CHAPTER FOUR

CATALYSTS FOR DEFENCE AND DISCARD: EUROPEAN NAVAL EXPANSION IN THE PACIFIC, THE INDUSTRIAL-ERA ARMS RACE, AND AUSTRALASIA'S 'RUSSIAN SCARE'

Introduction

In the previous chapters, the theoretical and methodological approaches that form the basis of this research were outlined. This chapter will explore long- and medium-term historical processes that influenced the creation of colonial naval forces in Australia and New Zealand. By extension, these same processes were instrumental in the development of each colony's torpedo boat defences, as well as their eventual discard and abandonment. The chapter begins by addressing the *longue durée* theme of Western trade in the Asia-Pacific and Indo-Pacific regions and its centuries-long influence on the emergence and expansion of European navies into the Pacific region. Particular emphasis is placed on the British Royal Navy's rise to international prominence during the eighteenth and nineteenth centuries, and its critical role in the establishment of colonies in Australia and New Zealand, as well as their subsequent naval defences.

A series of *conjonctures* that markedly influenced creation of torpedo boat defensive networks within Australia and New Zealand during the last decades of the nineteenth century are then examined. These include the Royal Navy's inability to effectively patrol and protect Great Britain's far-flung colonial possessions; warfare within Australasia and abroad, and the new naval technologies these conflicts spawned; and a race among Europe's most powerful nations for imperial supremacy in the Pacific. Additionally, this chapter highlights the development of the torpedo and torpedo boat and their brief but influential heyday as innovative, yet relatively inexpensive modes of warfare. It concludes by exploring the fear of

Russian seaborne invasion that served as the catalyst for the procurement and integration of torpedo vessels within Australasia's colonial naval defences. Taken together, these long- and medium-term processes were also influential in the disposal of Australasia's torpedo boat assets, and set the stage for a discussion of these abandonment *événements* in the following two chapters.

Vanguard of Empire: The British Royal Navy's Entry Into the Pacific Realm

The presence of European naval forces in Australasia, and the Indian and Pacific Oceans generally, originated with the arrival of Spanish and Portuguese explorers in Chinese and Southeast Asian waters during the late-fifteenth and early-sixteenth centuries. These early voyages of exploration and discovery were largely the result of commercial interests in Europe that strived to acquire easier access to Asian commodities by establishing direct oceanic trade routes between the ports of the Asia-Pacific region and their European counterparts (Delgado 2006: 47). The Portuguese were at the vanguard of this mercantilist-driven initiative, entering the Pacific by way of a series of voyages during the late 1490s that incrementally brought their ships around the Cape of Good Hope and on to India, Indonesia, the islands of the South China Sea, and the Asian mainland (Boxer 1969). Following initial voyages of exploration and discovery in the Caribbean and Americas, the Spanish Crown financed Ferdinand Magellan's successful attempt to discover a westward sailing route to Asia and its lucrative markets. Magellan's discovery of the strait that bears his name did not go unnoticed by other European nations, and it was not long before competing merchant ships—predominantly flying the flag of either Great Britain or the Netherlands—began entering the Pacific by the same route, or an alternate around Cape

Horn pioneered by Dutch navigators in the early seventeenth century (Boxer 1965; Joyner 1994).

Although the British actively engaged in legitimate trade in Asia and the Pacific, some members of its maritime community also recognised early on that vast wealth could be acquired relatively quickly through seizure of goods carried aboard Spanish vessels transiting between colonial outposts such as Manila and Acapulco, and points beyond. Beginning with the 1577 voyage of Francis Drake, British sea captains conducted numerous privateering expeditions—as well as outright piracy—against Spain's Pacific-based shipping and coastal ports, often with the tacit support of the government in London (Bawlf 2003; Lavery 2009: 18). The rationale behind these raids was as inspired by geopolitics as it was the potential for economic gain: the British Crown wished to break Spain's hegemony over Pacific trade networks by refuting its proclamation that the Pacific Ocean was a 'Spanish Lake' (Nowell 1945: 1-18; Andrews 1967: 40-57; Spate 1988: 11; Cutter 1998: 73; Spate 2004: 27-29).

British vessels also came into progressively more frequent contact with Dutch ships as a consequence of the latter's increased presence in the Asia-Pacific region. By the beginning of the seventeenth century, the two nations were directly competing with one another for 'East Indies' trade, and in some cases tensions escalated into outright conflict. Although the Dutch proclaimed a 'free trade' policy that recognized the world's oceans as belonging to the whole of humanity, their actions frequently contradicted their high-minded ideals. As Arthur Herman (2004: 149) notes, Dutch merchants 'routinely excluded competitors from their markets in Indonesia and Japan and did not hesitate to shoot their way into markets that tried to exclude them'. These aggressive policies are perhaps best illustrated by an incident in 1623 in which the Dutch VOC (*Verenigde Oostindshe Compagnie*, or United Dutch East India Company) captured, tortured, and executed several English

merchants in the Moluccas, effectively curtailing Great Britain's attempt at trade in the Spice Islands (Herman 2004: 150). Existing hostilities were further exacerbated by a series of wars between Great Britain and the Netherlands during much of the latter half of the seventeenth century (Boxer 1965; Cook 1973; Frost 1988; Scammel 1989; Fisher and Johnston 1993). As a consequence of these Anglo-Dutch conflicts, as well as the ongoing potential threat of piracy and privateering attacks from Dutch and other foreign vessels, the Royal Navy began supplying the occasional warship as convoy escort for the merchant fleets of the British East India Company.

While the British made commercial inroads into the central and western Pacific, the Dutch discovered—via both intentional and accidental circumstances—the previously unknown landmasses of Australia and New Zealand. A series of shipwrecks on the western Australian coastline—including the Dutch VOC ships *Batavia* (1629) and *Vergulde Draeck* (1656)—confirmed the presence of a potentially fatal shore for vessels participating in the East Indies trade (see Ingelman-Sundberg 1975; Henderson 1982; Green 1973, 1977a, 1983, 1989, 2007; Dash 2002; Drake-Brockman 2006; Souter 2007; van Duivenvoorde 2008, 2009; FitzSimons 2011). Voyages by the Dutch explorer Abel Tasman, who mapped most of Australia's northern, western and southwestern coastlines between 1642 and 1644 and established that it was geographically separate from New Zealand and Antarctica, vastly improved Europe's limited knowledge of Australasia (Sharp 1968; Tiley 2002: 2, 8).

Tasman's expeditions were conducted at the behest of the VOC, who hoped to discover previously untapped commercial markets and a new southerly shipping route for merchantmen engaged in the East Indies trade. Australia fell far short of the VOC's expectations, as it appeared 'barren, devoid of any commercial value, and peopled by an extremely hostile race' (Tiley 2002: 2). New Zealand fared little better. While Tasman noted

it to be 'a very fine land' with an abundance of suitable timber for shipbuilding, he expressed concerns about the Indigenous Maori, labeling them 'hostile' and a potential danger to visiting mariners (Sharp 1968; 124). Ultimately, both landmasses would lose the immediate interest of Europe and remain unvisited for over a century.

Changes in the fortunes of Europe's most powerful nations during the eighteenth century led to a renewal of interest in Australasia, and a subsequent rise in Great Britain's Asian- and Pacific-based naval presence. The Spanish Empire, once the dominant European power in the Pacific, was weakened militarily during the seventeenth century and by 1750 lost control of the trade monopoly it once held over its colonial possessions (Herman 2004: 160, 274). The Dutch gradually sacrificed their military prowess and colonial interests for commerce, and were ultimately content to assume a neutral posture and focus attention on their merchant fleets and lucrative trading centres in the East Indies (Herman 2004: 264). Portugal lost most of its East Indies possessions to the Dutch during the seventeenth century and by 1750 its colonial influence was limited primarily to Brazil and a handful of other possessions in Latin America. France, which developed a powerful navy during the seventeenth century and subsequently started to make inroads into India, the East Indies, and the Pacific, was repeatedly thwarted in its attempts to dominate Europe (Jenkins 1973: 69-200; Sumida 1989: 4-6; Herman 2004: 274).

In stark contrast, Great Britain underwent a meteoric rise in global prominence, largely as a consequence of a major naval expansion that commenced at the turn of the eighteenth century. Jon Sumida (1989: 5) attributes the expansion to a 'financial revolution' that enabled the British Crown to engage, with Parliamentary approval, in long-term borrowing of large sums of money to finance its war efforts. This capacity to obtain near-continual loans for naval expenditure ultimately 'allowed Britain to maintain continuous

control of home waters and to defend her far-flung commercial and colonial interests' (Sumida 1989: 5; see also Dickson 1967; Kennedy 1976: 69-147).

Subsequent increases in the number of East Indiamen transiting between Britain and its ever-expanding trade empire in the Far East brought with it an increase in the Royal Navy's presence in the waters around India, Asia, the Spice Islands, and beyond (Herman 2004: 274, 282). While the appearance of Royal Navy flotillas and individual cruisers in the Indian and Pacific Oceans did not completely prevent the loss of merchant vessels to enemy warships and privateers, they were at least 'effective enough to keep trade routes open, with the result that British commerce continued to expand even in time[s] of war' (Sumida 1989: 6; Herman 2004: 283). In addition to escort duties, the Royal Navy also increasingly assumed responsibility for the interdiction of vessels engaged in illegal trafficking of goods throughout the British Empire. The problem of seaborne smuggling was particularly acute in Britain's North American colonies, and it was the Royal Navy's anti-contraband activities that, in part, led to heightened tensions between the British government and American colonists, and the subsequent outbreak of the American War for Independence in 1775 (Herman 2004: 306-310).

Although its role in the Pacific was restricted primarily to matters of defence, the Royal Navy also had a significant hand in exploring and documenting its vast expanse, much of which was still largely unknown to Europeans in the mid-eighteenth century (Herman 2004: 298-299). Of particular interest to the British was the potential for new trade routes to the East Indies and China that bypassed the Americas by a northern passage, or strategic control of those that already existed (such as the southerly route that passed through the Strait of Magellan). Between 1764 and 1769, Royal Navy expeditions under the command of Commodore John Byron and Captain Samuel Wallis entered the Pacific by way of the Strait

of Magellan. Among their orders was a directive to investigate the hypothesized whereabouts of a vast, populated landmass called *Terra Australis Incognita* thought to exist in the far southern latitudes, and lay claim to it before Britain's European rivals did (Tiley 2002: 10).

By the time the last of Byron and Wallis' vessels returned to Great Britain in March 1769, another expedition utilising a Royal Navy ship and crew had been at sea for eight months and was on its way to conducting the most comprehensive survey of the Pacific Ocean to date. The first voyage of Captain James Cook, as well as two others conducted between 1772 and 1780, markedly increased Europe's knowledge of the Pacific, its environs, and inhabitants. Cook circumnavigated Antarctica, put Hawaii on the world map, conclusively refuted the existence of *Terra Australis Incognita*, and demonstrated the lucrative potential of North American sea otter pelts in Asian markets (Beaglehole 1968; Gibson 1992; Gibson and Whitehead 1993: 103-130; Parkin 1997; Tiley 2002: 15-20, 26-28; Herman 2004: 301-305; Delgado 2006: 51). Further, publication of his charts and narratives by the British Admiralty publicly proclaimed these discoveries to the rest of the world, and provided a means by which other nations could for the first time safely and accurately navigate what was once an unknown and forbidding ocean. Consequently, new players, including Russia and the soon-to-be independent United States of America, would emerge as competitors in Pacific-based maritime commerce and trade (Evans 1986: 5-6; Carlson 2002; Igler 2004; Delgado 2006: 51-53). Not surprisingly, the majority of these mercantile enterprises were soon complemented by naval escorts and patrols tasked with defending their respective nations' shipping and trading entrepôts.

Of all Cook's contributions, it was his reconnaissance of New Zealand in 1769, and discovery and subsequent survey of Australia's east coast in 1770 that would have the most significant and lasting ramifications for Great Britain's presence in the Pacific. In stark

contrast to the relatively rugged and barren landscape that greeted Europeans who touched upon the Australian mainland in previous centuries, the coasts of what would become New South Wales and Queensland offered the appearance of lush vegetation and an abundance of water and food resources. The Indigenous populations in these areas also appeared relatively benign, but such a distinction mattered little to the British government, unwilling as it was to give consideration to peoples who 'did not appear to live up to the intellectual ideal of the 'noble savage'' (Hughes 1986: 54-55; Lavery 2009: 149).

By the beginning of the 1780s, British colonisation of Australia appeared inevitable; among other things, proponents of such a scheme rationalised that one or more settlements on the continent could serve:

> a very commanding influence in the policy of Europe. If a Colony from Britain was established in the large Tract of Country, & if [Great Britain] were at war with Holland or Spain, [it] might very powerfully annoy either State from [its] new Settlement. [Great Britain] might with a safe, & expeditious voyage, make Naval incursions on Java, & the other Dutch Settlements, & [it] might with equal facility, invade the Coasts of Spanish America…This check which New South Wales would be in time of War on both those Powers, makes it a very important Object (James Mario Matra, quoted in Hughes 1986: 62).

Ultimately, however, it was Great Britain's burgeoning population of convicted criminals that motivated the government to establish the first Australian colony at Port Jackson (present-day Sydney). By the late 1780s, the nation was plagued by a growing 'class' of indigent poor, the majority of whom were reduced to petty thievery in order to survive (Hughes 1986: 72). Added to this was a steady influx of prisoners from Britain's ongoing conflict with France and Spain, and demobilised (i.e., unemployed) soldiers returning home from the American war (Tiley 2002: 34-35; Delgado 2006: 62). With the loss of its North American colonies in 1781, the British government was no longer able to export its convict 'problem' overseas, and its domestic alternatives (land-based gaols or prison hulks moored at

Portsmouth or in the River Thames near the Royal Dockyards) were horribly overcrowded and unfit for human habitation, even by eighteenth century standards (Hughes 1986: 62-66; Tiley 2002: 34-36; Lavery 2009: 147). The solution for the foreseeable future was to establish a new receptacle for Britain's undesirables, and in May 1787 a fleet of 11 Royal Navy vessels departed the Solent carrying the first group of transported convicts bound for Australia.

Intermittent Flotillas and Worn Out Ships: The Early Naval Defence of Australia and New Zealand

In line with prior British colonisation elsewhere, the initial settlement of Australia was ostensibly a Royal Navy affair. As David Stevens (2001: 6) observes:

> The first four governors of New South Wales were naval officers, and strong leavenings of seamen were among the first settlers. Indeed, the navy's influence on Australia's early political, economic, and social life was immeasurable, but has often been seldom appreciated or understood. Although British naval activity was often portrayed as the quest for national prestige or, less charitably, as the search for a dumping-ground for convicts, it was actually directed with strategic intent to forestall France, and to a lesser extent Spain, through the expansion and diversification of trade and shipping.

For much of the last decade of the eighteenth century and first half of the nineteenth century British naval vessels would be a common, if infrequent, sight in Australian waters, particularly in and around Port Jackson and its environs. In fact, the Royal Navy was critical to the survival of the fledgling colony, as its ships initially provided the only link between New South Wales and the outside world. However, it was the navy's symbolic 'connection with the great and powerful mother country' that was most important to the colonists (Bach 1986: 12). In addition to serving as the conduit through which they were able to acquire all of the items they needed for their day-to-day existence, naval ships also acted as their first and only line of defence against foreign aggression and occupation (Shaw 1977: 58-78; Bach 1986: 12; Staniforth 2003: 66).

Although the presence of the Royal Navy was essential to Australia's defence—as well as its very existence as an outpost of the British Empire—it quickly became apparent to the colony's early administrators that there was little enthusiasm on the part of the Admiralty to provide the ships, manpower, and infrastructure necessary to establish a legitimate naval base at Port Jackson. John Bach (1986: 12) has described the early naval presence in Sydney as a 'tale…of worn out and crazy ships, inadequate stores and indifferent authorities'. Following the loss of the First Fleet's flagship HMS *Sirius* at Norfolk Island in 1790, the governor of New South Wales, Arthur Phillip (who coincidentally also served as a Captain in the Royal Navy), requested a warship of similar size and armament as a replacement, but was effectively ignored by the government in London (for a discussion of the loss of *Sirius* and archaeological investigation of its wreck site, see Stanbury 1998, 2007). A second petition, made in the wake of the discovery that the colony's only supply ship had deteriorated to the point that it was unfit for service, was also overlooked. Amazingly, this level of neglect persisted for the remainder of the eighteenth century. In instances where urgent and/or repeated requests were made to the Admiralty for better naval assets, the occasional vessel was deployed from England, but more often than not proved 'unsuitable in design or…[too] unserviceable…to perform the necessary duties' (Bach 1986: 12).

The turn of the new century saw little immediate change in Australia's naval status. Two successive governors, Captain Phillip Gidley King and Commodore William Bligh, made repeated requests to the Admiralty for at least two Royal Navy ships to be stationed at Port Jackson, with an addendum that these vessels be relieved by two new warships every three years. King in particular warned of the threat that 'too great a number of bad characters' (i.e., the French navy and American whalers) presented to Sydney if they were to establish a foothold in the Society Islands (Tahiti) and other nearby Pacific archipelagos

(Phillip Gidley King, quoted in Bach 1986: 12). The British government, as it had since Sydney's establishment, ignored these petitions as well, and continued to be largely disconnected from the military affairs of its Australian colonies. Indeed, some scholars have identified the Admiralty's indifference as a significant factor in Bligh's loss of authority during the Rum Rebellion of 1808 (see Evatt 1971; Bach 1986: 13; Fitzgerald and Hearn 1988). In the wake of the mutiny and Bligh's subsequent replacement by British Army officer Major-General Lachlan Macquarie, the Royal Navy's presence in Australian waters was intermittent at best, and its ships would not resume regular visits to Port Jackson until after the end of Macquarie's governorship in 1821 (Bach 1986: 13; Frame 2004: 35).

Around the time Macquarie was stepping down from his administrative duties, representatives of the Admiralty and British Colonial Office reached an agreement that, for better or worse, reestablished naval patrols in Australian waters. From 1821 onwards, a single warship from the Royal Navy's East India Squadron was to be detached for exclusive service in New South Wales (Bach 1986: 13; Frame 2004: 35-36). In addition, the squadron was expected to deploy other vessels for occasional visits to new colonial settlements in Queensland, as well as assist in the establishment of the Swan River colony in Western Australia. Because these patrols utilised approximately half of the seven warships that comprised the East India Squadron's fleet at any given time, they were not especially popular with its commanders, and frequently cited for disrupting the station's 'normal' duties (Bach 1986: 16).

Concerns for the well-being of British subjects operating in the waters around New Zealand, coupled with the growing problem of unregulated settlement on both the North and South Islands by foreign (primarily American) shore-based whalers and sealers, created yet another 'disruption' for the East India Squadron during the latter half of the 1820s

(Grady 1978; Morton 1982; Busch 1985: 29; Bach 1986: 16; Day 1986; Campbell 1992, 1993; Ell 1995; Richards 1996; Prickett 2002: 5; Smith 2002: 4). The Colonial Office was particularly concerned about increased Maori attacks against British whalers, sealing gangs, and merchants, and petitioned the Admiralty to provide the latter with some form of naval protection (Harker 2001: 6). In response, the East India Squadron was ordered to include 'an occasional visit' to New Zealand as part of the itinerary of the warship deployed to Port Jackson (Bach 1986: 16, 70; Jones 1986: 11; Harker 2001: 6). Unsatisfied with this concession, the colonial government in New South Wales—in an attempt to garner protection for the colony's citizens then operating in New Zealand waters—pressed the matter even further, and demanded that a small Royal Navy vessel be permanently detached across the Tasman. The Admiralty's reaction was to remind the Colonial Office that it was 'neither expedient nor safe' for the navy to 'interfere in a territory not belonging to His Majesty', although it provisionally offered to protect British subjects in New Zealand by taking them aboard available naval vessels in times of crisis (Bach 1986: 16).

By the mid-1830s, relations between European settlers and Maori had deteriorated to such an extent that the commander of the East Indies Station, Rear-Admiral Sir Thomas Capel, ordered the captains of two Royal Navy vessels, *Rattlesnake* and *Zebra*, to stay abreast of affairs in New Zealand during their visit to New South Wales, and ready their crews to sail across the Tasman on short notice (Bach 1986: 17). Capel also petitioned the Admiralty for two ships to permanently operate on the Australia station, but his request was denied; consequently, he was forced to resume the existing policy of deploying one ship to Australia (and by extension New Zealand) annually. Even after New Zealand was appointed a British consul in 1839, and officially annexed as a British colony the following year, the Colonial

Office and Admiralty continued to bicker over the issue of assigning it naval protection (Bach 1986: 16, 70).

Ironically, land-based events that transpired in New Zealand in the 1840s finally motivated the Admiralty to establish a separate Royal Navy station for the Australasian region. The first was the arrival of a small contingent of French settlers on the Banks Peninsula (South Island) in August 1840. Two years earlier, a French mariner, Jean François L'Anglois, had purportedly purchased a parcel of land near present-day Akaroa from local Maori, and upon his return to France advertised his intent to establish a colony and whaling port on Akaroa Harbour (Andersen 1920: 79-80; Tremewan 1990). In response, the British government dispatched the vessel HMB *Britomart* to Akaroa to claim sovereignty over the Banks Peninsula (Andersen 1920: 80, 85). By the time the French arrived, the British had already laid claim to the area; nonetheless, they were permitted to found their settlement, and even periodically based two small warships—*L'Aube*, and *Allier*—in Akaroa Harbour until 1849 (Cooke 2000: 9).

The other, more significant occurrence involved New Zealand's Indigenous population. The Treaty of Waitangi that established British sovereignty over New Zealand also granted Maori *iwi* (tribes) the privileges of British subjects, including guarantees that they would retain possession of their lands, forests, fisheries, and other *taonga* (treasures). However, the Maori did not universally accept the treaty, nor were its provisions outlining land sale, use, and ownership always closely adhered to by some *iwi* chiefs and representatives of the British government (Orange 1987: 100-115; Hobbins 2008: 3-4). Large-scale sale of land to *pakeha* (colonial settlers) disquieted some Maori groups, and subsequent tensions between these *iwi* and the colonial government and its Maori loyalist

allies escalated into multiple armed insurrections known as the New Zealand Wars of 1845-1848 (Belich 1998; Hobbins 2008: 4-5).

The Royal Navy played a critical role in the conflict, providing not only seaborne artillery support for land forces, but also an 'amphibious' naval brigade that fought ashore alongside elements of the British Army (Bach 1986: 71; Harker 2001: 6; Frame 2004: 51-52). Although British forces ultimately prevailed in the initial round of New Zealand Wars, the prospect that disaffected Maori groups could again rise in revolt at some point in the not-too-distant future persuaded the Admiralty to establish a permanent Australian-based division within the East Indies Station (Jones 1986: 12). Among other things, military planners hoped that the new flotilla could operate much more effectively with its own command structure, as well as 'theoretically [be] in a much better position to give effective assistance to [New Zealand's] colonists' in the event additional trouble developed (Bach 1986: 71).

While immediate concern for colonial security in New Zealand may have been the catalyst for establishing an Australasian-based naval flotilla, it was a conflict nearly a decade later on another continent that would finally result in the actual creation of the Australia Station. The outbreak of the Crimean War in 1853 pitted Imperial Russia against the combined militaries of Great Britain, France, the Ottoman Empire, and the Kingdom of Sardinia. As a consequence of their vastly superior naval power, the British and French assumed the brunt of Allied seaborne operations, and adopted a two-pronged strategy that attempted capture of the Russian fleet at the Baltic port of Revel, as well as the Russian naval base at Sevastopol on the Black Sea (Preston and Major 1967: 9; Warner 1975: 126-127; Herman 2004: 451-452; Lavery 2009: 211).

The Russian government feared the Royal Navy to such an extent that it withdrew its naval forces and surrendered both the Baltic and Black Sea to Allied control 'without firing a shot' (Herman 2004: 451). The conflict, however, was far from over, and Great Britain's subsequent three-year military campaign on the Crimean Peninsula would be regarded as one of the most 'disastrous' and 'pointless' in its history (Herman 2004: 451; Lavery 2009: 212). It was also during this period that two Russian frigates, *Diana* and *Aurora*, entered the Pacific, sailed to Hawaii, and subsequently engaged in a months-long cat-and-mouse pursuit with a far superior Anglo-French naval squadron under the command of Rear-Admirals David Price and Auguste Febvrier-Despointes (Cooke 2000: 13). Both Russian vessels eventually returned safely to their homeport of Petropavlovsk, thereby demonstrating the relative impunity with which enemy warships could operate on the periphery of the British Empire and potentially harass Great Britain's Pacific-based merchant shipping (Barratt 1981).

The Crimean War ultimately ended in stalemate, but the animosity it generated between the British and Russian governments would persist for decades and have a significant and long-lasting effect on the naval defence of Australia and New Zealand. In the immediate wake of the conflict, the colonial ministers of Australia convened to discuss governmental matters, and the issue of defence was high on the agenda (Stevens 2001: 6; Frame 2004: 46). Representatives of Victoria and Tasmania, in particular, expressed concern for the welfare of their respective colonies, arguing that they were the most vulnerable to foreign naval assault and the least capable of responding to outside threats. Only New South Wales had made any provision for its maritime defence, constructing and arming a small wooden-hulled ketch named *Spitfire* in 1855 as a direct consequence of ongoing hostilities between Great Britain and Russia (Macandie 1949: 12; Gillett 1982: 14; Evans 1986: 25).

Spitfire served as a patrol vessel for Port Jackson, but its career would be short-lived; around the same time the colonial delegates were meeting to discuss the continent's defensive shortcomings, preparations were being made to transfer *Spitfire* from military service to piloting duties in Queensland (Gillett 1982: 14-15; Jones 1986: 14; Stevens 2001: 7; Frame 2004: 46, 51).

Much to the relief of the colonists of Australia and New Zealand, the lapse in defence created by *Spitfire*'s departure from Port Jackson would be brief. After years of pleading with the Admiralty for a permanent naval presence in their waters, Australasia's colonial governments were informed of the creation of a separate and independent Australia Station in March 1859 (Macandie 1949: 14-17; Jones 1986: 12, 14; Stevens 2001: 6; Frame 2004: 46-47). The inaugural station was placed under the command of Captain William Loring and comprised a small force of Royal Navy warships—including a frigate, corvette, and three sloops—that would be permanently detached to Port Jackson as the Australian Squadron (Feakes 1951: 27). Tom Frame (2004: 47) has described the creation of the Australia Station as 'an important advance' for the Australasian colonies because it represented implicit acknowledgement on the part of the Admiralty that it needed to actively assume responsibility for defending its Pacific possessions. Of course, one could easily argue that the level of security the Australian Squadron actually provided was largely symbolic, since its five relatively small warships were responsible for patrolling not just the immediate waters around Australia and New Zealand, but a combined area of sea and land that covered approximately one-sixth of the Earth's surface (Macandie 1949: 14-16; Frame 2004: 47-48).

Nineteenth-Century Imperial Expansion, Technological Innovation, and the Development of the Torpedo Boat

With Russian expansion into Europe and Asia temporarily checked in the wake of the Crimean War, Great Britain incorporated increasingly larger tracts of the world into its already sizeable imperial realm. As Arthur Herman (2004: 462) has observed, the British Empire 'grew on average more than 100,000 square miles a year' in the decade after 1865, and comprised 'more than 4.5 million square miles of territory, inhabited by more than 66 million people' between 1870 and 1900. As Britain's dominion grew, so too did the extensive trade networks and maritime commerce that supported its continued existence and expansion (Kennedy 1976: 181; Kubicek 1999). In addition, international—but predominantly European and American—demand for foreign commodities created a variety of new markets as well as subsequent increases in global trade and the amount of shipping necessary to transport it (Stevens 2001: 5-6; Herman 2004: 462-463).

As in previous centuries, the Royal Navy played a critical role in the British Empire's protection. By the latter half of the Victorian era it was also increasingly essential to the Empire's very existence. As possessor of the world's largest merchant fleet, and 23 percent of global trade by 1880, Great Britain relied heavily on its navy's ability to guarantee 'the safety of the global economic system, a new world order based on British values…[and] the gold standard' (Sumida 1989: 6; Stevens 2001: 6; Herman 2004: 463). In the 1870s, a handful of British military strategists recognised that the Royal Navy had a new mandate above and beyond its traditional offensive and defensive tasks; one that required it to actively defend British trade interests, suppress enemy commerce, and 'keep open the great sea-routes to and from the heart of the Empire—the islands of Great Britain' (Semmel 1986: 88, 91).

In the Pacific, British concern for protecting its seaborne trade routes and mercantile interests was exacerbated by burgeoning European imperialism and a race among the

continent's major powers to establish new colonies in the Indo-Pacific and Asia-Pacific regions (Nicholls 1995: 6; Stevens 2001: 5; Lavery 2009: 228-229). The French took possession of Indochina (Vietnam and Cambodia) during the 1880s, annexed Madagascar, and subsequently established naval bases at the port cities of Saigon (Ho Chi Minh City) and Diego-Suárez (Antsiranana). By the end of the following decade, Germany founded colonies in New Guinea, Samoa, and the Caroline and Marianas islands (Nicholls 1995: 6). Even Russia, largely dormant as a naval combatant in the decade following the end of the Crimean War (but possessing the third largest fleet in the world after Britain and France), reemerged as an imperial player in the 1870s. In addition to its acquisition of the ice-free port of Dalian from the Chinese, and subsequent establishment of a fortress and naval facility at nearby Port Arthur (Lüshun), the Russian government appeared intent to develop a naval capacity in Persia (Iran) and Japan (Stevens 2001: 5).

Europe's major powers were not the only nations engaged in empire building in the Pacific. The United States, long associated with Pacific-based pelagic whaling and other forms of maritime commerce, would declare war on Spain in 1898 and ultimately take possession of the Philippines, Guam, and those Samoan islands not already under German occupation (Stevens 2001: 5). From the early nineteenth century, the U.S. Navy played a vital role in American trade with Asia, and its ships visited Australia as early as 1839, when the United States Exploring Expedition under Commander Charles Wilkes sailed unannounced into Sydney Harbour (Evans 1986: 14-15; Frame 2004: 36-38). While Australasia's colonial governments did not accord the U.S. Navy the same threat level as that of Imperial Russia, they nonetheless were wary of American intentions. In particular, they shared a concern with the British government that the United States might form a strategic alliance with France,

and that the combined navies of both nations would, in the event of war, vastly outnumber that of Britain in terms of fleet strength and firepower (Bach 1986: 174; Frame 2004: 37-38).

One of the primary catalysts for European (and to a much lesser extent, American) imperial expansion during the latter half of the nineteenth century was a drastic change in military—but specifically naval—technology in the years prior to, during, and after the Crimean War. Great Britain, in particular, embraced advances spawned during the century's early decades to create formidable ships of war such as HMS *Devastation*, a literal 'floating castle' of 11,880 tonnes that featured massive internal engines as its sole means of propulsion, as well as enormous turreted guns, armour two feet (0.6 metres) thick in places, and even electric lights (Padfield 1981: 164; Brown 1995: 217). On the other end of the spectrum was the gunboat, a relatively small, lightly built vessel powered by sail as well as an auxiliary engine (Headrick 1981: 47-50). These craft famously served as the source of the term 'gunboat diplomacy' for their ability to 'chug upriver, past impenetrable jungle and villages of hostile natives to bring firepower to bear on anyone defying the Union Jack' (Herman 2004: 461). However, as the century progressed, other European powers followed Britain's lead and integrated new technologies into their own naval forces. Arthur Herman (2004: 460) notes that subsequent 'twists and turns in the race for the supreme battle fleet' threatened to usurp the Royal Navy's supremacy and 'leave the course open for other [navies]…to put the British Empire at risk'.

The first major technological innovation occurred during the 1820s, when French artillerist Henri-Joseph Paixhans developed a successful shell-firing gun (Warner 1975: 129; Gould 1990: 166). Faced with the prospect that their existing fleets of wooden warships could be significantly damaged or destroyed by the new French weapon, Great Britain, the United States, Belgium, and the Netherlands commenced a series of parallel experiments to

determine the effectiveness of armour plating against solid shot and, later, exploding projectiles. By the 1830s, both France and the United States had introduced large-caliber shell-firing guns aboard their naval vessels (Baxter 1933: 56). Other nations, unsurprisingly, followed close behind.

The second notable advance resulted as a direct consequence of the first, and was manifested in the world's inaugural oceangoing ironclad vessel of war, *La Gloire*. Designed by naval architect Dupuy de Lôme and launched in 1859, *La Gloire* was essentially a wooden hulled frigate sheathed in armour plating nearly five inches (12.7 centimetres) thick (Warner 1975: 129; Wells 1987; Gould 1990: 163, 166). The inclusion of such a revolutionary and novel form of warship in one of the world's preeminent naval fleets was, predictably, countered in overwhelming fashion by Great Britain (Gray 1975: 49). One year after *La Gloire*'s entry into French naval service, the British launched HMS *Warrior*, a new class of battleship built entirely of iron that was nearly twice the size of its Gallic contemporary and completely outclassed it in terms of protective armour and firepower. Significantly, *Warrior* also mounted steam engines capable of generating 5,200 horsepower and propelling its clipper hull at speeds of 14 ½ knots on the open ocean, making it the world's fastest warship afloat at the time (Warner 1975: 129; Ballard 1980: 53; Brownlee 1985; Lambert 1987; Wells 1987; Herman 2004: 452-453).

The introduction of steam propulsion to warships was one of the nineteenth century's most significant maritime developments; one that fundamentally altered naval technology and warfare on a global scale. No longer subject to the vagaries of the wind, vessels of war could get underway in any form of weather or sea state, manoeuvre much more effectively than their sail-driven contemporaries, and cover vast distances much more quickly than before. As with shell-firing artillery and protective armour cladding, the concept

of the steam-powered combat vessel can be attributed to the French. *Le Napoléon*, a 92-gun wooden hulled ship-of-the-line launched in 1850, was another of Dupuy de Lôme's warship designs, and utilised both sail power and a 960-horsepower steam engine fitted with a screw propeller (Lambert 1984: 37; Gardiner and Lambert 1992: 39). The speed generated from *Le Napoléon*'s combination of sail and steam propulsion was significant enough that it prompted the Royal Navy to adopt a similar arrangement for its own fleet assets. As a consequence, several British wooden line-of-battle ships were either constructed with, or converted to, steam propulsion during the 1850s (Gould 1990: 167). Other navies initially proved less willing to establish whole fleets of steam-powered wooden battleships, although those of Russia, Turkey, Sweden, Austria, Denmark, and Naples all featured at least one vessel of the type, either built or converted with British assistance (Gardiner and Lambert 1992: 41).

The combination of steam propulsion, large shell-firing guns, and heavy iron armour had all the appearances of a winning combination, and the British Admiralty embarked on a shipbuilding programme that resulted in the production of 30 iron-hulled vessels (based largely on HMS *Warrior*'s design) by 1865. Not surprisingly, other navies closely monitored Britain's progress and began developing similar vessels of their own. However, just as their popularity was starting to gain momentum, the efficacy of armoured warships was challenged by the ship-to-ship engagement between the USS *Monitor* and CSS *Virginia* (ex-*Merrimac*) during the American Civil War (see Davis 1975; Nelson 2004; Holzer and Mulligan 2006). This battle—the very first of its kind—was of considerable interest to naval designers and strategists, but because each vessel withdrew without significantly damaging or sinking the other, its results were ultimately deemed either inconclusive or a 'draw' (Warner 1975: 129; Simson 2001: 86; Davis 2006: 55; Tucker 2006: 175).

Another major—and largely unforeseen—issue facing the world's new generation of naval fleets was the potential for rapid obsolescence. The Royal Navy's *Warrior* and its sister-ships, to cite but one example, may have represented the pinnacle of contemporary warship design when built; however:

> Naval gunnery had already leapfrogged ahead. The *Warrior*'s armor plate had been tested against 200-pound shells. But a year after she went into service, guns were being tested that could fire 300-pound shells capable of punching through eight-inch-thick armor—nearly twice as thick as the *Warrior*. The British navy was facing a problem on a scale never confronted before. Industrial technology was introducing change faster than the admirals, policy makers, or even the engineers and designers could deal with. The modern age of the "arms race" had arrived, with each new innovation forcing everyone else to scramble to regain the lead with innovations of their own. New ships came down the slips every year, each equipped with a bewildering array of new features and changes, as technology more and more dictated the terms of naval strategy (Herman 2004: 457-458).

To add to the confusion, some naval strategists advocated the use of certain weapons systems and/or tactics based on the flimsiest of pretexts. One of the most notable and controversial examples involved the use of ramming, a method of sinking ships that had its origins in Classical antiquity and involved breaching an enemy vessel's hull below the waterline with a bow-mounted ram cast from metal such as bronze or iron (Casson 1971; Foley and Soedel 1981). As early as the Crimean War, a handful of French, British, and Russian naval commanders proposed that ramming might be an effective means by which the first generation of steam-powered, ironclad or iron-hulled warships could damage or destroy opposing vessels. By the beginning of the 1870s, the ram-shaped bow had become a common feature of naval craft design and construction (Baxter 1933: 341; Sandler 1979: 118-133; Lyon 1992: 135). Richard Gould (1989, 1990: 193-223, 1991, 2000: 281-289) has explored this technological phenomenon, most notably through archaeological examination of the design, construction, and performance attributes of the ironclad warship HMS *Vixen*. Launched in 1866, *Vixen* was intended for use as a seagoing gunboat-ram, but instead was

permanently assigned a role guarding the entrance to the Royal Navy Dockyard in Bermuda due to its poor performance and handling qualities in the open ocean.

Ramming gained even more traction in the wake of two naval battles during the latter half of the 1860s. The first occurred during the American Civil War and involved the destruction of the wooden-hulled sloop-of-war USS *Cumberland* at the hands of the ironclad ram CSS *Virginia* (see Davis 1975: 90-92, 109; Nelson 2004: 229-230; Quarstein 2006: 74). In the second engagement, the Austrian ram *Archduke Ferdinand Maximillian* attacked and sank the Italian ironclad *Re d'Italia* at the Battle of Lissa in 1866 (Lewis 1883; Clowes 1902; Gray 1975: 57-62). In each case, the attacking ship was able to vanquish its foe more as a result of favourable circumstances (i.e., confined waters that reduced the victim's chances for escape) than either its ramming apparatus or associated tactics (Clowes 1894; Sandler 1979: 150; Gould 2000: 274). Nonetheless, ramming and the technology it spawned were embraced by many of the world's navies until the beginning of the twentieth century.

Significant increases in the technological diversity and complexity of naval vessels, armament, and equipment during the latter half of the nineteenth century, and the decisions (military or otherwise) that gave rise to and resulted from these changes, characterise cultural processes that Gould (1990: 193, 2000: 268) has termed *trend innovation* and *tactical indecision*. Trend innovation refers to the tendency of military powers participating in an arms race to revive 'archaic technologies and their continued use in circumstances wherein their obsolescence is painfully obvious', as well as their need to copy one another in the 'acquisition and use of such technologies' (Gould 1990: 161). An excellent example would include the tactic of ramming described above. Tactical indecision, by contrast, has been described as the 'consistent misapplication of new technologies to naval tactics' (Gould 2000: 267). The Federal ironclad ships USS *Galena* and USS *New Ironsides* are two examples

of this phenomenon. *Galena* and *New Ironsides* were built during the American Civil War and designed for use in ship-to-ship combat in much the same manner as *La Gloire* and *Warrior*; however, the former proved vulnerable to shellfire, while the latter—although more than capable of fulfilling the function for which it was originally constructed—was utilised exclusively in blockade duties and bombardment of shore-based defensive installations for the duration of the conflict (Gould 1990: 173-174, 2000: 281).

By the mid-1870s, advances in ship design and weapons technology had spawned a vast array of new warship types, many of which were the result of, in whole or in part, trend innovation, tactical indecision, or both. As Brian Lavery (2009: 221) notes, the Royal Navy alone comprised 'broadside ironclads like the *Warrior*, central battery ironclads, armoured rams, coast defence ships, mastless turret ships such as the *Devastation*, and barbette ships'. The vast majority of these watercraft featured heavy armour and robust construction that was increasingly resistant to any and all forms of above-water shipboard ordnance. It is therefore not surprising that naval strategists looked increasingly to means for causing catastrophic damage to an enemy vessel's hull below the waterline. Ramming for a very brief period seemed to fulfill this role, and in the immediate wake of the Battle of Lissa was considered 'the *ultima ratio* of maritime war' (Rawson 1899: 565). However, it was yet another weapon that made its combat debut during the American Civil War that would finally provide the world's navies the capability for active subsurface attack. That weapon was the torpedo, and one of its initial delivery systems, the torpedo boat, would serve as the means by which small, relatively inexpensive craft could destroy appreciably larger adversaries—and get away with it—for the first time in naval history.

The Submarine Turtle *and the Roots of Torpedo Warfare*

The term 'torpedo' appears to have first been coined by American inventor Robert Fulton during the first decades of the nineteenth century, and was initially used to describe a variety of largely stationary underwater explosive weapons that today are known as mines (Fulton 1971; Lyon 1992: 134). However, the concept of utilising underwater explosives as a weapon of war was put into practice in the previous century, when another American inventor, David Bushnell, designed and built the first operational combat submarine, *Turtle*, during the American War for Independence (1775-1781). Bushnell's weapon was the first step in a mode of naval warfare—and accompanying series of technological innovations—that would reach its zenith nearly a century later with the development of specialised torpedo craft of the type delivered to the Australasian colonies (Figure 4).

Turtle was constructed at Saybrook, Connecticut, in 1775 under the direction of Bushnell and his brother Ezra, and was officially supported by General George Washington of the American Continental Army, among others. The vessel's hull was constructed of six-inch (15.24 centimetres) thick oak timbers that were caulked and tarred to prevent water entry, as well as a variety of metal fittings, including a heavy 'manhead' or entry hatch, ballast water pumps, valves and plumbing, and propulsive screws. The hull's overall appearance was described as 'like a round clam, but longer, and set up on its square side' (Wills, 2000: 4-6). Significantly, Wills (2000: 6) has noted that *Turtle* was likely the first vessel to 'employ screw propulsion as a means of motive power', an attribute which, among other things, would have tremendous impact on the development of torpedoes and torpedo boats during the following century.

Turtle's 'business end' comprised an external black powder charge with a clockwork fuse that could be set for a delayed detonation of up to 12 hours. This crude torpedo was

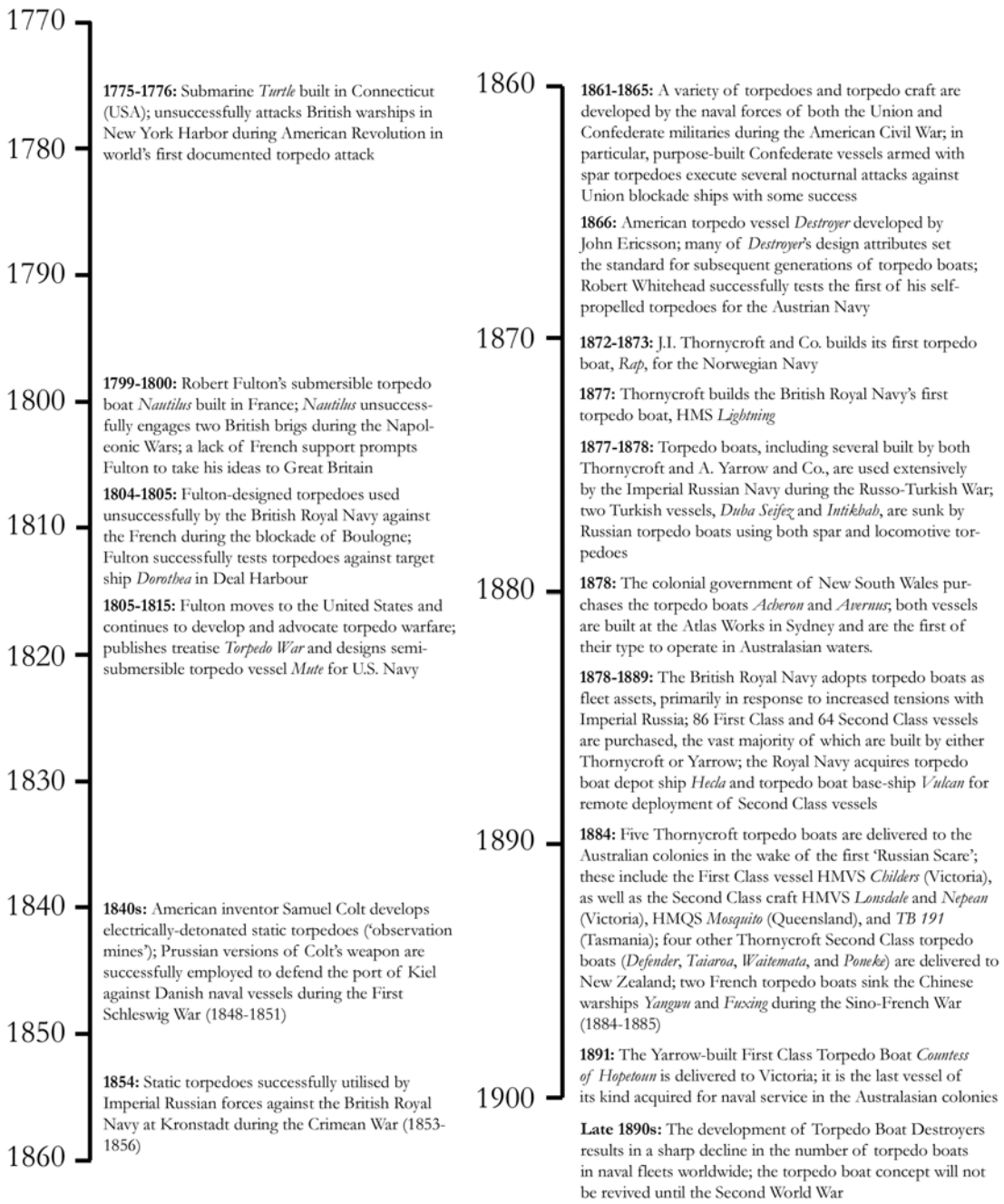


Figure 4. Timeline showing the development of torpedo warfare and technologies between 1770 and 1900, and the evolution and use of torpedo boats during the latter half of the nineteenth century.

attached to an enemy vessel's external hull via a large woodscrew. Once affixed, the woodscrew and torpedo assembly were detached from *Turtle*, which moved away from its victim submerged and—theoretically—undetected (Roland 1977: 171, 1978: 62-88; Lyon 1992: 134; Wills 2000: 6).

Ultimately, *Turtle* was used in two unsuccessful attacks against British warships moored in New York Harbor—the first targeted either HMS *Eagle* or HMS *Asia* on 6 September 1776, and the second was intended to sink HMS *Phoenix* almost exactly a month later on 5 October. In each instance, the explosive charge could not be attached to the hull of the intended victim; however, the submarine returned without damage or incident. *Turtle*'s failure to sink an enemy vessel led to a decline in support, and although Bushnell ultimately abandoned the enterprise, he didn't entirely give up his interest in underwater explosives. For the remainder of the War for Independence, he served as an officer in the newly created Army Engineer Corps, and continued to experiment with both rudimentary torpedoes and landmines (Johnston 1893; Wills 2000: 6).

Robert Fulton and the Origins of the Torpedo Boat

As the eighteenth century came to a close, *Turtle*'s exploits in the American War for Independence appear to have been largely forgotten—or were at the very least overlooked. However, there were those who embraced Bushnell's ideas and advocated the idea of submerged warfare to a new generation of scholars and inventors. One of these individuals was the American author and statesman Joel Barlow, who was a classmate of Bushnell's when both men attended Yale and the latter was conducting his earliest experiments with underwater explosives. Barlow would later serve as a mentor and patron to

the next significant pioneer in torpedo warfare—Robert Fulton (Hutcheon 1981: 31, 35; Wills 2000: 7).

On the face of it, Fulton's origins would have in no way implied a future career in the development of submersible watercraft and underwater weaponry. Born in 1765 in rural Pennsylvania, he developed a reputation as a painter of miniatures by the age of twenty, and moved to England in 1786 to apprentice under the famous American portraitist Benjamin West (Fulton 1971: ix). Once in England, however, Fulton's interests turned to engineering. His efforts to promote the design and construction of inland canals for trade and transportation in Great Britain met with little success, and in 1797 he travelled to Paris to sell his ideas to the French government. It was while in France that he became actively engaged in designing and promoting submarines and the underwater explosives to which he ascribed the name *Torpedo*, after the electric ray's scientific genus. The term is derived from the Latin *torpere*, which means to be stiffened or paralysed.

Fulton's first and most recognised torpedo vessel was *Nautilus*. It was constructed on contract to France's Ministry of Marine, and fabricated and assembled at Perier's workshops on the Seine River between 1799 and 1800. The vessel's hull was manufactured almost exclusively of copper, and measured 21 feet, 3 inches (6.48 metres) in overall length, with a maximum beam of 6 feet, 5 inches (1.94 metres). A wooden deck with a maximum length and width of 20 feet (6.10 metres) and 6 feet (1.83 metres), respectively, was mounted atop the hull. Iron fasteners were originally employed to hold the copper hull elements together, but this was later altered when galvanic corrosion developed at interface points between the two metals. Crewmen regulated *Nautilus*' buoyancy via a hollow iron keel, which in addition to comprising the vessel's enclosed water ballast tank also contained a combination of

permanent and removable ballast. Three individuals made up the boat's complement (Pesce 1906: 183; Wills 2000: 7-8).

Although primarily operated as a submersible, *Nautilus* was capable of running on the surface via a retractable sail that could be 'run out and rigged in minutes' once it had returned from the depths. As with *Turtle*, a screw that was cranked by hand propelled the craft underwater. A second hand-cranked propeller positioned at the bow was mounted horizontally to assist with adjustment of the vessel's keel angle. *Nautilus* deployed a gunpowder-filled copper canister of unspecified size that was towed on the surface behind the submarine as it ran submerged. The torpedo would then be pulled into the side of the target ship, detonation of the powder occurring by a contact fuse affixed to its forward end (Wills 2000: 7-9).

Nautilus was put through its initial sea trials in June of 1800, off Le Havre (Furber 1934). By September, the submersible was underway on its first cruise, during which Fulton and his crew sighted and engaged two British Royal Navy brigs at anchor off the French town of Growan. Already alerted to the fact that the French were operating a submarine in their coastal waters with Fulton's oversight and assistance, the crews of both brigs spotted *Nautilus* and weighed anchor before they could be attacked. This would be the submarine's only combat engagement, as Fulton, soon disenchanted with the 'tyrannic principles of [Napoleon] Bonaparte', ordered *Nautilus* broken up and its components sold (Parsons 1922: 86). He departed for England in April 1804 and—somewhat surprisingly—entered into negotiations with the British Admiralty to design and construct an improved version of the French submersible (Parsons 1922: 25-27; Flexner 1944: 272-274; Hutcheon 1981: 40-49; Philip 1985: 94-101; Wills 2000: 9).

It was while in Great Britain that Fulton experimented with different forms of torpedo delivery systems and essentially invented the first torpedo boats. These were used unsuccessfully by the Royal Navy during the blockade of Boulogne in 1804 and 1805 and comprised:

> [Wooden] clinker-built boats, each twenty-seven feet long, six feet extreme breadth of beam, single banked, and six long oars; one blunderbuss, on a swivel, on the larboard and one on the starboard bow; one ditto on the larboard and one on the starboard quarter, total four, for which cartridges should be prepared, each containing twelve half ounce balls (Fulton 1971: 16).

The torpedo itself was a copper canister containing 150 pounds of black powder, and connected to a cork-filled box intended to prevent it from sinking to an ineffective depth. It was mounted to the stern and connected to a harpoon-firing rifle with a length of line. The crew of the torpedo boat would row towards their intended victim, and once in range, an individual charged with operating the harpoon gun would fire it at the enemy vessel's bow. If the harpoon struck home, the torpedo would be thrown overboard, triggering a clockwork fuse attached to it. In theory, the movement of water past the vessel created by either the tide or its movement underway would pull the torpedo alongside and beneath the hull, where it would detonate once the timer on the fuse expired (Fulton 1971: 15).

Although the Boulogne expeditions failed to damage or destroy any French vessels, Fulton later demonstrated the efficacy of his torpedoes in a successful test against a target ship, the Danish-built brig *Dorothea*, on 15 October 1805. However, Admiral Horatio Nelson's victory against the French at Trafalgar less than a week later seemingly reinforced the superiority of existing British naval tactics and technology, and led to an immediate decline in the Royal Navy's support for torpedo warfare. British interest in Fulton's ideas would be renewed towards the end of the first decade of the nineteenth century, but by this time he had moved to the United States, where he advocated torpedo-based defences to the

American government and published his best-known treatise on the subject, *Torpedo War*. Until his death in 1815, Fulton continued to develop and promote torpedoes and torpedo-delivery systems, including a large, armoured semi-submersible craft named *Mute* that was to have been constructed for the U.S. Navy at Sackets Harbor, New York. The overall design of this vessel would in many respects form the blueprint upon which all subsequent torpedo boats would be based (Fulton 1971: x-xii; Lyon 1992: 135; Wills 2000: 9, 11).

America Embraces the Torpedo

In the years immediately following Fulton's death, the concept of torpedo warfare appears to have largely faded from the minds of military strategists. The potential advantages that torpedoes offered to naval tactics and operations were not revisited until the early 1840s, when yet another American, Samuel Colt (the inventor of the revolver), developed a means for electrically detonating explosive devices underwater. Colt proposed that his 'observation mines' (a tethered form of torpedo comparable to today's naval or 'contact' mines) could be deployed in 'submarine batteries'—or submerged static arrays—across river and harbour entrances and manually detonated in times of conflict via shore-based observation posts (Lundeberg 1974; Lyon 1992: 135). His ideas were supported by events in Europe later in the decade, when the Prussians successfully utilised their own versions of Colt's mines to defend the port of Kiel against an invading Danish fleet (Lyon 1992: 135). Static torpedoes even saw limited use in the Crimean War, when Russian variants inflicted damage on the British warships HMS *Merlin*, HMS *Vulture*, and HMS *Firefly* at Kronstadt during the Baltic campaign (Sleeman 1880: 187-188; Brown 1990: 152-154). Interestingly, these mines were designed by German physicist Moritz von Jacobi and Immanuel Nobel

(father of Alfred Nobel of Nobel Prize fame, and the owner of a 'torpedo works' in St. Petersburg, Russia).

It was during the American Civil War that torpedo warfare effectively came of age. Although both the Union and Confederate militaries employed various modes of underwater attack during the conflict, it was the Confederacy in particular that adopted torpedoes and torpedo-delivery systems as a critical element of its naval strategy (Lyon 1992: 135; Wills 2000: 30). Faced with a rival navy that 'had incontestable and total dominion over the waters' surrounding the North American continent at the outbreak of hostilities, Confederate Secretary of the Navy Stephen Mallory formulated a four-fold plan based on 'technical surprise' that, in addition to incorporating the use of torpedoes, utilised armoured warships, steam-powered commerce raiders, and rifled naval ordnance (Luraghi 1996: 61-68; Conlin and Russell 2006: 21). Specialised vessels capable of operating as offensive torpedo delivery platforms were developed as a variation of static submarine mining tactics, and in general fell within three broad categories: steam launches and other standard surface craft modified to carry torpedoes; purpose-built, steam-powered semi-submersible boats capable of retracting their smokestacks (to effectively eliminate their profile above water); and submarines propelled by hand (Wills 2000: 30).

Torpedo vessels employed the use of one or more explosive devices that were either towed behind it or, more commonly, deployed forward as a 'spar torpedo'. The latter configuration essentially comprised a watertight copper canister containing a large quantity of black powder that was affixed to the bow via a long pole or 'spar' manufactured from either wood or iron. When commencing an attack, the torpedo boat's crew would extend the spar forward of the bow, lower the attached explosive charge into the water, and attempt to detonate it against the hull of an enemy vessel below the waterline (Armstrong 1896: 73-75;

Gray 1975: 79-80; Adlam 1981: 25; Gardiner and Lambert 1992: 166; Lyon 1992: 135). The method(s) by which the torpedo was triggered varied, but usually employed either a chemical- or percussion-triggered contact fuse (see Glassel 1877: 225; Scharf 1887: 753-754; Alexander 1902; Tomb 1914; Pry and Zeitlin 1984). Electrically detonated versions were also reportedly used, but with much less frequency.

Whatever the means of delivery or detonation, torpedoes proved a potent weapon during the conflict. As Milton Perry (1985: 4) has observed, these 'infernal machines' sent:

> more Union vessels to the bottom than all of the warships of the Confederate Navy—in the James, at Charleston Harbor, in the Red River in the West, and during Farragut's famous encounter at Mobile Bay…[in total] some fifty ships were sunk or damaged by mines. Forty-three of these were Union, a figure that embraces the destruction of four [ironclad] monitors.

The overwhelming majority of torpedo-induced losses incurred by the U.S. Navy during the Civil War were the result of static mine defences. A number of these vessels were the subject of varying degrees of archaeological investigation and/or heritage preservation initiatives, including the ironclad monitors USS *Tecumseh* and USS *Patapsco*, ironclad ram USS *Eastport*, side-wheeled steamer USS *Harvest Moon*, and armed transport *Maple Leaf* (see West 1996; Pearson and Birchett 2001; Amer, et al. 2004: 46-49, 243-356; Cantelas and Babits 2011). In the case of the latter, archaeological assessment of its well-preserved hull revealed extensive torpedo damage in the vicinity of the starboard bow where, among other things, 'the deck was destroyed…[and] the hogging truss…broken' (Cantelas and Babits 2011: 193).

A notable exception to 'typical' Union vessel losses caused by stationary mines was USS *Housatonic*, a wooden-hulled sloop-of-war sunk by *H.L. Hunley*, a human-powered iron submersible armed with a single spar torpedo. The engagement between *H.L. Hunley* and *Housatonic* in February 1864 constituted the world's first successful attack by a submarine against an enemy vessel, and demonstrated the efficacy of torpedo craft against appreciably

larger armed surface ships (Bak 1999: 126-131; Ragan 1999: 192-197; Smith 2000; Oeland 2002; Walker 2005: 35-37; Starbuck 2011: 73-78). It also revealed the dangers inherent to the new form of warfare. In the immediate aftermath of its assault against *Housatonic*, *H.L. Hunley* was lost with all hands under circumstances that, despite detailed ongoing archaeological investigation of both the Confederate submarine and its victim, remain unresolved to this day (see Wills 2000: 69-76; Conlin and Russell 2006: 20-21; Hunter 2007: 208-209; Neely 2008-9: 7; Conlin and Russell 2011: 43).

H.L. Hunley's history-making mission occurred less than six months after another naval engagement that, by comparison, is far less celebrated but just as significant in the annals of torpedo warfare. On the night of 5 October 1863, Confederate forces attempted a torpedo boat attack against USS *New Ironsides*, the flagship of the Federal fleet then blockading Charleston, South Carolina. The attacking vessel, known as a *David*, was a 'cigar-shaped' semi-submersible of composite construction approximately 50 feet (15.2 metres) in length. It was operated by a crew of three, powered by a single steam engine capable of producing a maximum speed between 7 and 8 knots, and utilised a contact torpedo attached to a 14-foot (4.3-metre) spar constructed of iron pipe (Ragan 1999: 135). While the Confederate vessel was able to approach *New Ironsides* largely undetected, the detonation of its torpedo created a geyser of seawater that cascaded back into its smokestack, extinguished the boiler, and swamped the crew compartment. All four crewmen subsequently abandoned ship, an act of desperation that resulted in the detention of two by Union naval personnel detached to search the surrounding waters. Incredibly, the other two crewmen were able to avoid capture, climb back aboard *David*, reignite its boiler, and limp back to Charleston (Perry 1985: 81-84; Hoehling 1989: 80; Ragan 1999: 135-138; Simpson 2001: 23-24).

Initially, the crew of *New Ironsides* believed their ship had been little affected by the attack; however, it soon became apparent that the level of damage inflicted by *David*'s spar torpedo was far worse than originally thought (Perry 1985: 85; Ragan 1999: 137). Divers sent to inspect the warship's hull beneath the waterline noted that external plating was slightly dented in places, but a subsequent assessment of the interior hull by the ship's carpenter concluded *New Ironsides* was 'very seriously injured', and needed to return to its homeport for repairs as soon as it could be spared from blockade duty (Commodore S.C. Rowan to Admiral John Dahlgren, 28 November 1863, as cited in Perry 1985: 85). Shortly thereafter, *New Ironsides* set sail for the Philadelphia Naval Yard, where it was placed in dry-dock and subjected to a more thorough inspection. Assessors noted numerous damaged hull elements, including weakened supports, a shattered knee, and a large deck beam that had been 'driven on end' (Perry 1985: 85). The extent of the damage effectively precluded the Federal ironclad from playing an active role in the remainder of the conflict (Perry 1985: 84-85; Ragan 1999: 137-138).

In the wake of the *New Ironsides* attack, Confederate spar torpedo boats of the *Squib* Class attempted nighttime assaults against the Federal warships USS *Memphis*, USS *Wabash*, and USS *Minnesota* in the waters of South Carolina and Virginia, respectively (Perry, 1985: 123-128). Torpedo craft assigned the *Squib* designation were essentially small, swift, steam-powered launches modified with lightly armoured upper decks and a casemated cockpit. All were purportedly operated with poorly trained crews and therefore failed to sink their targets, although *Minnesota* incurred some damage during the attack against it (Sleeman 1880: 191; Perry 1985: 127; Hinds 2009b: 80-81). In May 1864, another *David* Class vessel named CSS *St. Patrick* attempted to sink USS *Octorara* in Mobile Bay (Alabama), but had to abort the

mission when its boiler exploded and killed a crewman (Smart 1959: 98; Ragan 1999: 240-242).

Despite these setbacks, the Confederacy's adoption of torpedo warfare as a key component of its overall naval strategy clearly reaped benefits that are all the more apparent when vessel losses sustained by both sides are compared. In stark contrast to the high number of Union warships damaged or destroyed as a consequence of the C.S. Navy's offensive and defensive use of torpedoes, 'only a single Confederate vessel' was destroyed by their Federal equivalents (Perry 1985: 4). This attack, executed against the ironclad ram CSS *Albemarle* in October 1864 by a Union steam launch armed with a spar torpedo, was the first of its kind initiated by Federal forces (Hoehling 1989: 130-134; Simpson 2001: 23-27). It gained notoriety as one of the greatest naval exploits of the American Civil War, and finally motivated northern military leaders to create their own fleet of specialised torpedo vessels (Bennett 1896: 469, 481; Smart 1959: 98-99).

The first purpose-built Federal torpedo boat was *Stromboli*, a wooden-hulled, steam-powered semi-submersible designed by the U.S. Navy's Chief Engineer, Captain William Wood, and constructed at New Haven, Connecticut, in the summer of 1864. The vessel's timber upperworks, including the deck and exposed sides above the waterline, were clad in iron armour plate one inch (2.5 centimetres) thick. A pilothouse positioned approximately amidships measured 5 feet (1.5 metres) in diameter and was manufactured from twelve layers of one-inch (2.5 centimetre) thick iron plating (Bennett 1896: 482). Upon completion, *Stromboli* was renamed USS *Spuyten Duyvil* in honour of the New York City borough of the same name. In a unique departure from preexisting Civil War-era torpedo boats, *Spuyten Duyvil* employed a combination of internal machinery, bow-mounted ports, and a retractable 'torpedo tube' (effectively a reloadable spar) to deploy and attach multiple static mines to the

underside of an enemy vessel's hull (Unknown author 26 October 1866; Bennett 1896: 482-483; Hinds 2009a: 24-25). The torpedo boat saw limited action on Virginia's James River in the closing months of the war, and helped seize and control that vital waterway in support of the Union Army's assault on the Confederate capital at Richmond (Perry 1985: 142-144). *Spuyten Duyvil*'s last operational mission was to utilise its torpedoes to clear obstructions from the James River, a task it continued to perform for some months after the Confederate surrender in April 1865.

Although *Spuyten Duyvil* was placed in ordinary in 1866, many of its more innovative characteristics were adapted to yet another American torpedo vessel concept. *Destroyer* was the brainchild of John Ericsson, a Swedish-American mechanical engineer and inventor widely known as the designer of the Federal ironclad USS *Monitor*. Ericsson had long contemplated underwater weaponry and tactics, and developed an interest in torpedo boat design in the early 1870s (Church 1890; Hinds 2009a: 26-27). Many of the attributes specific to *Destroyer*, including its low silhouette, very fine lines fore and aft, angled armoured casemate, and powerful engine (reportedly capable of generating a top speed of 25 knots, or 46.3 kilometres per hour), would become standard features on subsequent generations of torpedo vessels. However, *Destroyer*'s most distinguishing innovation was its bow-mounted 'underwater cannon', which employed a combination of compressed air and guncotton to fire one or more explosives-laden projectiles (Barnard 1881; Unknown author 20 July 1883; Holland 2005: 855-857). This precursor to the modern torpedo tube performed well during trials, as did *Destroyer*'s other cutting-edge features; however, the U.S. Navy ultimately rejected the vessel (Unknown author 1894: 119). Disappointed, Ericsson attempted to sell his idea(s) to the British Admiralty, who initially showed great interest and paid for extensive tests of their own, but also failed to incorporate the design as a fleet asset (Hinds 2009a: 27).

Robert Whitehead's 'Locomotive Torpedo' and the International Torpedo Boat Arms Race

Around the time Ericsson began formulating his concept for *Destroyer*, another weapon was being designed and tested that would radically alter the course of torpedo warfare and subsequent development and use of the torpedo boat. During the early 1860s, a retired Austrian naval officer, Giovanni de Luppis, invented a prototype explosive device that could travel along the surface of the water under its own power, and be guided to its target via a rudder attached to tiller lines operated by a shore-based observer (Hinds 2009a: 26). The weapon, which de Luppis dubbed *Der Küstenbrander* (the coastal fireship), failed to impress Austrian naval authorities; instead, he was encouraged to develop the idea further with the guidance and assistance of a qualified marine engineer (Gray 1975: 52; Lyon 1992: 136).

In 1864, de Luppis met Robert Whitehead, an Englishman employed by the Austrian government at an engineering works in the Adriatic port city of Fiume (modern-day Rijeka, Croatia). Whitehead was already highly regarded among the Austrian naval hierarchy for his role as chief designer of the engines installed in the warship *Archduke Ferdinand Maximillian* (famous for ramming and sinking the *Re d'Italia* during the Battle of Lissa). Perhaps unsurprisingly, he seized upon the opportunity to develop yet another potentially significant naval weapon (Gray 1975: 52-53; Warner 1975: 130; Hinds 2009a: 26). From the beginning of his collaborative endeavour with de Luppis, Whitehead recognised several significant flaws in *Der Küstenbrander*'s design, and following multiple attempts to improve its steering and propulsion systems, conceded that the original concept was doomed to failure. As a consequence, the two men dissolved their partnership—but whereas de Luppis appears to have let his ideas fade into obscurity, Whitehead continued to pursue the problem with an energy and urgency that 'took on the proportions of an obsession' (Gray 1975: 53).

Whitehead's tenacity ultimately paid off, and in December 1866 the Austrian Navy tested the first of his 'locomotive' or self-propelled torpedoes. The new weapon was a far cry from *Der Küstenbrander*, and although somewhat cumbersome when compared to modern-day torpedoes, shared many of their same attributes:

> From the tip of its sharp-pointed nose to the end of its tail it measured 11 ft, 7 in [3.5 metres] and its cylindrical body had a maximum diameter of 14 in [0.4 metres]. It was…fitted with a pair of vertical fins that ran the full length of its sleek body…to prevent the torpedo from rolling or spinning on its axis while running. The sharp, almost needle-pointed, nose contained a pistol impact detonator actuated by a firing-pin of simple design. On hitting the target the pin thrust back to detonate an 18 lb [8.2 kilogram] charge of dynamite which was packed into the nose section…Immediately behind the dynamite-filled 'war-head' was the air chamber holding the compressed air which provided the motive power for the engine (Gray 1975: 65).

The locomotive torpedo was designed to travel completely submerged from the time it was discharged until it struck its intended victim, but because its effective range was only a 'few hundred yards' (approximately 275 metres), Whitehead did not feel that a guidance system was necessary (Lyon 1992: 136). To the contrary, early variants of what would come to be known as 'Whitehead' torpedoes were fired in the general direction of their targets with the assumption that they would travel in a relatively straight line if properly adjusted and aimed. A more pressing concern for Whitehead was that the torpedo maintained a consistent depth while underway, and for a number of years he worked to develop a mechanism that could perform this function (Gray 1975: 67-75; Gardiner and Lambert 1992: 166; Lyon 1992: 136). Finally, in 1868, the hydrostatic device that resulted from these experiments was reliable enough for Whitehead to commence promoting his brand of torpedoes to the navies of the world. In the interim, he had also developed a working underwater torpedo tube fundamentally similar to those in use aboard today's military submarines (Gray 1975: 71).

Barely two years passed before the Royal Navy invited Whitehead to test his new weapon in British waters. After several weeks of trials, including a successful 'live-fire'

demonstration that resulted in the destruction of a target vessel, the British Admiralty committed to purchasing several torpedoes from the Fiume factory, and was awarded a non-exclusive license to establish its own manufacturing facility at the Royal Arsenal in Woolwich (Gray 1975: 85; Gardiner and Lambert 1992: 92, 166). The Admiralty was also accorded the right to train a select number of officers in the use of the hydrostatic device that enabled Whitehead's torpedoes to maintain a consistent depth while underway, but—at Whitehead's insistence—prohibited from acquiring specific details about its design and construction (Gray 1975: 85-86).

The Royal Navy's acquisition of the self-propelled torpedo finally prompted its chief strategists and administrators to invest in vessels capable of utilising the new weapon in combat. The first of these, HMS *Vesuvius*, was completed in 1874. Four years later, construction commenced on HMS *Polyphemus*, a warship that has been described by David Lyon (1992: 138) as 'an updated and much faster *Spuyten Duyvil* equipped with Whiteheads'. Both ships featured submerged bow torpedo tubes, a storage area forward for multiple reloads, relatively low freeboard, and engines modified to reduce noise and promote stealth (Gardiner and Lambert 1992: 92; Dingle 2009: 46). In addition, *Polyphemus* was armed with a complement of submerged torpedo tubes along either side of its hull, and—no doubt as a consequence of the ramming vogue then still very much in its heyday—retained a bronze 'spur ram' that also functioned as the cap for the bow torpedo tube (Gardiner and Lambert 1992: 92; Lyon 1992: 138-139). However, for all their cutting-edge attributes, *Vesuvius* and *Polyphemus* were still relatively large and slow—traits that made them increasingly vulnerable following the appearance of 'quick-firing' guns. These new forms of shipboard artillery could be reloaded and traversed much more rapidly and effectively than earlier generations of

cannon, and also featured significant advances in projectile velocity, range, and accuracy (Gardiner and Lambert 1992: 164; Lyon 1992: 139; Dingle 2009: 46-47).

Given the shortcomings inherent in *Vesuvius* and *Polyphemus*, Victorian-era torpedo boat technology might have hit an evolutionary dead-end were it not for the pioneering efforts of two British boat builders then operating on the River Thames. John Isaac Thornycroft and Alfred Fernandez Yarrow were the proprietors of separate firms in the riverfront London boroughs of Chiswick and Poplar, respectively (Gray 1975: 141-142). Both men began their careers constructing lightweight—but incredibly fast—steel-hulled river launches during the 1860s, and frequently competed directly with one another for clientele (Dingle 2009: 47). As a consequence, each strived to gain the upper hand over the other, and 'inventiveness and quality control acquired a new importance in their high-precision work' (Lyon 1992: 139). By the 1870s, the launches produced by J.I. Thornycroft & Co. and A. Yarrow & Co. featured engines and machinery that were 'at the outer limits of the technology of the day' and capable of generating speeds that were the fastest of any watercraft then afloat (Lyon 1992: 139). Not surprisingly, it was only a matter of time before the world's navies—and the Royal Navy in particular—seized on the opportunity to adapt them to combat roles.

The first purpose-built torpedo boat developed from high-speed steam launches was *Rap* (or *Rapp*), a Thornycroft design constructed on contract to the Norwegian government in 1872-1873 (Sleeman 1880: 163-164; Armstrong 1896: 165; Gray 1975: 141; Lyon 1992: 139; Hinds 2009b: 100). Originally configured to carry a towed torpedo array, the Norwegian boat was later outfitted with spar torpedoes for a short time before ultimately being modified with Whitehead dropping gear in 1879. *Rap* remained on the Norwegian Navy's active service roster until 1920, at which time it was decommissioned and converted into a

static exhibit at the Norwegian Naval Museum. It is currently still on display and remains the world's oldest and best-preserved example of a Victorian-era torpedo boat (Lyon 1992: 139).

Rap's launch would be followed four years later by the Royal Navy's first proper torpedo boat acquisition, HMS *Lightning* (alternately known as *Torpedo Boat* [*TB*] *No. 1*). Yet another product of Thornycroft's Chiswick shipyard, *Lightning* was ordered in response to the sudden 'proliferation of torpedo launches' among several of the world's most powerful fleets (Gray 1975: 144). Russia, in particular, had outfitted a number of privately owned steam launches with spar and locomotive torpedoes during recent hostilities with Turkey (the Russo-Turkish War of 1877-1878). At the same time, the Russians ordered approximately 100 purpose-built torpedo boats from Thornycroft, Yarrow, and at least seven different Russian firms (Armstrong 1896: 166). Two of these vessels would utilise spar torpedoes to sink the Turkish river monitor *Duba Seifez* in May 1877, while two others executed the world's first successful self-propelled torpedo attack against the revenue steamer *Intikbah* in January 1878 (Sleeman 1880: 196-197, 203; Gray 1975: 112-115; Dingle 2009: 47).

These assaults, coupled with the growing realisation among both military strategists and politicians that torpedo boats could provide a 'cheap and effective counter' to larger warships such as ironclads, prompted many nations to place orders with Thornycroft and Yarrow or—if they had the necessary expertise and capability—produce homegrown versions of the popular British designs (Lyon 1992: 139; Dingle 2009: 47). Shipbuilders that manufactured their own successful torpedo boat variants included France's Le Normand and La Seyne, Germany's Schichau and Germaniawerft, and the Herreshoff Manufacturing Company in the United States (Sleeman 1880: 178-179; Grant 1987; Lyon 1992: 139-140; Simpson 2001: 9, 53-80; Hinds 2009a: 29-30). Two other British firms, J. Samuel White and

Laird, Son & Co., also made occasional contributions, but it was Thornycroft and Yarrow who effectively cornered the torpedo boat market for the remainder of the nineteenth century and produced literally hundreds of vessels for no less than 20 different nations in Europe, Asia, and Central and South America (see Appendix E).

For its part, the Royal Navy—in accordance with the recommendations of the British government's Torpedo Committee of 1873—expanded its fleet of torpedo vessels to include several Thornycroft- and Yarrow-built steel-hulled variants (Lyon 1992: 137; Dingle 2009: 47). These in turn were divided into two distinct classes. 'First Class' boats were typically 70 feet (21.3 metres) in overall length or greater, outfitted with multiple torpedo tubes and defensive armament comprising one or more quick-firing cannon and/or machine guns, and designed primarily to protect larger, slower warships from attack by other torpedo craft (Figure 5). Their role as fleet defender foreshadowed the emergence of the torpedo boat destroyer during the 1890s, which subsequently evolved into the modern-day destroyer (Lyon 1992: 142-143, 1996: 13-14; Dingle 2009: 47). Due to their relatively large size, First Class torpedo boats were able to operate as independent fleet assets; however, the low freeboard that characterised early variants of the type significantly impaired their seaworthiness in anything other than fine conditions and light to moderate swell. For this reason, those constructed by Yarrow during the 1880s and 1890s featured a distinctive 'turtleback' foredeck (Dingle 2009: 47).

In contrast to their First Class counterparts, Second Class torpedo boats were considerably smaller, featuring an overall length of 65 feet (19.8 metres) or less, and a shallow-draught hull that allowed them to operate on inshore coastal waters, as well as bays and rivers (Figure 6). The type partially evolved from the Royal Navy's steam-powered launches and 'picket boats', several of which were carried on davits aboard larger warships

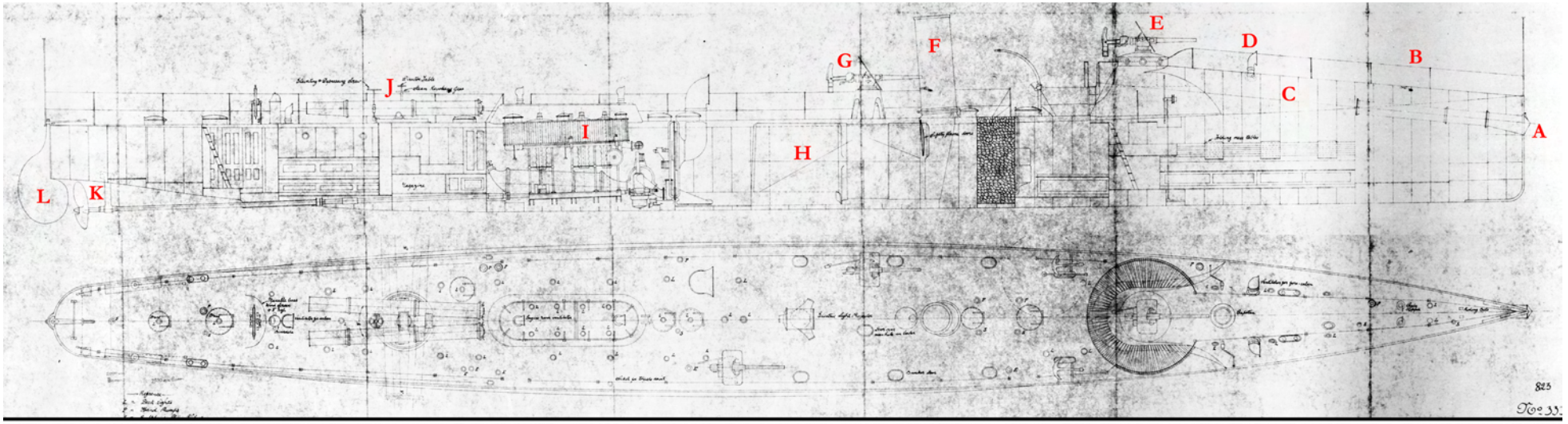
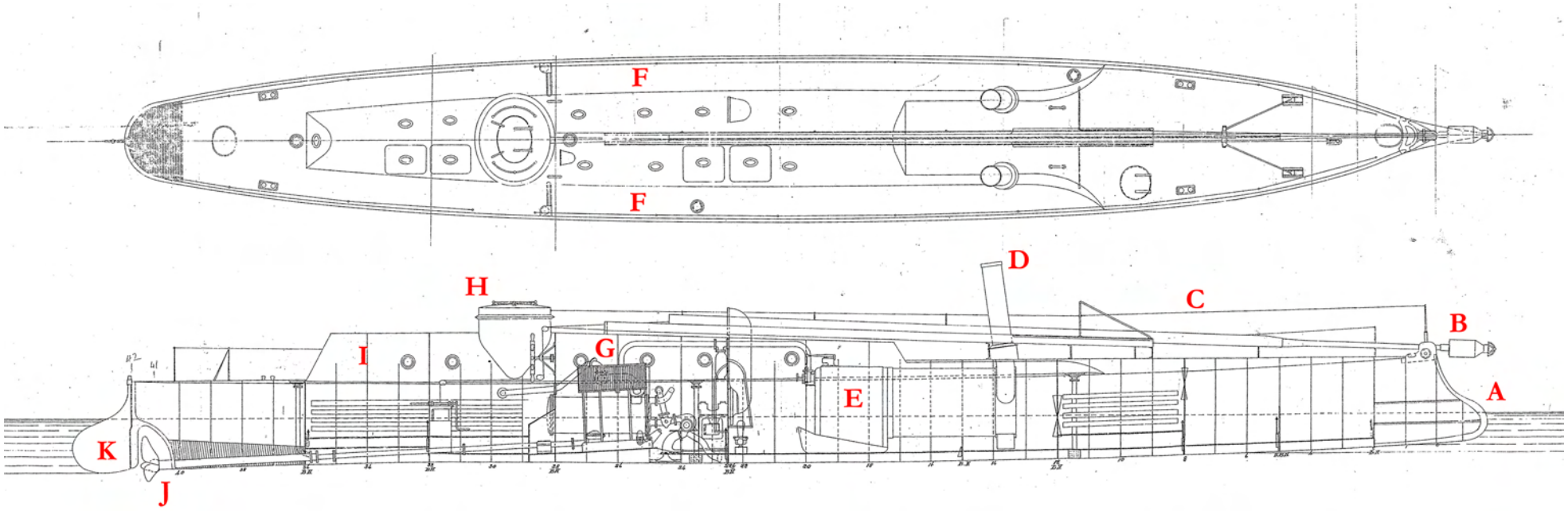


Figure 5. Builder's draught of the Yarrow-built First Class Torpedo Boat *Countess of Hopetoun*, with distinguishing design and construction features highlighted (including hull components referred to in later discussions of the vessel's archaeological attributes). Base image courtesy of Des Williams.



A - 'Ram' Bow
B - Spar Torpedo
C - Steel Cable Handrail
D - Funnel
E - Boiler
F - Location of Dropping Gear for Whitehead Torpedoes (not shown)
G - Engine
H - Conning Tower
I - Armoured 'Turtleback' Casemate
J - Propeller and Propeller Shaft
K - Rudder

Figure 6. Builder's draught of the Thornycroft Second Class Torpedo Boat design upon which the majority of vessels purchased by the Australasian colonies were based. Distinguishing design and construction features are highlighted, including hull components referred to in later discussions of the archaeological attributes of HMVS *Lonsdale*, HMQS *Mosquito*, and the New Zealand torpedo boat *Defender*. Base image courtesy of the Thornycroft Torpedo Boat Museum (Accession No. TTBM/FILE 3/30).

and—when necessary—outfitted with either spar or locomotive torpedoes to augment the fleet's offensive and defensive capabilities. However, it was the Russians' successful use of small torpedo vessels in the Russo-Turkish War that served as the primary catalyst for the development of purpose-built Second Class boats. Within a decade, the type received another popularity boost when a pair of converted French ship's boats outfitted with spar torpedoes destroyed the Chinese corvette *Yangwu* and wooden gunboat *Fuxing* at the Battle of Fuzhou during the Sino-French War (1884-1885).

Like their picket boat antecedents, Second Class torpedo craft were to be carried in numbers aboard larger warships and deployed in unison as 'mosquito fleets' to assault enemy flotillas, individual battleships, or naval anchorages. This was due in no small part to their diminutive size and relatively fragile construction, which severely limited their sea-keeping abilities, operational radius, and ability to withstand large-calibre incoming fire (Lyon 1992: 141-142; Dingle 2009: 50). As a consequence of heightened tensions between the British government and Imperial Russia during the late 1870s, the Royal Navy expanded the concept of remote torpedo boat deployment by purchasing a commercial steamer then under construction and converting it into a 'torpedo depot ship' named *Hecla*. This vessel, and the purpose-built 'torpedo boat base-ship' *Vulcan* functioned as forward operating platforms from which multiple Second Class torpedo boats could be launched (Lyon 1992: 142; Dingle 2009: 50). They were also intended to operate in a secondary capacity as tenders to First Class torpedo craft.

Between 1878 and 1889, the Royal Navy acquired a total of 86 First Class and 64 Second Class torpedo boats, the vast majority of which were built by either Thornycroft or Yarrow (Gardiner and Lambert 1992: 308-315; Dingle 2009: 47, 50). During this period, another 19 vessels were ordered for Great Britain's colonial navies in Australia, New

Zealand, and India; of these, eight (two First Class and six Second Class boats) were deployed to Australia, and four (all Second Class craft) to New Zealand. Taken together, these craft would constitute the largest percentage of colonial Australasia's seaborne naval defence—a distinction that would carry over in Australia into the immediate post-Federation period. The seven First Class torpedo boats intended for use in India were constructed in 1887 but never delivered, instead being integrated into the Royal Navy between 1892 and 1901 (Gardiner and Lambert 1992: 316-317). Torpedo boat depot and base-ships were never considered for service in Australia and New Zealand, despite their utility and 'instrumental role' in the Royal Navy's development of its torpedo tactics (Dingle 2009: 50). This almost certainly had a hand in the decision(s) of the various Australasian colonial governments to establish *land-based* torpedo boat support facilities, and likely also influenced the manner in which these installations were designed, arranged, constructed and ultimately dismantled and abandoned.

The 'Russian Scare' Origins of Australasia's Colonial Navies and their Torpedo Boat Defences

In 1869, Great Britain announced its intention to withdraw Imperial troops from its colonies in Australia, the result of a refusal by the continent's colonial governments to continue to maintain the presence of British soldiers on their soil at public expense (Nicholls 1988: 55). By August of the following year, the last remnants of the British Army embarked for home, forcing many Australians to consider matters of colonial defence, particularly as they applied to attack from the sea by foreign powers. Australia's vulnerability to naval assault had already been demonstrated by several unannounced visits to its waters by Russian warships in the 1860s, the most notable of which was the arrival of the flagship of the Russian China Station, *Bogatyr*, to Sydney and Melbourne in 1863 (Clem 1968: 440; Evans

1986: 23-24; Nicholls 1988: 38, 60-61, 94; Cooke 2000: 36-38). Frequent rumours of a Russian naval squadron operating 'somewhere in the Pacific Ocean' served to further fuel speculation about, and to a certain degree fear of, perceived Russian designs on the Australian colonies (Colwell 1973: 72; Wimmer 2008: 13).

Threat of direct confrontation between Great Britain and Russia—the first since the Crimean War—appeared imminent in 1876, when British Prime Minister Benjamin Disraeli sided with the Ottoman Empire against Russia over the latter's alleged atrocities against Muslims in the Balkans during the Bulgarian April Uprising (Nicholls 1988: 72; McCarthy 2000: 44; Hupchick 2004: 264). The situation was exacerbated by long-simmering tensions between the two nations generated by the Crimean War, and more recent British concerns about Russian designs on India. Afghanistan, in particular, was viewed as an ideal buffer zone against Russian expansion, and both sides attempted to play favorites to Afghan leader Sher Ali. Subsequent political and military brinkmanship that resulted from each nation's attempt to attain supremacy over the other in Central Asia became known as the 'Great Game', and persisted until the first decade of the twentieth century (Hopkirk 1992). Not surprisingly, heightened animosity between the two imperial powers translated into fear of imminent Russian invasion in Britain's Australasian colonies (Nicholls, 1988). Australia's 'wealth and important position', in particular, made it susceptible to:

> a landing of [Russian] troops on the least-guarded portions of the…coast, and perhaps where least expected. [The] coast having probably been fully surveyed by the Russian Squadron which some time back appeared so suddenly a visitor at [the] door without a word of warning, it is by no means unlikely that, should the opportunity arise, [Australia] might receive a less friendly visit from the same Power (*South Australian Register*, 17 March 1885).

Uncertainty about Russia's Pacific ambitions, coupled with the Australian colonies' inability to prevent a foreign seaborne assault in the event it actually occurred, served as major

catalysts for a series of 'Russian Scares' that beset the continent for much of the 1870s and 1880s (Lack 1968: 437-443; Nicholls 1988).

The elevated level of suspicion and alarm generated within Australia's general populace motivated the colonial governments to create committees and commissions tasked with examining each colony's respective defensive capabilities (Stevens 2001: 8; Frame 2004: 56-58). This differed very little from the collective Australian reaction to previous war scares and foreign naval activities in the Pacific, with one critical exception: a unanimous appeal to the British government that a respected military planner be sent to the colonies to advise and help them develop their own defensive networks. The Colonial Office responded by appointing Sir William Jervois of the Royal Engineers to serve as Defence Advisor to the Australian Colonies. Lieutenant-Colonel Peter Scratchley, also of the Royal Engineers, was sent to assist Jervois. The two men commenced a ten-month review of Australian colonial defences in May 1877 (Frame 2004: 57).

In assessments that resulted from these inspections, Jervois and Scratchley argued against the probability of full-scale foreign invasion of Australia due to its great distance from potential aggressors (the nearest Russian naval base, cited as but one example, was located at the Siberian port of Vladivostok). However, they also noted that the colonies were susceptible to seaborne raids on their principal ports by small naval flotillas. The worst that any colonial Australian port could expect to endure would be capture of merchant ships for the purpose of extortion, or bombardment of towns and cities within range of the aggressor's shipboard artillery. Landing of enemy troops, while always a possibility, would occur in limited numbers and with a practically nonexistent supply line, meaning that any occupation of Australian cities or towns would be temporary in the most dire of

circumstances. Consequently, both men advocated sea power as each colony's first line of defence (Jervois 1884; Nicholls 1988: 72-74, 78-84).

Since the end of the Crimean War and subsequent establishment of the Royal Navy's Australia Station, both the Admiralty and colonial governments had invested heavily in the development of naval infrastructure. The Royal Navy, in particular, wished to expand deployment periods for its warships patrolling Australasian and South Pacific waters, with an eye towards expanding British influence in the islands of the latter (Bach 1986: 24; Frame 2004: 50-51). Although the mother country's enhanced naval presence in Australia was a vast improvement over that of the earlier colonial period, the governments of New South Wales and Victoria wished to bolster the security of their respective ports and coastal waters—and assert their 'growing prosperity, status and importance'—through the establishment of their own naval forces (Frame 2004: 51).

However, the British government initially declined repeated entreaties from both colonies, largely out of concern over the legal status of colonial warships operating in foreign or international waters. As David Stevens (2001: 8) notes, the Admiralty feared that vessels 'wearing a colonial ensign might cause imperial complications [in peacetime]…[and] in wartime, an enemy cruiser might sink a colonial gunboat and claim that she had sunk a British warship'. In addition, many of the Royal Navy's commanding officers believed any potential colonial naval force would be 'too small to maintain efficiency…of little use in war, and dilute…any financial contribution the colonies might make towards the imperial burden' (Stevens 2001: 8).

These concerns would be tested in New Zealand during the first half of the 1860s, following a renewal of hostilities between a number of Maori *iwi* in the North Island and British troops and colonial settlers. The second series of New Zealand Wars (1860-1870)

would once again see active involvement of Royal Navy vessels and personnel in a variety of capacities, including shore-based military operations. In addition, several civilian steamships were commissioned for Royal Navy use in riverine and near-shore coastal patrol duties, river reconnaissance, evacuation of civilians from combat zones, and transport of troops and military equipment. Of these, the side-wheeled paddle steamer *Tasmanian Maid* (HMS *Sandfly*), barque-rigged screw steamer *Alexandra*, stern-wheelers *Prince Alfred* and *Rangiriri*, and brig *Moa*, have been the subject of archaeological investigation, and provide an excellent overview of the variety of colonial watercraft pressed into service during the conflict (Dodd 2008, 2010a, 2010b; New Zealand Archaeological Association: Site Record I44/466 and I44/467).

Renewed hostilities in New Zealand would also serve as the combat debut for Australian naval personnel and the only colonial warship then operating in Australia. In early 1860, the Victorian government loaned the steam-screw sloop HMVS *Victoria* to the Royal Navy for use as a military transport (Gillett 1982: 82; Stevens 2001: 7; Frame 2004: 54). *Victoria* shipped more than 250 imperial British troops to New Zealand, and was later utilised for shore bombardment, coastal patrol and blockade duties, conveyance of men and matériel between the British settlements at Auckland and New Plymouth, and evacuation of women and children from New Plymouth to Nelson when the former was attacked by Maori warriors. In December 1860 *Victoria* detached several of its crew to the British assault on a Maori *pa* (fortified settlement) at Matarikoriko, but was recalled to Melbourne three months later, where it remained for the duration of the conflict (Gillett 1982: 83; Stevens 2001: 7; for a discussion of the history and archaeology of the British assault on Matarikoriko, see Prickett 1981: 86-88).

Partly as a consequence of *Victoria*'s military involvement in New Zealand, the British House of Commons passed the *Colonial Naval Defence Act* in 1865. The Act established a definitive naval defence policy for Great Britain's far-flung colonial possessions by granting them the right to 'provide, maintain and use their own vessels of war' for the purpose of self defence, and raise and train crews to serve aboard them (Frame 2004: 51). These ships and their crewmen could also, if necessary, operate as commissioned auxiliaries of the Royal Navy. With passage of the *Colonial Naval Defence Act*, the Victorian government moved to bolster its single fleet asset, acquiring the British Napoleonic era battleship HMS *Nelson* on permanent loan in 1867, and purchasing the ironclad monitor HMVS *Cerberus* from the British firm Palmer Shipbuilding & Iron Co. four years later (Gillett 1982: 84-85, 90-91; Webb 2008: 1-3; Tulley 2009: 131). By the end of the 1870s, New South Wales had reconstituted its naval capability through the purchase of two torpedo boats, *Acheron* and *Avernus*, from the Atlas Engineering Company in Sydney's Pyrmont district (Gillett 1982: 16-19, 2008: 2). The other Australian colonies were also keen to develop a naval capability, but under enormous pressure to spend public revenues on competing priorities, particularly those related to infrastructure development.

Perhaps recognising that the majority of Australian colonies lacked the finances to purchase large warships for their protection, Jervois and Scratchley placed particular emphasis on the use of torpedoes, either as moored stationary weapons or deployed aboard vessels outfitted to carry them to the enemy:

> I have referred to locomotive torpedoes and torpedo-vessels, because these are the means by which, it is urged by some, that the defence of ports which cannot be otherwise specially protected may be provided…Nor…can I advise that the recommendations made by some of my naval friends for the purchase and maintenance by the colony of a considerable number of war-cruisers [and] gun vessels…should be acted on (Jervois 1884: 18).

In Melbourne, this translated to the suggestion that a submarine mining station be established near the Heads of Port Phillip Bay capable of deploying static torpedoes and torpedo boats to defend strategic locations within the port's shipping channels. Sydney was to be protected by stationary torpedo defences similar to those at Melbourne, as well as *Acheron* and *Avernus* and an auxiliary submarine mining facility at Newcastle. Queensland's small population, capital city, and revenue were considered to 'not present so tempting an object of attack' as either the colonies of New South Wales and Victoria (Jervois and Scratchley, cited in Nicholls 1988: 81). Nevertheless, Jervois suggested the colony establish torpedo defenses in Moreton Bay (at the mouth of the Brisbane River). This would include ground torpedoes (stationary mines) moored in three lines across the bay to protect the river mouth, as well as one or more small vessels fitted with spar torpedoes that could be used to attack enemy warships (Nicholls 1988: 82). In Hobart, submarine mines and a single torpedo boat would comprise the extent of Tasmania's naval force. Finally, a submarine mining station was suggested as a way to augment South Australia's coastal defences, which consisted of two planned fortifications (Fort Largs and Fort Glanville) and forthcoming procurement of a solitary naval asset, the iron-hulled cruiser HMCS *Protector* (Jervois 1884: 7; Nicholls 1988: 80-84; Wimmer 2008: 14)

Jervois and Scratchley's plan for Australia's defence was published in November 1879, but it would take another unannounced visit to the continent by the Imperial Russian Navy before it was seriously acted upon (Jones 1995: 182). In 1881 the warships *Afrika*, *Vestnik*, and *Plastoun* paid a visit to Sydney and Melbourne, as well as Hobart and Glenelg (near Adelaide). These vessels comprised the beginning of a permanent Pacific-based Russian naval squadron headquartered at the Japanese port of Nagasaki. Shortly after their departure from Australian waters, Melbourne newspaper *The Age* ran a series of articles that

questioned the Russians' motives and roundly criticised local defences. Foremost among the stories published in this and other Australian newspapers was a report that the flotilla's commanding officer, Rear-Admiral A.B. Aslanbegov, had transmitted details of Melbourne's defensive capabilities and weaknesses to his superiors back home via telegraph (Fitzhardinge 1966; Clem 1968: 443; Evans 1986: 32-35; Nicholls 1988: 94; Massov 2008: 3). While this was later proved a hoax, the Russian Navy's unannounced arrival and the realisation that its ships were now within easy striking distance of Australia's wealthiest port cities almost certainly influenced parliamentary decisions later the same year in South Australia, Victoria and Queensland to purchase naval craft for their maritime protection (Nicholls 1988: 94-95; Jones 1995: 182). Western Australia, which did not attain self-government until 1890, was prohibited from establishing and operating its own naval assets under provisions of the *Colonial Naval Defence Act*, and was ultimately the only Australasian colony without any form of waterborne defence capability prior to Federation (Vickridge 2011).

Across the Tasman Sea in New Zealand, similar fears of Russian invasion materialised within the government and among the general populace. Great Britain had initially refused to deploy Imperial troops to assist New Zealand's colonial forces during the New Zealand Wars of the 1860s and 1870s, thereby underscoring its reluctance to maintain responsibility for the colony's defence. With the cessation of hostilities these internal threats diminished; however, Russian and French expansion in the Pacific Ocean, combined with heightened tensions between Great Britain and the United States during the American Civil War, forced many New Zealanders to consider their vulnerability to hypothetical attack by a foreign aggressor. These concerns were exacerbated further by the withdrawal of all remaining British troops from New Zealand in 1870.

Phobia finally turned to panic following publication of an article in Auckland's *Daily Southern Cross* on the morning of 17 February 1873. The city's populace awoke to learn of an:

> event productive of grave disaster to New Zealand, and destructive of the ancient prestige of England and her boasted supremacy as Sovereign of the Seas. That event was the sudden appearance of the hostile iron-clad man-of-war, the 'Kaskowiski,' which took possession of the British warship lying in the waters of the Waitemata [Harbour], seized…principal citizens as hostages, demanded a heavy ransom for the city, and emptied the coffers of the banks of all the gold and specie they contained (*Daily Southern Cross*, 17 February 1873).

To make matters worse, the assault had reportedly been carried out with new and innovative naval technology. Upon entering Waitemata Harbour undetected, the 'Kaskowiski' deployed a fully submersible 'submarine pinnace' that stealthily approached the British warship and discharged a 'mephitic water-gas' to incapacitate its crew (*Daily Southern Cross*, 17 February 1873). Despite a valiant effort on the part of the gassed British warship's 'weak and almost breathless' officers and seamen to repel Russian boarding parties, their vessel was captured, and soon flew the 'hated double eagle…at the main [mast] above [the] beloved "meteor flag of England"' (*Daily Southern Cross*, 17 February 1873). Two tense days passed before Auckland's citizens learned the story was a hoax perpetrated by the newspaper's editor David Luckie. During that time, many had reportedly buried valuables and fled into the hinterlands, or formed impromptu militias in an attempt to repel the Russian 'invasion'. Although heavily criticised for the panic he instilled, Luckie's primary purpose for composing the article—to bring the colony's relative defencelessness to the fore of its citizenry's consciousness—was ultimately effective (Cooke 2000: 36-38).

Like their Australian counterparts, New Zealand's military planners recognised that the colony's biggest threat would come in the form of seaborne raids on principal ports by small naval units comprised of a handful of warships. Although few potential enemy vessels had visited New Zealand by the time of the 'Kaskowiski incident', the colony's defensive

vulnerability had been amply illustrated by the Russian Navy's unannounced visits to Australian waters (Cooke 2000: 36-38; Nicholls 1988: 38, 60-61, 94). Complementing the Australian visits of *Bogatyr*, *Afrika*, *Vestnik*, and *Plastoun* were the 1861 voyage of the cruiser *Haydamack* through the Tasman Sea, unannounced arrival of the frigate *Svetlana* at Sydney in 1862, and subsequent appearance of the screw corvette *Boyarin* at Hobart and Adelaide in 1871 (Evans 1986: 22).

New Zealand's fear of Russian invasion finally translated into action in 1880, when government officials invited Lieutenant-Colonel Scratchley to assess the colony's coastal defences and submit a report of his findings. The request for Scratchley's assistance came at just the right moment. *Afrika* would visit Auckland in December 1881, and *Vestnik* would call on Wellington in May 1886, stoking concerns that the Russians were collecting intelligence on the colony's defences (Cooke 2000: 48-49). Scratchley suggested each of New Zealand's four primary port cities (Auckland, Wellington, Dunedin, and Lyttelton—the latter serving as the main entrepôt to the city of Christchurch) be protected by a three-tiered defensive system comprising shore-based artillery, submarine mines, and torpedo boats. He emphasised the adaptability of spar torpedoes to most types of vessels, and believed them best suited to the defence of the colony's harbours; consequently, the New Zealand government was urged to purchase no less than three torpedo boats for each port and base them at purpose-built shore installations integrated within the submarine mining defensive system (Cooke 2000: 129; Moffat 1996: 4-5).