deepest end thereby appearing 'T-shaped' in configuration, most did not. Sometimes goods sheds were erected nearby. When secured alongside, vessels would use their masts and yards as cranes, lifting goods and sometimes animals to and from the vessel.

Generally appearing with very little infrastructure other than that described above, the Western Australian 'jetties' were found to be of such an unsophisticated and basic form that the simplest of definitions of the terms 'port' and 'port-related structure' needed be developed and applied to the Western Australian context: i.e. any facility built for landing passengers and goods at any place designated for the loading and unloading of vessels. This contrasted with the internationally-accepted definition of the term 'port' appearing in Rene de Kerchove's *International Maritime Dictionary*. It reflects their role in serving far

more mature local or regional economies, i.e. 'A place for the loading and unloading of vessels recognized and supervised for maritime purposes by the public authorities' (de Kerchove 1948: 598).

...a port may possess a harbor but a harbor is not necessarily a port. Any natural creek or inlet on the sea shore with adequate depth of water and sufficient shelter for ships fulfils the essential conditions of a harbor. To make it a port, in the accepted sense of the word, there must be in addition accommodation and facilities for landing passengers and goods and some amount of overseas trade (de Kerchove 1948: 598).

As indicated, the 1993–1994 Heritage Council study showed that few structures along the Western Australian shores fit those (relatively sophisticated) criteria. As regional ports developed and where there was a need to move great numbers of passengers and vast, sometimes bulky and heavy quantities of goods, the simple jetty lengthened and expanded in a process similar to that described at the Fremantle Long Jetty. Some came to be of massive proportions, progressively reaching out from shore into water deep enough for large ocean-going vessels to moor alongside, or at a special-purpose facility at its head. Capable of supporting heavy rail transport, they carried cranes, wooden buildings and other infrastructure on their decks. Four of those studied in Western Australia, a place characterised by shallow coastal waters, were of necessity close to 1 km long and well over 10 m wide. Though much more complex structures, they were nonetheless just larger cousins to the simple 'finger' jetties serving small communities and their attendant vessels. The tidal range in the north was such that the vessels that visited were built so they could lie in the mud alongside as the tide receded.

In also recognizing the well-known colonial tendency to coin regional terms and phrases and to export sometimes inappropriate names from the parent country and elsewhere, it also became essential in the course of the 1993–1994 study to examine the accepted definitions, especially of those terms that are not self-explanatory, such as 'wharf', 'jetty' 'pier', 'groyne' and 'mole', and to see how they were applied in the West Australian instance. Here, reference is also made to the *Compact Edition of the Oxford English Dictionary*.

In British circles, for example, the term 'jetty' which while having other connotations, generally refers to a narrow projecting open pile (vertical support driven into the sea-bed) structure running at an angle to the shoreline and providing on its 'deck' a horizontal landing enabling vessels to moor on either side to receive and discharge cargo, or to land passengers. These jetties can be found constructed of timber, stone, iron, or steel, or a combination of these. While stone can also be used in the British context, the term jetty in the Western Australian sense always denoted a structure built almost entirely of timber, albeit sometimes with a stone base where it came ashore. The term 'pier' while not used in Western Australia, is also used throughout the world in the same sense, but it also often appears where the structure is solid, e.g. of stone or masonry. A 'wharf', or 'quay' for its part is a wooden, stone or iron platform besides which a ship may be moored for loading and unloading. Again these can be jetties or piers projecting at an angle into the stream, though generally they are parallel to shore and are 'land backed', having more sophisticated heavy and capacious infrastructure, such as storehouses, rails, cranes, etc., built on adjacent land. Again many are not, and being built on piles, are often similar to simple jetties in construction. While 'groynes' are usually an artificial projection of rock acting as a protective barrier against the sea, they can also comprise a framework of timber, or a low broad wall of concrete or masonry serving to trap sediments to keep channels free. A

'mole' for its part, is a massive structure, usually of stone, used primarily as a breakwater to enclose an artificial harbour. These are found throughout the modern and ancient world.

### **The Albany Town Jetty Study**

Another opportunity to broaden the scope of the Western Australian port-related structure studies arose at Albany in 1994. There, for the first time the question could be asked whether the underwater remains at Fremantle were anomalous.

With a verdant hinterland and a cool temperate climate conducive to European settlement the area was recognised by French and British explorers alike as a desirable place to establish a colony. This resulted in a pre-emptive British military settlement in 1827 and there a small, orderly society established a foothold. Princess Royal Harbour and King George Sound also combined to form one of the world's greatest natural harbours and in contrast with Fremantle it became famous as a shipping haven. By 1851 Albany had become the coaling station for the P&O steamers and all shipping to and from eastern Australia, the Straits Settlements and other overseas ports called there. As a result of these positive attributes, and though it certainly struggled in its formative years, the far more 'genteel' and ordered settlement at Albany appears to have exhibited far fewer symptoms of a failed society than Fremantle (Garden 1977). This understanding subjectively informed the application of the 'colonial beer garden' analogy to Fremantle's early port.

In the 1860s a new jetty was completed at the foot of Albany town servicing small boats and lighters bringing goods and passengers to and from the mail steamers. A few years later Government offices and a customs' store were built nearby, but with a long stretch of shallows off its head, works to extend the jetty were required. These developments commenced in 1873, while the Long Jetty at Fremantle was being built.

Another facility in the form of a deepwater jetty was completed in 1888 and from then on large cargo vessels could moor alongside it utilizing extensive warehouses nearby. As part of this development a private company commenced building a railway line connecting the 'Deepwater Jetty' to the town, progressing past the 'Town Jetty' (as it then became known) and north to Perth. In the process they took over large tracts of the foreshore, reducing public access to the waterfront by controlled boom gates across the rail line and developing a sense of alienation that was to prove both mental and physical to the townsfolk. This contrasted with the situation at Fremantle, where people appeared to have easy access to its jetty when not in use for shipping.

As at Fremantle, the 1890s gold rush caused an increase in the number of ships calling at Albany. Passenger-carrying mail steamers preferred to use the Town Jetty, rather than the Deepwater Jetty, however. In order to allow them to moor at a special head designed specifically for them, the Town Jetty was extended by 150 m and the waters around the structure were dredged. This was a key difference with Fremantle, where in lying in an open roadstead subject to heavy seas and swell, dredging had never occurred for its would have been negated during the next storm.

Notwithstanding its clear advantages as a port, the opening of the enclosed harbour at Fremantle in 1897 and its proximity to the state's capital city, Perth, heralded the demise of Albany as the state's premier overseas destination.

Nonetheless, unlike Fremantle, fishing and other commercial boats continued to use the Albany facility and the structure then became a focus for the town's social life including promenading, fishing, swimming and yachting. The local yacht club and naval cadets were based there, the sea baths were rebuilt and a dance hall, shop and an accommodation area

were also added. After WWII around 150 m of land on the foreshore was reclaimed, totally burying the original structure (which was demolished in the process) and the surrounding sea-bed. What remained projected on past the head of the old mail steamer jetty was strengthened and used for steam-powered whale chasers after WWII. Later as the structure deteriorated the sea baths, the yacht club and naval cadet premises were demolished, as were parts of the jetty itself. While it remained in commercial use for berthing the harbour pilot boat and other craft, the closure of the whaling station in 1978 caused the whale chasers to leave what had by then become colloquially known as the Whaler's Jetty. It was then closed off and the structure abandoned. Commercial craft, fishing boats, ferries, sightseeing vessels and tugboats still used the inshore parts of the structure, however.

### The Albany and Fremantle Sites Compared

In comparing the two structures, the Albany Town Jetty, like the Fremantle Long Jetty, was in use from the 1870s, was extended a number of times over the years, was adjacent a port town and was also popular for a time as a promenade and venue for swimming, recreation and fishing. It was also subject to demolition. The two jetties then are contemporary and alike in their service histories.

There the similarities end. Unlike Fremantle, where shipping ceased using the structure around 1900, parts of the Albany Town Jetty remained in use for shipping and for recreational boating throughout. Situated in a safe haven having with very little 'fetch' (distance over which seas and swell can build), the post-depositional natural 'scrambling' (Muckelroy 1978) of material under the sea-bed (a natural transformation process) at Albany was minimal and any disturbance of the sediments there would have been mainly by the action of ship's propellers until the advent of sports diving in the late 1960s. Here is another contrast with Fremantle, where seas and swell were also a major influence on the deposit.

The resumption of large tracts of shallows and the increased industrialisation of the area in the post-WWII period ensured that by the 1970s the town of Albany had again become physically and emotionally cut off from the waters of the harbour with only hardy fishers regularly using the structure. This mirrored events in the nineteenth century. In 1983 a committee was formed with a view to re-establishing the link between the town and its harbour. With a view to enticing tourists, this also involved the development of a marina and a fishing boat harbour, again entailing some dredging of the sea-bed. A feature of this plan was the retention and restoration of the Town Jetty for commercial and tourism purposes, with provision for interpretive materials presenting the history of the structure and the port. Five years later the state government funded the first stage of the development and announced the intention to commence dredging adjacent to the jetty. As a direct result of the lessons learnt at the Fremantle Long Jetty and from two earlier test excavations conducted at the Whaler's Jetty in response to reports of looting by local sports divers, the museum advised that the sea-bed at the Albany jetty was of archaeological significance. In being de facto protected by the application of the Western Australian Maritime Archaeology Act (1973) which had been successfully applied to the sea-bed surrounding the Fremantle Long Jetty, the developers accepted that artefactual material should not be disturbed by the proposed dredging and incorporated the need to assess the deposit in their planning process.

In November 1994, soon after the state-wide port-related structures study mentioned above was completed, funds were provided so that the museum could carry out a test

excavation of the sea-bed near the jetty. Work then began under the leadership of the author with some members of the team who had joined at Fremantle, including Carpenter and Garratt. One major difference was the presence of contract maritime archaeologist and local historian Adam Wolfe. He was commissioned to link the jetty into his comprehensive research detailing the maritime history of the Albany region—listing and describing all the related marine infrastructure including buildings, water tanks, rail and the like (Wolfe 1994). As a result the Albany study fitted well into the then developing ‘maritime cultural landscape’ movement in Australia (see Duncan, 2011). Conducted a decade after the Long Jetty excavation, with much having been learned and without the severe constraints on time that rendering it in effect a salvage archaeological program, there were other differences in methodology at Albany. Another fundamental difference was the presence of an expert diving research chemist Vicki Richards from the WA Museum’s Department of Materials Conservation. She conducted a pre-disturbance chemical, biological and structural analysis of the area to be excavated in order to ascertain the state of the submerged structures and the nature of the sea-bed (Garratt et al. 1995).

### The Site

A non-disturbance examination of the sea-bed at various points around the Albany Jetty and along transects designed to cover the area earmarked for dredging highlighted the contrasts with the Fremantle case. Firstly the sea-bed offshore was found to be of a thin layer of mud overlying sand and the occasional weed mat rather than of the bare sand characterising the sea-bed offshore at Fremantle. Again in contrast the Albany, the sea-bed around the jetty was littered with modern material, primarily jetsam from commercial craft including fishing boats and those objects lost and discarded by people using the jetty for fishing. At Fremantle these activities had ceased soon after WWII, when the structures fell into total disrepair and were demolished. While appearing otherwise unremarkable, on the sea-bed directly underneath the berth of the large Albany harbour tug, there was a massive deep gully, or ‘scour pit’, extending the full length and width of the vessel and penetrating approximately 2 m below the sea-bed surface sediment, which was itself c. 7 m from the surface. Caused by the tug warming up its engines in gear, this deep pit contained large amounts of detritus, weed and many objects, both old and modern. Some materials had been exposed as the pit was dug, others were blown in by the propeller wash or by the currents. This scour pit, a ‘cultural transformation process’ of some considerable magnitude, extended under the jetty to join nearly with a ferry berth in shallower water. There, though the other ferry had a far smaller propeller, a c. 5 m diameter scour pit was also evident and there objects lay scattered over the sea-bed, both in and around the pit. In both pits there were nineteenth century bottles, ceramic sherds, concretions and organic materials such as wood, rigging and leather scatted on the seafloor amongst the weed. Though steep, and contrasting with the ferry’s pit, the tug boat pit had hard, stable slopes, with the sea bottom under the thin mud layer on its surface being much more compact than the sands of Fremantle.

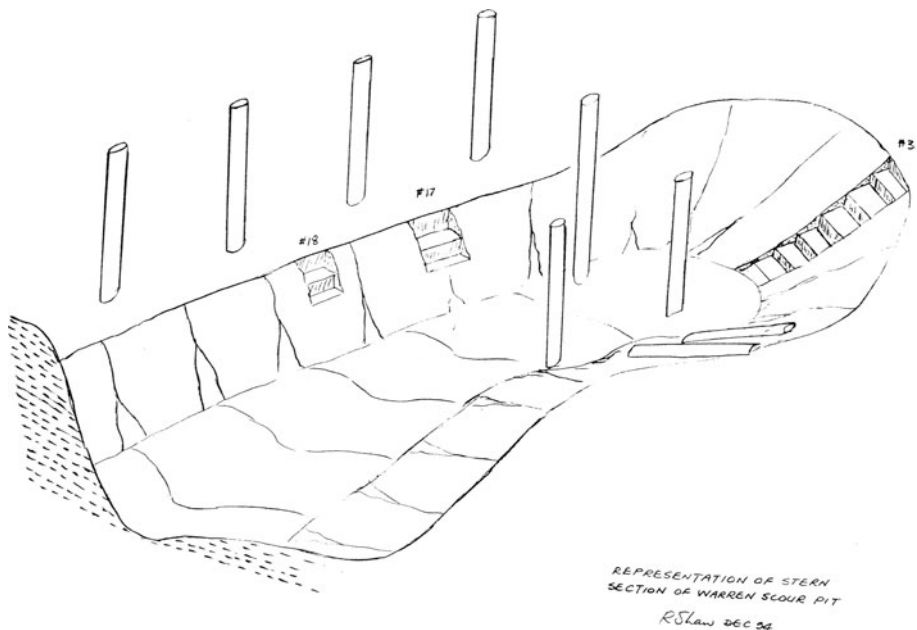
In contrast to the Fremantle situation where of necessity tests concentrated only on the area under threat, at Albany, where time was not an issue, a series of test excavations proceeded along control lines away from the structure and outward from the area designated for dredging. These were conducted by excavating at pre-determined intervals using



standard water-dredging techniques, coupled with a grid frame to provide the necessary vertical and horizontal controls.

Two excavation systems were employed. These were (1) test pit and (2) test trench. A 'test pit' sampling strategy involved the laying of a graduated 2 m<sup>2</sup> grid frame on the sea-floor, using a water dredge to excavate beneath it and recording detail in the pit and in its walls. The end result in each case was a conical pit c. 1.5–2 m deep, that was just sufficient at its lower end to allow diver and excavation equipment access. As at Fremantle, though to a lesser extent due to the harder substrate beneath the mud on the seafloor, the deposit cascaded down the slope. In contrast, visibility in and around the pits was zero and all recording and recovery was by feel alone. Photography was only possible pre-excitation or on the following day when the silt had settled. Nonetheless cultural material was observed (as expected), followed by compacted layers of weed (*Posidonia australis*) fragments each interspersed with sand and mud. Below them were hard layers of 'sand cockles' edible bivalve shells (*Katylsia scalarina*, *K. peronii* and *K. rhytiphora*) that proved quite difficult to penetrate.

A 'test trench' sampling strategy was used within the existing tug-boat scour pits, again using a 2 m<sup>2</sup> grid system. Supported on four stainless steel legs, with stable slopes and good visibility, the excavation commenced at the original sea-bed and proceeded down-slope to the bottom of the scour pit and beneath. Measurement was in 3D, using a builder's level, a sliding scale on the grid for eastings and northings with depth measured by plumb-bob. When proceeding down the slope a 'step trench' resulted as the frame was relocated down-slope and linked before each move to the previous excavation. Layers were recognisable and were recorded in the walls of the scour pits (Fig. 5).



**Fig. 5** The Albany tugboat scour pit showing the museum's step trenches (R. Shaw, WA Museum)

## Results

Diving operations were conducted over a period of 16 days and in all, a total of just over 175 diver hours were spent under water. The excavations showed that throughout the affected area there was a thin layer of mud underneath sand interspersed with hard layers of weed mat and below these were compacted layers of 'sand cockles'. These were sampled and sent for carbon dating analysis producing, in one test pit dates of 1730 BP ( $\pm 80$  BP), 2,670 BP ( $\pm 60$  BP), 5,070 BP ( $\pm 80$  BP), as the depth increased. No prehistoric artefacts were recorded amongst the shells, though it was recognised that Aboriginal shell middens and Indigenous stone artefacts could well have been present. Before casting their lines from the jetty, for example, modern fishers waded into the shallows and in running their hands or spades through the sand obtain in a remarkably short time more than enough cockles to use as bait or take home to eat.

While concretions and some organic materials were visible throughout, the vast majority of the nineteenth century artefacts recorded in the upper layer above the weed mats were ceramics and glassware. Most were of Australian or British origin, including locally-made bottles. A range of pickle jars, sauce bottles and medicine containers were unearthed, some containing their original contents. As expected, most of the ceramic material was associated with the shipping companies that used Albany, as indicated by the various markings on the ceramics. There were very few alcohol or drink containers evident in the deposit.

The range and age of the artefacts recorded in the jetty area were generally consistent with expectations for a working jetty in operation from the mid-nineteenth century to the present day. That the structure had also been used for modern fishing and recreational purposes was also evident from some of the finds, though the presence of a drive-in theatre speaker in the area frequented by the modern steam-driven whalers proved less easy to explain. The spatial location of material was also consistent with the Fremantle experience, i.e. that the greater concentrations of historic material lie generally under and alongside jetties and to approximately 10–20 m either side of it. As at Fremantle this distance reflects the beam of the vessels alongside. Where vessels had moored at the head of the old mail steamer jetty, as opposed to alongside it, again the artefact spread reflected this practice and in the Albany Town Jetty case, the head of the 1874 jetty proved especially rich. In all, 125 artefacts (or groups of artefacts) were recovered from the Albany jetty site and recorded in an artefact register. These were allocated a registration number, classified by material composition and briefly described. Those recovered were catalogued, conserved and prepared for study purposes. Some were selected by the curator of the Albany Residency Museum and after rinsing were immediately placed on exhibition there.

As one of the most significant of all port-related structures examined as part of the 1994 Heritage Council Study, the Albany Town Jetty site was nominated to the Heritage Council of Western Australia for protection as an historic structure under the *Heritage Act* 1990. In following the Fremantle precedent the sea-bed around the jetty was already protected under the *Maritime Archaeology Act* 1973.

## The Comparisons

The Albany excavation shows that there was initially good reason to view the Albany and Fremantle jetties as contemporaries with equivalent service histories, i.e. as comparable sites. It also appeared reasonable to expect that comparisons could be made about the

extent of any particular range or group of artefacts found at these two structures. With few alcohol and soft drink bottles in evidence initially it was thought that the relative paucity of alcohol bottles in the deposits found at Albany supported the application of the 'colonial beer garden' analogy to Fremantle.

It is now recognised that there are too many variables to allow those comparison to be validly made, nonetheless. First, the two periods (late nineteenth and mid-twentieth centuries) during which the Albany jetty was cut off both geographically and emotionally from the town would have resulted in less promenading and less tendency towards the production of a 'colonial beer garden' as was the case at Fremantle. Secondly, the notion that the Albany jetty's location in a far more sheltered location, with conditions alongside far more benign rendering the visiting crews and resident wharf labourers less likely to seek succour in drink also appears unsustainable. Research shows that there appears to have been a general state of inebriation in the maritime trades, i.e. it was not restricted to Fremantle. As one example, the owners of the SS *Georgette*, the first successful steamer on the coast, a vessel expected to have attracted a better class of crew, and one that regularly called at Albany, wrote in 1876 complaining to the Colonial Secretary 'unfortunately we cannot obtain seamen of temperate habits' (Conor and MacKay 1876). In looking to whether this was a feature only of the remote and poorly-serviced coast of Western Australian, drunkenness in the maritimes does appear to have been a global phenomenon. In examining sea life in the late eighteenth and nineteenth centuries, for example, the poet Masefield quoted a Captain Hall who wrote:

In hot climates I really do not think it an exaggeration to say that one third of every ship's company were more or less intoxicated or at least muddled and half stupefied every evening (Masefield 1905: 100).

The reference to hot climates is significant, for Albany does not experience the characteristic long, hot, dry and debilitating Mediterranean summers of Fremantle, rather it has a cool, sometimes very cold, temperate climate. Then there are the differences in the sampling methods used. While the Albany scour pits can be seen to mirror the Fremantle propeller wash situation in exposing large quantities of cultural materials, the Albany divers availed themselves of an additional and very important variable. At Fremantle the divers had to cover a large amount of offshore sea-bed in their search for exposed objects, while in concentrating the Albany deposit in one discreet location, a mere leap away from the jetty, the tug boats had made the souvenir hunter's job so much easier. These factors allowed them to clear the pits of all attractive objects on a regular basis. Anecdotal evidence shows that they would often wait for the tug to berth to commence work and often were successful in accessing the site by night until surveillance by the port authority concerned that they might be killed or injured by the boats above slowed the practice. Thus, while there was a smaller and older population demographic at Albany producing far fewer sports divers than at Fremantle and while there was a much colder climate deterring only the most hardened and motivated souvenir hunters, it does appear that the two Albany scour pits presented a veritable ever widening 'open pit mine' in which the Albany divers could fossick for artefacts with very little effort. Hard data on these variables was not available, however.

While it is expected that there would be little difference in what recreational divers chose for recovery at Albany and at Fremantle, subjective considerations applied to the museum's collection strategy in the hurried excavation conducted at the Long Jetty produced yet another variable when compared with the far more ordered strategy the museum applied at Albany (Rodrigues 2009 analyses both recreational and archaeological diver

collection strategies at shipwreck and jetty sites). Also skewing the sample in an unquantifiable manner was the extent of the nineteenth century dredging at the Albany jetty—its effect in removing materials from the site, unknown, but most likely substantial. Then there was the landfill at Albany, a feature not mirrored at Fremantle. While at Fremantle excavation was possible quite close to shore, in the Albany case well over 100 m of the jetty and adjacent sea-bed were covered in landfill and could not be sampled. For these and other reasons artefacts from the jetty's earliest period could not be accessed, further skewing the collection and rendering any attempt at comparison problematic.

## Conclusion

Notwithstanding the manifest simplicity of the colonial-era port-related structures studied their importance and place within the economic and social structure of society and as an integral part of the maritime cultural landscape is undeniable, and is perhaps best encapsulated in the words of one of Australia's best known authors and commentator:

[to Australians] A jetty is a maritime colonnade—the humble equivalent of Bernini's great St Peters colonnades. The construction is self-evident, employing a trestle arrangement similar to that used in light railway bridges. The engineering is so direct and explicit that we fail to see that it has a lot more to tell us.

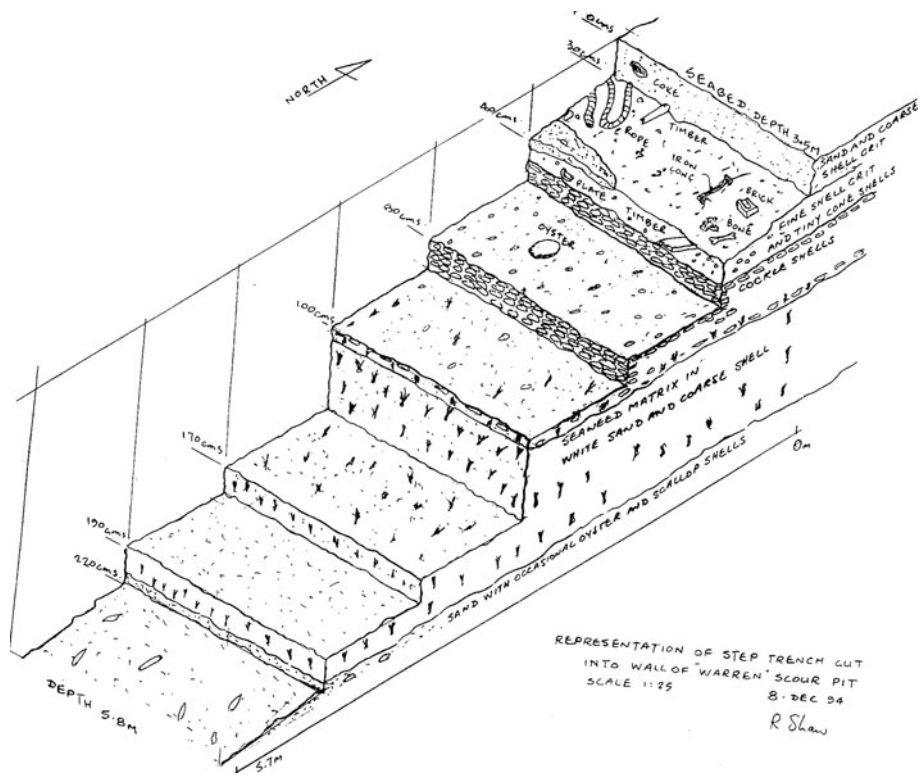
The jetty is an illustration of economic externalism one among many such markers in the Australian economic record...it is a physical reminder of the paramount role of trade in the economy. Their scale and simplicity was a response to limited means. They are a more reliable guide to working Australian than the high-style architecture of the day decked out in its borrowed period finery...Few structures speak so poignantly or with such forceful directness about the outwardness of Australian life.

... The jetty, railway, and the roads radiating north and south and inland were a diagram of intermeshing extractive activities, A convergence of economic forces and trade directed away from Australia (Drew 1994: 42–46).

While the rest of the world, especially those with ancient cultures and ports such as in the Mediterranean or in Asia, might justifiably blanch at the analogy used, there are a number of commonalities and elements from the Australian experience perhaps of value to them in conducting their own port-related structures studies.

First, the problem with any jetty, wharf or other port-related structure, no matter how rich it might be, is the fact that unless the materials are found in a definable and dateable context, as in the case of the discreet shipwreck, the results are diminished in archaeological (as opposed to an antiquarian) importance. A pointer, albeit a fleeting one, appeared in the ability to recognise layers in one scour pit at Albany as a result of it being in a benign (e.g. sheltered) environment where the sediments were conducive to the maintenance of a vertical and stable excavation face. While the utilisation of the Albany structure occurred over too short a period for the layers to prove of much significance, where a combination of factors such as those experienced at Albany occurs at a place that has been in use for centuries, an ancient anchorage, jetty, pier, wharf, groyne, or mole may exhibit many dateable layers and thereby prove as archaeologically valuable and far richer than any shipwreck (Fig. 6).

In being ancient, and possibly long since lost to living memory some of these places lie buried by shoreline or other river and estuarine changes leaving few indications of their existence. As one pointer to the possibility of locating them, the Western Australian studies



**Fig. 6** Layers recognised at Albany (R. Shaw, WA Museum)

indicated the presence of abandoned mooring and warping anchors set well away from a structure allowing for the practice of 'lightening' to and from vessels moored offshore, of for the master to 'warp' the vessel off and safely sail away. While some anchor finds will reflect this practice, care needs be taken nonetheless, for there was also an ancient and time-honoured technique called 'club hauling'. By this means, masters caught on a lee shore would drop an anchor while still underway, tethering it towards the stern thereby swinging their vessel onto a suitable angle to the wind, and as the sails filled they would cut the cable and save their ship at the expense of the anchor. Where they were unable to buoy or raise the anchor in the process it was often abandoned (de Kerchove 1948: 156). The finding of seemingly-isolated stone anchors in Asia and the Mediterranean may reflect these various practices, and in cases where they are not the product of 'club hauling' might lead to the discovery of ancient, and long-forgotten port-related structures lying completely submerged or buried by shoreline changes.

Finally in the two jetties and the 1993–1994 Western Australian port-related structures study appeared the nascent framework for the informed examination and understanding of the remains of any particular passenger and cargo-handling facility and for understanding the associated material remains on the adjacent sea-bed. By this means the place of the jetty or port-related structure as a *bona fide* part of Australian maritime archaeology was secured (McCarthy 2002; McCarthy 2014).

When one applies these understandings globally especially to those ancient societies with emerging maritime archaeological units, there are enormous opportunities for study

and protection. The growing number of countries becoming signatories to the UNESCO convention recognizing the importance of all old submerged structures and the remains around them attests further to these possibilities.

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## References

- Burke S, Di Marco P, Meath S (2010) The land 'flow[ing] with milk and honey': cultural landscape changes at Peel town, Western Australia, 1829–1830. *Australas Hist Archaeol* 28:5–12
- Carpenter J (1984) Bathers Bay and the Long Jetty. Port of Fremantle quarterly winter 1984
- Cumming D, Garratt D, McCarthy M, Wolfe A (1995). Port related structures on the Coast of Western Australia. Department of Maritime Archaeology, WA Maritime Museum, Fremantle, Report 100
- de Kerchove R (1948) *International Maritime Dictionary* (2nd edition 1961). Van Nostrand, New Jersey
- Drew T (1983) The Holdfast Bay Project 1974–1978. The Society for Underwater Historical Research, North Adelaide, SA
- Drew P (1994) *The coast dwellers: Australians living on the edge*. Penguin Books, Ringwood, Victoria
- Duncan B (2011) 'What Do You Want to Catch?': exploring the maritime cultural landscapes of the Queenscliffe Fishing Community. In: Ford B (ed) *The archaeology of maritime landscapes*. Springer, New York, pp 267–289
- Ford B (ed) (2011) *The archaeology of maritime landscapes*. Springer, New York
- Garden DS (1977) *Albany: a panorama of the sound from 1827*. Thomas Nelson, Melbourne
- Garratt D (1984) *The Long Jetty Excavation Report 1984*. Department of Maritime Archaeology, WA Maritime Museum, Report 78. <http://museum.wa.gov.au/sites/default/files/No.%20078%20Long%20Jetty.pdf>. Accessed 2 sep 2013
- Garratt D, McCarthy M, Richards V, Wolfe A (1995) *The Albany Town Jetty Excavation Report*. Department of Maritime Archaeology, WA Maritime Museum, Report 96. [http://museum.wa.gov.au/sites/default/files/No.%20096%20Albany%20Town%20Jetty\\_0.pdf](http://museum.wa.gov.au/sites/default/files/No.%20096%20Albany%20Town%20Jetty_0.pdf) (accessed 2/9/2013)
- Henderson G (2011) *Unfinished voyages: Western Australian Shipwrecks 1622–1850*, 2nd edn. UWA, Nedlands
- Letters Conor and MacKay (1876) Colonial Secretary's Office, State Library of Western Australia, CSO 845
- Letters penned by Captain DB Shaw to the owners of the American Barque *Saranac* October/November 1892. Copies on Maritime Archaeology Department Long Jetty file MA-124/84:1
- Marx K (1867) *Das Capital: Kritik der politischen Ökonomie*. Otto Meissner, Hamburg
- Masefield J (1905) *Sea life in Nelson's time*. Methuen, London
- McCarthy M (1987) The Ocean Jetty: the colonial beer garden? *Australas Archaeol* 24:32–35
- McCarthy M (2002) The archaeology of the jetty: an examination of jetty excavations and 'port-related structure' studies in Western Australia since 1984. *Bull Australas Inst Marit Archaeol* 26:7–18
- McCarthy M (2003) The holistic approach to the maritime heritage. *Bull Australas Inst Marit Archaeol* 27:25–34
- McCarthy M (2014) Similarities: port-related structure studies on the Australian Indian Ocean Coast: a pointer to one of India's greatest submerged archaeological resource? *International Seminar on Maritime Archaeology*, New Delhi, 2007: 141–155
- Muckelroy K (1978) *Maritime archaeology*. University Press, Cambridge
- Rodrigues J (2002a) Holdfast Bay historical artefacts: assessing an unprovenanced collection. *Bull Australas Inst Marit Archaeol* 26:27–34
- Rodrigues J (2002b) Holdfast Bay Jetty: examining associated material culture. *Bull Australas Inst Marit Archaeol* 26:35–42
- Rodrigues J (2009) An amnesty assessed. Human impact on shipwreck sites: the Australian case. *Int J Naut Archaeol* 38(1):153–162
- Society for Underwater Historical Research (1978) *Museum register for the society for underwater historical research: project morgan wharf*. Museum's Extension Service, SA Museum, North Adelaide

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- Statham-Drew P (2003) James Stirling. Admiral and founding governor of Western Australia. UWA, Nedlands
- Westerdahl C (1992) The maritime cultural landscape. *Int J Naut Archaeol* 21(1):5–14
- Wolfe A (1994) The Albany Maritime Heritage Survey 1627–1994. Prepared for the Western Australian Heritage Council, the Albany Port Authority and the Albany Maritime Heritage Association. Albany: Wolfe and Associates