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Putting people back into ships: the use of archaeological evidence in the interpretation of preserved ships

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Much of Colin White's paper was delivered extempore and was illustrated with slides of the various ship preservation and archaeological projects which he quoted as examples. What follows, therefore, is not the exact text of his paper, but a version he has prepared specially for publication.

Introduction

In the Divinity Schools in Oxford, there stands an ancient, battered chair, so dark with age and constant polishing that it is impossible to be sure of what type of wood it is made. A leaflet explains that the wood came from the *Golden Hind*, the ship in which Sir Francis Drake made his famous circumnavigation. She was preserved at Deptford, by order of Queen Elizabeth I and when, in the early 1660s, she eventually began to fall to pieces, she was broken up and her timbers used to make a number of mementoes. The Oxford chair was presented by John Davies of Camberwell, Keeper of Stores at Deptford Royal Dockyard. A plate fastened to the back bears a poem by Abraham Cowley, which ends:

Drake and his Ship could not have wished from Fate
A more blest Station or more blest Estate
For Lo! a Seate of endless Reste is giv'n
To her in Oxford, and to him in Heav'n.

They knew what they were doing, those men of 1660. Once an old ship—however distinguished—had come to the end of her natural span, she was broken up. No time consuming restoration projects. No elaborate fund-raising appeal. Just a quiet and dignified end, with proper care taken that suitable relics were preserved for posterity.

How very different to our modern attitude! Since the last war, ship preservation has gone wild. The current International Register of Ships lists more than 400 vessels over 40 feet and the list is growing almost daily. In Great Britain alone, there are at least 15 different warship preservation trusts, all competing for funds and most of them in considerable financial difficulty. Ships are seen as crowd-pullers and every entrepreneur seeking to tack some 'heritage' onto his latest waterfront development so as to please the city planners, is anxious to acquire one.

But all these newly-converted ship enthusiasts forget that, in the characteristically trenchant phrase of Basil Greenhill, 'ships are exceptionally biodegradable'. They need daily maintenance: some of it the unskilled paint-chipping variety, so familiar to generations of sailors and some of it highly skilled and therefore very expensive. As Peter Spectre wrote in *Wooden Boat* in 1981, 'You can raise sea-chests full of money, and fill our ports and museums with newly acquired historic ships, but if you don't have the people to take care of them and the desire to do the job right, you will wind up with ships that are caricatures and not floating symbols of our proud heritage'. Look around some of our maritime centres today and you will see just how prophetic those words were.

By now, the distinctive neigh of a hobby-horse will have become apparent and it is necessary to pause for a moment to make my position completely clear, so that I am not written off as an anti-preservation fanatic. That position was fully set out in a paper given to the joint MARE/SNR Conference in Greenwich in October 1992 and now published in the Proceedings of the Conference by the Oxford University Press. Entitled 'Too Many Preserved Ships Threaten the Heritage', the paper suggested that, in our laudable enthusiasm to preserve our maritime past, we are in danger of going too far; that in attempting to save more than is actually feasible, given the financial constraints under which we all labour, we are in grave danger of threatening those projects that are already up and running. The paper urged that a period of restraint and consolidation was required and suggested that the time had come to prioritise, and even to start saying 'no' to apparently worthy cases if the funds were not available. Above all, the paper called for a national policy for ship preservation in Britain.

So, I am not against preservation *per se*, on the contrary, I actively support it. But I am against uncontrolled and indiscriminate preservation.

My Greenwich paper highlighted a number of problems faced by ship preservation projects the world over: lack of finances; limited logistical support in the shape of docks and ship repair facilities and shortage of ship husbandry skills. This paper will concentrate on another problem: interpretation. Once we have excavated all the artefacts from our wrecks, once we have saved and fully restored our historic ships, how do we set about interpreting them to the visitors we will need to attract if we are to earn the revenue to meet our running costs?

Two case studies

One of the great pioneering ship restorations in Great Britain was, of course, the preservation of Nelson's famous flagship HMS *Victory*. After a long and distinguished active service lasting well over fifty years, she was finally placed 'in ordinary' (i.e. in reserve) in 1812. At one point it seemed as if she was going to go the same way as the *Golden Hind* but she was saved—as tradition has it, by the personal intervention of her Captain at Trafalgar, and Nelson's great friend, Thomas Masterman Hardy—and converted into a stationary flagship for the admiral at Portsmouth. There she remained throughout the nineteenth century, moored in the middle of Portsmouth Harbour, revered by all, visited by thousands—and slowly disintegrating. Eventually, despite successive refits, she was so old and frail that it was feared that she might sink at her moorings and so, in 1922, she was taken into dry dock and a nationwide appeal was launched to raise money for her restoration, the 'Save the *Victory* Fund'.

The aim of her rescuers was to restore the ship to her condition at the Battle of Trafalgar in 1805. In effect, this required a major rebuild—so major that very little of the ‘original’ ship was left. The restoration was organised by Chief Naval Constructor of the day and so, not surprisingly, it was conducted more like a standard RN ship refit than an historic ship restoration project. So, for example, little attempt was made to record what the restorers found when they started work and no detailed account appears to have survived of the work they carried out. As a result, the ship took on a pristine and even sterile appearance. Photographs of the period show the deserted, empty gundecks, with each gun perfectly aligned with naval precision. Even the living areas, such as the Wardroom and messdecks, were bare and lifeless—the only nods in the direction of social history being a few mess traps and solitary hammock. Visually, it was stunning and deserved all the plaudits it received. But as an attempt to give visitors a sense of what the *Victory* looked like in 1805 it has to be judged a failure. There was no sense at all of the sheer clutter that would have resulted when some 850 officers and men were crowded into that confined space. Instead it had a tidy, rather genteel, and even prissy feel to it: almost as if this complicated war machine had suddenly been transformed into a National Trust property.

The second case study is a modern one. In Birkenhead, across the River Mersey from Liverpool, are preserved two 1960s warships: the frigate HMS *Plymouth* and the submarine HMS *Onyx*. Here, the problem is not over-sanitised restoration but an almost complete lack of it, due largely to acute lack of funds. The two ships have been marketed as veterans of the Falklands War of 1982, but this association has not had the drawing power the organisers expected—scarcely surprising since the war has already been relegated to the footnotes of History by the Gulf War, Bosnia and, above all, the extraordinary changes that have come about in the wake of the revolution in Russia. The ships are simply not earning enough money to keep them in the manner to which they were accustomed when they were in active service with the Royal Navy and so their general appearance has suffered and the level of interpretation offered is not high. As a result, like the *Victory* of the 1920s restoration, but for different reasons, the ships appear somewhat cold and lifeless.

It is important to emphasise that there are countless other ship preservation projects all over the world which are encountering similar problems. So, these two projects are used here only as examples and there is no intention to single them out in any way. They have been chosen simply because they help to highlight points that need to be borne in mind when attempting to interpret preserved ships.

Two vital ingredients bring a ship alive. The first is the sea. Ships were not made for lying idly in dry dock, or alongside a jetty. A ship is only fully living when she is plunging through the seas, the wind whistling through her rigging. As John Gardner wrote, in *The Wooden Boat* in 1975, ‘Large vessels, no longer in use on the sea, are, to a considerable extent, no longer vessels, and the experience they provide can only be a faint and distorted reflection of our maritime past’.

The second important ingredient is people. Ships in use are crowded with people, with all the bustle, the sense of purposeful labour, and the distinctive sounds (and smells!) that people bring with them. Vessels without people are literally lifeless—unhappy *Marie Celestes* doomed to drift through time in search of their soul. It is, of course, rather difficult to create a sense of being at sea in a preserved ship! But what about people? Surely, we can do something to create a sense that there are still people on board?

The ‘Star Trek’ solution

My own preference is for what I call the ‘Star Trek’ method. We all can conjure up an image of the Transporter Room of the Starship *Enterprise*, where Chief Engineer Scott stands by the controls, waiting for the command from Captain Kirk, on the surface of the planet below, ‘Beam us up Scottie!’. In my opinion, the kind of interpretation that works best is when a ship gives the impression that Scottie has just pulled his levers and beamed up the entire crew: leaving behind their tools, equipment, personal possessions, clothes, documents and all their other human impedimenta, lying just as it was when the owners were physically present.

In Great Britain, the best example of this method is the great mid-Victorian ironclad warship HMS *Warrior*, preserved in the Historic Dockyard at Portsmouth, a few yards aware from the *Victory*. Arguably the most revolutionary warship ever built, she survived quite fortuitously through having been converted into an oiling jetty once her usefulness as a warship had come to an end. Only the shell of her hull survived: her rigging, machinery, armament and internal layout all had to be recreated from scratch. Long and meticulous research established most of the important features and an ambitious restoration programme was embarked upon. Masts, yards and a maze of standing and running rigging restored her graceful proportions, replica engines and boilers filled the cavernous spaces beneath her water-line and squat fibreglass guns began to fill up the once-gaping gaps on her gundecks.

But one vital feature was still lacking: the small items; the personal ‘clutter’ that would transform her from a splendid example of ship restoration into a living experience. Where were the restorers to find this sort of social information?

Into the breach stepped Midshipman Henry Murray. Murray served in the *Warrior* during her famous first commission when the eyes of naval architects and planners the world over were upon her. Like all midshipmen, he was required to keep a daily journal as part of his training and in it he recorded the movements of the ship and the evolutions she carried out, illustrated with charts and technical drawings of various items of equipment. But then, for some reason (possibly as a punishment) he was ordered to draw a meticulous plan of the layout of each deck of the *Warrior* showing the exact location of every item of equipment, however small. After remaining in his family for almost a hundred years, the journal was finally presented to the Royal Naval Museum where it remained in the archives until it was examined as part of a routine search for *Warrior*-related material and its priceless contents finally revealed.

Thanks to Murray's plans, it has been possible to reconstruct accurately almost every nook and cranny of the *Warrior*. The great ship now pulsates with life and, standing by one of her mess-tables, packed with utensils and personal items, it is possible to feel the breath of her past crew-members lifting the hairs on the back of one's neck.

Nor has this lesson been lost on the modern restorers of HMS *Victory*. For some years now, she has been undergoing a second, and even more thorough, restoration designed to ensure that she will be looking her best for the bicentenary of the Battle of Trafalgar in 2005. As in the 1920s restoration, much attention is being focussed on the hull and rigging; but the opportunity is also being taken to use the results of modern research into the social history of the Navy to give the visitors some insights into the daily life on board. For example, instead of arranging the guns in the meticulously-aligned rows mentioned earlier, a number of them have now been displayed in varying positions: some illustrating the drill for firing them; others showing how they were dismantled for maintenance, or stowed safely in rough weather. Instead of a single hammock swinging in lonely splendour, a section of the lower gundeck is now given over to a complete set of them, hung at the regulation distance apart, and vividly conjuring up the cramped conditions endured by Nelson's sailors. In this restoration at least, social history research has taken its rightful place alongside research into methods of ship construction.

But the *Victory*'s restorers have now hit the same problem as those encountered by the *Warrior* team. What about the 'clutter'? How can we reconstruct the everyday items with which the ship's company would have surrounded themselves? Sadly, in those days midshipman were not required to keep such meticulous journals as those expected of their Victorian successors and so there was no Midshipman Murray waiting in some museum archive to come to the rescue.

The contribution of archaeology

When traditional scholarly research has been exhausted, other sources of information have to be investigated: most notably, archaeology. For, lying on the sea-bed all over the world are priceless collections of material that offer minute insights into the ways in which ships were manned and equipped—time capsules just waiting to be opened.

The most well-publicised example of such a time-capsule was of course the *Mary Rose* which also now lies alongside HMS *Victory* in the Historic Dockyard at Portsmouth. The extraordinary and fascinating collection of artefacts which were found in the wreck have yielded priceless information about daily life in a Tudor warship—right down to the crew member's comb with a head lice still trapped in it!

The *Mary Rose* project also offers another and very different lesson: the risks involved in diverting energy and resources into raising a wreck. It is usually people outside the archaeological and naval historical circles—fund raisers, developers and even politicians—who push for the raising of wrecks; seeing only their glamour and naively ignoring the enormous conservation problem that they pose. The example of the *Mary Rose* is

often quoted in support of such ventures but in fact anyone who is seriously considering such a course of action would be well-advised to examine the project much more closely.

More than ten years after its blackened timbers broke the surface of the Solent, the hull is still absorbing large sums of money and, as a result the project is now in serious financial difficulties. The ship is undoubtedly a powerful draw to visitors and has a remarkable ability to move and inspire but it has done little to advance our knowledge of Tudor ship construction. The real importance of the *Mary Rose* project is—and always was—the artefacts and they have been forced to take second place to what is now (admittedly with the advantage of hindsight) beginning to assume a cuckoo-like shape.

Artefact idolatry

Of course, original artefacts bring with them their own peculiar set of problems: above all the excessive reverence, amounting at times to idolatry, with which they are sometimes treated. Artefact idolatry is responsible for the obsession with lighting levels that leaves some galleries looking like a film-set for a remake of 'Dracula'. Artefact idolatry puts curators so in thrall to relative humidity that they can display only a fraction of their collections in the highly expensive climate controlled showcases that ideal conservation standards require. Most striking of all at present, artefact idolatry is at least partly responsible for the deep trouble in which the National Maritime Museum at Greenwich currently finds itself over its *Titanic* exhibition. Setting aside the ethical questions for a moment, what does that undistinguished collection of bits and pieces from the ocean bed actually add to our knowledge of life aboard an ocean liner in the Edwardian period? Examples of most, if not all, of the individual items can be found in other museum collections.

The truth is that the exhibition did not need the added attraction of so-called 'real' artefacts at all: the *Titanic* name is a sufficiently strong crowd-puller on its own and does not need any artificial, marketing-department-led assistance. Greenwich could easily have mounted an exhibition drawing on material from existing collections all over the world and looking at the story of the *Titanic* and her tragic loss, at the myths surrounding her sinking and, above all, at the remarkable pioneering work of Dr Robert Ballard and his team—and people would have queued in their thousands to see it. The fatal lure of a few 'real' artefacts has turned a potential jewel in Greenwich's crown into a poisoned chalice.

We need to demythologise objects. We need to remind ourselves that History is about people and that objects are only useful insofar as they help us to tell the story of people. Divorced from their users, they lose most of their meaning and their value is appreciably diminished. Moreover, objects are simply tools. And they yield their riches best when they are actually used. We can study them until our eyes run with strain, we can draw them, photograph them, and write learned articles about them. But we can never understand them half so well as when we actually use them. The problem, of course, is that when we use them we wear them out.

Replicas—the ideal solution

One solution which is currently gaining ground is the use of replicas. At one end of the scale, there are the replicas of individual small items that have been used in the restoration of HMS *Warrior*. At the other, are the full-sized replica ships that are being constructed all over the world from the Batavia in Holland to the *Endeavour* in Fremantle.

There are those who sneer at replicas and point out that they almost always involve compromises with authenticity. The best response to such snobbery are the wise words of the great maritime Australian, Alan Villiers, 'All old ships are either wrecks or replicas'. When we remember that even the *Victory*, *Cutty Sark* and *Warrior*—those great icons of the 'real thing' school—are now largely replicas, as a result of cumulative 'restoration', the objection of unauthenticity loses its power. The replica of the *Bounty* in Sydney Harbour may have engines, heating, flushing toilets and all the other accoutrements of our limp-wristed century but she still gives to many hundreds of tourists a brief but vivid glimpse of what it was actually like to live and work in a sailing vessel with its maze of rigging and its cramped conditions.

As with ships, so too with objects. Clearly the artefacts we recover from the sea-bed are usually too fragile to be handled regularly. But they can provide us with the accurate information we need in order to make authentic replicas which can then be used to fit out our preserved ships. For replicas have a finite life, with no conservation problems. Like Drake's *Golden Hind* they can be honourably retired when their natural span is over and, if they are broken, replacements can be made.

Replicas feature large in the current restoration of HMS *Victory*. During the 1970s a wealth of eighteenth century naval equipment and ship's stores were recovered from the wreck of HMS *Invincible*, a 74-gun battleship which went aground on a shoal in the Solent and eventually had to be abandoned. Most of the material recovered was at first sight unglamorous and even uninteresting but, nonetheless, it provided the naval historians with some valuable insights into the variety and complexity of the stores of a sailing warship. But among the workaday items were a few stars: for example, the square plates, rough dishes, made of two thin planks jointed together, with a lip around the edge to contain the gravy from a hot meal. The association with the well-known phrase 'three square meals a day' was irresistible and the plates appeared in countless newspaper articles. More important, replicas of them have appeared on the mess tables of HMS *Victory*, where they are now seen by the thousands of visitors who pass through the ship. By this means, an archaeological insight is being passed onto far more people than could be reached by even the most popular article or book.

However, the *Invincible* collection had its limitations. Because the ship went aground, rather than sinking, the crew had time to abandon her in an orderly fashion and they took most of their personal belongings with them. So, while the collection is an invaluable source for official stores, it is not much help in researching the sort of personal material that one might expect to find in an eighteenth century warship. For this sort of information, the ship's historians have recently begun to turn to the *Pandora* Project.

The *Pandora* was of course a near contemporary of the *Victory* and, when due allowances have been made for the special nature of her voyage and the particular part of the world in which she was serving, the material found in her can give some valuable insights. For example, the Keeper of HMS *Victory* is currently creating a replica of the ship's sick bay, which we now know was housed on the upper deck just underneath the fo'c'sle. Contemporary plans can give us some idea of the layout and the furniture it contained; surgeons' manuals and historic medical collections can suggest the equipment and medicines that might have been in use. But the discovery of the Surgeon's cabin in the *Pandora*, with its remarkable pot pourri of personal and professional items—his watch lying next to his syringe—has created an incomparable yardstick against which to judge the results of the academic research. Or, to take another example, it has been long suspected that the officers of the eighteenth century Royal Navy had ways of keeping themselves warm in cold weather. Until recently, the only certain evidence we possessed were a few references in contemporary sources (e.g. a list of the *Victory*'s stores at the time of Trafalgar, in the Royal Naval Museum archive includes a 'portable stove') and a miniature cabin stove in a contemporary model of HMS *Royal George*. But supposition has now been replaced by verifiable fact with the discovery by the *Pandora* divers of a complete (and 'portable'!) stove.

But the *Pandora* can offer still more exciting insights. We know that she foundered very quickly and that, as a result, her ship's company was forced to take to the boats very hurriedly, carrying with them only those possessions that they were able to snatch up in a few moments. It is likely, therefore, that the officers' cabins—and even more excitingly, the crew's quarters—still contain a large amount of personal possessions. The diving team is currently working its way for'ard and we await their finds with keen interest!

Conclusion

Until comparatively recently, every young man who entered the Royal Navy to train as an officer, received a copy of a handsomely-bound book, *The Naval Officer's Manual*. The frontispiece was a photograph of an ordinary seaman with the simple caption: 'The Greatest Single Factor in War.' In 1954, Sir Mortimer Wheeler made a similar point to his fellow-professionals, when he wrote in *Archaeology from the Earth*, 'Archaeology is a science that must be lived, must be seasoned with humanity'.

Ships can best be brought alive by making People the greatest single factor in their interpretation: the people who designed and built them; those who sailed and navigated them—even those who have fought to save and restore them. For, in the end, all who work in maritime studies—be they writers and researchers; curators and conservators, divers and archaeologists—have the same purpose and goal: to season History with humanity.

For that to happen, we all need to share our insights more; to cross-fertilise more between our specialisms. Specifically, we need to use the insights of maritime archaeology to put people back into our preserved ships.

Indigenous water-craft use in Australia. The 'Big Picture' and small experiments on the Queensland coast

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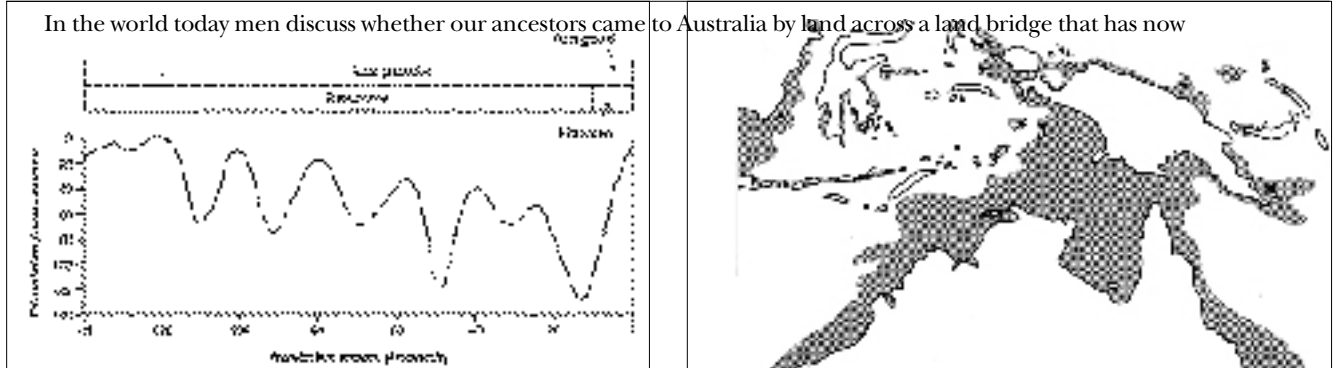


Figure 1. Sea-level changes during the last 140 000 years (after Chappell, 1983).

gone, or by boat, across the sea from Asia. Scientists who study faces say we look like some of the southern Indian people and like some of the hill people of the Celebes. Well let them continue to find the answer.

The truth, of course, is that my own people, the Rirajjingu, are descended from the great Djankawu who came from the island of Baralku far across the sea. Our spirits return to Baralku when we die. Djankawu came in his canoe with his two sisters, following the morning star which guided them to the shores of Yelangbara on the eastern coast of Arnhem Land. They walked far across the country following the rain clouds. When they wanted water they plunged their digging stick into the ground and fresh water flowed. From them we learnt the names of all the creatures on the land and they taught us all our Law.

That is just a little bit of the truth. Aboriginal people in other parts of Australia have different origins and will tell you their own stories of how the mountains came to be, and the rivers, and how the tribes grew and followed the way of life of their Spirit Ancestors (Wandjuk Marika, OBE, in Foreword to Isaacs, 1980).

Introduction

This paper focuses on a number of issues concerning Australian indigenous water-craft where interpretations have changed significantly in recent years. These include the role of water-craft in the initial colonisation of Australia; the extent of contact after first settlement; and the nature and extent of water-craft use from initial settlement to European contact. Limited experimental work undertaken on the Queensland coast will also be described which questions previous assumptions concerning the capabilities of indigenous water-craft.

Water-craft types and distributions are not described in detail in this paper. This information is contained in the journals of early European explorers, and these and



Figure 2. Pleistocene land mass of Sunda and Sahul. Shaded area represents maximum extent of continental shelf (-200m sea-level) (after Flood, 1989).

other sources are summarised elsewhere (e.g. Thomas, 1905, 1907; Mathews, 1907, 1909; Roth, 1908, 1910; Radcliffe-Brown, 1916; Davidson, 1935, 1937; Haddon & Hornell, 1937; Thomson, 1952). More recent summaries are by Jones (1976) and Holland (1976). Doran (1982) has discussed Austronesian water-craft, and Irwin (1992) provides a comprehensive account of Polynesian water-craft use, both of which include implications for Australia.

The role of water-craft in the initial colonisation of Australia

At no time in the last three million years has there been a complete land bridge between the Asian (Sunda) and Australian (Sahul) continents and before then the gulf was even wider (Figs 1 and 2). In any discussion of the human colonisation of Australia, water-craft, must therefore play a key but elusive role.

In 1976, Jones noted that the water barriers (60–100 km) between Sunda and Sahul, even at periods of lowest sea levels, would have been formidable, and having reviewed the capabilities of Tasmanian and mainland water-craft proposed that crossings from Sunda to Sahul would have been 'sporadic and rare, the result of accident rather than design' (Jones, 1976: 261). In response, White and O'Connell (1979: 24) indicated they were 'not convinced

that Wallace's Line was ultimately breached by chance voyages in the context of an infinite period of time' though an alternative view was not made clear. Jones (1979: 450) replied that there was no evidence that late Pleistocene water-craft in the region were more sophisticated than any known ethnographic examples. He therefore maintained a

...scenario of peoples foraging on the shorelines of the southeastern part of Asia, and with some capacity to ride on water with rafts or other primitive craft, slowly and stochastically gaining access to the islands of Wallacea and eventually Australia by random processes (Jones, 1979: 449).

Jones also thought the chances of success of any particular voyage would have been extremely low and that it was likely there had been many unsuccessful landfalls on the Australian and New Guinea coasts.

In a subsequent synthesis of Australian prehistory White and O'Connell (1982: 44) develop a view more consistent with that of Jones. They indicate that once some simple forms of water-craft were developed, the chances of accidents would have risen sharply. The craft, in their view, were probably, like historic examples, very simple, such as logs or reed-bundle rafts, normally used for crossing river mouths or making trips of a few hundred metres to offshore islets and reefs. In summary, they support Jones' (1976) original view that

...regularly visited islands lay well within a voyaging range of 10 km and that risks were too great for longer trips to be made regularly or intentionally. As far as we know, this would be true throughout Australia except in such very sheltered waters as occur inside the Great Barrier Reef along the north-east coast (White & O'Connell, 1982: 45).

They go on to suggest that if

...craft with similar capabilities to those just described were developed in Sunda-land and Wallacea in Late Pleistocene times, then islands separated by less than 10 km would have been open to intentional voyaging. Looked at in this way, a number of Wallacean islands would indeed have been open to human settlement, although this would not have been true of all of them, *nor of Sahul itself* (White & O'Connell, 1982: 45 emphasis added).

The above views have persisted in the writings of the biogeographers Keegan and Diamond (1987: 66), although somewhat ambiguously, since on the one hand they note 'modern Westerners have tended to assume they alone were capable of purposeful exploration', but then follow the White and O'Connell model and suggest

...the most parsimonious assumption is that one raft-load of people from Timor or the Moluccas survived after being swept to Australia or New Guinea, and this unlikely accident was not repeated for tens of thousands of years (Keegan & Diamond, 1987: 66).

Keegan and Diamond discuss the probability of a single raft load of people successfully colonising an isolated landmass and note that the riskiest phase in colonisation is when a small group reach an uninhabited island. They refer to White and O'Connell's (1982: 48) use of demographic

simulations to reconstruct

...a 'suitable picture' of the initial settlement of Australia and New Guinea as comprising a large family consisting of one male, two or three women, and some male and female juveniles (Keegan & Diamond, 1987: 77-78).

There is some irony in this proposal, since while they accept the idea of accidental dispersal, the composition of this hypothetical group would appear neither random nor accidental! Nevertheless, it is a more convincing scenario than the often promulgated 'one young pregnant female' clinging to a log (Calaby, 1976: 24), which White and O'Connell (1979: 24) had earlier and rightly suggested should be relegated to the realm of theoretical biology.

While Jones in his 1976 paper developed the 'sporadic, rare and accidental' model of initial colonisation, subsequently followed by others, there is nevertheless a prophetic irony in the last lines of his paper. He notes that

...perhaps it will be here [the eastern flank of the Malayo-Melanesian archipelago], at the junction of the world's greatest ocean and the world's greatest archipelago, that we will eventually find man's oldest water-craft (Jones, 1976: 261).

It is unlikely that we will ever find (as Jones would have been aware), the physical evidence of 'man's earliest water-craft', nevertheless new data would indeed suggest the location identified by Jones was an area of very early water-craft development. Furthermore, the view that the initial settlement of Sahul was dependent on land bridges or lower sea-levels, that colonisation was accidental and that subsequent adaptation occurred in isolation now all appear questionable. Evidence in support of a reassessment comes from a number of sources.

The timing of the initial colonisation of Australia remains controversial, but there are increasingly confident claims for a date of c. 60 000 years (see Roberts, *et al.*, 1994: 695). Whether this date, or the more conventional date of 40 000 years is accepted, it is clear that lower sea-levels and land bridges were not critical since at these times, sea-level would have oscillated around -40 m, not c. -130 m at 20 000 years ago at the height of the last glacial maximum (see Fig. 1). Thus the issue of land bridges is robbed of its romantic attraction (van Andel, 1989: 742). In fact Thiel (1987) has reversed the argument suggesting that the idea of people moving at times of lowered sea-level (i.e. when more land became available) is not a useful explanation; rather she proposes that as rising seas reduced land area in many regions and drowned some islands these pressures lead people to seek new lands. On this basis she proposes that Australia may have been first colonised between 53 000 and 45 000 years ago, and again at 18 000-8 000 years ago when sea-levels rose, and also notes that this might explain some of the genetic diversity identified in Australia.

Recent support for the early use of water-craft comes from archaeological investigations in New Ireland, New Britain and the Solomon Islands chain. Here four sites, Matenkupkum and Buang Merabek on New Ireland, Yombon on New Britain and Kilu on Buka at the northern

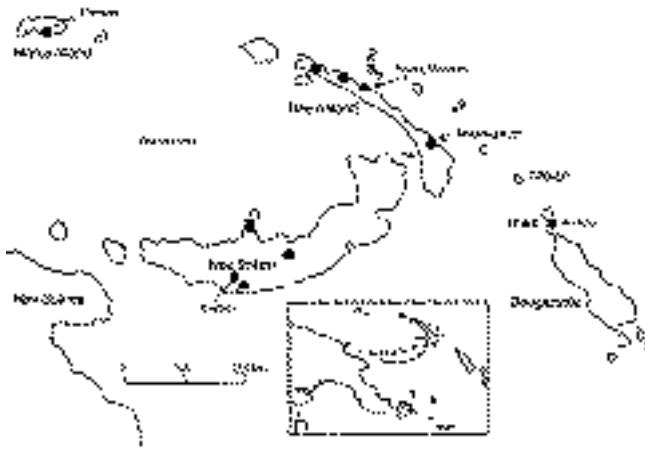


Figure 3. Pleistocene sites in island Melanesia. Those mentioned in the text are named (after Fredericksen, *et al.* 1993; Gosden, 1993; Pavlides & Gosden 1994).

end of the Solomon Island chain all date to at least 30 000 years ago. Indeed Yombon in a rainforest environment dates to 35 000 years ago (Pavlides & Gosden, 1994). Getting to Buka at this time would have involved an open ocean journey of up to 180 km (Gosden, 1993: 132). Further intriguing evidence also comes from Manus Island where the site of Pamwak, part way down the sequence, has a terminal Pleistocene date. To reach Manus would involve an open ocean voyage of 200–300 km, which could therefore potentially have opened up Pacific exploration as far as Vanuatu (Fredericksen, *et al.* 1993: 151) (Fig. 3). Evidence of early colonisation is not confined to Melanesia. To the north, the Ryukyu chain of islands was never joined at times of low sea-level to either the Japanese archipelago or the continental shelf. Thus the find of a human skeleton at Yamashita-Cho Cave on Okinawa must support the evidence for early sea crossing (Gamble, 1993: 228). Recent dates of 30 000 years BP from Tasmania also raise the possibility that it too was colonised across open water (Gamble, 1993: 232).

The view that has persisted into the last decade of the ‘small group, accidental’ colonisation of Australia is thus challenged, though cannot be disproved. In retrospect however, it is perhaps curious that it maintained currency for so long. Biogeographical models would suggest that rather than the ‘young pregnant female’, substantial group size, high birth rates, low death rates, prime reproductive ages (Black, 1978) and replenishment from an original homeland (MacArthur & Wilson, 1967: 118–21), is a more tenable model of successful colonisation.

The ‘accidental/sporadic’ models of colonisation are also pervaded by a gradualistic evolutionary model of water-craft development from logs to rafts to canoes. However this need not be the case. The past two decades in evolutionary theory have seen growing support for the idea that species undergo spurts in evolutionary change, a concept known as ‘punctuated equilibrium’, and this may have parallels in cultural development. It is a view shared with Gamble (1993: 11, 37, 182) in his review and

explanation of global colonisation in which it is accepted that populations adapt to changes in their environments and that where these changes are rapid so too are cultural changes. The gradualistic model on the other hand has tended to remove from populations a sense of choice and has detracted from a discussion of reasons or motivations for population dispersal and cultural change.

A major stumbling block in the view of many researchers, to non-accidental or planned settlement, is that people cannot have known that land lay ahead to be colonised. However, it is clear from the great Polynesian voyages of the Pacific that this is a modern western perception of the sea and travel. It has been proposed that the discovery of some islands led to the expectation of more islands to be discovered (Keegan & Diamond, 1987: 67), and Irwin (1992) has demonstrated that bushfires, cloud formations, wind directions, birds and a range of other factors can provide clues to the location and direction of land that cannot necessarily be seen.

Thorne and Raymond (1989) have provided some possible solutions to the issues outlined above; in particular the potential use of more sophisticated water-craft than is generally assumed. They suggest that a potential model for the type of water-craft that may have been used in the past is found along the coast and rivers of China today (see also Birdsell, 1977: 134–44). This is a

...simple bamboo raft, made of up to eleven stout lengths of bamboo lashed side by side, braced by thinner bamboo crosspieces. The lashings are strips of the outer skin of the bamboo, which contains long, thin fibres as strong as steel wire. The result is a platform between one and two metres wide, and up to about four metres long, tapered at the front. The long bamboos are slightly turned up at the bow, to better ride the waves, and there is a slot built into the stern to take a steering oar. Amidships, the raft may have a step to take a mast and sail; otherwise it is rowed by the fisherman, who stands up facing forward and pushes on his oars, in the Asian fashion (Thorne & Raymond, 1989: 39–40).

Thorne experimented with such a raft and thought it clear that

...even such simple water-craft could have reached the coast of Greater Australia - especially at times of lower sea levels (Raymond & Thorne, 1989: 42).

Significantly, Bowdler (1990: 337; 1992: 581; see also Gamble, 1993: 182) has also put forward a case, the details of which are too complex to enter into here, based on artefactual evidence that would derive Southeast Asian and Australasian populations of the Upper Pleistocene from China, in an archaeologically simultaneous colonisation which swept across several water barriers some 40 000 to 50 000 years ago.

Unfortunately, the perishable materials from which early water-craft were made would not survive in archaeological sites so that it may remain difficult to resolve this issue. Bamboo does occur indigenously in Australia, but the species are not generally of a size for making watercraft, and this may provide a partial explanation for the apparent

loss of water-craft technology in Australia (Bowdler, pers. comm.), a point discussed further below.

In sum, it is clear from the evidence presented above that land bridges/sea-levels may not have been overly significant factors in the first colonisation of Australia. Further, the 'random, small scale, accidental' models of colonisation, which have persisted into the last decade, may not offer the most 'parsimonious' explanation as suggested by a number of researchers. Instead a case can be made for planned voyages using sophisticated water-craft. As Bowdler (1990: 337) has suggested there was

...probably not one, or two, or any given number of colonisations, but as Thorne (1980b) has suggested, 'one long continuous migration, all maritime, but with consequent adaptive cultural variation.

Contact after initial colonisation

The extent to which outside contact continued after the initial colonisation of Australia has been debated since the arrival of Europeans and this divergence of views remains today.

As early as 1870, for example, it was suggested by Huxley (1870) that the Tasmanians may have come directly from New Caledonia, a view that received intermittent support (e.g. Pulletine, 1929; MacIntosh, 1949), though at the time was soundly dismissed by Davidson (1937). Others (e.g. Thorpe, 1929) proposed a Polynesian link with the New South Wales coast and still others (e.g. Graebner, 1905, 1913), an ancient West Papuan diffusion into the extreme west of Australia overlain by a later group originating from eastern Papua. At a more general level, some (e.g. Elliot-Smith, 1933: 129; Rivers, 1926) argued that practically every element of Aboriginal culture came from outside Australia in recent times, while others (e.g. Kenyon *et al.*, 1924) argued that most if not all cultural differences could be attributed to local causes. Hamlyn-Harris (1917: 29) thought there was little outside contact due to the 'clannishness' of Aboriginal groups. Thomson (1933: 454) on the contrary thought there had been repeated invasions over long periods, while Thorpe (1924: 492) considered all introduced items to be of recent origin. In a detailed review of material culture items, McCarthy (1940: 314) saw Aboriginal culture as 'indissolubly bound up with that of Oceania'.

In hindsight some of these views might appear entirely fanciful, but it must be stressed that they were being made prior to the era of modern physical anthropological and archaeological research in Australia, and well before dates of over 30 000 years were established for human settlement.

A more balanced review of potential contacts was implicit in detailed distributional studies of Australian material culture items undertaken over a number of years by Davidson and McCarthy (see McCarthy, 1974, 1977 for extensive references). Davidson based his studies on analysis of museum collections within the framework of a theoretical 'age-area' model. The basic principle of this model was that items found at the peripheries of Australia

were the earliest introductions, while later items were not so widely dispersed from their point of origin. McCarthy (1970: 149) has demonstrated where Davidson may have applied the age-area concept too rigidly, and discussed difficulties in its application but has maintained the value of such an approach and continued to use it.

In the era of modern archaeology and ethnographic research the contact debate has continued. Golson (1971), for example, noted generally that outside cultural processes had an effect on Australia. White (1971: 187) saw trade and contact through Cape York as part of a long tradition that resulted in a correlation between the development of agriculture in Melanesia and the appearance of later stone technologies in Australia. Jones (1979) stressed that the appearance of the dingo in Australia demonstrated that contact was made in recent times. White and O'Connell (1979: 26) however, suggested that while Cape York people adopted elements of New Guinea culture, including items of technology, folklore, ritual and language, most aspects of Aboriginal technology could be attributed to local developments. Mulvaney (1961: 100; 1975: 49) has also maintained that ceremonial and material cultural borrowing occurred which enriched Aboriginal lifestyles and increased sea-going efficiency but added that this did nothing to alter the basic orientation of Aboriginal economic or social systems.

In contrast, McCarthy (1957; 1977: 252) has argued that the emphasis proposed by Mulvaney and others underestimates the effects of contact. He has proposed that the dugout canoe and harpoon for example were outstanding permanent traits added to Aboriginal culture, causing significant change to fishing and navigation methods. Other items which in McCarthy's view (1977: 258) formed a significant complex of introduced items included barbless bone fish-hooks and stone files for smoothing them, bark canoes and paddles, nets, multi-pronged spears and bone *muduk* points which he suggested spread southward along the coast from Cape York to Victoria.

The extent and effects of culture contact on Australia are therefore unresolved. Two of the most recent syntheses of Australian prehistory reflect this continuing divergence of views.

Flood (1989) throughout her book makes reference to the Australian wide appearance of new traits from outside Australia, and for Cape York she notes that there is undoubted Papua New Guinea influences on technology, ritual, art, mythology, language and physical characteristics. On the other hand, White and O'Connell (1982: 49,83) spend little time on such comparisons and propose that none of the data presently available for Sahul require its population to be derived from more than one source. They suggest that local differentiation provides an adequate explanation for all variations that have so far been demonstrated in modern and prehistoric populations.

A number of people, including myself (Rowland, 1980, 1987), have thought it paradoxical that people moved so widely throughout the Southeast Asian region and into the

Pacific; yet that these movements are not widely considered to have had a significant impact on Australia.

Keegan and Diamond (1987: 72–73), for example, note the paradox that the Polynesians traversed thousands of kilometres of the Pacific yet failed to reach Australia or the central Solomons. Their explanation however appears somewhat contradictory. They note that the difference was that New Zealand was uninhabited when the Polynesians arrived, but Australia and the central Solomons were not. Nevertheless they note

...it is likely that the Polynesians did reach Australia and the central Solomons but were killed on arrival, prevented from settling by the already established Australians and Melanesians, or assimilated into existing populations (Keegan & Diamond, 1987: 73).

Irwin (1992) who undertook comprehensive simulation studies of Pacific navigation notes that a case can be made that not only did Oceanic people explore and settle the remote Pacific but also found the continental limits of their island world. In fact

...Australia was so easy [to reach] it is inconceivable that this did not happen many times, accidentally or otherwise, and Pacific artefacts have been found on its northeastern coast, although their archaeological context is unknown (Irwin, 1992: 100).

The results of one of Irwin's computer simulations was such that he could not conceive of why no Lapita pottery had been discovered in Micronesia and Australia. While he could satisfy himself for Micronesia

...the case of Australia is more difficult to argue away. Even if colonists failed to stay or survive local competition, they took with them a conspicuous material culture, and it is not impossible there are sites to be found, perhaps in areas of the northern coast on Barrier Reef Islands (Irwin, 1992: 145).

The appearance of new material culture items in a region may result from internal processes (independent invention/innovation), or through external contacts (diffusion/migration). As indicated above diffusionist explanations dominated the first half of this century at a time when in evolutionary terms Aboriginal cultures throughout the world were seen to be lowly and uninventive. Subsequently, diffusionist theories became unpopular because they were seen to deny indigenous cultures an innovative technological or economic role (Rowland, 1987: 38). In the era of modern archaeology, diffusionist views have been largely ignored. While it may be easier to detect evidence of invention/innovation in an archaeological sequence, diffusion/migration needs to be considered as an alternative explanation (Dortch, 1981; Rouse, 1986; Rowland, 1987, in press; McNiven, 1993), if for no other reason than internal development may simply be accepted by default.

If contact from outside Australia did occur, then there are a number of areas across northern Australia where this was most likely to have originated. Like others before me (e.g. Haddon, 1920, 1935; Hamlyn-Harris, 1915, 1917;

Thorpe, 1924; Thomson, 1933, 1952, 1966) I have found the evidence for contact through Cape York compelling (Rowland, 1987, in press).

Cape York and Papua New Guinea are only 150 km apart and more closely linked through the islands of Torres Strait. Contact via this chain would have occurred as such however, only within the last 7000–8000 years when sea-levels reached their present position and the islands were formed (McCulloch *et al.*, 1989: 1709). Prior to this time Torres Strait would have been part of an extensive upland plain of remanent karstic reefs and igneous hills largely unattractive to human settlement (Barham & Harris, 1983: 544).

People were on the Queensland and New Guinea sides of Sahul prior to 40 000 years ago and it would therefore seem probable they shared at least some common traditions. How long these remained after the separation of the Sahul land mass into New Guinea and Australia is difficult to resolve. Some support for the idea of continuity is evident in broadly similar levels of stone technology at this time (Hayden, 1977), though sites are few and scattered and specific parallels difficult to find. Nevertheless Bowdler (1992: 570, 576) has perceived a general similarity in stone tool assemblages across the broad area of Southeast Asia and Australasia, representing 'a sort of travelling survival kit' that varied according to raw material availability, site usage and general environmental context. At this stage insufficient comparative work has been undertaken between archaeological collections in Australia/New Guinea and Southeast Asia and this remains an exciting avenue for future research.

By at least 9000 years ago horticulture was being practised in the New Guinea highlands (Golson, 1977) and one might therefore expect that if continuity existed over Sahul horticultural evidence might be found on the Australian side of Torres Strait. Plant foods eaten by Aboriginal people of northern Australia are closely related and even identical to those that formed the basis of Indonesian and Southeast Asian horticulture (Golson, 1971: 198–201). However, environmental differences between New Guinea and northern Australia may have discouraged similar adaptive responses. The regular high rainfall, landform diversity and rich soils on the New Guinea side of Torres Strait, are replaced on the Australian side by ancient relict landforms under tropical savanna environments with a long dry season and poor laterised soils (Jones & Bowler, 1980: 7–8). Nevertheless, after separation a chain of trade networks did link Papuans of the Gulf with the Aboriginal groups of Cape York and this is reflected in a cline of economic systems from largely horticultural in the north to hunting and gathering in the south (Barham & Harris, 1983). Quasi-horticultural activities in northern Australia such as winnowing and grinding of wild rice, the gathering of yams snapped off below the join of the tuber and vine stock so that they will grow again, and the dispersal of edible tree fruits in suitable habitats such as middens, may be a legacy of contact between New Guinea and Australia

(Jones, 1975). However, since the terrestrial environments of New Guinea and Australia are markedly different it may be more profitable to search for evidence of continuity in coastal areas and associated technologies where diversity would not have been so marked. The problem that arises however in coastal areas is preservation, especially at those crucial periods when sea-level was lower.

Any continuity that did exist over Sahul would certainly have been reduced when sea-levels divided Sahul into New Guinea and Australia. From this point on we therefore need to identify introduced items of material culture; and water-craft again become a key but elusive factor.

While changes occurred in Australia after 7000 years ago the reasons for these changes are not easy to decipher. For example, dingo bones and small tools appear in the archaeological record after 7000 years ago, and while the dingo certainly originated outside Australia the origin and dating of small tools and dingoes has been more controversial. Some archaeologists (White & O’Connell, 1982: 26,102) favour a view that small tools were independent inventions within Australia, while others (Flood, 1989) suggest small tools and dingoes were introduced. Whether small tools and dingoes were introduced about the same time has also been debated as has the time of their arrival. Initially they were thought to have been introduced as early as 7000 years ago, but are now more firmly dated to about 4000 years ago (Flood, 1989: 203–4; Bowdler & O’Connor, 1991). It has been proposed that no great influx of people was necessary to bring these new elements into Australia but rather that a gradual trickle of new people and elements were added to a traditional way of life, changing but not radically transforming the existing patterns (Flood, 1989: 209).

A well linked trade network between Australia and New Guinea through the Torres Strait Islands did exist at the time of European contact (Moore, 1974: 343). Aborigines at Cape York traded spears, spear throwers and red and white ochre with the Western Islanders and were involved in a wider network of trade through Muralag (Prince of Wales Island). The Islanders traded pearl shell, conus shell and turtle shell artefacts and human heads to Papua New Guinea and received in return canoes, drums, various items of ceremonial adornment and weapons from the Fly River (Moore, 1984: 35–6).

There are a number references (Haddon, 1935; Jack, 1922; McCarthy, 1939; Stokes, 1846) to voyages of Torres Strait Islanders far down the coasts of Cape York but these are discounted by Moore (1978: 323), who claims the only real evidence of contact is provided by McConnell (1936: 432–4). Moore (1978: 324; 1979: 323) argues that Torres Strait influences resulted from inter-tribal contacts and not by extensive Islander visiting. By inference then he did not see a great extension of water-craft into the Australian realm. In support of Moore’s view it should be noted that there are no equivalent references in Australia to the 50 ft double out-riggers observed by Flinders in the Torres Strait and that at contact, at least, exchange between Papua

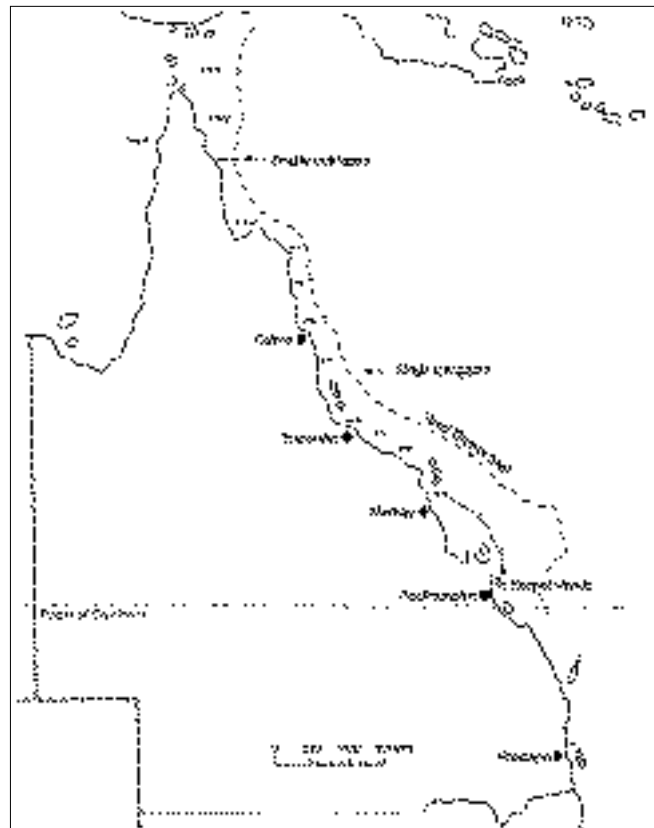


Figure 4. Distribution of outrigger canoes on the Queensland coast (after Rowland 1987).

New Guinea and Cape York was not direct but through a series of interrelated exchanges. The trade in canoes in particular seems to have been highly controlled (Lawrence, 1994: 262, 265).

Evidence of culture contact through Cape York is, however, evident in items of material culture, in human physical types, and via linguistic evidence.

Similarities in items of material culture between Papua New Guinea and Cape York have been frequently noted (see Rowland in press for references). McCarthy (1940) has provided the most comprehensive summary of these, and lists material culture items and techniques under a number of headings dependent on possible date, location and means of entry. Apart from items similar in appearance, there are also references in the literature (e.g. Kennedy, 1949; Virchow, 1884) to items such as stone axes produced in materials of supposedly foreign origin that would repay scientific investigation.

Physical anthropologists have long debated whether there was one, two, three or more migrations into Australia (see Birdsell, 1993), and the extent of movement through Cape York is unclear. Blood group gene frequencies and skull traits have demonstrated a north to south cline (see Kirk & Thorne, 1976: 1–8 for references) and anecdotal physical descriptions parallel these clines with evidence of Papuan physical appearance stretching down Cape York (e.g. Gribble, 1933: 2; Thomson, 1934: 235; Dalrymple, 1873: 631; Allen & Corris, 1977). Some genetic contact

was therefore occurring at Cape York. Most however would probably agree with Brace (1980: 153) that a trickle of biological influences would account for the differences rather than specific waves, migrations or invasions.

Linguistic evidence has so far provided only vague indications of the direction and nature of contact. In New Guinea there are several dozen language families with somewhere between eight or nine languages though none would appear related to Australian languages (Dixon, 1980: 238). In Australia, there were about two hundred languages at the time of European colonisation, however it is not known if these were introduced with the original arrivals or arrived later since languages can change dramatically over short periods. Links between Arandic of Central Australia and Cape York languages have been suggested (Wurm, 1974: 366) but such claims remain unsubstantiated. Recent investigation of names for fish-hooks has suggested to Walters (1988: table 2: 105) at least some borrowing and diffusion of linguistic terms throughout the region from an Austronesian source.

Archaeological research has so far contributed little to defining areas of culture contact but may do so by establishing chronological controls on possible introduced items. However, contact may have occurred over such a long time period and at irregular intervals, making it difficult to define a chronological sequence of contact. Such contact may also have originated from a number of points at different time periods and extended at different rates and directions across Australia. Much of the evidence for such contact, in the form of perishable items of material culture, would be unlikely to survive over long periods of time. Indeed most of the present evidence for culture contact is based on observations of material culture in use throughout the period of European contact, where it is difficult to separate traditional culture items from those influenced by possible contact.

A number of items of Australian material culture are nevertheless arguably derived from external sources and two of these, canoes and items of fishing gear, are discussed below in order to outline the difficulties of interpretation and to speculate on future trends.

Two major types of canoes were in use on Cape York at the time of European contact, double-out-riggers in the north and single-out-riggers in the south (Roth, 1910; Thomson, 1934: 243; Haddon & Hornell, 1937: 179). It would seem reasonable on morphological grounds to see a relationship between these outrigger canoes and similar ones in Papua New Guinea. However, without chronological control it is difficult to determine whether out-riggers were invented in Papua New Guinea and the concept transferred to Australia or vice versa; or if out-riggers were independently invented in both areas. Hale and Tindale (1933-4: 121) believe both the double and single-out-riggers were derived from external contacts, while Roth (1910: 11) argued the single-out-ri-gigger was a local modification of the double-out-ri-gigger. In neither case do they provide detailed arguments to support their conclusions.

The maximum distribution of outrigger canoes has been variously put at the Endeavour River (Thomson, 1952: map 1), Fitzroy Island (McGillivray, 1852, II: 15), and just to the north of Dunk Island (Banfield, 1977: 238). However, they were sighted as far south as the Whitsunday Islands [described by Cook (Beaglehole, 1955: I: 337), Banks (Beaglehole, 1962: 75) and Parkinson (1784: 141)] and Cape Hillsborough (Rowland, 1986, 1987). Out-riggers were thus in use much further south than previously thought; at least intermittently as far south as Cape Hillsborough though they apparently did not displace bark canoes in these areas. It is possible that they may have been distributed further south in the past but this would be difficult to confirm. In the areas they were observed, it is not clear whether they were made and used locally, were obtained by trade, or represent occasional visits by Papuans and/or Torres Strait Islanders along the coast (Rowland, 1986, 1987) (Fig. 4).

The extent of canoe penetration from Papua New Guinea into Australia is obviously of crucial importance since canoes would have provided the means for the introduction of other items of material culture. However, as to the age and extent of such penetration we can only speculate at present.

Prior to 6000 years ago the present coastline and islands of Queensland would not have existed as such. Throughout the Pleistocene there were probably far fewer islands off the Queensland coast than at present. After 6000 years ago, however islands would have become more numerous and would have begun to take on their present characteristics, with some fluctuations occurring up until 3000 years (Flood, 1980: 83; 1981: 19). These islands would initially have been 'empty habitats' susceptible to colonisation by people adapted to marine environments. Whether the islands were colonised from adjacent mainland areas or from further north remains open to investigation. There is some evidence to suggest that most of the islands were not intensively exploited until around 3000 years ago (Rowland, 1983), which correlates in time with Austronesian expansion in the Pacific (Rowland, 1980, 1987). Certainly by the time of European contact there is evidence of island chain movement along the Queensland coast reflecting the behaviour of marine specialists dependent on reliable water-craft. The inhabitants of Dunk Island, for example, travelled as far south as Hinchinbrook Island, and seemed to have more in common with Hinchinbrook people than those of the adjacent mainland (Banfield, 1908: 62). Similar island chain movements are noted for the Whitsunday Islands (Lamond, 1960; Tindale, 1974; Rowland, 1986, 1897), and for the Keppel Islands (Rowland, 1980, 1982).

The distribution of some items of fishing gear also seems to parallel the distribution of outrigger canoes and the importance of offshore islands. For example, fish spears with three or four hardwood prongs were used in the north and as far south as the Keppel Islands (McCarthy, 1955: 286). Two types of fish-hook were used along the coast: a composite hook in the north (Roth, 1901: 21) and crescent-

times (Bowdler, pers. comm.).

A possible solution to the dilemma proposed by Bowdler would be that water-craft in many cases simply became a minor item in the process of adaptation following initial settlement. This might seem obvious or simplistic, but can be explained in biogeographical terms, and has some significant implications.

Although still favouring a coastal colonisation of Australia and Southeast Asia (Bowdler, 1977, 1990, 1992), Bowdler (1992: 569) now accepts (without any sense of a return to Birdsell's 1977 saturation model) that the 'process of adaptation to the new continent, now seems to have been considerably more rapid than originally supposed'. This is not surprising if we follow the biogeographical theories of colonisation proposed by MacArthur and Wilson (1967), and may provide some resolution to the problem raised by Bowdler.

In biogeographical colonisation models of new environments there are good reasons for assuming high levels of mobility, where exploratory behaviour is adaptive (Birdsell, 1957: 53) and where it can also be considered adaptive for colonisers to be opportunists rather than specialists (Rowland, 1975: 73–74).

Fretwell (1972) has noted, for example, that exploration groups are likely to advance some distance ahead of a main colonising group. These groups may be involved in only small-scale, short-term random exploitation of resources in an area before they return to the main settlement. However, if sufficient resources and suitable habitats are found in the newly explored area, pockets of population might thus be established some distance ahead of advancing fronts. Fretwell (1972: 91) also notes that a 'very small increase in population size may result in a very large change in distribution'. A corollary to the above, is that in order to adapt to local environments colonisers will incur a loss of dispersal power. In this sense colonisers having got where they are going do not need to go any further. This loss in its turn tends to fragment populations into demes which specialise separately to the local environments in which they occur (MacArthur & Wilson, 1967: 159). Thus in some habitats to which populations adapted water-craft would have been unnecessary.

The above analogies are predominantly derived from animal behaviours. Nevertheless, there are also human parallels. The initial human colonisers of the Pacific must have got there in sophisticated ocean going water-craft, however by the time of European contact the canoes of Hawai'i, New Zealand and the Chatham Islands were inshore types or constructed for short trips between islands, those of Easter Island were completely lost and the double canoes best suited to ocean voyaging were found only in central and western Polynesia (Gamble, 1993: 232).

Thus in Australia too, as people adapted to the continental land mass water-craft may have become less significant in some areas. In particular, I note in 'some areas' only, since I cannot accept Bowdler's (in press) conclusion that there was an overall diminution in water-craft use, although there would have been some reduction for the

reasons outlined above. Nevertheless at least some groups would have remained coastally focussed and continued to use and develop water-craft types.

Bowdler makes two important observations which may assist in resolving the problem. Firstly, in relationship to Western Australian islands she notes that

...ethnographic evidence, especially for the more southerly islands, suggests islands were not visited or occupied at the time of European contact (Bowdler, in press: emphasis added).

Secondly:

...with the exception of Keppel, Whitsunday and perhaps High Cliffy Island in Australia's north, and possibly Bruny Island it is a remarkable fact that no offshore Australian islands which require a water crossing of at least one kilometre can be demonstrated archaeologically to have been exploited by Aboriginal people before 3000 years ago (Bowdler, in press).

Hence it appears that offshore islands in the north of Australia were visited before 3000 years ago, those in the south perhaps not. Two reasons for this can be suggested. Firstly, the waters of southern Australia are considerably colder, rougher and less protected than those in the north. Secondly, the number of offshore islands and their pattern of clustering (with the exception of the Tasmanian islands) is decidedly less marked in the south than in the north. It is also probable that islands in the north with their surrounding coral reefs are more species rich than islands in the south. Therefore offshore islands in the south would not have been as attractive and may not have been visited. I would therefore not use the term 'recommencement' to describe the use of water-craft after 3000 years but there is enough evidence to suggest an increase in use at this time, and in the north at least this was probably influenced by the introduction of out-rigger and dug-out canoes.

My suggestion that specialised marine economies developed in the islands of the Barrier Reef Province (Rowland, 1980, 1982), and that islands in the north were used differently to those in southern Australia due to differences in their resource bases, size and clustering, now appears to be confirmed across northern Australia in general (O'Connor, 1992: 49, 67).

The timing of the apparent 'recommencement' of water-craft use noted by Bowdler I argue is more than coincidentally related to an expansion of people in the Pacific at around c. 3500 BP. There remains in my view then a connection between world-wide environmental changes at this time (Rowland, 1983), expansion of Austronesian people into the Pacific (Rowland, 1980, 1987) and the transformations that began to occur in Australian Aboriginal societies. This does not, as some might suggest, deny these societies their own internal dynamics. It simply shifts the focus from the population in isolation to one that was part of a larger universe of ideas and impacts. This makes the dynamics of such societies all the more interesting as they accepted, rejected or modified ideas.

Experiments and the capabilities of Aboriginal water-craft

Jones (1976) concluded that 5 or 6 km one-way, or 13 km return trips could be considered a limiting distance for most Australian canoes though he later noted there was considerable regional and temporal variety in types of water-craft and in their ability to cross water (Jones & Allen, 1980). Investigations on the offshore islands of Queensland would suggest that canoes were indeed capable of far greater distances than 13 km return trips. Evidence for this comes from the Percy Islands (Rowland, 1984).

The Percy Islands are a cluster of two major islands and nine smaller ones. They are the most distant group of islands off Australia's east coast, although High Peak Island in the south-east is the most easterly. From Middle Percy it is about 125 km north-west to Mackay and 85 km to the Guardfish and Bedwell group of islands directly to the east. From South Percy Island it is 27 km to Bamborough Island in the Marble Group of islands. From there to the mainland is another 20 km. The Percy Islands are in fact closer to the fringes of the Barrier Reef (about 50 km) than they are directly to the mainland (Fig. 5). The only reference to water-craft use on the Percy Islands comes from Bartley who describes bark canoes along the coast near Mackay and notes that Aborigines 'would not hesitate to cross over from the mainland to the Percy Islands and Norththumberland Islands, and even to the Barrier Reef' (Bartley, 1896: 332-3).

Surveys on the Percy Islands have located sites of a very substantial nature. They are sites which demonstrate that a full range of economic activities were being undertaken. They are not sites that demonstrate short term or seasonal activities (Rowland, 1984).

Previous investigations on the Keppel Islands have been interpreted by Sullivan (1982: 10) as implying that in the sheltered waters of the Great Barrier Reef people may have travelled further to exploit resources and evidence from the Percy Islands supports this view. However such a view needs to be qualified.

The Keppel Islands are not truly protected by the reef system. Being parallel with the end of the reef system they are to some extent exposed to more oceanic conditions through the Capricorn Channel. The Percy Islands are within the reef system but since they are equally distant from the mainland and the reef they are exposed to oceanic conditions which can be rough (pers. obs.). It is simply not sufficient to say therefore that people travelled further in this area due to more sheltered conditions. Other issues must be considered.

Sullivan's emphasis on the more sheltered nature of the reef zone negates the influence of human needs and motivations. Even if the area offered more sheltered conditions it is difficult to conceive why people visited the Percy Islands. There are numerous islands in Broad Sound and Shoalwater Bay that could have enabled people to island hop to the Percy Islands, but as much as 27 km would have been involved in making a final crossing to the Percy Islands. The islands are small, with only moderate to abundant coastal resources and minimal terrestrial

resources. They do not appear to have any particular attraction and their combination of coastal resources and suitable stone material for tools is repeated to varying degrees along 1000s of kilometres of the Queensland coastline. Thus a simple explanation as to why these islands were exploited is inadequate when getting to them would have been relatively hazardous and time consuming.

For the New South Wales coast Sullivan (1982: 16) suggested that islands were visited in summer, and possibly only in summer, and that they were the focus of fishing and birding. This is not the case for the Queensland coast where sites on islands from the Keppels through to the Whitsundays are indicative of broadly based coastal economies rather than narrow seasonal ones.

Sites on the New South Wales islands were all first occupied within the last 2000 years and Sullivan therefore proposed a widespread change in technology, perhaps facilitated by an exchange of knowledge between local groups of an expanding population to account for this. The pattern for Queensland coastal islands is more complex. Several sites on South Keppel Island date within the last 700 years, and there is no evidence of earlier occupation at these sites. However at Mazie Bay on North Keppel Island occupation occurs from before 4200 BP with a hiatus in deposits around 3500 BP. Stratigraphic evidence from the site suggests exploitation of North Keppel Island on an irregular (but not necessarily seasonal) basis from 4200 BP. Historical and archaeological evidence from the Keppel Group in general implies that from 700 BP there may have been a population based permanently on the island. It does seem odd that no earlier sites are present on South Keppel, as it would have been no more difficult to reach than North Keppel. We therefore must leave open to consideration that this pattern reflects the vagaries of archaeological preservation.

Extensive investigations have now been undertaken on a number of islands further north (Barker, 1989, 1991; Border, 1991), confirming a number of characteristics of island use in the area: the high density of sites on the islands, the emphasis on coastal resources, the broad scale pattern of exploitation, the tendency of people to move through the island chains and of course by inference the importance of water-craft.

Thus within the Barrier Reef Zone some form of water-craft was present by at least 4200 years ago when trips were being made from the mainland to the Keppel Islands. At some point in time also trips of at least 27 km (from South Percy Island to the Marble Group) one-way, and 54 km return trips were being made. There is reason to believe therefore that even with simple bark canoes substantial return trips of this nature could be made.

In 1981 a number of local Rockhampton Aboriginal people and myself constructed a bark canoe following closely the description of Keppel Island canoes provided by Roth (1898). This canoe was then paddled down the Fitzroy River from Rockhampton, up the coast to Emu Park and then across to the Keppel Islands, a distance

of around 60 km. Due to time constraints no attempt at a return trip was made. This experiment confirmed that weather conditions are crucial, but the most significant impression gained was of the considerable durability of the canoe, which after the completion of the journey showed no evidence of water-logging or other damage. The canoe was then also used for some time around the rocky promontories of Keppel Island for exploring and fishing. This canoe which has attained a good deal of cultural and historic significance is now housed in the Dreamtime Cultural Centre in Rockhampton.

Conclusions

In conclusion, a number of points can be made concerning the use of water-craft throughout Sunda and Sahul that question long-term or existing views and open up exciting avenues for new and challenging research.

Firstly, it no longer seems necessary to accept the 'small-scale/accidental/sporadic' models of the colonisation of Sahul, which have been accepted for so long, as the most parsimonious explanation of events. This is not to deny that throughout a period of 40 000 years such events did not occur. The former view however suggests we need to focus research on the bamboo water-craft of the coasts and rivers of China, and elsewhere, noted by Thorne; and on the artefactual evidence from China, Southeast Asia and Australasia as suggested by Bowdler. It also suggests we need to take a different perspective on the 'rhythm of Australian prehistory' mentioned but not discussed by Jones (1976), but implied in his view that people gained access to Australia 'slowly and stochastically by random processes'. We need to see events in both Sunda and Sahul as more dynamic; responsive to both environmental and cultural changes.

Secondly, there is increasing evidence for contact after separation of Sahul into New Guinea and Australia, especially through Cape York, but also on to other areas of the northern coast of Australia. This would have been by people who were predominantly coastally orientated and would thus have achieved contact via their ability to cross water. While the types of water-craft they used will remain elusive there are nevertheless exciting opportunities to investigate the development of associated items such as fish-hooks, harpoons and other fishing gear. Again the emphasis must be on dynamic communities who accepted, rejected, modified and invented rather than ones that developed in isolation. The study of invention/innovation and diffusion/migration must play complementary roles.

Thirdly, there is a need to look more closely at Bowdler's suggestion that water-craft use diminished in importance after colonisation and was not accelerated again until after 4000 years ago. On the one hand, this is a reasonable expectation in some areas, in that colonisers tend to lose their abilities to colonise when they achieve their objective. On the other hand, this apparent reduction in water-craft use may be a result of the vagaries of archaeological preservation (and at least for the period 40 000 to 6000 years ago most of the evidence both direct and indirect

would now be buried beneath the sea). Furthermore, it is proposed that in northern Australia at least where seas are calmer and more protected, the water is warmer, islands more numerous and clustered and more resource rich, there does not appear to be a major reduction in water-craft use. Nevertheless at around 4000 years ago out-riggers and dug-out canoes were introduced which did enable, at least in the north of Australia, a greater use of the sea and offshore islands and enabled the development of groups of marine specialists with a broad spectrum fishing technology probably introduced with the canoes.

Fourthly, it has been demonstrated by archaeological surveys on the most distant offshore islands of the Queensland coast and by experiment that the capabilities of even the most basic of canoe types may have been greater than previously assumed. While Jones suggested 13 km return trips were around the maximum capabilities of most Australian canoes I would suggest at least 60 km return trips were undertaken and greater distances were possible. When out-riggers and dug-out canoes were introduced still greater mobility would have been possible.

Finally, the picture presented here draws Aboriginal people into a much more dynamic scenario of interaction with the environment, other peoples, and with their own internal social dynamics. This applies from 40 000–50 000 years ago when Bowdler derives Southeast Asian and Australasian populations of the Upper Pleistocene from an archaeologically simultaneous colonisation which swept across several water barriers; to my own scenario that equates, at c. 4000 years ago, world-wide environmental change, the expansion of Austronesians into the Pacific, and impacts on aspects of Australian Aboriginal culture. This does not deny that the internal dynamics of Aboriginal societies themselves were also changing.

Gamble (1993: 182, 241) has argued that people were everywhere in prehistory because they had purpose, that boats were co-opted from existing materials and were 'devices whose time had come'. This produces an inevitability to historic processes that I believe is not well founded. Environmental and human social systems are both dynamic and interactive and must be considered in explanations of change. Nevertheless, like Gamble the views expressed in this paper have attempted to emphasise the motivational aspects of human colonisation processes. The technological manifestations of those motivations, particularly water-craft may remain elusive, but distributional patterns of sites and artefacts through time, and further experiments with traditional water-craft types provide exciting challenges for the future.

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Probe surveys of 'dry' shipwrecks

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Figure 1. View of box trailer with reservoir and gantry for retrieval of the 6 m water probe. The 3 m water probe and pump are visible in the foreground.

The NSW Department of Urban Affairs and Planning's maritime archaeology program has evolved a regular fieldwork program since its inception in 1988. To-date, wreck inspections have been of the pre-disturbance type and largely confined to below water wrecks. A significant proportion of the State's wreck resource, however, constitutes coastal land based sites. Of the eighteen hundred known shipwrecks to have occurred in New South Wales up to 1918*, approximately three hundred and sixty, or 20% of losses** were recorded on beaches, ashore. This figure does not include the many vessels wrecked on the inland rivers and river bars.

Several of these shore based sites have recently attracted the attention of the Department's fieldwork program. Two sites in particular provided intriguing problems of re-location and positive identification. This challenge was met by the Department with the technical aid of Manly Hydraulics Laboratory, a division of NSW Public Works Department, who developed a water probe system.

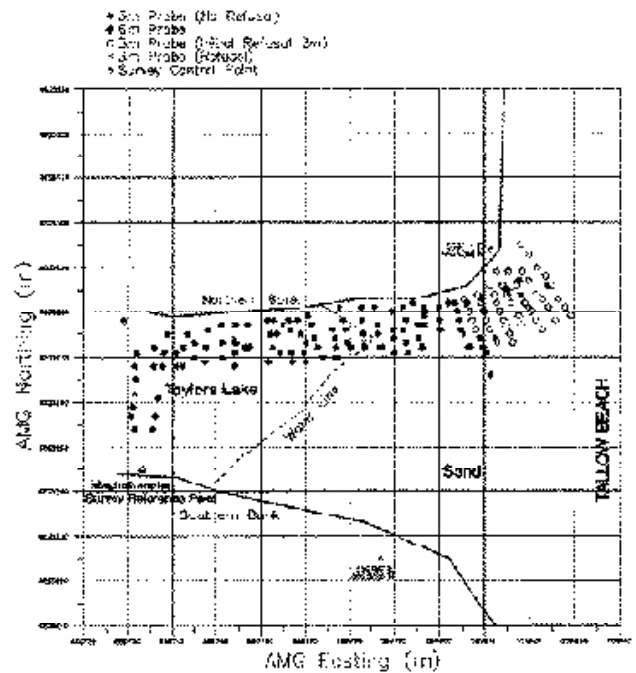


Figure 2. Survey plan indicating the extent of the Suffolk Park shipwreck probe survey. Isolated refusals with the 3 m probe are indicated with crosses.

Suffolk Park wreck

The presence of a buried shipwreck at Suffolk Park, just south of Byron Bay, New South Wales, was brought to the attention of the Department through community concern over a local caravan park development. Newspaper reports indicated that a shipwreck had been located during sandmining operations in 1965, at which time, a large (3.7 metres, 12 feet) copper sheathed ship's rudder was removed from the site. With the cessation of mining and the regeneration of the area, the exact location of the wreck was soon forgotten. No accurate records were kept by the mining company, Cudgen Rutile-Zircon Propriety.

The Department undertook an investigation of the area in April 1994, in order to attempt to re-locate the wreck site and to determine the possible impacts of the housing development. The 1965 sandminers were contacted to delimit the most likely find spot. Three varying positions were offered, all within a 100 metre square area at the mouth of Taylors Lake which flows into the ocean. The estimates of the depth of the wreck varied from 4-6 metres (12-18 feet), partly a factor of changes to the immediate landform resulting from the mining and subsequent stabilisation.

A magnetometer survey of the area was undertaken by the University of New England in 1993. Several discrete areas registered high magnetic anomalies. These areas were of interest to the Department's probe survey which

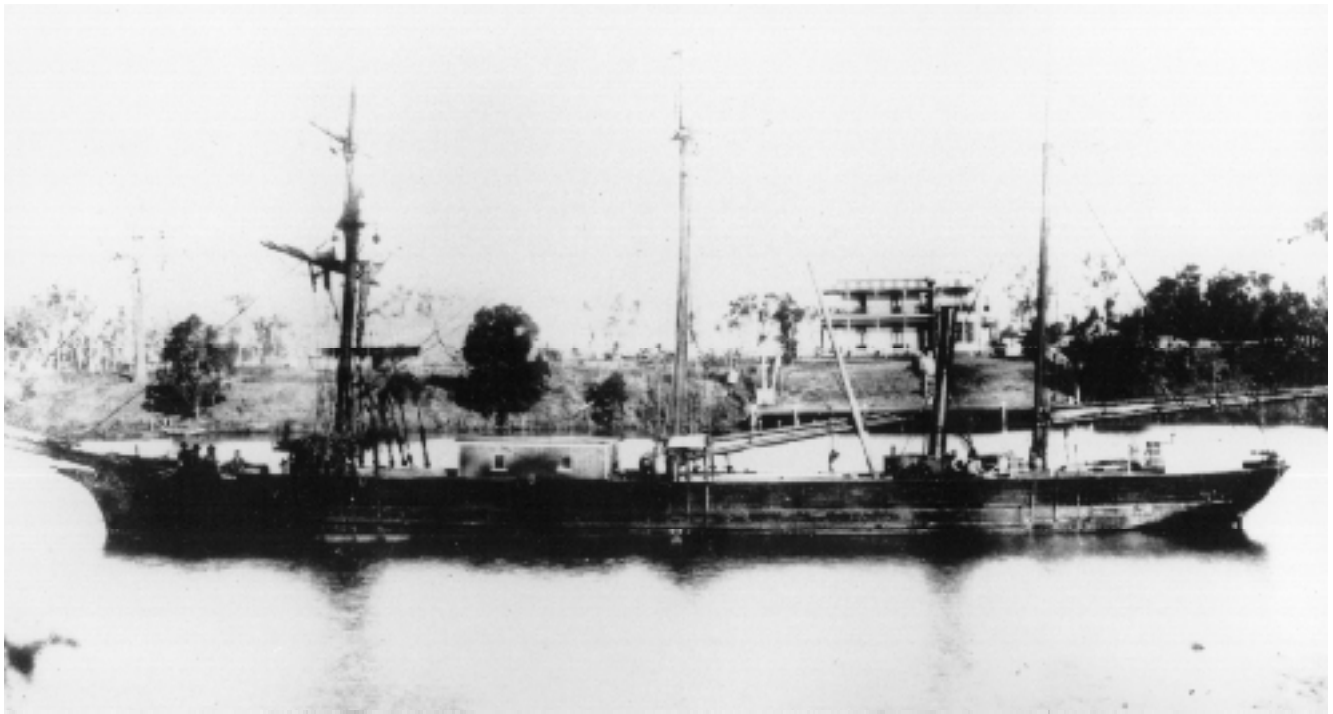


Figure 3. Copy of an original photograph of the SS *Emu* taken in front of Oakland House, Coraki, NSW. Photo courtesy of Mr John Yeager, Sydney.



Figure 4. Colin Brown (MHL) sinking the 3 m water probe forward of the engine area of the steamer *Emu*.

aimed to overlap them as far as practicable. It was proposed to confirm the depth of each anomaly and whether they originated from a submerged shipwreck structure or some other source. Two probes were used, one of three metres in length and one of six metres (Fig. 1). The probes consisted of 3/4 inch galvanised pipe attached to a water pump. The water is jetted out of the pipe into the sand. A lifting/driving action of the operator enables the probe to reach the required depth. One person is capable of operating the smaller probe, while two persons and a gantry/winch were required to stabilise and recover the six metre probe due to the gripping action of the sand at depth. The collapsible gantry, pump and reservoir were mounted on a box trailer, streamlining deployment and operation times.

A replenishable water supply is required to run the probe. Where the survey was conducted in or near shallows at the front of the lake, water could be pumped continuously and directly into the probe. For areas away from a water source, a large plastic reservoir was required, with regular refilling. The location of the survey area and of each probe taken, were recorded using a theodolite with EDM facilities.

The three metre pipe was used as the principle probe as it could be operated relatively quickly to cover a wide area. A line of six metre probes were placed through the area where remains were considered most likely to be located. Some four to five refusals were detected with the probes and matched targets detected by the magnetometer survey (Fig. 2). In all cases, however, the probe was able to indicate that the obstructions were of a metallic nature but discrete targets. No timber was

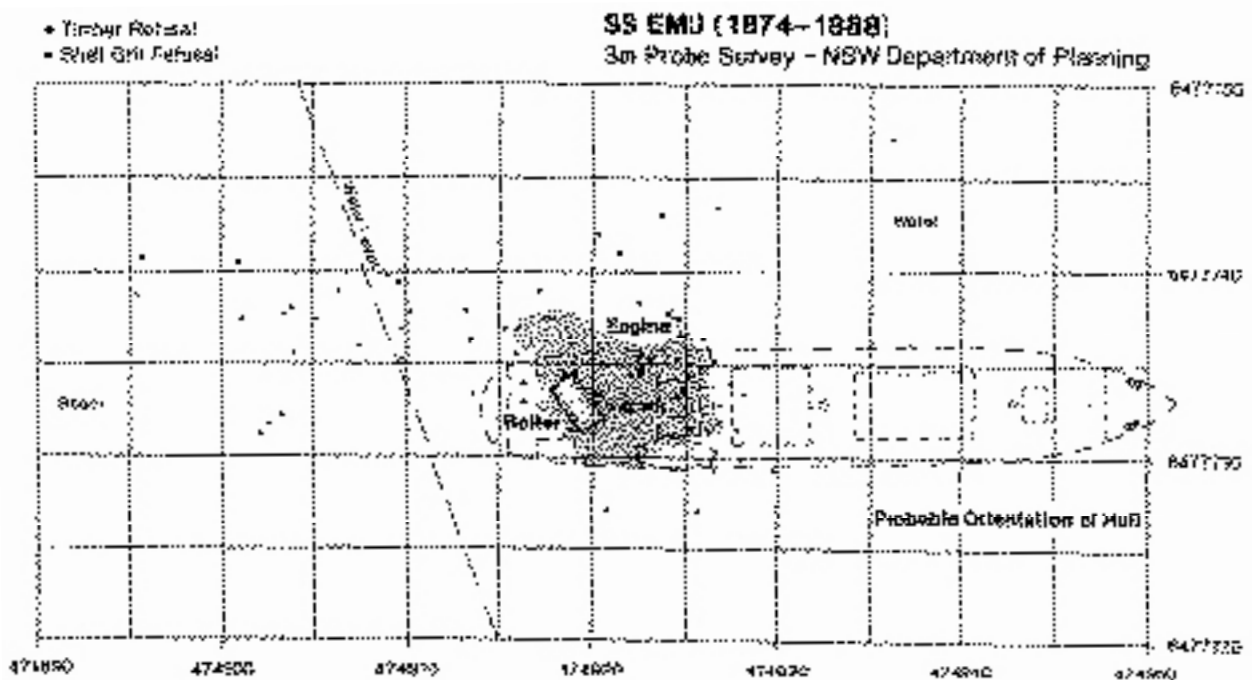


Figure 5. Survey plan indicating the extent of the SS *Emu* shipwreck probe survey. The hatched area corresponds to the limit of probes registering a solid timber refusal.

located, indicating that the buried features most probably represented the extensive amount of metal scrap left behind after the sandmining operations. Unfortunately, due to the extent of the adjacent sand dunes, the total area of the magnetometer survey could not be covered by the probe survey.

The probe survey was able, however, to discount an area of approximately 30 x 120 metres as containing buried shipwreck material. Further, it was able to cover this area to a depth of 6 metres, encompassing the suggested depth of the wreck. The absence of shipwreck remains within the probe survey area suggests that the sandminers suggested position may have been inaccurate, probably a result of the dramatic alteration to the landscape and opening to Taylors Lake over the succeeding thirty years. The suggested area for the wreck lay well outside of the proposed development and no further action was required.

SS *Emu* wreck

A local resident informed the Department of a Scotch boiler and remains of an engine visible on the beach at Crowdy Head, NSW. An historical search indicated the known wreckings in the area; the location and engine type suggesting the remains belonged to the wooden coastal steamer *Emu*. The *Emu*, built at Auckland, New Zealand in 1874, was driven ashore and wrecked on Crowdy Beach in 1888 (Fig. 3). When beached, the vessel's sides rapidly broke open and the steamer became a total loss.

With the wreck's position already established, the Department undertook a probe investigation of the site, implementing the skills developed with the Suffolk Park wreck (Fig. 4). The initial aim was to delimit the extent of

buried hull structure, nothing being visible in the sands besides the top surface of the engine cylinders and boiler. Secondly, the orientation, depth and apparent condition of buried remains needed to be established. The third aim was the extraction of a timber sample for analysis as an aid to the identification of the site. The overriding goal of the survey was for minimal interference to the wreck structure and the beach area, generally.

Mr John Riley, a specialist in marine steam engines, was invited to examine photographs and building specifications of the *Emu*'s engine. Using the stated stroke of the engine, he calculated that the buried hull remains would be located approximately 1.5 metres (5–6 feet) below the upper level of the cylinder casing. A three metre water probe was therefore deployed at the site, the water intake being fed directly from the ocean via a small compressor. Using the orientation of the engine as a nominal centreline for the buried hull, survey lanes of approximately two metres were extended across the site. All probes registering a 'refusal' were plotted using an EDM theodolite on a master site plan, tied into the Australian Mapping Grid.

Several of the probes encountered timber at approximately 1.5–2.0 metres depth. Some ninety-six individual probes were completed, covering an area of approximately 40 x 20 metres (Fig. 5). The probing proved extremely successful with the limits of the buried hull being readily determined. With a skilful operator, it was possible to distinguish timber, metal, shell or other refusals of the probe. These differences could be recorded by the scribe at the theodolite. The entire operation was completed within a single day.

A timber sample was extracted from the buried



Figure 6. Drill and caisson used to extract timber samples from the buried shipwreck structure.

structure forward of the engine. A 75 millimetre diameter metal caisson was fed down through the sand until it rested on the buried timber. This was then jettied free of sand and a drill with an extended bit placed into the tube. A core sample, c. 25 millimetres in diameter, was extracted and the caisson removed (Fig. 6). Upon analysis by the CSIRO Division of Forest Products in Melbourne, the timber was identified as New Zealand Kauri Pine. This confirmed the identification of the vessel as the *Emu*, a vessel constructed in New Zealand in 1874.

The development of the probe survey technique has been extremely promising. It allows for the rapid investigation of buried shipwreck sites located in beach or dunal areas, and in submerged shallow water areas. While

most effective in sampling known shipwreck positions, the technique can be used in the search for unlocated sites up to depths exceeding six metres. The probe survey equipment can be readily mobilised and deployed in most coastal situations and can utilise its own water reservoir or have water drawn from an alternative water source (e.g. creek, ocean). Most importantly, the probe technique has minimal intrusion upon the shipwreck structure and the surrounding environment. As a management tool, the technique can be highly successful in determining the nature, extent and condition of buried shipwrecks without having to undertake costly, and intrusive, test excavations.

* NSW component of the National Shipwreck Database currently being updated to 1949.

** Figure taken from the NSW component of the National Shipwreck Database for losses entered up to 1919.

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The surgeon's equipment from the wreck of HMS *Pandora*

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Figure 1. A Petit screw tourniquet, a marble mortar, an ivory syringe and a drug bottle from the *Pandora* wreck site.

The British naval frigate, *Pandora*, after capturing some of the *Bounty* mutineers at Tahiti, was attempting to find a passage through the Great Barrier Reef on its return to England when it struck the reef and sank in 1791. One of the highlights so far of the partial excavation of the *Pandora* wreck has been the retrieval of a collection of medical equipment which must have come from the cabin of the surgeon, George Hamilton (Fig. 1). The surgeon's chest of instruments would have contained at least the standard complement of equipment and drugs required by the Royal Navy's regulations at the end of the 18th century. The surgeon was expected to supply the instruments from his own resources, while the drugs came from the Society of Apothecaries following a detailed schedule laid down by the Navy.

Figure 2 shows a screw tourniquet made of a copper alloy. This is a Petit tourniquet—the invention of a famous French surgeon, Jean-Louis Petit (1674–1760) who described it to the Royal Academy of Sciences in Paris in 1718 (Thompson, 1942: 85). Petit was the first person to apply the French word *tourniquet*, meaning a turnstile or roundabout, to an instrument for stopping haemorrhage. Petit rightly claimed his invention had the advantage of applying selective pressure directly over the main artery, that it was self-retaining in position, and that it could be readily adjusted during an amputation to ease pressure and reveal spurting arteries that required ligation. The screw, which was originally made of wood, was combined with a stout linen or canvas strap which encircled the limb. Metal versions of brass or bronze such as the *Pandora* example soon followed and became standard surgical equipment in naval, military and civilian surgery.



Figure 2. The Petit screw tourniquet which was originally fitted with a strap to encircle a limb (9 cm high).

A Royal Navy list issued in 1812 detailing the instruments required for the surgeon's chest, mentions no less than six Petit tourniquets but only two amputation knives and one saw with a spare blade (Lloyd & Coulter, 1961: 16). The large number of screw tourniquets required is understandable when we realise that in a naval battle there could be a number of seamen with limb injuries waiting for the surgeon, and application of a tourniquet could prevent death from blood loss. Indeed William Northcote writing in 1770 described the Petit screw tourniquet as 'the most convenient as the patient can easily manage it himself' (Northcote, 1770). The concept of a wounded seaman with a shattered bleeding limb, adjusting his own tourniquet appears a rather imaginative one, but with the backlog of casualties there may have been little choice. Figure 3 from Turnbull's *The Naval Surgeon* (1806) shows the standard set of amputation instruments of that time.

The amputation of limbs was the commonest major operation in naval and military surgery of this era.

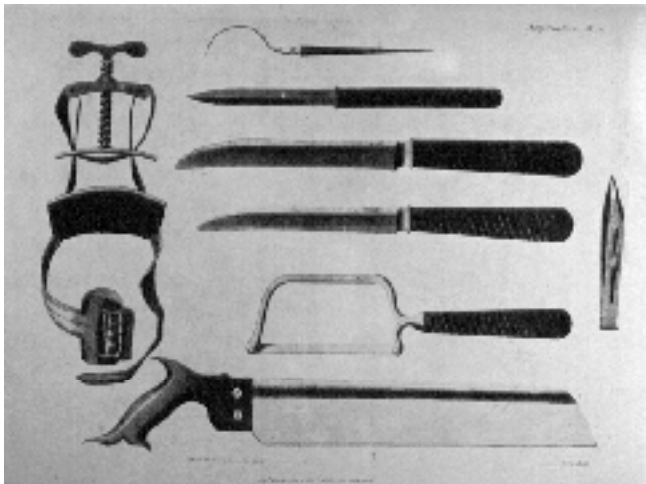


Figure 3. Turnbull's book *The Naval Surgeon* published in 1806 illustrated the standard set of amputation instruments.

Before the causes of infection were understood, limb injuries which nowadays would be regarded as relatively straightforward, such as compound fractures, were treated by amputation to prevent eventual death from infection or gangrene. Napoleon's chief surgeon, Baron Larrey (1766–1844) was reputed to have performed over two hundred amputations in one day following the Battle of Borodino in the Russian campaign just before the capture

of Moscow (Castiglioni, 1946). Larrey must have wielded his amputation knife with great flourish as he is said to have once cut the coat-tail off a bystander and of course his assistant's fingers were always at risk.

Naval surgeons like the *Pandora's* George Hamilton would have worked in far more confined surroundings than their military brothers. Wounds were dressed, and operations were performed between decks, usually in the cockpit with lighting from candles or lanterns. The wounded lay on the surrounding deck awaiting attention and the operating table was a makeshift one. Edward Ives, a surgeon on Admiral Watson's flagship in the Indian Ocean in 1755, has left a graphic account of his experiences:

At the very instant when I was amputating the limb of one of our wounded seamen, I met with an almost continual interruption from the rest of his companions, who were in the like distressed circumstances; some pouring forth the most piercing cries to be taken care of, while others seized my arm in their earnestness of being relieved, even at the time when I was passing the needle for securing the divided blood vessels by a ligature.

He goes on to say that such incidents were often accompanied by the noise and vibration from the firing of large cannon on the lower gun deck just above his head. Another naval surgeon, Robert Young, described his experiences on HMS *Ardent* at the Battle of Camperdown in 1797.



Figure 4. A painting graphically depicting a leg amputation at St Thomas's Hospital, London, about 1780. (Artist unknown.)



Figure 5. A portrait of Surgeon George Hamilton, taken from his book *A Voyage Round the World* (1793), in which he described the *Pandora* voyage and his experiences at Tahiti.

Working without a surgeon's mate to cope with ninety wounded seamen in a fifteen hour session, he says that congestion in the cockpit was so great that the wounded brought down were laid one on top of the other at the foot of the ladder. He goes on to say 'Melancholy cries for assistance were addressed to me from every side by wounded and dying', and at one stage 'fifteen or sixteen dead bodies were removed before it was possible to get a platform cleared and come at the materials for operating and dressing' (Lloyd & Coulter, 1961: 58–59).

A realistic representation of an amputation scene at St Thomas's Hospital, London about 1780, is shown in a painting by an unknown artist in the possession of the Royal College of Surgeons of England (Fig. 4). The poor patient has a Petit tourniquet on his leg and is held down by strong men top and bottom. The surgeon with his coat off has his back to us and is making a quick sweep with his knife to encircle the limb. At the rear stands a disdainful physician who distances himself from the journeyman surgeon and sniffs a pomander of aromatic substances contained in the top of his gold-headed cane. An iron will, speed and dexterity were essential qualities required of the surgeon

operating under these conditions, not only to cope with the large number of wounded in battle situations, but also to minimise suffering and prevent surgical shock in this pre-anaesthetic era. In civilian surgery the fastest documented leg amputation seems to have been performed by Robert Liston at University College Hospital, London, in 1846. As he commenced the operation he asked the onlookers to time him and when he finished four different times were announced—the longest was twenty-eight seconds and the shortest twenty-five seconds. The lowest figure was supplied by Liston's dresser who may have had his own future surgical advancement in mind (Thompson, 1942: 23). The *Pandora*'s surgeon, George Hamilton, (Fig. 5), must have been very familiar with the horror scenes of naval casualties during his long career. It is ironic that Hamilton, only two and a half years after surviving the wreck of the *Pandora* was himself destined to undergo the amputation of his left arm when serving on the HMS *Lowestoft* in the Mediterranean in action against the French in 1794. In March 1794 he was discharged from his ship at Leghorn in Italy and on 1 May of that year he was examined at Surgeon's Hall in London, certified as having lost his arm and recommended for superannuation (Carpenter, Pigott & Whitwell, 1985). It seems that the Navy was prepared to retain the services of a one-armed admiral in the case of Lord Nelson but understandably considered a one-armed surgeon as another matter.

The ivory syringe (Fig. 6) recovered from the wreck site would have had a number of uses all involving irrigation of body cavities with fluids. In the eighteenth century the actual injection of fluids into the body tissues by syringe was used only on corpses in the embalming process; it was not until the mid-nineteenth century that administration of drugs by hypodermic injection originated. Alexander Wood gave the first subcutaneous injection of morphia in 1853. The *Pandora* syringe was of the smaller type then in use (larger ones would have been for enemas or clysters) and could be used for irrigation of ears or nose with fluid, or irrigation of wounds, ulcers and abscesses to wash away foreign material or pus. One likely use for the *Pandora* syringe following the ship's sojourn at Tahiti would have been in the treatment of gonorrhoea. Heister in 1750 recommended irrigation of the male urethra 'in order to wash out the corrupted matter and mitigate the heat, acrimony and pain' (Heister, 1750). He said the most useful irrigation fluid was warm milk or barley water, sweetened with sugar, honey or syrup of marshmallows. We do not know whether George Hamilton followed this advice when treating the *Pandora* crew or what their reaction to this concoction might have been.

We come to two glass bottles recovered from the sea-bed (Figs 7 and 8). Apothecaries stored drugs as both wet and dry preparations in pottery jars often highly ornamented with elaborate labels which lined the walls of their shops and added an air of mystery essential to the healing process at that time. It is unlikely that drug jars of this sort would go to sea, and a naval surgeon would have used more



Figure 6. The dismantled ivory syringe from the surgeon's collection of instruments.

mundane containers such as these bottles. The bottle in Figure 7, made of white glass with a fitted glass stopper, is about 9 cm high and of square section. Those square section bottles were sometimes called case bottles as they were found in fitted medicine chests where the square section enabled secure packing. These bottles were also sold separately apart from sets in medicine chests. This bottle contained remnants of a black substance which was thought, from its aroma, to include oil of cloves. Oil of cloves was used for its antiseptic properties, and was also a mild local anaesthetic. The taller bottle with a cork stopper (Fig. 8) is about 12 cm high and is of round section. It has the iridescent crystalline appearance which is a common degradation change in glass found in archaeological sites. This bottle was empty and we do not know what it originally contained.

Mortars and pestles are almost as old as mankind and were used in cooking for preparing spices and in pharmacy for crushing roots, dried herbs and earths. The heavy marble mortar (Fig. 1) was becoming obsolete towards the end of the eighteenth century, but no doubt the navy retained it with an eye to economy. Up to this time mortars were made of bronze, bell metal or various forms of stone and marble, but these were susceptible to corrosion by acids and were prone to shed particles leading to contamination of the contents. About 1780 Josiah Wedgwood overcame those difficulties by using a form of his biscuit porcelain and produced porcelain mortars which were acid-resistant and so smooth and hard that no fragments could rub off.

A brass instrument case or *étui* in the form of a flattened cylinder about 12 cm high is shown in Figure 9. This was originally gilt, and fairly extensive areas of gilding remain, as do bands of embossed decoration. The longer, upper portion lifts off the lower part which contains a small, fitted green glass bottle whose mouth is supported by a horizontal plate. The plate contains two vacant holes which, most likely, originally held elongated objects reaching the full length of the case. The function of this case remains to be fully elucidated. Similar cases, but of shorter form, were made to hold sets of lancets used to open veins for bleeding, but no case of this elongated form fitted with a bottle has been noted in texts on antique surgical instruments. If this case had been the property of the *Pandora's* surgeon, George Hamilton, one possible use was as a caustic container with space for two long applicators. Caustic chemicals were applied to heal wounds and ulcers, to remove small growths and even to open abscesses. They were known as potential cauteries, as they served the same function in a gentler way, as the cauterising iron heated in the fire. Lunar caustic (silver nitrate solution) was used with long applicators to reach inside body cavities such as in treatment of throat infections.

Finally we are reminded that passengers on the *Pandora* were not only of the human kind, by the finding of a lice comb. Figure 10 shows the remains of a wooden comb with very fine teeth used to remove lice from human hair.

As the *Pandora* site continues to yield more artefacts illustrating eighteenth century naval life, these particular



Figure 7. A square-sectioned case bottle with fitted glass stopper. The contents probably included oil of cloves.

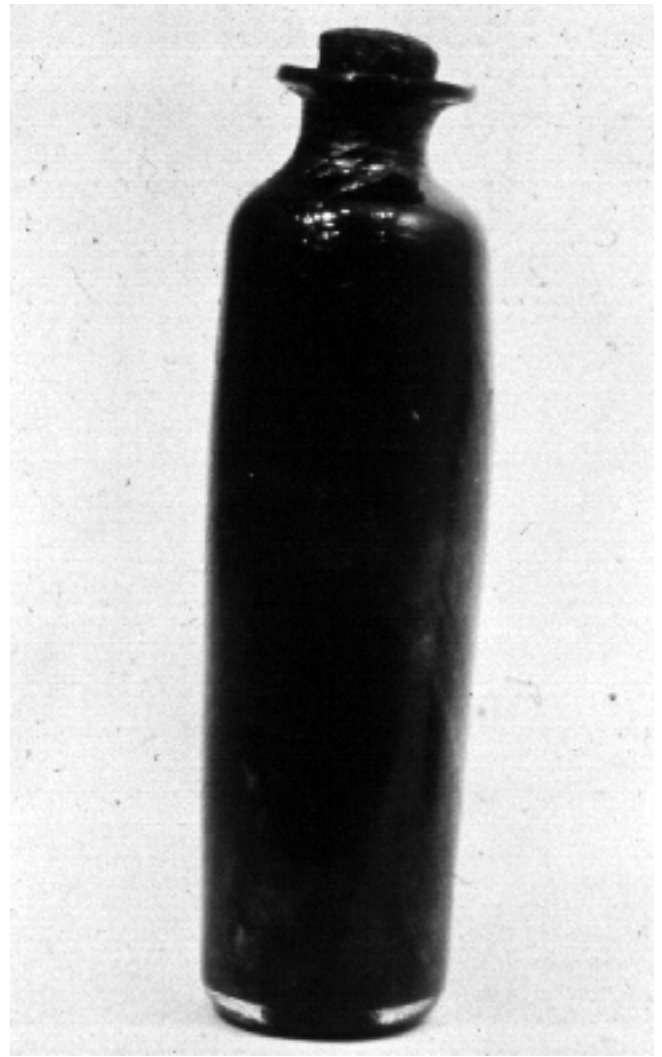


Figure 8. A round glass drug bottle (the cork shown is not original).

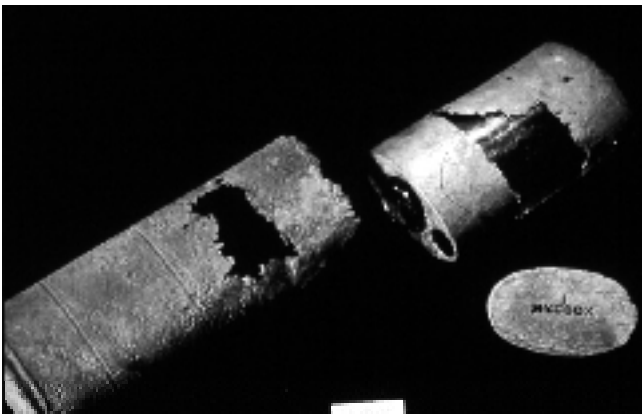


Figure 9. An étui or instrument case containing a small fitted bottle of green glass.

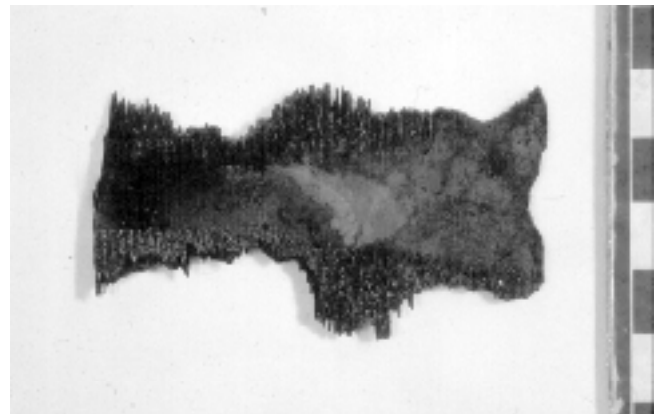


Figure 10. The remains of a wooden lice comb.

items from the surgeon's chest serve to remind us of the difficult role of the naval surgeon of that era. His status was relatively low in the naval hierarchy where he was a warrant officer and not a commissioned officer, he had no official uniform, he was poorly paid and moreover, he practised his art in an era when medicine itself was in a primitive state. Surgical operations were limited in scope, agonising for the patient and frequently endangered life. Drug treatments included a large number of strange preparations now known to be useless. The few effective remedies included various extracts of opium, mercury salts for syphilis and concentrated lemon juice for scurvy. Digitalis obtained from the purple foxglove was just coming into use for the dropsy caused by heart failure and quinine or Jesuits' Bark for malaria still awaited recognition.

Despite all these handicaps the naval surgeon was charged with the awesome duty of maintaining the ship's company in good health in the face of onslaughts of epidemics of infectious disease, prevalent nutritional diseases such as scurvy and the horrifying injuries of battle. We can only admire the fortitude of men such as the *Pandora's* George Hamilton who were prepared to fill this role.

Acknowledgements

The author received generous advice from Dr Mervyn Cobcroft of Ipswich, Queensland, a recognised authority on the history of medical instruments. The Royal College of Surgeons of England gave permission to reproduce the painting in Figure 4 from the College collection. Mr Peter Gesner of the Queensland Museum made the artefacts available for inspection and supplied the photographs of these items from the Museum's records. The Mitchell Library, Sydney, provided the photograph of George Hamilton.

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Life on board Manila galleons

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Introduction

There is a ceremony which takes place on board ships when they cross the Equator called 'Crossing the Line'. A member of the crew, usually the oldest one who has crossed the Equator before, dresses up as Neptune. He is attended by all the other crew members, likewise previously initiated, who dress up as Davy Jones and other assorted underwater dignitaries. The captain actually turns over command of the ship to this motley crew, and they proceed with much pomp and circumstance to put on trial everyone who has not yet crossed the Equator. Charges make much fun of individuals' idiosyncracies, and sentences run from hilarious to outrageous (Lovette, 1936: 42–47). I first heard of this ceremony as a child when I attended a travel show promoting South Pacific cruises. It is still practised today, and its origin is unknown, but considered to be very old. There are records of a very similar ceremony conducted on board Manila galleons in the seventeenth century.

Manila galleons were the first regular, and the world's longest enduring, trans-Pacific shipping line, running for 250 years from 1565 to 1815 (Schurz, 1939:15). They also provided an important impetus to the Spanish settlement of California. For years the colony in Manila petitioned the Crown to establish a rest stop on the California coast, which was finally done in 1769. Orange County, in southern California, takes its name from the many orange groves that used to be there, planted by the Spaniards to provision the scurvy infested galleon crews.

Magellan discovered the Philippines in 1521 during his circumnavigation, but although Spain was very interested in getting into the spice trade, it was unable to colonize the area until a way of sailing back across the Pacific could be found. Crossing the Pacific from east to west is relatively easy since the currents and winds just north and south of the Equator run consistently in that direction, but sailing back against them is impossible without an engine: returning via Africa was forbidden to Spain by the Treaty of Tordesillas. During the following decades ships were sent out from New Spain. Finally, in 1565, Miguel Legaspi discovered that, by sailing as far north as Japan, one finally picked up an east running current. The colony and the shipping line were both established that year.

What was it like being a sailor on one of those ships? Fortunately, we have a journal written by an Italian, Giovanni Francesco Gemelli Careri, who was a passenger on the eastbound route from Manila to Acapulco in

1697. He was a wealthy passenger who took advantage of the opportunity to dabble in the Manila trade, but he records many anecdotes which give us glimpses into the life of the crew. One story he relates is about the 'Festival of the Signs'—*La Fiesta de las Senas*. 'The signs' were the first signs of lands as the ship approached the California coast. Usually these were the rafts of giant kelp which break up in the fall (Autumn) and float many miles out to sea. Sighting 'the signs' was a cause for great rejoicing because it meant that the end of the voyage was approaching. The sailor who was the first to spot them received a valuable reward from the captain, and a festival was held as soon afterwards as weather permitted.

During the festival the crew took over the ship and put the officers and passengers on trial. A respected crew member dressed up as president with two other sailors as judges. The rest of the crew rounded up the 'miscreants' and brought them before the tribunal. Great fun was had with this kangaroo court and sentences were duly passed. These sentences, usually death, could be commuted by paying a fine in money, sweetmeats or other valuables, and the crew amassed quite a pile. This they divided among themselves. Gemelli Careri was found guilty of eating too much fresh fish—no doubt an attempt on his part to avoid as much of the spoiled provisions as possible. This custom took place on more voyages than the one in 1697, and the sailors could get carried away as evidenced by the fact that regulations were passed from time to time to check the abuses (Schurz, 1939: 272).

The similarity between the Festival of the Signs and the Crossing the Line ceremony are striking, and makes one wonder if these two ceremonies are somehow connected. Is there a cohesion to maritime culture that is strong enough to pass on a body of tradition across nationalities and centuries or are these ceremonies merely isolated occurrences of the ubiquitous initiation ceremony common to every culture in some form? If they are part of a maritime cultural tradition, what does that tradition consist of, and how is it passed on? This paper will describe some of the aspects of shipboard culture on Manila galleons and suggest how further archaeological research can contribute to answering these questions.

Elements of maritime culture

The two most significant factors affecting shipboard culture are the international composition of the crews and the tedium of long voyages. To begin with the

composition of the crew, we find that it is the exception rather than the rule to have uni-national crews. Even navy ships during time of war often have foreign sailors on board, sometimes even from the country being fought (Kemp, 1970: 170). Ships of discovery displayed a mix, for example Magellan (a Portuguese sailing for Spain) recruited other Portuguese, and also Italians, French, Flemings, Germans, Sicilians, English, Malays, Africans, Moors, Madeirans, Azoreans and Canary Islanders for his fleet (Smith, 1993: 135).

The international nature of ships' crews was true for Manila galleons as well, although the composition varied considerably between the eastbound and westbound routes. On eastbound ships, the crew usually ranged from 2:1 to 5:1 Indios to Spaniards (Schurz, 1939: 210). This general term, 'Indios', was used by the Spanish to apply to all natives throughout their vast empire. In the Philippines it could refer to Malaysians and Indonesians as well as any of the many Philippine peoples. Filipinos from the coastal groups with a strong seafaring tradition were preferred, but when they were unavailable, since they were also in high demand on other more attractive local routes, natives from the interior of Luzon were conscripted. There were also Chinese, Japanese, Southeast Asian and Indian sailors in lesser numbers. In the early days the crew usually numbered 60 to 100, but as the ships grew larger so did the crew. Crews as large as 250 were employed on many ships, and the *Santissima Trinidad*, at 2000 tons probably the largest galleon built, had a crew of 384 (Schurz, 1939: 210).

On the return voyage, a large number of these sailors often had to be replaced due to death or desertion. In 1618, seventy-four of the seventy-five Filipino sailors jumped ship when they were hired by villagers in the hinterlands of Acapulco. Replacements were drawn from the poorer colonists of New Spain or conscripted from native, mestizo and black groups there.

There was as much mixing among the officers as among the men, although of a somewhat more European nature. Despite a 1696 law against hiring foreign pilots, there were not always enough Spanish ones available. There were French, English, Portuguese, Irish and German pilots. In 1709 the *Encarnación* had a French commander and the *Covadonga*, in 1742, was commanded by a Portuguese. Gemelli Careri mentions that he took his meals with the Armenian bosun (Gemelli Careri, 1752: 464). These are just some of the many examples.

The main reason to sail on a Manila galleon was the hope of wealth. A captain could expect to make 25 000 to 30 000 pesos in addition to his salary from the sale of his trade goods in Acapulco. Sailors were allotted a small amount of space to bring merchandise to Acapulco. According to official regulations this space was sufficient for each sailor to make about 80 pesos profit, but through careful packing and creative use of space on board the sailors were probably able to get considerably more than this amount. At any rate profits of 100–200% of the original

investment in Manila could be made. But to succeed at the acquisition of this hoped for wealth, the voyage had to be endured and survived. With a voyage that could last in excess of six months, and usually lasted 4 1/2 to 5 1/2 months a lot of living went on.

This shipboard life was first and foremost affected, not by the hardships of the voyage, but by the tedium. Most descriptions of shipboard life focus on the hardships such as the unsanitary conditions, wormy and rotten food, harsh discipline and low pay. Partly this is the case because there is more information about these matters, but also because they appeal to the imagination. Even though many descriptions include the disclaimer that conditions on board ship were probably not noticeably worse than those on land for comparable classes, they still go on about maggots in the meat and cheese so hard it was used for buttons (Lloyd, 1981:10), and we shudder. The arduous journeys are listed, the cases of scurvy, the wrecks, but in 1606 the shortest eastbound trip—a mere 100 days—was made and there were no recorded health problems (Zulueta & Higuera, 1981: 89).

The imagination is not stirred by boredom. Yet mind numbing boredom, day in day out sameness, was present to a much higher degree on board ship for all classes than for their respective counterparts on shore. (This tedium is what makes reading ships' logs and voyage journals such as *Two years before the mast* or Gemelli Careri's *Voyage around the world* such a chore.) The watch was changed; the heading was recorded; the sails were furled and unfurled and repaired; the sea and sky merged into a limitless blue or grey; day after weary day dragged on. Efforts to escape this curse profoundly affected the nature of shipboard life and also provided a common denominator in the multi-ethnic, multi-national environment. The *Fiesta de las Senas* was one such time of escape. It also united the crew, at least temporarily.

Besides the festival itself, the anticipation of spotting the first signs must have provided a topic of conversation for some weeks before. Who would be the lucky one to spot them first?—Alphonso has a keen eye. How close are we? The pilot says we're two days out, but he is a dog who can't even recognize Polaris!—Likewise, retelling the various sentences must have continued for some time afterward.

There were other observances to break up the monotony. Crew members of whatever religious background participated in the celebration of Catholic saints' days which usually included some kind of extra rations and relaxation of discipline. Of somewhat longer duration were the devotions of various officers. Gemelli Careri (1752: 461) records that in the middle of the Pacific crossing the pilot began nine days of devotions followed by the same by the ship's master. These devotions included the passing out of sweetmeats to the crew, the lighting of lights, dancing and performing skits. It would be interesting to know what these skits were like and what traditions may have been combined in them.

Gambling was all pervasive. Laws forbidding it were not enforced since captains could make a considerable amount of money from betting. There were cock fights, cards and dice. I have not found any reference to Chinese or Filipino games of chance, but it would be surprising if they were not present. Sailors often bet the anticipated proceeds from the sale of their goods in Acapulco. The clothing, issued by a 1620 proclamation of the king to protect the Filipino sailors ill prepared to deal with the severe cold of northern latitudes, was also sometimes gambled away.

Storms also provided some respite from boredom. Particularly bad ones could be terrifying, so there was the fear of the moment, but also retelling tales of that fear must have provided additional entertainment. Storm superstitions are found in all cultures and often assume a very similar form. St Elmo's Fire—the name by which European sailors know the electrical glow that appears at mast tops in a storm—is called the Lantern of Tian Fei by the Chinese (Levathes, 1994: 103). In both cases it is interpreted as a sign of divine protection. There is also a striking similarity between European pictures of sea serpents and Chinese pictures of sea dragons.

This description applies particularly to the eastbound voyage. The westbound voyage differed from the eastbound one primarily in that it was shorter, usually two to three months instead of four to six. This seriously cut down on the health hazards and food spoilage problems. Also far fewer storms were encountered at these latitudes, and the severe cold that the tropics-born sailors were ill-equipped to endure was missing. The hardships were much reduced, but the tedium was still very present. All the activities described above, except the *Fiesta de las Senas*, were carried on.

These examples do not prove that separate cultural backgrounds were blended into an identifiable whole on board ship forming a tradition that could be largely passed on. To establish the existence of a cohesive shipboard culture, life on board Manila galleons would have to be compared, first with their nearest kin, Portuguese, Dutch and English East Indies traders, then with other merchant ships, both European and Asian, then with navy ships also. These comparisons would have to stretch over time as well. Before this can be done, life on Manila galleons requires more understanding.

If a mix of nationalities is an essential ingredient of this culture, and the tedium and other shared experiences of a long voyage provide an environment for blending these backgrounds, what form did this blending take? The picture is far from clear but some characteristics stand out. First, what blending did take place was certainly not democratic. The Spaniards were in charge and their influence was out of proportion to their numbers. Spanish law and values were standard, Spanish religion was formally practiced and Spanish must have been the lingua franca. Still, the Spaniards willingly incorporated many things from the cultures they came into contact

with. Most often these were materials or technologies that fit into the Spanish framework. A few illustrations of this come from the provisioning of the ships.

Rice was included as a basic food item in addition to biscuit (Schurz, 1939: 268). This was both economically practical and what the majority of the crew were used to eating. Chocolate from the New World was introduced into the Philippines and given as a ration on the galleons twice a day. It was very popular with the crew. The Asian practice of using large bamboos for water storage was adopted though jars were used as well. Also rain-water was caught at sea by using mats leaning against the gunwales and resting in split bamboos which trough-like drained into jars. Gemelli Careri refers to the ship's boat as a *champan*, but talks of rebuilding it after clearing Baja, California.

Finally, survival provided another motive for covert acceptance of things that could not be suppressed. To survive, the Spaniards needed the cooperation of most of the Filipinos and Chinese most of the time. One such activity was the manufacture and use of palm wine, the native drink of the Philippines. The Spaniards tried to discourage its use, principally because it competed with Spanish wine, but it continued to flourish not only in the Philippines, but also appeared on board the galleons more often than Spanish records acknowledge. Those ship-jumping Filipinos mentioned earlier even brought the manufacture of it to coastal Mexico along with the still which has been traced back to a Mongolian design (Guzman-Rivas, 1960: 86).

Conclusion

This paper represents a first attempt to develop a picture of life aboard Manila galleons. It is far from complete. It has not answered the question posed at the beginning—is there such a thing as a coherent, recognizable maritime culture that is capable of perpetuating itself? Shipboard life certainly constitutes a set of traditions that are passed on by men who make the sea a career, but does it deserve the name culture? A testable model is needed. I do believe that this culture or tradition combines elements from many different sources and so is international in character, but 'blended' is probably too strong a term. Frederick Barth (1969) describes how ethnic groups cooperate in multi-ethnic, land societies while remaining essentially separate. This is a likely pattern for shipboard life as well.

Data to address this question will have to be drawn from many sources. Ethno-historic records like Gemelli Careri's journal are invaluable, but archaeology has much to contribute as well. Many of the activities mentioned today leave no trace in the archaeological record, but some do. Dice and other gaming pieces have occasionally been found (Grosvenor, 1977), but these have been treated as serendipitous findings of evidence of recreation. A more systematic investigation could be made. A study of the games and game items of all the cultures represented on board would help excavators recognize objects that

might otherwise be ignored.

Food consumption leaves more traces, but so far these have not been seriously investigated on a Manila galleon site (Clark, *et al.*, 1989; Mathers, *et al.*, 1990; Mathewson, 1992; Goddio, 1994). Asians and Spaniards used different kinds of vessels for food consumption. Types of personal ceramics might throw some light on the degree or lack of hispanicization on such an ethnically determined area as eating.

To date, few Manila galleons have been excavated. As more are investigated, additional data will become available. Common personal items, though they can deteriorate easily, are fortunately the least likely to have been salvaged by the Spaniards or modern treasure hunters. Much remains to be learned.

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A matter of ethics: shipwrecks, salvage, archaeology and museums

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Introduction

Museum visitations, or the number of people who visit a particular museum, is fast becoming, in these days of economic rationalism, the way in which the success of a museum is measured. The ability of a museum to attract the crowds ensures continued funding for research, design, conservation and acquisition of museum display material. High visitor numbers increase the prestige of a museum and ensure the lucrative sponsorship offers.

It follows that a low visitation figure often means the loss of funding, the loss of prestige, the loss of staff and possible closure. To obtain favourable visitation figures, museums employ hoards of professionals to research, design, build, advertise and, in some cases, obtain other museums' displays to encourage the continued patronage of their museum.

With so many other amusements and art venues to compete against, large museums are constantly pressured by respective government departments, museum boards, directors and the visitor to create or obtain so-called 'Blockbuster' exhibits which will ensure good visitor numbers and financial viability.

For example, the Australian National Maritime Museum (ANMM) at Darling Harbour in Sydney—must be competing in Australia's premier capital for museums. Besides the ANMM, Sydney has The Australian Museum, The Museum of Applied Arts and Sciences, The Museum of Contemporary Arts, Hyde Park Barracks, Museum of the Holocaust, The Observatory, The Police Museum, the Museum of Sydney, The Sydney Mint Museum, The Mary McKillop Museum, the proposed Museum of Immigration, the just announced Museums of Coca-Cola and Performing Arts, along with dozens of smaller museums situated in and around Sydney at various National Trust and Historic Houses buildings.

The most recent 'Blockbuster' to visit the ANMM was the *Mary Rose* Trust exhibition—'Mary Rose: Life and death on Henry VIII's lost warship'. This exhibition, which looked at the finding, excavation and subsequent raising of the *Mary Rose* was very successful—much to the delight of the Museum's staff, council and director.

However 'Blockbuster' exhibitions, especially in the area of maritime history are scarce, if designers and curatorial staff are not allowed to plan and construct their own exhibits, their own 'Blockbusters' then the museums have to import them. Unfortunately in their quest for profits and prestige certain museums are often in direct conflict with established archaeological principles and museum ethics. One such 'Blockbuster' currently available on the international display circuit is the *RMS Titanic Exhibition*.

The story of the *Titanic* has to be the most well known of all the world's great maritime disasters. To quote The Sydney Morning Herald (17 June 1994):

...one can only speculate endlessly about why the *Titanic* is so fascinating. It's something about plucking 2000 people from every walk of society, every culture. In kind of a Noah's Ark principle, you take two of everything and put them on a ship and expose them to the most dreadful crises.

On 15 April 1912, five days out of Southampton on its first ocean voyage across the Atlantic to New York, the 47 246 ton, steel, Royal Mail Ship *Titanic* sank after striking an iceberg. Due to a number of human errors, environmental factors and design faults, over 1 400 people lost their lives in the disaster. For 73 years the *Titanic* lay beneath the waves, 4 000 metres beneath the Atlantic, unseen, undisturbed but certainly not forgotten.

On 1 September 1985, a combined American and French Expedition, under the command of Dr Robert Ballard—from The Woods Hole Oceanographic Institute in Massachusetts (now a TV Star in his own right—courtesy of *Seahunt* DSV) discovered the remains of the *Titanic* 3 900 kilometres east of Newfoundland.

During the course of the 1985, and the subsequent 1986 expedition Ballard and the team from Woods Hole photographed and mapped the wreck site and its associated debris field. Significantly and despite pressure to do so, the Woods Hole Institute raised no material from the site.

After the discovery, Dr Ballard and a group of RMS *Titanic* survivors, concerned over the possible looting of the site by less ethical organisations, approached the United States Government to protect the wreck and its associated remains from salvage.

Since finding *Titanic*, I have received a tremendous number of letters from Americans which address the future hopes of individuals regarding *Titanic*. By an overwhelming majority, Americans, as well as other people from around the world, want to protect *Titanic* from wanton grave robbers. *Titanic* is like a great pyramid which has been found and mankind [sic] is about to enter it for the first time since it was sealed. Has he [sic] come to plunder or appreciate? The people of the world clearly want the latter (Ballard, 1985: 21).

After a lengthy United States congressional hearing on the *Titanic*—the United States Government passed a Bill in 1986 entitled *The Titanic Maritime Memorial Act*. The Act:

- 1) recognised the sanctity of the wreck site *Titanic* as a maritime memorial.
 - 2) would prevent American citizens from indiscriminate salvage operations.
- and
- 3) 'sought an agreement with other nations including Great Britain, France and Canada to protect the wrecks scientific, historical and cultural significance'.

In 1987, despite the actions of the United States

Government, and amidst great (and continuing) controversy, a private American corporation called *Titanic Ventures* (subsequently *RMS Titanic Limited*) and the French Government agency Institute of France for the Research and Exploration of the Sea (IFREMER) conducted a joint salvage operation on the site and recovered over 1800 artefacts (Jones, 1994; Knight, 1993; Pennec, 1989; Swan, 1994).

In June 1993, the same commercial company recovered a further 800 artefacts from the sea floor. Hundreds of objects have now been recovered including a steel safe, wine bottles, a megaphone (believed to have been used by the *Titanic's* Captain Smith, the bell from the crow's nest and a pair of bag pipes—which, according to *RMS Titanic Limited* was used to pipe the ship out of Southampton Harbour (Dines, 1994). The only objects the commercial salvage company appear not to have recovered from the wreck are the deck-chairs.

In order to support their continued commercial exploitation of the wreck site *RMS Titanic Limited*, a public company—has proposed a ten-year, 30 city tour of material recovered from the site (Rubin, 1987). Starting at one of the principle maritime museums of the world and, up until quite recently, a supporter of the correct management, excavation and interpretation of underwater cultural heritage sites—the National Maritime Museum, Greenwich, London.

Quoting Martin Dean, Director of Archaeology Diving Unit, University of St Andrews:

The museum is allowing itself to be sold an exhibition, the prime motive of which is to recoup the costs of the *Titanic* company. This is just trophy hunting. We did it with lions and tigers earlier this century, and it endangered those species. Shipwrecks are another non-renewable resource and plundering reduces the stock of information for the future (*Museums Journal*, 1993: 11).

In an attempt to stave off such criticism of the lucrative exhibition of *RMS Titanic* material—Dr Roger Knight, the Director of Collections at Greenwich made available in August 1993 information received from *RMS Titanic Limited* concerning the salvage of the material from the wreck site (Knight, 1993).

In this statement the company stated:

- 1) all the material was from the debris field and not from the actual hull and therefore did not contravene the United States *Titanic Maritime Memorial Act*.
- 2) that all material had been properly excavated and there positions accurately recorded.
- 3) that the material was raised to protect it from further degradation and ensure its continued survival.
- 4) that *RMS Titanic Limited* have undertaken the responsibility for keeping the entire assemblage of artefacts from the *Titanic* together permanently for the perpetual purpose of appropriate public display.
- 5) that *RMS Titanic Limited* had 'honoured the efforts and hopes of the two nations, their agencies and expedition leaders, that worked together [sic] to discover the *Titanic* shipwreck. We have also respected the U.S. Congress which attempted to legislate a responsible plan to protect the shipwreck and site, once she [sic] was discovered' (Tulloch, 1993: 1–3).

Assured by the response of *RMS Titanic Limited* to the ethical questions, Lord Lewin, Admiral of the Fleet and member of the Board of the National Maritime Museum, stated:

...we approved this exhibition because we are aware of the cultural value and the vulnerability of the underwater heritage. All the artefacts have been recovered from the seabed, and not from within the hulk. The wreck has never been entered by man [sic] and can never be entered at that depth and pressure (Dines, 1994: 63).

Based on the information given by *RMS Titanic Limited* the National Maritime Museum (Greenwich) opened the *Titanic* Exhibition in October, 1994 (*The Guardian Weekly*, 9 Oct. 1994). However, nice press statements, pretty pictures, visitor surveys, registration numbers and dots on a map of the sea-bed do not make an ethical exhibition.

As the largest collectors of cultural heritage material, museums must be seen to be setting an example in the area of acquisition and display of archaeological material and must play an active role in the prohibition of the illicit market in cultural heritage material.

Concerned over the growing number of museums that have acquired, through purchase or donation, or have displayed, commercially obtained archaeological material—for example The British Museum's purchase of ceramics from the wreck of the *Geldermalsen* in 1986, the International Council of Museums (ICOM), the Council of American Maritime Museums (CAMM), International Council on Monuments and Sites (ICOMOS) and the International Council of Maritime Museums (ICMM) have, over the last fifteen years, introduced guidelines and standards on the museum display of archaeological material.

The most recent adoption of international standards and recommendations was by the International Congress of Maritime Museums who, on 10 September 1993, adopted standards for the exploitation of underwater sites and the acquisition, preservation and exhibition of artefacts recovered from shipwrecks and other underwater cultural heritage sites (Henderson, 1994).

In a nutshell, members of the ICMM, including the National Maritime Museum, Greenwich, agreed:

- 1) That ICMM member should in regard to collecting policy follow the provisions of the ICOM Code of Professional Ethics, the ICOMOS Charter, and the UNESCO Convention.
- 2) That ICMM member museums should follow section 3.1 of the ICOM Code of Professional Ethics and that in particular, 'Each museum authority should adopt and publish a written statement of its collecting policy'. Museums with collections derived from underwater archaeological sites should each adopt and publish either a written statement of their general collecting policy or a written collecting policy relating specifically to collections derived from underwater archaeological sites.

- 3) That ICMM member museums should follow section 3.2 of the ICOM Code of Professional Ethics as it relates to the acquisition of illicit material, and that in particular 'Museum(s) should not acquire by purchase objects... where...their recovery involved the recent unscientific or international destruction or damage of..archaeological sites'.
- 4) That ICMM member museums should follow Council of American Maritime Museums (CAMM) policy and 'not knowingly acquire or exhibit artefacts which have been stolen, illegally exported from their country of origin, illegally salvaged, or removed from commercially exploited archaeological or historic sites' in recent times.
- 5) That ICMM members should report to the responsible authorities any calculated illegal activities at underwater archaeological sites or auction or sale of artefacts from illegally excavated underwater sites in their countries.
- 6) That ICMM members should recognise that artefacts from underwater sites are integral parts of an archaeological finds complex which should stay together for research and display.
- 7) That ICMM should follow an active policy supporting the above mentioned international codes on cultural heritage and report illegal activities at underwater sites to the responsible authorities.
- 8) That ICMM should explore ways whereby more members museums can involve students from tertiary institutions in the use of their underwater archaeological collections for study purposes.
- 9) That the survey results be made available to all ICMM members in published form (Foster, 1993; Henderson, 1994).

In these resolutions, 'recent times' is taken to be since the 1990 Full Congress of the ICMM, and a commercially exploited heritage site is seen as one in which the primary motive for investigation and excavation is private financial gain.

No matter what guarantees RMS *Titanic* Limited provide Greenwich or any other museum regarding the salvage, conservation and curating of the *Titanic* material, there is no getting away from the fact that RMS *Titanic* Limited is a commercial salvage company which is raising the material from the wreck for one thing and one thing only—to make a profit and provide a dividend to their shareholders.

According to *The Times* (4 August 1994):

The ethical aspects were considered very carefully by the Greenwich Board and certain principles were established before this agreement was reached. That the artefacts **should** always be kept together as a collection and never sold, that the collection will always be available for public display and that the **aim should** be to establish a permanent museum' (Author's emphasis in bold).

It is interesting to note the use of the words **aim** and **should** in the above newspaper article concerning the welfare of material recovered from the site. However, despite these assurances RMS *Titanic* Limited (or Greenwich for that

matter) cannot guarantee the safe custody of the artefact material.

For RMS *Titanic* Limited is a limited liability, commercial, public company—governed not by archaeological ethics and museum morals, but by the economic laws of supply and demand, profit and loss, they are answerable not to Greenwich, and certainly not to archaeologists, but to their shareholders. If the majority of their shareholders, in this public company, wish to sell this material, to disperse this collection they can, and if RMS *Titanic* Limited sink (pun intended) as a limited liability company they cannot be forced to pay for the continued curating of the *Titanic* material. Thus another collection of archaeological material will be placed on the market and another public funded museum will be expected to pick up the objects and make them part of their own collection.

RMS *Titanic* Limited claim that all work is being done to 'the highest archaeological and conservation standard'. However they are conducting remote operated vehicle salvage of material, without any thought regarding accepted archaeological procedure. There is no research design, management or conservation plan for their operations on the site, they employ no archaeologists to supervise the salvage and have conducted no archaeological research into the material recovered. To quote Dr Margaret Rule concerning the salvage of material from *Titanic* 'they will add nothing to our knowledge and their is no justification for removing them (the objects)' (Dines, 1994: 63).

The argument from the salvors that the material salvaged 'only comes from the debris field and not from within the hull' may be used to get around The United States *Titanic* Memorial Act, but also shows a complete lack of any archaeological knowledge or training (despite their claim otherwise) for as any student of archaeology can tell us—the debris field is an integral part of all archaeological sites and should be considered as one with it.

Museums have an obligation to assist the protection of underwater cultural heritage—to quote the International Council of Museums:

...they should assume a position of leadership on the effort to halt the continuing degradation of the world's natural, historic, archaeological, ethnographical and artistic resources (ICOM, 1990: 28).

As the National Maritime Museum, Greenwich, is a member of ICMM and ICOM, its decision to display the material removed from the *Titanic* wreck site is unethical and can potentially damage other archaeological sites. The announcement, in October 1994, by the National Maritime Museum, Greenwich, that it will convene an international conference on the need to protect underwater cultural heritage by the establishment of a protocol to protect historically significant shipwrecks, after the close of the *Titanic* Exhibition, reeks of hypocrisy to say the least (*The Guardian Weekly*, 1994).

There is no need to recover material from the *Titanic*—to quote Ballard in his report to the congressional hearing on

The *Titanic* Memorial Act:

The Technology used this summer to find *Titanic* is the vanguard of telepresence technology now entering the deep sea. Telepresence is the ability to project our thoughts, eyes and in the most advanced form, our hands into a remote and commonly hostile environment (Ballard, 1995: 20).

Telepresence has been used successfully on a number of underwater archaeological sites, including *Mary Rose* and an unidentified shipwreck in the Mediterranean. Besides Telepresence, the team from Woods Hole Oceanographic Institution compiled over 60 hours of video and 60 000 still photographs during the September 1985 and July 1986 expeditions to the site, according to Ballard 'there is not a square inch of the *Titanic* that has not been photographed in beautiful detail' (Murphy, 1986).

Besides the incredible large number of books and other publications on the *Titanic* there have also been a large number of exhibitions and displays using photographs, archive footage, survivor accounts, shipping company records and contemporary salvaged material including exhibitions at Merseyside Maritime Museum in Liverpool, Maritime Museum of the Atlantic in Halifax, Nova Scotia, the South Street Seaport Museum, New York, and Ulster Folk and Transport Museum, Northern Island (Ballard & Michel, 1985: 718)

Then again maybe RMS *Titanic* Limited and Greenwich should contact Mrs W. Coutts the *Titanic* survivor who, according to Jerry Hale of *Weekly World News* (23 October 1990), was rescued from an iceberg in the North Atlantic in 1990.

A 29 year old woman thought to have perished on the *Titanic* has been rescued from an iceberg in the North Atlantic—78 years after the ocean liner sank on its maiden [sic] voyage in 1912.

Postscript

As a postscript to this paper, which I wrote just prior to the opening of The *Titanic* Exhibition at Greenwich, I would like to quote from a small article which appeared in *Museums Journal* (May, 1995: 11) which states:

The National Maritime Museum's *Titanic* exhibition has been so successful that it has been extended for six months until 1 October. By March the exhibition, which shows artefacts recovered from around the shipwrecked liner, had attracted 250,000 visitors, double the normal winter average. Answers to an interactive computer questionnaire shows that 74% of visitors believe a permanent *Titanic* memorial museum should be established in England. 70% of the 71,000 respondents believe that museums are right to display material that has been recovered from shipwrecks by commercial salvage companies.

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A contribution to the management of the historic shipwreck heritage: the environmental context of the Richmond River mouth shipwreck heritage at Ballina, New South Wales

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Abstract

To form a basis for the management of the historic shipwreck heritage of any part of the coast, it is necessary to appreciate the geological and geomorphological history of that part of the coast. This enhances understanding of both the original distribution of wreck sites, and the subsequent spatial distribution and probability of preservation of the wrecks. This study focuses on the Richmond River mouth at Ballina, northern New South Wales, in which some 94 ships are known to have been wrecked between c. 1845 and 1908, when the present river mouth arrangement was established. Substantial changes in the geomorphology of the river mouth are identified, from which a model of likely wreck distribution is developed. This model provides the essential geomorphological context for management considerations regarding any particular wreck in this river mouth.

The best approach to managing underwater heritage is to determine the extent of the resource—exactly what is or might be down there (NSW Department of Planning, 1994a: 2; emphasis added).

Introduction

The specific aim of the project reported here is to assess coastal and fluvial erosion threats, both past and present, to the historic shipwreck heritage of the north coast of New South Wales. This project addresses concerns regarding the conservation of these heritage sites by identifying site-specific coastal and fluvial geomorphological characteristics, and by providing essential data on real or potential past and present erosion or exposure threats to known shipwreck sites. Throughout the study the shipwreck site characteristic identified as being most important, in terms of heritage conservation and management, is the geological and geomorphological history of these sites. Reconstruction of this history provides geographical limits to the original locations of wreck sites, indicates possibilities of wreck preservation, and defines the geographical limits of probable present wreck location.

The study focuses on the mouth of the River Richmond at Ballina, northern New South Wales (Fig. 1), where there are 94 recorded historic shipwrecks dating from prior to 1845 through to 1908 (NSW Department of Urban Affairs and Planning Shipwreck Database: pers. comm. D. Nutley, 1995). The exact locations of many of these are unknown, although these can be estimated. A survey of historical documents, maps and charts, and aerial photographs provides evidence for major changes in the geomorphology

of the river mouth at Ballina during the historical period. These changes can be dated reasonably accurately and provide evidence for a changing sequence of geographical conditions throughout the 19th century. Examination of this sequence allows certain areas of the present mouth of the Richmond River estuary to be identified as remnant features of either former river mouths or sand-bars. These features, when placed in chronological context, may then be associated with shipwrecks of the corresponding period. From this information it is also possible to identify areas in which, due to subsequent sedimentation, the preservation potential of particular shipwrecks is high. In some of these areas, recent land use activities (the development of a residential housing estate on a former tidal sandbank and subsequently a supra-tidal dune field, for example) ensure no further disturbance to underlying wrecks, and thus provide one form of heritage protection in this area. This study, therefore identifies sites which naturally conform to one of the conservation methods advocated by the NSW Department of Urban Affairs and Planning, namely 'protection by covering the heritage item with sand or a synthetic material' (NSW Department of Planning, 1994b: 8).

Management requirements for the shipwreck heritage of the Richmond River mouth

Of the more than two thousand shipping losses presently recorded for coastal and river areas of New South Wales (NSW Department of Planning, 1994b), between four to five percent are documented to have occurred in and around the mouth of the Richmond River at Ballina, Northern New South Wales. In his reminiscences of the Richmond River during the period 1847 to 1922 James Ainsworth noted that:

Shaw's Bay, from Pilot Point to North Head, was literally piled high with the wreckage of vessels [too] innumerable [to count] which had been lost on the bar...

and that:

South Beach and the beach immediately to the north of Lighthouse Headland were littered in every direction with the flotsam of broken ships (Ainsworth, 1987).

Now, many of these wrecks are buried beneath the coastal sand, and in some cases, residential housing estates and roads.

To provide appropriate conservation or preservation management of this rich shipwreck heritage, it is important to know the following:

- (i) the identification of shipwrecks in the area;

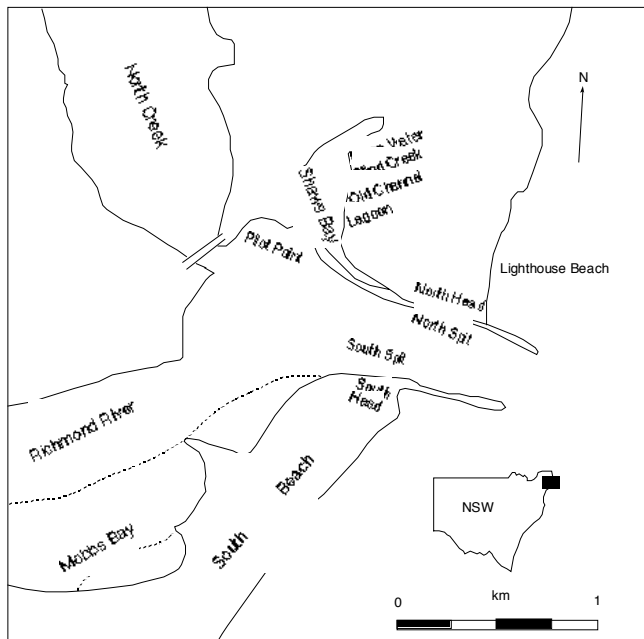


Figure 1. Location map of the mouth of the Richmond River, northern NSW, showing locations of places mentioned in the text. Note that prior to the development of the present Shaws Bay, this feature had several names reflecting the shifting nature of the channels and bar deposits.

- (ii) the location of the shipwrecks; and
- (iii) the environmental circumstances or context of shipwreck locations.

These three items of information then allow management options to be developed which take full account of both the historical value of the individual wreck and the degree of environmental threat of exposure either by natural erosion or human induced damage. Such an approach differs slightly from the process of assessment used by the NSW Department of Urban Affairs and Planning (NSW Department of Planning, 1994b), whose criteria for assessment focus only on the nature of significance (historical, archaeological etc.) and the degree of significance (inclusive of rarity and representivity). This paper reports an attempt to extend the assessment criteria by gathering and integrating both historical and geomorphological data for the Richmond River mouth. In theory, this case should be well suited for adaptation to a Geographic Information System (GIS), although in practice the uncertainty in both identifying specific wrecks and locating them exactly precluded such a methodological approach at this stage of the investigation. Future GIS development at a smaller scale is envisaged.

Methods

The identities and locations of many of the Richmond River mouth shipwrecks are unknown, although both a list of known wrecked vessels and descriptions of the locations of many of the wreck sites can be derived, with some degree of accuracy, directly from old maps and documents held within the archives of local libraries and historical

societies, and the NSW Department of Urban Affairs and Planning Shipwreck Database. The results of such data gathering are presented below. However, the third strand of information—the environmental circumstances or context of shipwrecks' locations—is essential to determine levels of threat to individual wrecks, and thus to contribute to establishing the urgency with which conservation or preservation management needs to be undertaken. Whereas potential threats of exposure are modern, and thus related to the present geomorphology of the river mouth, it is important to realise that the geomorphology of the mouth has changed substantially over the last century and a half. Thus, in order to assess the significance of individual wreck sites, it is necessary to know where these lay in relation to contemporary and consequential river and land morphology; this requires an understanding of the geological and geomorphological changes that have occurred to river and associated coastal morphology, the water flow and currents, and the foci of sedimentation (e.g. sandbanks) and erosion, over the last 150 years.

Data collection primarily comprised the examination of historical documents (letters, personal accounts and newspaper reports), largely held by the Richmond River Historical Society, maps and charts, some also held by the Society, and aerial photographs. These provided various levels of information, from anecdotal first-and-second-hand reportage, through to photographic and survey evidence for both the geographical geometry of the river mouth and site specific-conditions and wrecks. It should be noted that temporal control on some documents is weak: the survey date of some maps, for example, is unknown, and consequently ages assigned to the interpretations derived from the maps (Fig. 2) only represent publication dates and thus are *termini post quem*.

Historical changes in the geomorphology of the Richmond River mouth

When Captain Rous entered the Richmond River in 1828 he surveyed its entrance morphology (Daley, 1970; Daley & Trudgeon, 1983; Richmond River Historical Society, 1984) and described it thus:

The entrance is wide, 12 feet deep on the bar at half flood and 14 to 20 feet deep at the mouth, with a constant strong ebb tide from 3 to 5 miles per hour in mid channel although there is a regular rise of 6 feet by an under flood. A sand bank projects from the inner south shore, narrowing the channel to about 300 yards. It then opens suddenly to an expanse of two miles with two dry sandbanks in the centre; the main body running W by NW then... to the SW in a fine arm, 24 feet deep, nearly a mile wide... (Hall, 1983: 8–9).

This survey may be regarded as the initial reference point for monitoring the geomorphological changes to the estuary mouth which occurred throughout the 19th century, to some extent as a result of the impact of European land use practice (Fig. 2, c.1828). The earliest of these practices, which commenced soon after the arrival of sawyers into the Richmond Valley during 1842, involved logging the

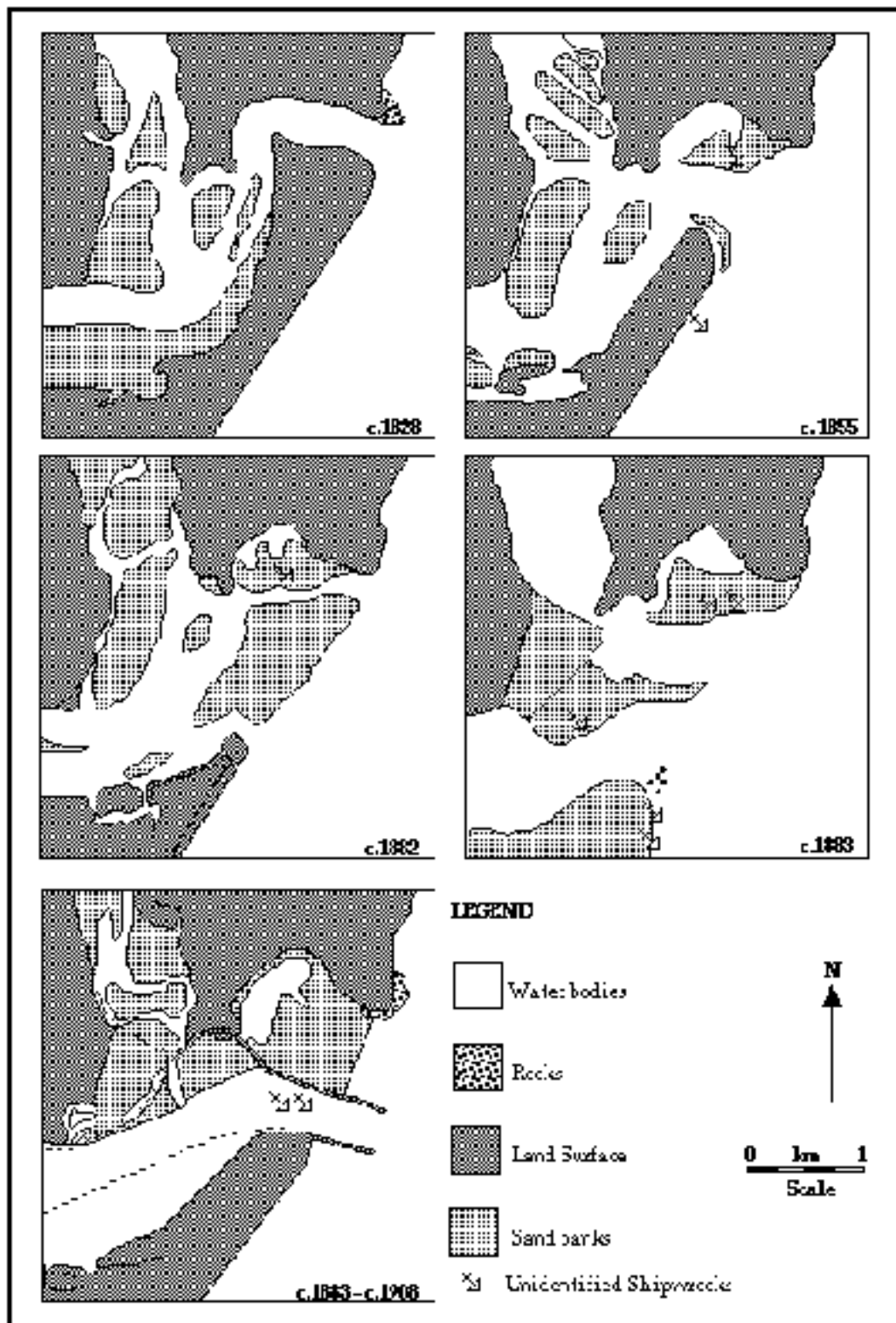


Figure 2. Changes in the geomorphology of the Richmond River mouth 1828–1908. c. 1828: as surveyed and mapped by Captain Rous; adapted from copy of Rous' map held by the Richmond River Historical Society. c. 1855 and c. 1882: showing locations of unidentified shipwrecks; adapted from maps held by M. Ryan, Lismore. c. 1883: showing locations of unidentified shipwrecks; adapted from a map published in the *Town and Country Journal* (23 June 1883: 1176). c.1883–c.1908: as surveyed during the construction of breakwaters and the establishment of the present river mouth morphology; adapted from a map dating to this time period held by the Richmond River Historical Society.

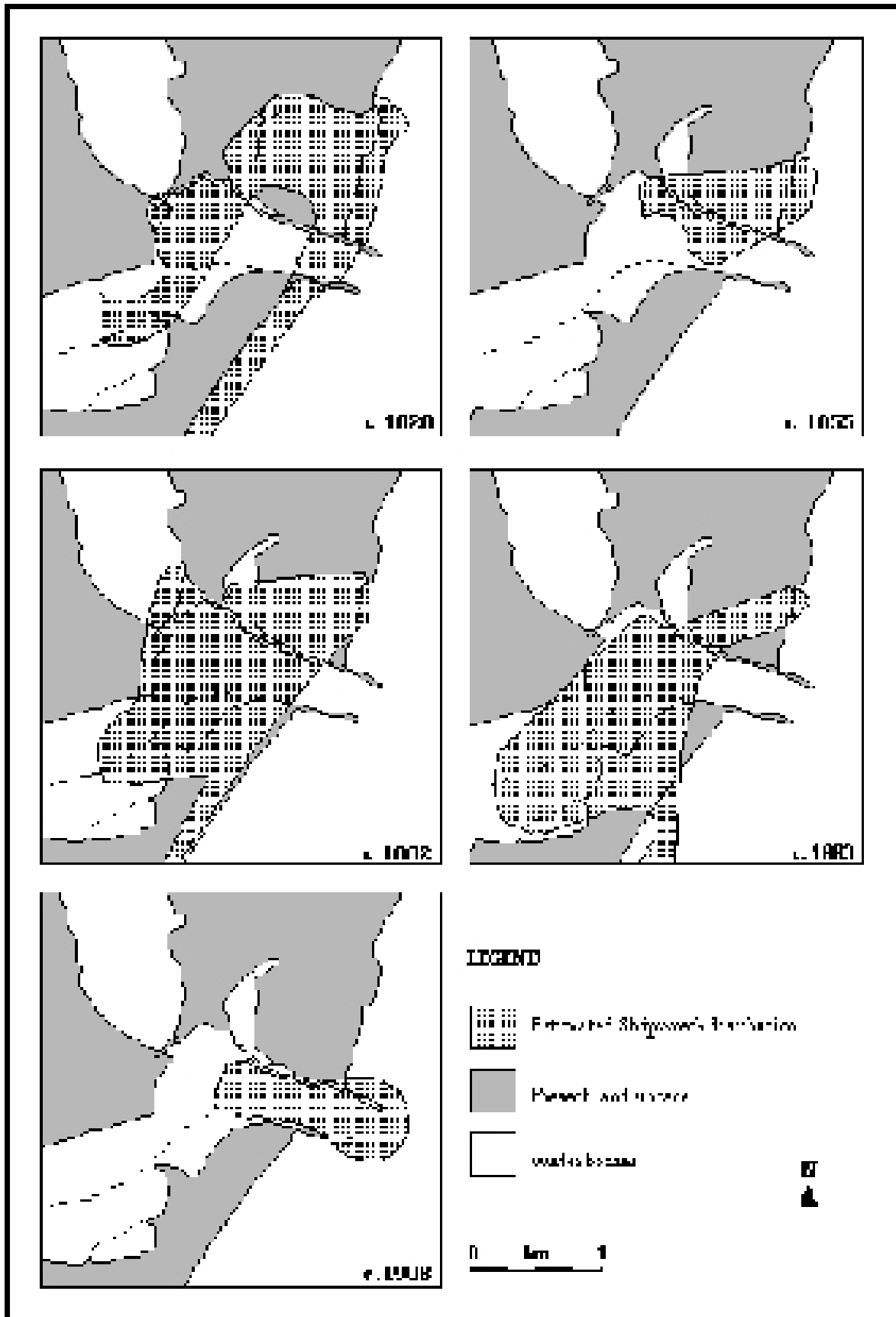


Figure 3. Estimated locations of shipwreck distributions in the Richmond River mouth during the periods (a) pre 1828, (b) 1828–1855, (c) 1855–1882 (d) 1885–1883, and (e) 1883–1908 and probably to present; derived from the interpretation of changing river mouth morphology and on written historical commentaries regarding the locations of wreck sites and contemporary conditions.

Vessel	Type	Date lost	Location
Northumberland	Schooner	1845	bar, South Spit
Hope	Schooner	7.08.1845	bar, South Spit
Golden Fleece	Barge	7.04.1847	bar, South Spit
Enterprise	Schooner	04.07.1847	bar
Melbide Ann	Schooner	1848	North Head
Sarah	Schooner	22.05.1848	on Rocks at North Head
Melbide	Schooner	7.05.1849	North bar
DPS	Ketch	7.03.1850	Richmond River, 1 mile south, estore
Heroine	Schooner	28.04.1850	Richmond River, 8 miles south, estore
Bramble	Schooner	28.04.1850	Outside River mouth (open coast?)
Lucy Ann	Schooner	28.04.1850	Outside River mouth (open coast?)
Harriet	Cutter	1851	bar
Columbine	Schooner	01.02.1851	inside River mouth
Madge Wildfire	Schooner	28.03.1851	near bar
Mary Ann	Schooner	13.08.1851	sand spit at entrance
Mary Jane	Cutter	1852	bar
Edize	Brigantine	7.01.1854	South Spit
Alet	Schooner	7.08.1854	North Spit
Planet	Schooner	24.12.1854	Richmond River
Adventure	Schooner	1855	Richmond River
William and James	Schooner	15.07.1856	Richmond River
Spitfire	Schooner	21.01.1857	bar
Abrahamson League	Schooner	05.04.1857	North Head
Arrow		03.07.1859	bar
Tayfield	Schooner	01.12.1859	bar
Champion	Schooner	27.11.1860	Richmond River
Goldbecker	Schooner	7.02.1861	bar
Henry	Schooner	08.03.1861	bar, North Spit
Jane	Schooner	1862	Richmond River
Harp	Schooner	1863	bar
Alexandra	Brigantine	07.11.1865	Richmond River Heads
Ranger	Schooner	07.11.1865	Richmond River Heads
Josephine	Brigantine	23.11.1865	Richmond River Heads, on middle spit
River Chief	Brigantine	25.11.1865	Richmond River Heads
Petra	Schooner	7.03.1866	bar
Falcon	Ketch	18.12.1866	bar
Annie O	Brigantine	7.07.1868	Richmond River
Clara	Ketch	1869	between the Richmond and Tyzed Rivers
Lucie Blair	Schooner	01.05.1869	bar, South Spit
Scoble	Schooner	01.10.1869	bar, on South Beach
Dragon	Barge	08.7.1869	Richmond River Heads
Fox	Schooner	07.01.1871	bar
Walrus	Schooner	07.01.1871	bar
Helen	Brigantine	12.04.1871	North Spit
Sylvanus	Schooner	13.04.1871	on rocks at North Head
Callender	Brigantine	08.08.1871	bar, rocks to north of entrance
John Bullock	Schooner	02.08.1871	North Head on rocks
Sarah Ann	Brigantine	7.10.1871	bar, North Spit
Margaret and Mary	Schooner	08.10.1871	bar
Walrus	Schooner, scow	10.01.1872	Richmond River Heads, north side
Culloden	Schooner, paddle	28.04.1872	North Spit
Hlander	Brigantine	07.10.1872	Richmond River Heads, North Spit
Elsmere	Barge	28.03.1873	Richmond River Heads, estore
Yeba	Schooner, paddle	28.03.1873	Richmond River Heads, South Spit
Audrey	Schooner	11.02.1874	bar
Walleby	Schooner	14.05.1874	Richmond River, North Spit
Victory	Brigantine	01.05.1875	Richmond River, North Head
Suzannah Booth	Brigantine	23.04.1876	bar
Summer Rose		10.08.1876	North Spit
Samuel Merritt	Barge	13.01.1877	estore at North Spit
Peony	Barge	07.03.1877	5 miles south, estore
Abel	Barge	27.07.1877	Richmond River
Wallace and Bruce	Brigantine	7.08.1878	between Richmond River & Sydney
Tide Wave	Brigantine	01.08.1878	bar
Yeba	Schooner, scow	28.01.1880	Richmond River, converted into a hulk
Sibers	Schooner	05.05.1880	Richmond River Bar, North Spit
Ocean Bride	Topmast	20.05.1881	north side of Channel
Florida	Schooner		
Francis Hixon	Schooner, scow	11.12.1882	bar
	Schooner, paddle	12.01.1883	bar, 100 yards inside bescore line
Platypus	Schooner, paddle	12.01.1883	Richmond River, south arm
Cuthbert	Topmast	7.04.1883	bar
J and T Fenwick	Schooner	01.04.1883	Richmond River entrance
Coquette	Schooner	08.05.1883	bar
Lashore	Schooner, scow	10.05.1885	Richmond River entrance
Comet	Schooner, scow	28.07.1888	between channel and North Head
Winnie	Schooner, scow	1887	bar
Sarahfield	Brigantine	10.02.1887	bar, South Spit
Suzesh	Schooner	20.01.1890	last seen off Richmond River
Comet	Schooner, scow	10.03.1890	South Spit
Eliza Allen	Brigantine	1891	Richmond River
Union	Schooner, scow	20.04.1892	bar
Grace Lynn	Schooner	03.08.1892	bar
Mabel White	Topmast	20.03.1894	8 miles off Richmond River
William Langford	Schooner, scow	15.11.1894	bar
Goodron	Lighter	1895	Richmond River entrance
Lifey	Brigantine	18.07.1898	bar, on rocks under the North Head
Sarah Fenwick	Schooner, scow	27.03.1900	Heads, north end of breakwater
Protector	Schooner, paddle	01.07.1901	bar
City of Grafton	Schooner, scow	7.04.1903	bar
Lady Musgrave	Schooner, scow	27.03.1904	bar
Turkik	Schooner, scow	13.08.1907	Near North Wall
Rescue	Schooner, paddle	04.08.1908	entrance, near South Spit
Sophie Ann	Schooner, scow	04.08.1908	entrance, southern sand spit
Captain T Fenwick	Schooner, scow	14.12.1915	upstream, 15 miles from Usmore

Table 1. Vessels wrecked in the vicinity of the Richmond River mouth. Principle data obtained from the NSW Department of Urban Affairs and Planning Shipwreck Database and supplemented by historical documents held by the Richmond River Historical Society.

extensive forests in the area, particularly for red cedar (*Toona australis*) (Jervis, 1958; Trudgeon, 1983). Prior to the existence of roads or tracks much of the forests surrounding the Richmond River catchment were, by necessity, accessed by the river with the ‘cedar getters’ principally using small whaling boats to explore for, and transport, red cedar from along the river and its tributaries. In this manner the first felling of red cedar occurred close to the water’s edge, and later as timber became increasingly scarce, it was felled progressively further inland. Bullock teams were then increasingly employed to drag logs to loading points both on the Richmond River and its tributaries and along the coast (Trudgeon, 1983). By 1845, 624 500 super feet (1 499 m³) of cedar was exported from the Richmond River estuary, some two-thirds of the colony’s total cedar export (Hall, 1983). By this time the Richmond River, North Creek, and their tributaries changed notably (Fig. 2, c.1855). It is probable that, due to this timber industry, the loss of vegetation close to the rivers contributed to enhanced soil erosion, and thus increased siltation of these rivers, and to increases in water flow into the Richmond River during the wet season. Observed increases in the severity of floods between 1840 and 1885 may be attributed to these processes.

Forest clearing within the tributary catchments also contributed to an increase in the natural scour of the main channel of the Richmond River, especially in flood time. Ainsworth (1987: 13) notes that

...the timber men cleaned out the upper arms and the tributaries...of the river in order to float the logs out of the scrubs to the main stream.

He further indicates that

...this clearance allowed the upper waters—especially in times of floods—to come down quicker with the result that the accentuated scour at the entrance swept away every barrier and for some time afterwards left bar conditions much improved (Ainsworth, 1987: 13).

No systematic dredging of the mouth was undertaken until Sir John Coode’s scheme for the provision of a breakwater at the river mouth was ratified in 1882 and his report presented to Parliament in 1885 (Hall, 1983). With no breakwaters to direct the flow of the river during flood events, the river forced through a pre-existing sand barrier spit to the south of the river’s entrance, sometime during the late 1850s, creating both new entrances and new arrangements of sandbanks (Fig. 2, c.1882, c.1883). Ainsworth (1987) noted that floods which occurred during 1858 or 1860 severely eroded the south spit, and stated that ‘this flood cut a new wide, straight, and deep channel (a 22 ft pole found no bottom in it) through the south beach’. This new channel, however, proved to be short lived, and although

...there was an improvement in navigation conditions as a channel 22 foot deep was forced through South Beach...it was not permanent and gradually worked north where the same difficulties and dangers were again experienced (*The Northern Star*, 18.12.1935: 13).

During the 1850s a serious flood apparently also scoured a 20-foot deep channel through the bar, and in 1864 eight floods were reported (Richmond River Historical Society, n.d.). By 1885 there were three entrances to the Richmond River:

...one about where the surf club shed is erected along the base of a hill to Shaws Bay; another about the position of the present entrance and a third through the south of Mobbs Bay (Murray, 1983).

Between the 1880s and 1908, breakwaters and training walls were constructed, with the northern mouth at Shaws Bay being closed in the 1890s by the construction of the north wall breakwater (Hall & Trudgeon, 1981) (Fig. 2, c. 1883–1908). By the end of this period, the present morphology of the river mouth had largely been established, and so ended around six decades of significant and substantial river mouth geomorphological change.

Geomorphological controls on shipwreck location and preservation in the Richmond River mouth

There are records for 94 shipwrecks dating from before 1845 to 1908 in the mouth of the Richmond River (Table 1), although the exact locations of only a few of these are known. General statements, derived from an understanding of the changing river mouth morphology and written historical commentary, however, may be made regarding the expected distributions of shipwrecks of given ages. Figure 3 illustrates these probable distributions.

This is a potentially very rich historical heritage, whose management poses several problems. Firstly, the lack of knowledge of many of the locations limits the implementation of protective actions. Secondly, the nature of a populated river mouth, with the possibilities of fluvial and open shore erosion and land use erosion (whether inadvertent, or deliberate during dredging, sand extraction, construction, etc.) presents considerable potential threat to the integrity of the shipwreck heritage. Whereas this study is not yet able to prescribe specific management actions, it does provide an overview which enhances the understanding of the general environmental context of the shipwreck heritage of this area, and in some cases of specific wrecks, and thus places realistic limits on both expected location of unlocated wrecks, and degree of threat to wrecks.

Two important factors influence the probable distribution of presently preserved shipwrecks in the river mouth. First, the locations of the original wreck sites, related to both the geomorphology of the river mouth and the shipping practices within the mouth, at the time of the wreck, places an immediate distributional control on location. This is reflected, for example, in the patchy distribution of known wreck sites, with concentrations of sites at, for example, the former South Beach mouth where ships presumably foundered on the bar there, and in the Shaws Bay area, where protective channels were often used as anchoring places, but where shallow sandbanks and intertidal rock flats provided a threat to shipping safety.

In 1933, erosion of the beach north of the north wall breakwater exposed the remains of a wooden steamship (*The Northern Star*, 1.5.1933). The exact location of this wreckage was 20 feet from the north wall, 7 feet below the normal sand surface. Comparison of this location with the river mouth geomorphology depicted for 1855 and 1883 indicates that the wreck location is in the centre of the river channel where a river mouth bar would be expected to have been present.

Many of the other securely-recorded shipwrecks can also be attributed to foundering on sand-bars which, during the early historical period and certainly prior to the construction of the breakwater walls, were notorious for shifting. Before breakwaters were built, navigation of the Richmond River was impeded by

...the shifting nature of the entrance channel, the presence of shoals at the mouth of the river and the low depth of water on the bar during adverse weather...the dangers [of which] were considerably augmented by the conflict of the waters of North Creek with those of the main river at the point of meeting between East Ballina and Ballina (*The Northern Star*, 18.12.1935: 13).

The first vessel recorded to founder on the Richmond River bar was the *Urara*, sometime prior to 1845. Yet it would appear that this vessel was not wrecked but refloated since Ainsworth maintained that the *Urara* was one of four vessels regularly trading along the Richmond during 1847 (Ainsworth, 1987: 13). It was common practice at this time to repair, rebuild and refloat vessels which had been grounded or damaged (Hall, 1983). Interestingly Ainsworth's recollection of his first arrival at Ballina in 1847 includes a description of the grounding of his father's vessel the *Matilda Ann*.

Arriving off the river in due course we found the channel to be under the North Head following the base of the Hill round Shaw's Bay and past Pilot Point whence it ran beside the long South Beach and up river to West Ballina and beyond. The *Matilda Ann*, when crossing in grounded inside the bar on one of the many shifting sandspits and remained fast. My mother, my two sisters and myself were taken ashore in a boat and were landed on the inner North Head (Ainsworth, 1987: 13).

The worst disaster associated with early shipping on the Richmond river occurred on 28 September 1850 (*Sydney Morning Herald*, 7.10.1850: 2; 8.10.1850: 2; *The Northern Star*, 18.12.1935: 13). Three schooners, the *Bramble*, the *Heroine* and the *Lucy Ann*

...shortly after clearing the bar of the river were struck with a fearful south west squall and all three vessels were lost (*Sydney Morning Herald*, 7.10.1850).

In this incident fourteen people died; the entire crews of both the *Heroine* and *Bramble* were drowned (*Sydney Morning Herald*, 7.10.1850; 8.10.1850). Significantly 'the three schooners were passed by the *Ebenezer* bottom up on the following day, about thirty miles to the southward of the river and ten miles offshore' (*Sydney Morning Herald*, 7.10.1850) making it improbable to expect that wreckage of

these vessels would be found at the mouth of the Richmond River. Nevertheless the Richmond River Historical Society has records of 35 wrecks on the bar between 1856 and 1908, including six in 1871 (Richmond River Historical Society, n.d.). Many of these vessels, stuck fast in the sand and too badly damaged to refloat, formed the litter of shipwrecks to which Ainsworth (1987) has referred.

Secondly, the subsequent geomorphological history of the wreck site enhanced or inhibited the preservation of the shipwreck. The reconstruction of the South Beach spit in the late 19th century, for example, has permitted the potential preservation of ships wrecked in the short-lived South Beach mouth. Similarly, the closure and infilling of Shaws Bay provides protection to earlier wrecks in that part of the mouth. An example of protection available from the sandy sedimentation in parts of the river mouth is the steamship wreck mentioned above, and reported thus:

A wreck was exposed to view on the north beach at Ballina where the sea which rolled upon the Richmond Bar in bygone years claimed many victims in ships and men... At East Ballina a channel was cut out right along the north side of the north breakwall into Shaw's Bay. Some seven feet of sand was washed from above the wreck of a wooden steamer which lies about 20 feet from the wall. The whole of the planking and timbers are now exposed and show that it was a somewhat flat bottom vessel over 60 feet long and 18 or 19 feet beam. The timber and metal fittings are in as sound condition as the day the vessel was built, a tribute to the durability of our Australian hardwoods (*The Northern Star*, 1.5.933: 13).

Although most of the shipwrecks recorded for the Richmond River system are found in the lowermost reaches of the river, relatively close to the entrance, there are some ships recorded as having been wrecked up river. If these are still lying where they sank, they may be well preserved in anaerobic estuarine muds and silts which are ideally suited for the preservation of organic materials such as wood.

There is one other influence that the geology of the river sediments may exert upon the preservation of shipwrecks. In 1908, *The Northern Star* newspaper published an article calling for the dynamiting of wrecks in the Ballina channel, and the ships *Rescue* and SS *Sophia Ann* were dynamited as shipping hazards during that year (Murray, 1983). The reason for the ships to be cleared out of the channel was that

...the Richmond River has a body of indurated sand at a depth of 25 ft. and upwards... [which] holds any body like a steamer's boiler or the engine from sinking any deeper (*The Northern Star*, 11.5.1908).

Conclusion

The mouth of the Richmond River at Ballina is known to have changed in geomorphology, probably for several reasons, during the 19th century. During this period, some 94 vessels are recorded to have been wrecked in and around this river mouth. Many of these have probably not survived or have been destroyed. However, a number are known or can be reasonably expected to have survived. A survey of the changing geomorphology of the river mouth

provides insight into the distribution of the original wreck locations, since the locations of river channels and shallows altered during this period. Combined with a knowledge of the present geomorphology of the river mouth, it may now be possible to model the possibilities of shipwreck preservation at any locality in the river mouth area. This provides an essential input to the development of shipwreck heritage management in this area extending the current NSW Department of Urban Affairs and Planning (NSW Department of Planning, 1994b) practice of site assessment, by identifying (i) whether wrecks of given age are likely to occur at a location, and (ii) the degree of protection or risk to the preservation of a wreck afforded by the present geomorphological and land use characteristics of that location.

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Measurements should be given in metres where appropriate. However, it is appreciated that 19th century British shipping measurements, for example, were given in feet and inches and some workers still may record in these units. Authors should indicate where measurements are made this way by giving the measurements in feet and inches and then the conversion into metres in parentheses, likewise for measurements taken from published sources. Otherwise, metric units should be given with Imperial conversions, where required or appropriate, in parentheses.

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