Understanding the meaning of ‘shipwreck’: the relationships between cultural and environmental influences in north-eastern Australia

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Abstract

In the study of underwater cultural heritage, the word ‘shipwreck’ is freely used to describe the loss of a vessel, but what exactly does this word mean? The use of the terms ‘shipwreck’ and ‘accident’ are both constructs of language that are used to represent an often-complex series of factors that society doesn’t fully comprehend or wishes to understand. Most shipwrecks are the result of a confluence of cultural factors and environmental conditions that together lead to a ‘wrecking event’ and both are equally important to the understanding of shipwrecks. The holistic study of pre-disposing cultural factors and the environments in which shipwrecks occur, can help in understanding both the causes and the spatial distribution of shipwrecks in a given area by establishing the connections between these factors. This paper will explore these relationships in the context of shipwrecks in the north-eastern Australian region, including the Great Barrier Reef and Coral Sea. This region was selected for study due to the concentration of 19th century shipwrecks, the diverse environmental conditions within the area and the availability of extensive historical data about 520 shipwrecks compiled by the author as part of a wider historical characterisation of the areas maritime landscape (see figure 1).

Figure 1. Distribution of shipwrecks in the north-eastern Australian region (Luckman).
Introduction

The physical remains of shipwrecks provide valuable information about certain aspects of maritime culture, such as the construction of watercraft; wrecking events and subsequent deterioration processes; information about individuals and past societies and about a vessel’s physical pre-disposition to shipwreck. However, there are other questions that need to be answered about patterns in the occurrence and distribution of shipwrecks and how these relate to environmental conditions or cultural influences, which cannot be answered entirely by the physical study of their remains. While the effects of the natural environment that surrounds shipwrecks can be observed and understood, detailed historical background is needed in order to understand the economic, technological and human contexts into which these vessels fitted and to better interpret the evidence that is observed in the physical remains.

The study of cultural seascapes has greatly improved our overall understanding of the spatial and temporal relationships between shipwrecks, terrestrial maritime sites and environmental features (Gibbs and McPhee, 2002; Duncan, 2000; Parker, 2001; Westerdahl, 1998), however a detailed picture of the historical factors contributing to the loss of ships, and how this relates to the distribution of shipwreck sites is still lacking.

The aims of this paper are to briefly describe some of the main environmental and pre-disposing cultural factors; to explore how they combine to cause shipwrecks and to identify where these processes have affected shipwreck occurrence and distribution over time within a given region, using the characterization of shipwrecks in the North-eastern Australian region.

Environmental conditions in north-eastern Australia

Seasonal weather patterns

Because much of the shipping operating in the north-eastern Australian region during the 18th century and the first half of the 19th century were sailing vessels, shipping routes during this time were governed by the prevailing winds (see figure 2). Vessels travelling through the region from eastern Australian ports to Southeast Asia required winds that blew towards the north, which meant that they travelled this route during autumn, winter and spring, when Southeast trade winds are most common (Gentilli, 1971, pp. 74-82). During the hotter months of the year (November – March) the winds in the tropical latitudes blow from the north or were too variable in strength and direction to be trusted. Sailing directions of the time did not recommend vessels attempt to travel through the Torres Strait during the summer months, in either an eastern or western direction, and most certainly not from the west (Horsburgh, 1841, p. 673). With the advent of steam propulsion for ships, this factor became less important as steam vessels were not governed by wind and could travel the routes in either direction all year round (Nautical Magazine, 1845, p. 689).

Figure 2. Prevailing winds in the north-eastern Australian region (Australian Bureau of Meteorology).
It does not appear to be generally recognised that calm weather is in fact one of the most dangerous situations for vessels of all types navigating the Great Barrier Reef. If the weather is overcast, the clouds reflect in the calm surface of the water causing the horizon to blend in with the sea and inhibiting the visual identification of reefs below the water’s surface.

**Severe weather events**

The effects of severe weather conditions such as storms, cyclones and tornadoes are to a certain extent the exception to the rule regarding the causes of shipwreck. The effects these weather conditions have on the distribution of shipwrecks within the north-east Australian region vary considerably. Severe south-easterly storms in the winter months cause random shipwreck occurrences on the lee shores of the coast, and on the southern and eastern sides of reefs and islands in the region.

Although there is no recorded instance of vessels being destroyed by lightning or waterspouts (tornadoes at sea) in the region. These events are random and would result in shipwreck distribution of the same character.

Rotary storms, known as tropical cyclones in the southern hemisphere, affect shipwreck distribution quite differently. As the name would suggest, the winds rotate around the centre of the storm in a clockwise direction, so depending on which quarter of the storm one is affected by, the wind can be from different directions (Marine Board of Queensland, 1979, p. 252). The wind strength during cyclones can vary from 90 to 250 kilometres per hour. Depending on the barometric pressure at the storms centre, increased tides (tidal surges) between 1 to 3 metres can normally occur and have been reported to have reached a height of 10 metres (Whittingham, 1958, pp. 31-33).

**Regional geomorphology**

Because of its complex terrestrial and underwater geological structures, the north-eastern Australian region, especially the Queensland coast and Torres Strait, has long been considered one of the most difficult environments for marine navigation in the world (*Nautical Magazine*, 1846, p. 550). Both the Queensland coastline and the offshore reefs in this region run in a roughly north-south direction. This means that during winter the southeast winds push vessels towards them.

The main obstacle to shipping in the region is the Great Barrier Reef which runs for approximately 1900 km along Queensland’s east coast and into the Torres Strait. Raine Island entrance, and other passages in its vicinity, were popular in the first half of the 19th century, with ships passing between the Coral Sea, and Torres Strait (known as the outer route). Apart from these entrances being narrow, and having no highly visible landmarks until the erection of the Raine Island beacon, once through them, vessels had to wind their way through the maze of small reefs, coral pinnacles and shoals that lay between the outer reef and the coastal lagoon. This was especially dangerous for large vessels or those with deep draughts, which because of the tonnage rules represented a large proportion of British shipping at that time (Greenhill, 1980, pp. 12-13).

Vessels travelling the inner route along the coastal lagoon had no such problems providing their navigation was accurate. The depth of water in the lagoon averages about 30 metres with shallower waters inshore and deeper waters towards the inside of the barrier reefs. The inner edges of the reef are more difficult for ships to see because these are the backs of reefs, and do not face the prevailing seas. The reefs and many small islands required vessels travelling along the lagoon to must make frequent direction changes, requiring accurate navigation and efficient ship handling.

**Tides and currents**

Although tides and currents are not in themselves dangerous phenomena they can add to the dangers of navigation in certain circumstances. Vessels are most vulnerable to their effects when they have a restricted area to manoeuvre due to obstacles, or when ships are being navigated primarily by dead reckoning, without visual landmarks. This latter circumstance is
primarily applicable to navigation in the Coral Sea. Vessels traversing this region in the 19th century would be navigated by a combination of dead reckoning with magnetic compass and log line, celestial navigation to calculate latitude, and the use of a chronometer or nautical almanac to accurately determine longitude (Tryckare, 1964, pp. 24-25; Brady, 1849, p. 148; Sobel, 1995, pp. 1-13).

The most difficult factor to account for in these calculations is the effect of surface currents. Without visual references their effect is hard to detect until a position fix is taken with a sextant and chronometer, and in between these checks a vessel may drift off course and strike an obstacle, such as one of the many isolated coral reefs in the Coral Sea. If a current is moving in the same direction as a vessel, the speed determined by log line may underestimate the actual distance being travelled. A vessel in these circumstances may arrive at a specific danger, such as an entrance to the Barrier Reef, earlier than expected, catching the ship’s crew by surprise and leading to it becoming a casualty (Sobel, 1995, p. 6). The opposite could also happen, with a vessel altering course too soon because of the effects of current impeding its forward motion.

**Geomagnetism**

There is little evidence to support the influence of geomagnetism in the north-eastern Australian region as having contributed to shipwreck, but it has been included here because of historical references to its possible effect on ships’ compasses in the region. Although this phenomenon has been reported overseas, e.g. the Saint Lawrence River in Canada (*Nautical Magazine*, 1843, p. 428), the only mention of its manifestation in this region is a very early observation by Captain James Cook during his exploration of the Australian east coast. Cook named Magnetic Island, located off Townsville, after its supposed effect on his compass when in the island’s vicinity in 1770 (Gill, 1988, p. 82).

**What is cultural pre-disposition**

To understand the relevance of cultural pre-disposition, it is helpful to consider the meaning of the word “shipwreck”. The term shipwreck is a construct of language and has connotations similar to “accident”. Both these terms have been used to either simplify the complex, to describe an incident that’s not fully understood or defines the wish to understand that incident. The modern techniques used by accident investigators recognize that an accident is a confluence of effects, errors, faults or mistakes that culminate in an incident. Even government authorities and investigators of the 19th century were aware that shipwrecks had specific causes and spent substantial time and resources to investigate and indentify these causes in the hope of reducing the frequency of their occurrence through regulation. So, the word shipwreck describes a process that leads to an incident (a wrecking event) and the results of that event.

While a wrecking event may happen quickly, the process that leads to a shipwreck is rarely something that occurs in an instant and is often the result of a confluence of environmental and socio-cultural factors. The process can be influenced by prior factors that create a pre-disposition for a wrecking event to occur under certain circumstances or environmental conditions. These factors can even relate to the design or construction of a vessel. Therefore, it can be theorised that these pre-determining factors, or causes, of shipwreck can have a relationship with the types of physical locations in which shipwrecks are found (O’Shea, 2002; Gould, 2000; Thompson, 2000; Lenihan and Murphy, 1998).

**The study of socio-cultural process in shipwreck research**

The idea of using a sociocultural process perspective when interpreting shipwrecks is certainly not a new idea. As early as 1983 this theme surfaced in the publication *Shipwreck Anthropology*, in which Richard Gould and Larry Murphy explored this concept (Gould, 1983, p.7, Murphy, 1983, pp. 66-67). Both researchers subsequently expanded those ideas. Gould hypothesised that the wrecking event is embedded in ongoing cultural processes such as social, economic and symbolic activities (Gould, 2000, p. 13), while Murphy and Jonnson in *The Dry Tortugas National Park: Submerged Cultural Resource Assessment* state:
‘Shipwrecks represent general cultural processes of which they were a part prior to wrecking. If natural and cultural processes affecting maritime activities reflect patterned regularities, sites resulting from them will be patterned and will best be interpreted in a wide sociocultural context’.

Similar views are also shared by historian Mark Thompson, who has studied the wrecks which occurred on the Great Lakes in the United States using a cultural process viewpoint, as well as a cognitive approach based on his own practical experience in the shipping industry (Thompson, 2000, pp. 9-10).

The identification of risk behaviour is also an important theoretical perspective, especially regarding the effects of economics on risk taking in the marine transport industry. Studies that have dealt with aspects of risk include another maritime archaeologist involved with research into shipwrecks at the Dry Tortugas, Donna Souza, whose published work includes arguments for pre-depositional formation processes (Souza, 1998, pp. 47-48) and its relationship with risk taking behaviour (Souza, 1998, pp. 103-21). Gould has also looked at risk concerning unsafe vessel modification and insufficient maintenance due to economics as a factor contributing to shipwrecks (Gould, 2000, pp. 2-6). Another study within the North-eastern Australian region has been conducted by Gibbs and McPhee (2002), and concentrates on the area surrounding Raine Island Entrance, in Australia’s Northern Great Barrier Reef and their investigations looks at aspects of risk taking in relation to shipping routes.

An article by John O’Shea, which centred on research about Great Lakes shipwrecks in North America, presented a theoretical approach for analysing the spatial deposition of shipwreck materials using cultural process as its basis (O’Shea, 2002, pp. 211-27). Like Murphy and Jonsson, O’Shea proposes that it is useful to categorize pre-depositional site types based on the cause of shipwreck and considered that the traditional categories used in reporting by contemporary government marine departments such as stranding, collision or foundered etc. are sufficient to delineate the different site types (O’Shea, 2002, p. 213). These categories may be sufficient for the pre-deposition study of artefacts, but they are not detailed enough for studying the pre-disposing cultural factors that contribute to the spatial distribution of shipwrecks. For this we need more explicit cultural criteria that are not as close to the wrecking event.

**Socio-cultural factors associated with shipwreck**

The following list of cultural factors have been identified as influencing the occurrence of shipwrecks during the 18th and 19th centuries and may contribute to the pre-disposition of a vessel to be involved in a wrecking event. It is not possible to provide detailed descriptions of these factors within the scope of this paper, however full explanations for each of the factors and their various sub-categories can be found in my master’s thesis (Luckman, 2003).

**Economic factors**
- Foreign and domestic competition
- Marine insurance and vessel classification
- Vessel construction, repairs and maintenance
- Equipment, crewing and provisioning

**Technological factors**
- Vessel design and handling
- Problems with sailing vessels
- Problems with steam powered vessels
- Construction materials and techniques

**Hydrographics and navigation**
- Navigation instruments
- Charts and sailing directions
- Lighthouses and navigation aids
Problems with cargo or vessel employment

Improper loading of vessels
Hazardous cargoes
Risk associated with vessel employment

Human factors

Incompetency of masters, officers or crew
Drunkenness, fatigue and disease
Piracy and b arratry

Cultural pre-disposition in north-eastern Australia

General analysis

The analysis of the relationship between the general pre-determining cultural factors that have been identified, the local environmental conditions, and the historical data has highlighted some interesting facts. Of the 520 shipwrecks represented in this study, only 167 of them have definitive evidence of their causes of wreck. Even though this is only approximately one-third of the total number, it is a big enough sample to indicate general trends in the region. There were sixty detailed scenarios for shipwrecks having occurred in the north-eastern Australian region and these were analysed for matches to the environmental conditions and pre-disposing cultural factors which have been identified earlier in this paper, in order to determine which of these were present, and their level of occurrence. The cultural sub-categories representing pre-disposition were well represented, with only two not specifically identifiable in the regional sample. These were ‘foreign and domestic competition’ and ‘lighthouses and navigational aids’. The results show (see Figure 3) that environmental factors are the largest single causes of shipwrecks, but when the various cultural pre-disposing factors are taken as a whole, they are twice as likely to contribute to shipwreck. The figures when further condensed into environmental versus cultural form bear out this conclusion (see Figure 4) with cultural factors making 22% of the sample in comparison to the environmental influences which totaled 11%. These figures demonstrate the need to look carefully at cultural factors in the regional archaeological record as they play a role equally important to environmental considerations.

Figure 3. Factors contributing to shipwreck in the north-eastern Australian region (Luckman, 2003).

Figure 4. Primary factors responsible for shipwrecks in the north-eastern Australian region (Luckman, 2003).
Time of day in which shipwrecks occur

One of the most telling pieces of evidence to come from the characterisation of shipwrecks in the north-eastern Australian region was that a substantial percentage of them occurred at night (see figure 5). In common with much of the facts surrounding wrecking events, if you look at the information superficially, it would appear these wrecks occurred due to lack of visibility. When these events are analysed more deeply, it becomes apparent that it is the reasons that caused these vessels to be operated in the dark in the first place that are most important. It must be said, firstly, that there was no legitimate reason why a vessel was compelled to operate in darkness; this was a decision by the vessel’s captain. Vessels travelling in the coastal areas of the region had numerous anchorages that they could use. Ships in the Coral Sea had less access to safe anchorages but could stop and ‘lay too’, as it was termed, in open waters if they wished. From the historical and spatial evidence, it appears that there are at least three main reasons behind why these vessels were wrecked at night and the location of the wrecks.

The least significant of these reasons occurs when captains attempt to continue a voyage into the night in order to reach their destination, which was close at hand.

This can be for reasons of economic advantage, to avoid the onset of adverse weather, or due to time considerations such as tides or administrative pressures e.g. passenger schedules. This helps to explain why night-time wrecks occur so frequently around port entrances. Another reason for night-time passages is that they are purely for economic gain. By travelling through the night, voyage times are shortened, expenses are lowered, and profit maximised. This exercise often involved high levels of risk taking, requiring flawless navigation and ideal weather conditions. Where navigational aids, such as lighthouses or lightships were located around known dangers, navigators used these visual references, not only to avoid them but to guide them, and they were actively sought out. In the process of trying to locate the light, vessels were often wrecked on the very dangers that the light designated.

In the north-eastern Australian region this type of wreck is especially applicable to the inner shipping route from Fraser Island through Torres Strait. The third major reason for wrecking events occurring at night in the region is more complex, involving many different factors, and is centred on the outer barrier reef passages which lie off Cape York between 11°10’ and 12°30’ latitudes. Within this area, there are many passages through the reef which were used by shipping as part of the outer route via Torres Strait. These passages were most heavily used during the mid-1800s, were extremely hazardous, and the area around them has one of the highest concentrations of shipwrecks in the region, the majority of which have occurred during night-time. These were not unknown dangers; the area was well known to be very hazardous, both officially in East India Company and Admiralty sailing directions, and generally within the shipping industry. Both Horsburgh’s and Admiralty sailing directions state the necessity of entering these passages during daylight and to gain an anchorage before night. From the statements of shipwreck survivors from this area, it is apparent that they did not intentionally arrive at these entrances during night-time.

Why did they arrive in the dark? The answer to this can be found in the methods of navigation used to arrive at this location. Vessels planning to utilise these entrances first sailed roughly north through the Coral Sea until reaching the latitude of these entrances. They then pursued a westerly course along this line of latitude until reaching the Barrier Reef. There are no reefs or islands in the Coral Sea at this latitude from which to check a vessel’s position and arriving at the
Barrier Reef entrances during daylight hours was wholly dependent on correctly ascertaining the vessel’s longitude. Even with the advent of the chronometer and nautical almanac in the late 18th century, and with the continued use of dead reckoning, longitude was difficult to accurately calculate. Most wrecks in this area occurred after the area was surveyed in the mid-1840s, and when the entrance near Raine Island had been determined as the officially sanctioned passage through the Barrier Reef in this vicinity. The estimated physical positions of shipwrecks in the vicinity of Raine Island entrance appear to indicate that navigators of the 19th century were generally able to accurately ascertain their latitude, as the shipwrecks around Raine Island are tightly grouped. The reason for becoming shipwrecked during the night in this vicinity would therefore tend to support an inability to correctly calculate longitude by these navigators. This evidence is supported by British government investigation into the causes of shipwrecks, conducted during the mid-1830s and 40s, and which had concluded that a general inability existed among ships’ captains for correctly determining longitude.

**Crewing of shipwrecked vessels**

Another piece of evidence to support the theory of shipwreck predisposition is in the results of the analysis of data regarding the levels of vessel manning for shipwrecks in the north-eastern Australian region. Although there is only crew level data for about one-fifth of wrecks included in this study (103 out of 520), the results appear to be decisive. Of these 103 shipwrecks, only 32 had appropriate levels of manning (see figure 6). Of the 71 vessels identified as being undermanned, 23 were marginally short-handed (two crew short or fewer), and 45 were

![Figure 6. Undermanned sailing vessels in the north-eastern Australian region (Luckman, 2003).](image)

![Figure 7. Undermanned vessels by cargo in the north-eastern Australian region (Luckman, 2003).](image)
classed as badly undermanned, which I have defined as any vessel being three crew short or more, or in the case of vessels under 40 tons, with fewer than the minimum crew of three. A third of these badly undermanned vessels had less than half the appropriate number of crew. It is interesting to note that many of these worst examples of undermanning were of ships from the latter part of the 19th century, at a time when they would have been fitted with donkey boilers to drive steam winches and pumps, with a subsequent reduction in the need for crew. This was considered in the analysis; the crew level being dropped from 5 to 3 crew per 100 gross tons of vessel. Even with this reduction, many of this type of vessel were still shown to be badly undermanned. Undermanning was believed to be a serious problem according to contemporary sources and this fact would appear to have been borne out by the physical evidence. Although the existence of undermanning does not directly designate the location at which a vessel may be wrecked, it is a component in the level of the likelihood of survival for a vessel in adverse environmental conditions.

**Conclusion**

This type of socio-cultural analysis is important for several reasons. Not the least is because at the current rate of maritime archaeological investigation it will take many generations before a substantial proportion of shipwreck sites are investigated; so, in the interim this information can be a valuable tool for cultural resource management.

Understanding both the spatial distribution, historical characteristics and socio-cultural context of shipwrecks can enable a more accurate assessment of site resources and heritage significance or provide guidance for research and site protection priorities. Some individual shipwreck sites may not be considered particularly important when judged individually under heritage significance criteria but may have increased significance when considered within its regional and cultural context as part of a maritime seascape. These types of studies also provide comparative data and models that can be applied in the study of other regions both in Australia and overseas; remembering that some of these spatial schemes originate from other countries.

Another important aspect of these studies is the scarcity of historical evidence. The further back in time that shipwreck studies are undertaken the more fragmented and incomplete the historical record becomes. In these circumstances one of the real strengths and purpose of maritime archaeology becomes apparent by allowing the reconstruction of historical events in the absence of a detailed historical narrative of the event. Understanding what we observe in the archaeological record may be dependent on understanding the socio-cultural causes of shipwrecks and enable their physical signatures to be identified in the maritime archaeological record, which is a particularly exciting prospect. Once a potential pre-disposing factor is identified for a given shipwreck, it could be sought out as part of an archaeological investigation. The discovery and interpretation of such signatures in the remains of a shipwreck could greatly add to the knowledge of that historical event.

The manifestation of some pre-disposing factors may also effect the physical deterioration of shipwreck remains, especially those involving vessel design deficiencies, poor construction techniques or materials and the effects of hazardous or improperly loaded cargoes. Knowledge about the presence of these factors, along with the known environmental conditions, can assist cultural resource management authorities with accessing the current or future potential for site deterioration through predictive modeling.

It is hoped that this study may provide guidance to other researchers for applying the characterisation of shipwrecks in other areas of the world, including the pacific region, to the study and understanding of the regional occurrence and distribution of shipwrecks in those areas and how the study of pre-disposition can assist in this analysis.
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