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Shipwrecks as Archaeological Signatures of a Maritime Industrial Frontier in the Solomon Islands, 1788–1942

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Abstract This paper examines the nineteenth- and twentieth-century non-indigenous presence in the Solomon Islands as an example of a maritime industrial frontier. In particular it employs a combination of frontier and maritime cultural landscape theories to consider the material and cognitive elements that inform us about how a maritime industrial frontier was shaped and operated, including the relationships between shipwrecks, maritime infrastructure, nodal points of activity and indigenous agency. The integrated analysis of these elements reveals distinct maritime patterns considered indicative of the broader economic, political and social concerns occurring on this frontier on the peripheries of the Western European World System.

Keywords Maritime cultural landscape · Frontier · Shipwrecks · Solomon Islands

Introduction

The concept of the "frontier" has a long heritage in historical archaeological studies, providing a useful theoretical approach for the exploration of the social and cultural processes taking place at the boundaries between different cultural groups (e.g., Lightfoot and Martinez 1995; Naum 2010; Rice and Cusick 1998). A common theme within these studies has been the characterisation of particular types of frontiers based in part on the circumstances and processes of territorial expansion and resulting cross-cultural interactions (e.g., Green and Perlman 1985; Hardesty 1985). One such type is the maritime industrial frontier, where outsiders occupied coastal margins on a

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relatively impermanent basis (McNiven 2001, p. 178; Gibbs 2010, p. 4). However, further definition of this frontier type and exploration of the potential archaeological signatures is required. This paper examines how analysis of non-indigenous shipwrecks might provide insights into the nature of these sorts of activities, using as a case study European activities in the Solomon Island, situated in the S.W. Pacific.

The Solomon Islands offer an excellent opportunity to examine a maritime frontier environment owing to its role from the nineteenth century onwards as a entrepôt for non-indigenous (primarily culturally Western European) whalers, traders, recruiters, missionaries and copra planters in the nineteenth century, with subsequent limited development as a British colonial protectorate in the early twentieth century. Movement of peoples and goods engaged in these non-indigenous activities, both in and out of the area and between islands, was almost exclusively by water, with shipwreck an inevitable consequence. In this paper we focus on the period from the first confirmed non-indigenous shipwrecks in the region in 1788 through to the commencement of World War II in the Solomon Islands in 1942. The indigenous Melanesian and Polynesian peoples of the region certainly had diverse and vibrant maritime cultures and inter-island exchange systems, with indigenous interaction and agency playing a significant part in the creation and operation of the maritime frontier (Bennett 1987). It is very likely that in many circumstances the non-indigenous visitors were unwittingly and often unknowingly drawn into these existing indigenous trade networks and social relationships and subject to the agency of their islander hosts. However, it is not possible to cover in this paper the nature of the traditional indigenous maritime cultural landscapes or the detail of these cross-cultural exchanges, although some of the consequences of those interactions are also captured in the nature and distribution of the shipwreck resource.

Maritime Industrial Frontiers and the Maritime Cultural Landscape

This investigation draws on two key concepts; that of the frontier (and specifically the notion of a maritime industrial frontier), and the maritime cultural landscape. Frontier theory attempts to explain patterns and processes that occur on the geographic peripheries of activity for a particular cultural group (Green and Perlman 1985, p. 4). Frontiers mark territorial edges (McCarthy 2008, p. 203) and signify the social, economic and political influences that motivate people to venture beyond their cultural boundaries and influence the processes of adaptation they undergo once they are there. Elton defined a frontier as "a zone of variously overlapping (but not congruent) political, economic and cultural boundaries" (Elton, in Rodseth and Parker 2005, p. 11). In addition, frontier theory encompasses the relationship between the outward bound frontiersmen and the indigenous people of the land. As Paynter (1985, p. 164) neatly summarised:

> Frontiers obviously involve large-scale spatial relations…A frontier implies at least three cultural forms: the frontier, the homeland, and the aboriginal culture impacted by the expanding homeland culture.

Extraction of raw materials or access to land for primary production is a common motivation for territorial expansion, with industrial activity within peripheries being inextricably linked to the economics of the core state (Rodseth and Parker 2005: 15).

There are two primary frontier types: *insular*, which were isolated, economically self-sufficient and diverse (agrarian, pastoral), and *cosmopolitan*, which were short term and economically specialised (industrial, camp, fur trading, ranching) (Steffen 1980, p. xiii; Hardesty 1985, p. 213–214). The identification of frontier types contains the expectation that each will reveal commonalities in their intention and function, resulting in 'similarities in process (activity) and pattern (observable outcomes)' (Gibbs 2010, p. 3). Steffen (1980, pp. xiii-xiv) originally characterised cosmopolitan frontiers as lacking fundamental economic, political and social change, whereby the socio-economic groups underwent little or no internal change as the result of their frontier experiences. This should, however, be seen in light of the subsequent works on "The Middle Ground," which shows these zones as places of significant cross-cultural interaction, negotiation and innovation which generated new cultural forms (e.g., Edmunds 1995; Gosden 2004; White 1991).

Within the category of cosmopolitan frontier the geographical context could also have a bearing on the nature of how the incoming group(s) operated and the forms of interactions that they and indigenous groups might experience. *Maritime industrial frontiers* generally saw visitors set up short–term camps on or near the shore, usually for the singular purpose of exploiting marine resources, although this category might also include explorers, shipwreck survivors and others. Maritime industrial sites of this sort may have been semi-permanent but were generally temporary and had a limited resident population, although occupation might be repeated on a seasonal basis over a period of years (Gibbs 2010, p. 3). In some instances all operations were ship-based with no terrestrial infrastructure at all. Various authors have discussed the significance of beaches as the initial place of contact and exchange between cultures (e.g., Dening 1980; McNiven 2001). While conflict was not infrequent in cross-cultural encounters for a range of reasons, the fact that many maritime industrial groups stayed close to the coast with little or no hinterland development potentially reduced the level of tension. Another feature of maritime industrial groups was that many of them, such as whalers, were themselves more racially and culturally diverse and often more accepting of cross-cultural encounters and accommodations than permanent colonist groups. The fact that the majority of industrial groups were male-only also shifted the nature of social and sexual relations with indigenous populations. In many situations these combined factors encouraged social and economic "interdependence, cooperation and intermarriage," as well as cultural hybridization (Smith 2008, p. 375).

The second conceptual aspect of this study was to see the maritime industrial frontier as the rationale in the creation and operation of a maritime cultural landscape. This notion of a maritime cultural landscape was first proposed by Christer Westerdahl in 1978 as part of his attempt to undertake a unified analysis and interpretation of underwater and terrestrial maritime archaeological remains along the Swedish coast. While he initially defined it as "the whole network of sailing routes, old as well as new, with ports and harbours along the coast, and its related construction and remains of human activity, underwater as well as terrestrial" (Westerdahl 1992, p. 6), he later went on to expand this concept to include both the material and cognitive aspects of human relationships with the shore and the sea. Arguing that immaterial, cognitive and indicatory elements were highly informative tools for understanding the transformations of maritime landscapes by human activity, he suggested that maritime culture can be defined by "…a recurrent set of significant maritime traits" (Westerdahl 1994, p. 265), and it is therefore these recurrent material and non-material elements that make up a larger cultural complex (Tuddenham 2010, p. 7).

Tuddenham (2010) argued that the growing popularity of the cultural landscapes approach in maritime archaeology has been a reaction to the traditional particularist (and largely technical nautical) concerns of the discipline and is indicative of a shift towards a more holistic approach (c.f. Duncan and Gibbs 2015; Ford 2011). Its adoption has altered the ways in which maritime archaeologists approach their investigations, seeing them incorporating terrestrial sites associated with maritime activities into their research designs, using datasets that had previously been ignored, and considering "the cognitive aspects of human attachment to the sea" (Jasinski 1999, p. 10). Rönnby (2007, p. 65) suggested that there are three commonalities in maritime landscapes - exploitation of marine resources, communications over water, and the mental presence of the sea.

Crumlin-Pedersen noted that maritime archaeologists need to "learn to perceive the landscape and the settlements as they were seen with the eyes of the sailor…approaching land from sea" (in Parker 2001, p. 23). Tuddenham (2010, p. 9) also drew attention to the recurrent problem of borders between land and sea, and questioned whether the discipline of archaeology had inadvertently maintained a polarity between the two spaces, perceiving them as separate entities. Pacific anthropologists and archaeologists including those working in the Solomon Islands have emphasised that indigenous land tenure did not stop at the shoreline, but rather extended to include the sea, reefs, lagoons and all of the marine resources that lay within (c.f. Aswani and Sheppard 2003, p. 61; Feinberg 2008; Hviding 1995, 1996). Differences between land and sea were not distinguished by their physical nature, but rather by who had ancestral rights to access and manage the environments, and exploit the resources within them (Hviding 1995, p. 97). The cognitive perception of the land and sea as co-contributors to a unified area of human activity is considered to be a significant aspect of maritime cultural landscape theory.

Despite the increasing interest in maritime cultural landscapes, there is no single or straight forward method for defining or investigating different types of maritime systems. Duncan (2000, 2006, 2011) has sought to further define maritime cultural landscapes and provide a methodological model for analysing and interpreting western maritime landscapes. Through the analysis of multiple archaeological and anthropological studies he found there were key recurring maritime features, influences and processes being described in a variety of contexts, yet which had not been ordered into any formalised framework (Duncan 2006, 2011). The underlying premise is that maritime sites and regions need to be viewed and interpreted in their entirety, and this involves the consideration of multiple material and non-material, and land and sea based elements. The investigation of all the elements present in a particular type of maritime landscape allows for a holistic interpretation of the activities, processes and behavioural patterns that occurred within a maritime system. Following Westerdahl (1992, 1994, 2011), Parker (1999, 2001), Duncan (2000, 2011; Duncan and Gibbs 2015), Rönnby (2007), Ford (2011) and others, maritime cultural landscapes have evolved to include (but are not limited to) the elements presented in Table 1.

Solomon Islands Geography and Climate

The Solomon Islands, located in the South Pacific (Fig. 1), consist of a scattered double chain of 922 islands which extend 1667 km in a north-west-south-east axis and cover

Table 1 Maritime cultural landscape elements

Material maritime cultural landscape elements	Non-material maritime cultural landscape elements
Unintentional shipwrecks and their associated artefacts (submerged and surface wrecks)	Wreck locations
Intentional wrecks: scuttled ships and ship graveyards	Navigation aids (documentary, non-physical)
Shipwrecks in secondary use as maritime facilities (e.g., breakwaters; navigation aids/ warnings)	Nodal points of activity/maritime enclaves
Wreck clusters	Transport zones
Ballast: result of wrecking or intentional discard	Shipping routes
Terrestrial sites: maritime infrastructure (e.g., wharves; associated port facilities- warehouses, transit sheds, cranes etc.)	Shipping hazards
Navigation aids / warning markers, both man-made and natural (e.g., lighthouses, beacons, buoys, cairns, church steeples, distinctive natural features such as large rocks)	Transit points
Survivor camps: terrestrial camp sites constructed by wreck survivors	Natural topography: ship traps and safe havens
Salvaged materials: reused in other contexts but originating from wrecks or strandings	Territoriality: land and sea tenure
	Toponymic site names
	Traditional practices
	Cosmology
	Oral tradition
	Spiritual and ancestral connections
	Local knowledge and folk lore
	Symbology
	The mariner's perspective
	Survival strategies (runaways, wreck survivors etc.)

28,369 km^2 of land over 1.34 million km^2 of sea. Some of the larger islands, such as Guadalcanal, Malaita, Santa Isabel, Choiseul and Makira, are rugged and mountainous, with a steep incline occurring within a few kilometers from the shore. Other islands are small, low-lying coral atolls. Dense rainforest covers much of the Solomons and mangrove swamps are common along parts of the coast. Most of the islands are surrounded by coral reefs and shoals.

The dry season is from April to September/October, during which the trade winds blow from the east-southeast and are strong and steady, creating constant choppy conditions on unprotected areas of sea. Although calmer than the wet season, sudden gales and storms are common. The wet season is from October/November to March, during which time the winds come from the northwest and are much more variable, resulting in sudden squalls and turbulent seas (Bennett 1987, p. 5). Cyclonic depressions usually occur between November and April which particularly affect the eastern Solomon Islands (Bennett 1987, p. 13). Rainfall is heavy all year round, in particular

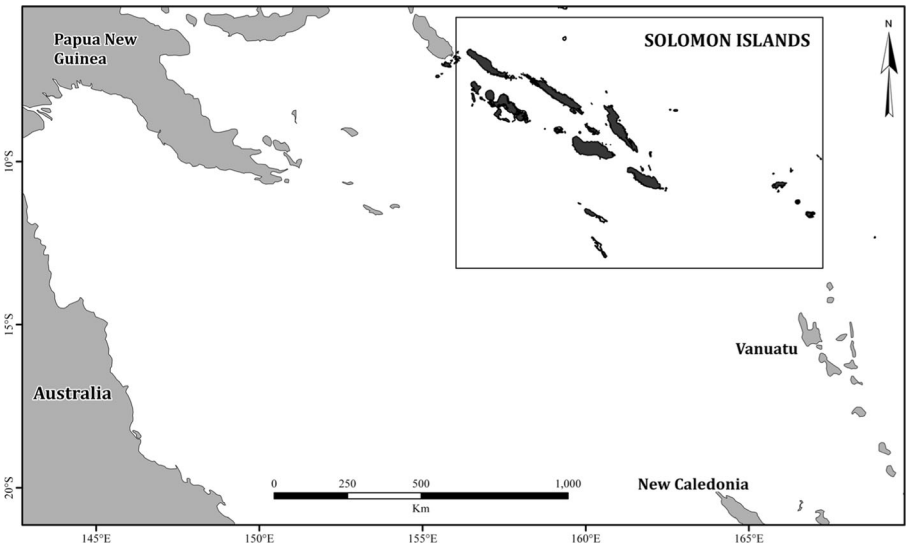

Fig. 1 Map of the South Pacific Ocean showing location of the Solomon Islands

between November and April. The current streams and tides are irregular and vary between the islands.

Summary of Non-indigenous Activity in the Solomon Islands

The appearance of non-indigenous mariners and then resource collectors and traders in the Solomon Islanders came as part of the late eighteenth-century expansion of the Western European World System towards Asia. Despite territorial competition across the region between several of these nations and their colonial offspring to claim rights to resources, labour and markets, the Solomon Islands was not formally under the administration of any nation until the declaration of the British Solomon Islands Protectorate (BSIP) in 1893. Even then it remained very much on the periphery of the British Empire. A broad chronology of the major non-indigenous activities in the Solomon follows, with detailed descriptions of these activities provided elsewhere (Bennett 1987; Korsgaard 2010, pp. 35–48).

- European exploration, 1567–1790s: Predominantly Spanish, French and English maritime explorers.
- Whaling industry, 1790s–1880s: American, British, French, New Zealand and Australian whalers. Seasonal visits to the region. Sailors lived and worked aboard their ships with no evidence of shore bases.
- Castaways, deserters and beachcombers, 1820s–70s: During this period approximately 50 non-indigenous persons (men) lived in local indigenous communities, often acting as interpreters or mediators.
- Trade industry, ca. 1850–1910: Individual traders bartered for pearl shell, tortoiseshell, bêche de mer, ivory nut and coconut oil with indigenous coastal people. They

often lived aboard their ships. In the 1870s a small number of permanent trade stations were established on land.

- Missions, 1840s–1942: Until ca. 1886 Anglican missionaries visited the islands sporadically throughout the year to take young men to Norfolk Island for religious training. The Catholic Church established short-lived missions in the 1840s but after these failed did not re-establish a permanent presence until 1898. By the early 1900s permanent mission stations of various denominations were established on coastal sites throughout the islands.
- Labour recruiting industry, ca. 1870–1911: Predominantly Australian and French recruiters obtained men from the Solomon Islands for labour on Queensland and Fijian sugar plantations for contracted terms of three years. Recruiters lived aboard their ships and only spent a number of weeks in the islands at any given time.
- Establishment of the British Solomon Islands Protectorate (BSIP), 1893–1976: The Solomon Islands became a British protectorate in order to prevent France or Germany laying claim to it. It also safe-guarded labour sources for the British colonies. A permanent British capital was established on the island of Tulagi with a Resident Commissioner.
- Plantation industry, ca. 1900–42: Copra planters, predominantly from Australia, established permanent coastal plantations and employed Solomon Islanders as labourers on two year indentured contracts.

It is important to note that these non-indigenous activities were not always in accord. For instance, the missionaries were active in the publishing vitriolic newspaper articles and pamphlets, as well as exerting political pressure, to denounce, regulate or eliminate the activities of other groups (especially the labour recruiters). In this respect, although the activities of missionaries were not industrial in nature, their presence and influence acted to alter the nature of the maritime frontier and the cultural landscape.

Methodology

Historic and modern primary and secondary documentary sources were analysed to identify, map and create a typology of the places (referred to here as "nodes" or "nodal points") where non-indigenous activities on land and sea occurred in the Solomon Islands (see Fig. 2). This included anchorages, watering places, and marine and terrestrial sites of trade, production, exchange and culture contact. Navigation aids refer to artificial structures including buoys, beacons, lights and markers, as well as natural aids such as large rocks, clusters of prominent trees, or other natural features that were used to assist in the identification of particular anchorages or sites. Formal documentary aids included British Admiralty maps and charts, government pilot books, and handbooks. This is in contrast to informal documentary aids such as newspaper articles, ship logs and travel journals that provided mariners with reef locations, wood and watering sites, and other useful information. Maritime infrastructure denotes all the sea and shore facilities made available to mariners, including ports, wharves, slipways, shipbuilders/repairers, storage and associated equipment.

Shipwreck data collected was used to create the Solomon Islands Historic Shipwrecks Database (SIHSD) consisting of 120 pre-WWII shipwrecks (Korsgaard

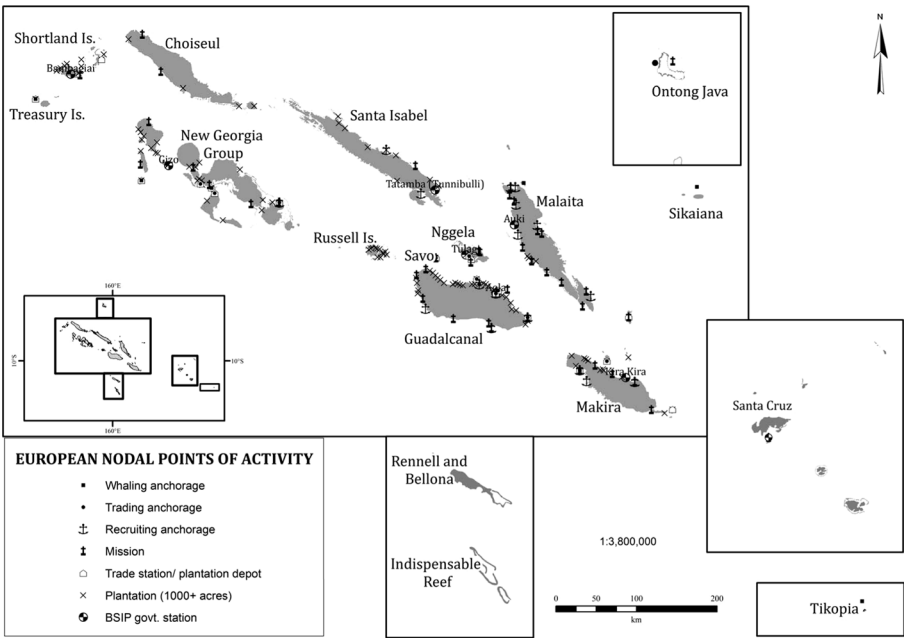

Fig. 2 Non-Indigenous nodal points of activity 1788-1942

2010: Appendix 3; Key criteria for the SIHSD were chosen based on previous regional wreck databases and analyses (Duncan 2000; Gibbs and McPhee 2004; Kenderdine 1995), as well as data fields used in the Australian National Shipwreck Database (Green and Vosmer N.D.) (Table 2). These fields enabled a series of questions to be asked with the aim of discerning patterns within the wreck occurrences. While not complete, the SIHSD is considered to represent a large number of the wrecks that occurred in the Solomon Islands during the 1788–1942 study period, although further work is needed to expand it. The shipwreck data was mapped into ArcGIS 9.3 and analysed to examine vessel technology and function, the causes of shipping mishap, and spatial and temporal distribution relative to other nodes of industrial or other non-indigenous activity.

Non-shipwreck Maritime Cultural Landscape Elements

Formal British government maps and charts for the Solomon Islands were in circulation from the 1830s, although until the 1960s many of these were highly inaccurate. Prior to the 1910s some charts had large tracts of coastline that had not been surveyed, and coordinates and soundings were regularly criticised in newspaper notices for being incorrect (e.g., *Sydney Morning Herald* October 26, 1855, p. 4, October 18, 1879, p. 3; *Maitland Mercury* November 24, 1896, p. 2). Some improvements were made to existing charts in the 1870s due to the increased number of British ships of war in the area which conducted surveys (*Maitland Mercury* August 5, 1876, p. 4). After the establishment of the BSIP further efforts

Table 2 Data fields for the Solomon Islands Historic Shipwrecks Database

Field name	Field description
I.D.	Unique database number
Vessel	Name of vessel
Type	Sailing rig, hull type, propulsion method
Tons	Vessel tonnage
Year built	Year of vessel construction
Country built	Country where vessel constructed
Registration/ Origin	Country where vessel registered or where vessel originated from
Function	Vessel industry/ function e.g., whaling, trading, labour recruiting
Owner/ Co.	Individual or company who owned the vessel at time of wrecking
Wrecked	Year of wrecking
Age	Age of vessel at time of wrecking
Cause	Cause of wrecking
Location	Location where the vessel was wrecked
Route	Origin and destination of the vessel, and the sea route
Cargo	Goods on board at time of wrecking
Event detail	Details of the wreck event, including number of people killed
Source	Bibliographic references

were made to improve the British Admiralty charts for the region, such as the surveying of Santa Isabel 1902, for which earlier charts had been deemed "unreliable to the point of being practically valueless" (*Sidney Morning Herald* December 11, 1902, p. 10).

Prior to the 1860s there were no known artificial navigation aids in the Solomon Islands. With the increase in maritime traffic in the region in the late 1860s and 1870s the occasional safety marker was erected, although these buoys and beacons were installed primarily by traders rather than being a government initiative. The development of the plantation industry in the 1900s resulted in the installation of aids at major plantation depots such as Ghavutu and Makambo, as well as at the BSIP capital on Tulagi Island. By the 1920s there were several lights, buoys and beacons scattered throughout the island group but they were limited considering the amount of maritime activity in region. There were also were very few maritime infrastructure facilities in the Solomon Islands. None were noted in the Hydrographic Department pilot books or historic newspaper articles prior to 1890, except for the coal station on Ugi (Makira Group) (*Brisbane Courier* August 29, 1887, p. 7). Even then the coal "station" was no more than a coal pile dumped on the sand (*Sidney Morning Herald* December 4, 1893, p. 5). Although many planters, traders and missionaries constructed their own wharves or landing jetties the BSIP only built one government wharf, at Tulagi, and possibly landing jetties at the district headquarters. This demonstrates that they did not seek to control either the industries operating in the region, or the ways in which the sea and land were used by the industries.

The lack of maritime infrastructure in the region contributed to how the sea and land were used. Refits were carried out in situ and natural features served as substitute facilities, such as reefs being used as slipways, whereby vessels were purposely put on them to carry out repairs (*Sydney Morning Herald* June 7, 1904, p. 4). The development of copra plantations resulted in the installation of some maritime infrastructure to support the industry, although until World War II (and in many places even now) much of the loading and offloading of cargo was conducted on the beach, whereby ships' boats were used to transfer goods between ships and the shore and vice versa (Struben 1961). The two major shipping and plantation companies, Burns Philp and Levers, had their headquarters and main depots situated on the islands of Makambo and Ghavutu, adjacent to the BSIP capital of Tulagi. This resulted in higher shipping activity in the area and the need for some maritime infrastructure and navigation aids. The presence of Chinese shipyards on Tulagi, and slipways on Tulagi and Makambo, would have resulted in damaged vessels being taken to the area specifically for the repair facilities.

The lack of maritime infrastructure and navigation aids in the Solomon Islands is indicative of broader socioeconomic and political concerns. Despite the revenue from duties and taxes levied on the various maritime industries, the dearth of these facilities suggests the British government was not prepared to invest in support systems for small, short-term enterprises operating on the frontier of the empire. This is reinforced by the failure to respond to shipping accidents in the region. Unlike core and less peripheral colonies examples where navigation aids such as lighthouses and beacons were installed in response to shipwreck occurrences (e.g., Duncan 2000, pp. 114–120; Duncan and Gibbs 2015) very few measures were taken to reduce risk in the Solomon Islands.

The underdevelopment of the Solomon Islands is also evident in the failure of industries to expand inland. Once the region had been "pacified" under the BSIP and the threat of indigenous attack was no longer a major deterrent for industries to expand their economic interests beyond the coast, they still chose not to do so. The absence of terrestrial infrastructure in the form of managed water sources (such as piped water or dams), roads (and vehicles), and railways meant that all non-indigenous activities needed to remain coastally-based, as there was no way to easily access or utilise the hinterland. This contrasts to landscapes in Europe, America and Australia that underwent significant transformations through the construction of railways that altered the ways in which people used the sea (e.g., Duncan 2000, p. 80; Hulse 1981, pp. 32–33). Duncan noted that in the Gippsland region in Victoria, Australia, shipwrecks decreased with the shift from shipping to railway transport. The eventual decline in wrecks over time in the Solomon Islands did not occur due to terrestrial transport, but rather because of the demise of the plantation industry and quite probably with the advent of marine engines enabling better navigation through reefs. The failure of the BSIP or large independent plantation companies such as Burns Philp to develop terrestrial infrastructure supports Steffen's notion of the area remaining focused on particular industries and not resulting in wider development (Gibbs 2010: 3; Hardesty 1985, pp. 213–214; Steffen 1980, p. xiii).

The inaccuracy of documentary navigation aids and the total absence of navigation markers and maritime infrastructure during the whaling period resulted in only a few

regularly utilised nodal points (see Fig. 2). Although they had access to the other published maps and materials, whalers also relied on their own past experiences and intelligence garnered within the whaling fraternity to inform them about where the best anchorages were that offered both safety and resources. However, their activities remained ship-based with no evidence that shore whaling stations were established, although elsewhere it was not unknown for whalers to plant gardens on offshore islands as a means of supply. The training of Solomon Islanders at these nodes as pilots, crew and translators for the whalers further reinforced the desirability of these locations for later industries and contributed to them being visited repeatedly as nodal points of non-indigenous activity. The traders in particular seem to have initially operated in those places where relations with indigenous groups had already been established, in particular Makira Harbour, Ontong Java, Sikaiana, Simbo and Rendova (New Georgia Group) (Cheyne 1852; Bennett 1987). However as they developed their own networks and established protective relationships with local chiefs or 'big men', the traders expanded their areas of activity into the central islands chain and to islands not previously frequented by the whalers.

Until the 1870s all non-indigenous activities, including whaling, itinerant trading, and labour and mission recruiting, had been sea-based and involved very little contact on land. After that time a number of terrestrial trade stations were established, marking the extension of European activity from sea to shore, and they signified a degree of non-indigenous permanency not exhibited before and resulting in noticeable changes to the maritime cultural landscape. This shift from maritime to terrestrial nodal points indicates a shift in the non-indigenous groups' perceptions of land and sea tenure, whereby the land was no longer considered to only be indigenous territory. Non-indigenous (and primarily European) land ownership was a visible display of permanency, power and control. The earliest trade stations were predominantly built on small islands that were easily defensible (or easy to escape from), and that were uninhabited or had only a small indigenous population (Bennett 1981, p. 172). Traders seemingly sought to manage their land and associated sea environments by controlling the amount of access indigenous groups had to the area, and therefore risk mitigation was a decisive factor when choosing a station location. Traders were still reliant on protection from local big men, but through the establishment of land bases they had more control over the flow of people and goods. Trade stations also altered the ways in which the seas were utilised. Itinerant traders could sell their goods at these stations and continue operating in the region without needing to return to Australia as frequently to sell their cargo, while the sale of non-indigenous goods attracted other non-indigenous parties, regardless of their industry or purpose in the islands.

The cultural landscape concept of land being an extension of the sea is apparent in the connection between sea-based activities and associated terrestrial sites. Trade stations and subsequent plantation depots, the settlement of Tulagi, missions, and the BSIP stations were all established as a direct result of, and response to, maritime industrial activities in the region. These terrestrial sites were dependent on maritime use to operate as they were all reliant on the sea for transport (of goods and people), communication, and economic survival. The two spaces cannot be viewed as separate operating systems as they were co-dependent and functioned as unified areas of activity.

Indigenous Agency

Solomon Islanders had a highly complex understanding of land and sea tenure prior to the arrival of the various non-indigenous groups. The land and sea were inextricably linked together and were bound within traditional political and social customs. Indigenous groups throughout the islands shared a common perception of division between salt water people and bush people (Roe 2000). The salt water people had rights over coastal tracts of land, the sea, reefs and lagoons, and the marine life within those spaces (Hviding 1996, pp. 99–100). The bush people had tenure over the inland areas where they cultivated taro and other crops (Hviding 1996, p. 97). This indigenous customary land and sea tenure impacted on the relationship between the Solomon Islanders and the non-indigenous visitors. Outsiders needed to seek permission to access both marine and terrestrial resources, and they were expected to respect sacred areas that were taboo and not to be entered. Ignorance of, or disregard for, local customs often resulted in conflict, such as when some traders collected bêche de mer from a reef in Mboli Harbour, Nggela, and failed to appropriately compensate the reef's traditional owners. The misunderstanding or intentional neglect resulted in the traders being murdered (*Maitland Mercury* August 5, 1876, p. 4).

The Solomon Islanders largely determined where the whaling, trade and recruiting industries conducted their businesses. The whalers were dependent on local groups to provide them with essentials such as water and wood, and this required a relationship of fairly equitable compromise between the two cultures. The Solomon Islanders benefited from the trade with the whalers but were not dependent on the non-indigenous goods and could easily refuse to trade with them if they chose (Bennett 1987, p. 33). Likewise, itinerant traders depended on the Islanders for wood and water, as well as their desired trade items. Indigenous groups hunted tortoises, collected pearl shell, processed bêche de mer, and produced copra and curios for the traders. Like the whalers, traders had to offer items of exchange that were of value to the internal Solomon Islands trade and gift exchange networks (Dureau 2001, p. 140). The traders' use of the sea was therefore determined by the availability of the local trade items and the willingness of local groups to trade with them.

A good example of the power that the Solomon Islanders had over their interactions with non-indigenous groups is evident from the following event. From 1870 to 1884 the labour traders successfully recruited large numbers of salt water people from Malaita and Guadalcanal in exchange for firearms (Moore 2007, p. 216). The salt water people had refused to trade firearms to the bush people in order to retain a military advantage over them (Bennett 1987, p. 43). In 1884 the Queensland and Fiji governments prohibited the giving of firearms to labour recruits as payment. This resulted in salt water people refusing to sign on as recruits as there was no longer a strong incentive to do so. The recruiters were forced to seek out bush people, who the salt water people now permitted to be used since the bush people would not acquire arms (Corris 1973, pp. 37–38). Recruiting statistics show that there was a dramatic drop in vessel occupancy rates from 78 % in 1883 to 51 % in 1884 (Shlomowitz 1981, p. 204, Table 1). In addition the average number of days spent recruiting per person increased from 1.25 days in 1883 to 2.05 days in 1884 (Shlomowitz 1981, p. 204, Table 1). This suggests that the firearms prohibition directly impacted on the recruiting industry and changed the way in which recruiting vessels used the sea. Recruiters were forced to change their recruiting locations and travel more widely, anchor

more frequently and for longer periods (while waiting for bush people to come from the interior to the coast), and spend more time in the region.

Shipwreck Patterns

Over half the shipwrecks (52.5 %) known for the study period occurred around the islands of Guadalcanal, Makira, Malaita and the New Georgia Group which were most heavily utilised by the whaling, trade, recruiting and plantation industries (Table 3). The place of trade stations as major nodes of activity is apparent in the clusters of wrecks of various vessel functions around them (Fig. 3). The wrecks are also clustered around locations that possessed fresh water, wood, fresh produce, anchorages, and later plantation depots. The vessel functions of the wrecks vary, indicating that these nodal points were utilised by both industry and non-industry (mission and BSIP) vessels. They remained nodal points over time owing to the resources they had to offer, as well as the established networks with local indigenous groups.

The spatial distribution of the industry vessels shows that each industry suffered higher losses at the island/island group in which they were most active. The whaling industry had the highest losses at Ontong Java, trading and plantation in the New Georgia Group, and recruiting at Malaita. This is representative of the industries utilising preferred locations which best served their economic interests in the region. There are also areas and islands with a noticeable absence of wrecks, such as the south coast of Guadalcanal, Rennell, Bellona, and Sikaiana. This corroborates documentary

Table 3 Spatial distribution of wrecks and vessel industries

Location	Whaling	Trade	Recruiting	Plantation	Non-industry or Unknown	Total (n=120)
Choiseul		1	1			2
Guadalcanal	1	4	3	3	5	16
Indispensable Reef	1	1	4		4	10
Makira	1	4	4	2	5	16
Malaita	1		6	3	3	13
New Georgia Group	1	8	1	5	2	17
Nggela Is.		1		3		4
Ontong Java	3	2				5
Russell Is.				1		1
Santa Cruz		2		2	5	9
Savo		2				2
Santa Isabel		2		1	2	5
Shortland Is.			1	1	1	3
Tikopia					1	1
Treasury Is.	1				1	2
Unknown		2	3	4	5	14
Total	9	29	23	25	34	120

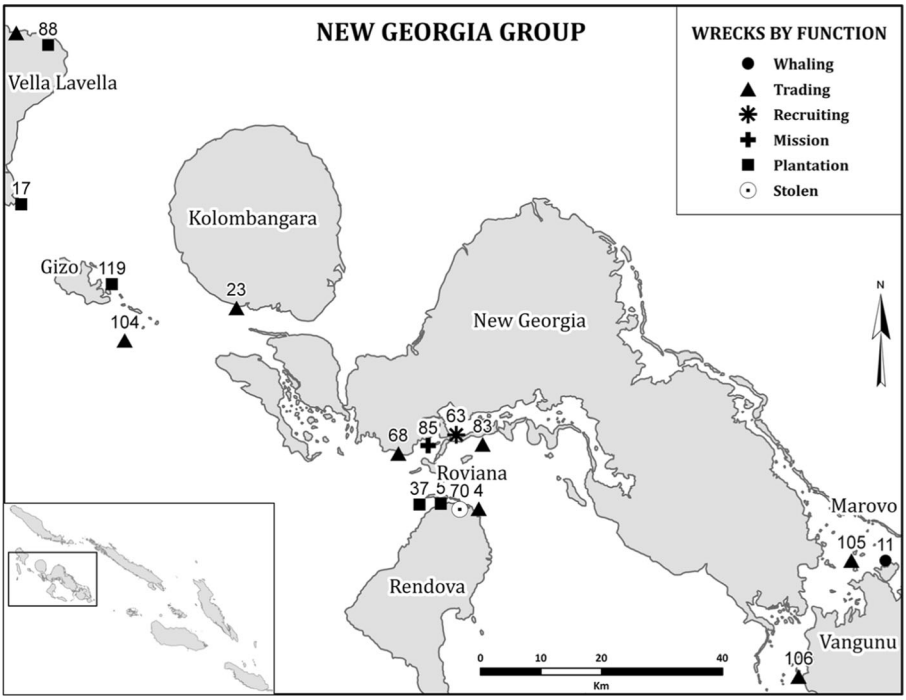

Fig. 3 Wreck clusters located around trade stations in the New Georgia Group

sources which note these areas as unprofitable for the non-indigenous industries owing to lack of resources or labour recruits (e.g., Bennett 1987, p. 43, 82).

60.7 % of wrecks occurred between 1870 and 1910. The low occurrence of wrecks up until the 1870s is representative of there being very few non-indigenous ships operating in the Solomon Islands, whereby only one or two whaling and trade vessels passed through the area per year (SMH November 22, 1872, p. 6; Langdon 1984, pp. 229–232). The increase in wrecks after 1870 can be attributed to the growing non-indigenous trade and labour recruiting in the region, and therefore increased vessel activity (trade and recruiting from the 1870s onwards, and plantations from the 1900s onwards). There were no noticeable spikes in wrecks in any given year, with wreck numbers ranging between one and four per year (Korsgaard 2010, Appendix 5).

82.7 % of the vessels wrecked were involved in maritime industries (see Table 3). There are far fewer wrecks of vessels not engaged in specific industries. The highest incidence of shipwreck for each industry occurred when the industry was at its peak (Table 4). There were two peak periods of wrecking for the trade industry; the 1870s and 1900s. The tortoiseshell, pearl shell and ivory nut trade peaked in the 1870s and gradually declined thereafter. Indigenous-produced copra took over as the main export in the 1890s and peaked in the 1900s. The two wrecking peaks may be considered indicative of this economic shift.

The low representation of mission vessel wrecks (4.2 %) is to be expected. Although the different denominations might have a schooner which made seasonal circuits of the islands and then returned to their bases in Australia or New Zealand, mostly they relied canoes or small whale boats to island hop, and on traders to transport them further

Table 4 Temporal distribution of wrecks and vessel industries

Period	Whaling	Trade	Recruiting	Plantation	Non-industry or Unknown	Total (n=120)
1780–1820					2	2
1820s	1					1
1830s	1					1
1840s	2	1			1	4
1850s		1			3	4
1860s	4		1		3	8
1870s		7	4		5	16
1880s	1	5	10		6	22
1890s		6	4		2	12
1900s		9	4	6	5	24
1910s				8	3	11
1920s				7	1	8
1930s				4	3	7
Total	9	29	23	25	34	120

afield (Hilliard 1978). Likewise, BSIP wrecks were infrequent (3.3 %) as very few vessels belonged to the BSIP. Until 1899 the Resident Commissioner was reliant on trade and plantation vessels for inter-island transport (Woodford 1899). The low number of mission and BSIP wrecks suggests that neither the church nor the British government were willing to invest money into this isolated on the frontier of the British Empire.

The decline in wrecks in the 1890s can largely be attributed to the gradual demise of the recruiting industry, with only 149 recruiting voyages to Melanesia for Queensland plantations conducted in the 1890s compared to 320 in the 1880s (Shlomowitz 1981, Table 1). The decline in wrecks in the 1910s is, however, not immediately obvious as there was increased vessel activity in the region due to the plantation industry. The reduction in wrecks may also be attributed to the increased use of powered vessels. The continued decrease in wreck numbers in the 1920s and 1930s is considered indicative of the global economic crisis, whereby fewer vessels were engaged in the plantation industry and fewer cargo loads of copra were being exported by ship.

The short-term nature of the maritime industries is represented in the shipwrecks, whereby the sharp rise and fall of wreck incidents for each industry is indicative of its limited life spans, reinforcing the temporary nature of the maritime industrial frontier landscape.

The thousands of reefs and shoals throughout the region and the unpredictable weather and currents were major hazards for mariners and this is also represented in the pattern of shipwrecks, with 63.9 % of wrecks resulting from environmental factors, in particular reef wrecks and storms (Table 5). The trade and recruiting industries suffered the highest losses of vessels due to environmental causes. The poor/non-existent navigation charts prior to 1900 contributed to these losses, as uncharted or incorrectly charted reefs were a danger for mariners, particularly in storms when they were not visible or were difficult to

Table 5 Wrecking causes and vessel industry

Wreck cause	Whaling	Trade	Recruiting	Plantation	Non-industry or Unknown	Total (n=97)
Environmental	3	18	13	9	19	62
Indigenous attack/ destruction	5	8	6		4	23
Technical		1		7	2	10
Unknown					2	2
Total	8	27	19	16	27	97

manoeuvre a vessel away from in strong winds and currents. Non-environmental reasons are harder to detect, such as poor navigation skills, inadequate navigation equipment, and technical problems (such as leaking or rotting hulls), since without investigation of relevant government authorities owners were unlikely to report human error or causes that might put insurance payouts in jeopardy. It is possible that these factors also contributed to some of the reef and storm wrecks, whereby the vessels may not have sank if it were not for these issues, although there is no known documentary evidence to support this for any of the wrecks in the SIHSD.

The second highest cause of wrecking was due to indigenous attacks on ships, making up 25.8 % of the 97 wrecks with known causes (see Table 5). In addition to the attacks resulting in wrecking there were another 37 recorded incidents of ships being attacked but escaping destruction (Korsgaard 2010, pp. 75–77, Appendix 4). The trade and recruiting industries were the target of most attacks and they took the greatest risks by repeatedly returning to locations of previous hostilities. The emergence of major nodal points of activity at locations that had the highest probability of attack indicates that although the industries took some precautions against attack (armed crew and lookouts) they seemingly put profit ahead of risk when deciding where to conduct their business. The sea afforded some sense of security as it offered an escape route in the event of cross-cultural conflict, as attested to by the 37 vessels which were attacked but escaped. Mariners were aware of the dangers involved in conducting business in the Solomon Islands and therefore their dealings were a combination of profit seeking and risk mitigation.

The relationship between the Solomon Islanders and the non-indigenous industrial groups was both mutually beneficial but also very precarious and dangerous. Cross-cultural conflict inevitably occurred and various groups were responsible for instigating acts of hostility for a range of reasons. Three main motives for the attacks were identified and they are indicative of the degree of misunderstanding and mistrust upon which these relationships were sometimes built (Table 6).

Vessel Technology

The vessel types and tonnages of the wrecked vessels are indicative of the changes in economic interests from ca. 1850 onwards, when there was a shift from large whaling barques and brigs to smaller trade schooners and ketches (Table 7). It is doubtful that

Table 6 Key causes for indigenous attacks on European ships

Cause of indigenous attack on ship	Details
Opportunistic raids to acquire European trade goods	These attacks occurred usually when a ship was not well armed or guarded. They were not just a display of 'naïve native greed'. The desire for goods was tied into larger cosmological understandings of material wealth and power (c.f. Gosden 2004, pp. 95–96).
Opportunistic or premeditated retaliation attacks for a grievance against a European	All white people were perceived to be from the same kin group and therefore if a ship's crew had committed an unacceptable act under indigenous law and custom then the kin of the hurt/ killed party would retaliate by attacking the next European ship that came to their area. There were a variety of reasons that instigated this response (see Korsgaard 2010, pp. 64–65, Appendix 2).
Opportunistic or premeditated attacks motivated by internal island politics and social customs	Conducted to acquire skulls as a material display of power and prestige within local traditions. Also for the ceremonial launch of a war canoe, or for the death of a chief or one of his relatives (SMH December 24, 1896, p. 3). European skulls were considered a great prize and harder to acquire than an indigenous one, so they were more highly prized in certain regions, particularly in the early years of contact. Ships were also attacked not necessarily to acquire skulls but to prove one's power and dominance to his people. Known to have occurred in Ontong Java when there was a dispute over who was to become the chief (Keopo, pers.com.; see Korsgaard 2010, Appendix 2 for details).

this shift was due to mariners seeking to reduce the risk of losing all their profit in a wreck by carrying out several voyages containing smaller quantities of cargo, as occurred in western environments (Coroneos, pers. com.). Rather, whaling vessels were large owing to the sizeable crew of 25–30 men (Bennett 1987, p. 29) required to hunt whales and to process and store the whale oil on board. In contrast, traders did not need large vessels to carry out their small, independent trade operations. This trend contrasts to that witnessed in the Western Australian shipwrecks investigated by Kenderdine, whereby the vessel size increased over time, with barques being dominant in the 1890s as they increased profits by being able to ship large quantities of cargo (Kenderdine 1995, p. 201).

Vessel technology is also a useful indicator of risk management practices and decision making processes. The popularity of fore and aft schooners over square rigged vessels was due to their ability to operate with reasonable speed regardless of wind direction and their adeptness at manoeuvring through reefed passages (Beck 2009, p. 67). Schooners had the windward ability to keep off a lee shore or to tack out of an exposed anchorage (Young 1993, p. 36). They also required fewer crew to operate which made them more cost efficient than larger vessels (Beck 2009, p. 67). Ketches and cutters became popular vessels for inter-island transport as they were small and easy to handle for a lone trader or small crew. These vessel types were suited to the natural environment and the small-scale nature of the industries.

Table 7 Sailing rig and tonnage

Rig type	No. vessels (n=62)	Total tonnage	Mean tonnage	Period/s in use
Barge	1	248	248	1920s
Barque	6	1567	261	1840s–1880s
Barquentine	1	223	223	1880s
Brigantine	6	887	148	1820s–1890s
Cutter	3	73	24	1870s–1900s
Frigate	0	0	0	1780s
Ketch	15	476	32	1880s–1930s
Lugger	1	10	10	1900s
Schooner	27	1912	71	1850s–1930s
Skiff	0	0	0	1900s
Sloop	0	0	0	1900s
Yawl	2	37	18	1900s–1920s

The lack of maritime infrastructure also impacted on the vessel types used by the non-indigenous groups operating in the region (Table 8). Although newer technologies such as composite and iron vessels (1850s on) and steam (1870s on) were being used in Australia (Kenderdine 1995, pp. 202, 206), the industries operating in the Solomon Islands continued to use wooden sailing vessels up until (and beyond) World War II. This preference for wooden vessels was due to the absence of port facilities, shipyards, vessel materials, and specialised tools and skills in the Solomon Islands, which meant that ship repairs had to be expediently carried out using local materials, and without repair facilities. In addition, the expense of importing spare parts or taking a vessel back to Australia for minor repairs would have been too prohibitive for many individuals.

The vessel age at time of wrecking may determine whether the virtual absence of iron hulled vessels or of the use of steam and engine powered propulsion is indicative of old or redundant vessels being used in the maritime frontier environment. Of the 55 vessels whose age is known the majority of wrecks occurred between 11 and 20 years, which is well within the expected lifespan of a vessel (Gibbs and McPhee 2004, p. 38). There were a high percentage of wrecks that occurred under ten years, and only two vessels are known to have exceeded 30 years (Table 9).

Recruiting vessels had the highest mean age of 18.4 years (see Table 9). They were notorious for being ill-equipped and unseaworthy (Saunders 1979, p. 39), and Beck (2009, p. 65) suggests that "many recruiting vessels were already old before they

Table 8 Propulsion and hull types

Propulsion	No. wrecks (n=97)	Period/s wrecked	Hull type	No. wrecks (n=96)	Period/s wrecked
Sail	84	1780s–1930s	Wood	92	All periods
Steam	4	1880s–1920s	Composite	1	1890s
Auxiliary	9	1900s–1930s	Iron	3	1870s on

Table 9 Vessel age at time of wrecking and mean age for vessel functions

Age	No. Wrecks (n=55)	Vessel function	Mean age (years)
0–5	9	Whaling	–
6–10	9	Trade	14.8
11–15	13	Recruiting	18.4
16–20	8	Mission	16.5
21–25	9	Plantation	11.1
26–30	5	BSIP	14
31–35	0		
36–40	2		

entered the trade and… were being used to make a profit before their demise." This "one more voyage" theory (Murphy 1983, p. 75) whereby no capital was invested in the maintenance of a vessel, and it was worked until it sank, cannot be disputed in the case of many recruiting vessels engaged in the South Pacific labour trade in the late nineteenth century (see Saunders 1979). However, while the wrecks in the Solomon Islands were not excessively aged their seaworthiness when were purchased may have been substandard making them a cheap investment for recruiters.

Conclusion

The analysis of historical sources within the context of maritime cultural landscape theory and frontier theory enabled the identification of key characteristics that shaped the cultural environment of the Solomon Islands maritime industrial frontier. The results show that the main contributing elements that influenced the character of the landscape were nodal points of activity, navigation aids, maritime infrastructure, non-indigenous and indigenous concepts of land and sea tenure, indigenous agency, and shipping patterns.

Shipwrecks are material evidence of events and processes that both shaped and occurred within the cultural and natural environments. The investigation of shipwrecks through quantitative analyses enabled the identification of multiple causal variables that contributed to the wrecking patterns at a regional level. The results show that the wrecks are sensitive indicators of spatial, temporal and industry-based trends and they are representative of wider historic global economic and political concerns.

This analysis of the Solomon Islands has produced the first archaeological characterisation of a maritime industrial frontier. The analysis revealed that the maritime cultural environment did not evolve over time into a managed maritime system with infrastructure and associated support or terrestrial development. Instead, non-indigenous activities remained coastally based and the non-indigenous industries were short-term ventures that did not expand or diversify. Unlike western maritime landscapes the maritime industrial frontier of the Solomon Islands was the product of both non-indigenous and indigenous agency, making it a culturally complex operating system. No one element was single-handedly responsible for shaping the maritime

industrial frontier landscape of the Solomon Islands. Rather, the contribution of various physical, behavioural and cognitive elements determined the ways in which the sea and associated land were used, and each of these elements was the result of broader economic, political, social, and cultural factors.

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