

# Death by a Thousand Cuts: an archaeological assessment of souveniring and salvage on the Australian cruiser HMAS *Perth* (I)

Kieran Hosty and James Hunter

*Australian National Maritime Museum, 2 Murray Street, Sydney, New South Wales 2000, Australia*

Shinatria Adhityatama

*Pusat Penelitian Arkeologi Nasional, Jakarta, Selatan 12510, Indonesia*

In 2014, the Australian National Maritime Museum (ANMM) received reports from recreational divers that the shipwreck site of HMAS *Perth* (I) was being systematically salvaged by commercial divers. After extensive discussions with Indonesian Government departments and agencies the ANMM led the first Australian/Indonesian remote sensing survey of *Perth* in December 2016. This was followed by an in-water survey in May 2017. These investigations revealed *Perth* has been devastated by systematic, large-scale unauthorized salvage. Following the survey, ANMM and its Indonesian research partner *Pusat Penelitian Arkeologi Nasional* (ARKENAS), working in conjunction with the Royal Australian Navy and Australian Department of Foreign Affairs and Trade, successfully lobbied the Indonesian Government to have the site declared Indonesia's first Marine Protected Area.

© 2018 The Authors

*Key words:* Maritime archaeology, commercial salvage, HMAS *Perth* (I), Second World War, Indonesia, Australia.

In 2014, the Australian National Maritime Museum (ANMM) received reports from recreational divers that the shipwreck site of HMAS *Perth* (I) was being systematically salvaged by commercial divers. After extensive discussions with Indonesian Government departments and agencies the ANMM led the first Australian/Indonesian remote sensing survey of *Perth* in December 2016. This was followed by an in-water survey in May 2017. These investigations revealed *Perth* has been devastated by systematic, large-scale unauthorized salvage.

Illegal or unsanctioned salvage of pre-1945 military shipwreck sites is not a new phenomenon, but the scale on which such activities are now occurring worldwide is both catastrophic and unparalleled. Whereas the vast majority of illicit salvage once targeted specific, relatively portable, and accessible shipwreck components—such as propellers, anchors, and small-calibre weapons, such as machine guns—documented instances of unsanctioned commercial shipwreck recovery that have occurred in the past decade have included large-scale removal of ship's machinery and architecture, or even entire wreck-sites. For example, 16 of 25 First World War military shipwrecks in Danish waters associated with the

Battle of Jutland have been salvaged in this manner (McCartney, 2016: 254–255; 2017a: 203, 2017b; 2018).

Several shipwreck sites of Second World War vintage in Indonesian and Malaysian waters have also been targeted—and largely or completely removed—by industrial-scale salvage. In addition to *Perth*, the latter group includes an array of Allied warships sunk during the Battle of the Java Sea, including the Dutch vessels HNLMA *Java*, HNLMS *De Ruyter*, and HNLMS *Kortenaer*, and British vessels HMS *Encounter*, *Exeter* and *Electra* (Fock, 2016). Yet other shipwreck sites of Allied vessels known to have been irrevocably damaged or destroyed in this manner include the American submarine USS *Perch*, Dutch submarines HRMS *O 16* and *K XVII*, and British battleship HMS *Prince of Wales* and battlecruiser HMS *Repulse* (Fock, 2014; *The Telegraph*, 25 October 2014 and 23 April 2015; Fock, 2016: 31). Several Second World War Japanese military shipwrecks have also been affected, but the extent of damage to these sites is not as well documented (*The Guardian*, 9 February 2017).

*Perth* and other military shipwrecks are considered 'sovereign immune' and therefore theoretically protected from illegal salvage or unauthorized disturbance under international law. This is based on

their recognition as State vessels, which Roach (1996) identifies as ‘warships, naval auxiliaries, and other vessels owned or operated by a State and used at the time they sank only on government non-commercial service’. It is a well-established aspect of international law that title to a sunken State vessel is not lost due to the passage of time, and that its sovereign immune status applies whether it is located in domestic, foreign, or international waters. Sovereign immunity can only be lost through capture or surrender during combat (before sinking), by international agreement, or via an express act of abandonment on the part of the government that owns the vessel. It is supposed to protect sunken warships from salvage by any individual or State (with the exception of opposing belligerents actively engaged in conflict during which the vessel was lost), unless express permission is sought and granted from the sovereign flag State (Roach, 1996, 1997; Dromgoole, 1999).

The rationale behind sovereign immunity is to protect military shipwrecks and aircraft crash-sites from unauthorized disturbance due to their ‘unique histories’ and, more importantly, because many are the ‘last resting places of...sailors and airmen who died in the service of their nations’ (Roach, 1996). It is also intended to minimize or prevent disturbance of unexploded munitions and hazardous contaminants such as fuel oil that could occur as a consequence of salvage activities. For all of its good intent, sovereign immunity has sadly proven inadequate in protecting and preserving *Perth*, a vessel that served with distinction during the Second World War and has rightfully been accorded legendary status among Australian naval vessels.

## HMAS *Perth* (I)

Following the end of the First World War, the world’s naval powers initiated a series of talks and treaties to limit the number, armament, and size of significant naval assets such as battleships and cruisers. Despite the *Washington Naval Treaty* of 1921–1922 and the subsequent *London Treaty* of 1936, rapid advancements in naval and weapons technology and the subsequent build-up of warships around the world, particularly in Germany, Italy, and Japan, created significant unease in post-war Australia (Pfennigwerth, 2007: 26; Carlton, 2010). Acting on the advice of Great Britain, Australia commenced a three-year programme of naval expansion that resulted in the acquisition of three modified Leander Class light cruisers (HMS *Phaeton*, HMS *Apollo* and HMS *Amphion*) from British naval yards. HMS *Amphion* was renamed His Majesty’s Australian Ship (HMAS) *Perth* and commissioned into RAN service on 29 June 1939. The other modified Leander Class vessels were renamed HMAS *Sydney* (II) and HMAS *Hobart* (I) (Pfennigwerth, 2007: 27).

Designed for commerce protection and convoy work, *Perth* was 562.3 feet (171.39m) long, had a displacement

of 6830 tons, and was capable of operating up to a maximum range of 6060 nautical miles (11,220km). It was armed with eight 6-inch (152mm) breech-loading naval guns mounted in twin turrets fore and aft (Pfennigwerth, 2007: 22, 29). Modifications to the vessel later saw it fitted with eight 4-inch (102mm) Quick Firing naval guns mounted in twin turrets amidships, as well as an array of machine guns, saluting guns, torpedoes, and depth charges. *Perth* was also outfitted with a catapult-launched amphibious Supermarine Walrus aircraft. According to Pfennigwerth (2007: 33–34), *Perth* was a relatively well-armed and equipped warship for the mid 1930s, but it had a number of significant weaknesses that would become increasingly evident following the outbreak of the Second World War in 1939.

Potential enemy warships—such as those of Germany and Japan—were being built larger and better armed, while *Perth* appeared outdated by comparison. It was fitted with relatively poor-quality optical range finders, and was built prior to the development of gunnery radar, gunnery operations rooms, and plan position indicators. It also carried insufficient quantities of ammunition for protracted naval engagements. *Perth*, like many other pre-Second World War warships, relied on a gunnery method known as ‘up ladder groups’ in which shells were fired at pre-set ranges that were steadily increased until the target was straddled. This type of naval gunnery was very ineffective; Pfennigwerth (2007: 33–35) cites one instance in which two British Royal Navy 6-inch cruisers fired more than 2500 shells at the German pocket battleship *Admiral Graf Spee* and recorded only 57 hits.

The Imperial Japanese Navy (IJN) by this point had also made great technological breakthroughs in torpedo technology. In particular, the IJN’s Long Lance torpedo, which carried a 490kg warhead, and could cruise at a speed of 50 knots (93km per hour) had an effective range of up to 22km. Japanese surface vessels had also developed the capacity to reload torpedoes effectively at sea. Some IJN cruisers were capable of launching up to 40 torpedoes; by comparison, *Perth* was only able to launch eight (Pfennigwerth, 2007: 35; Peck, 2016).

### *Early wartime service*

*Perth* left Portsmouth, England on 26 July 1939 on its delivery voyage to Australia. It made the journey via New York, the Caribbean and the Panama Canal, and was cruising off the coast of Venezuela near the islands of Aruba and Trinidad and Tobago when war with Germany was declared on 3 September 1939 (Fig. 1). Pending the arrival of British naval vessels to the region, *Perth* was ordered to remain on station off the South American coast and search for German shipping while also offering protection to Allied oil tankers sailing between Trinidad and Venezuela (Pfennigwerth, 2007: 46–47). *Perth* was based in the



Figure 1. Watercolour painting by Ernest Clegg of HMAS *Perth* (I) at New York City, 1939 (Image courtesy Australian National Maritime Museum).

Caribbean until early March 1940, when it completed its delivery voyage to Australia (Fig. 2). It arrived at Sydney's Garden Island naval base on 31 March 1940 to a tumultuous welcome (Royal Australian Navy, 2017).

On 28 November 1940, *Perth* departed Fremantle in Western Australia for the Yemeni port of Aden. It arrived there on 16 December 1940 after a relatively uneventful voyage. For the next 10 months *Perth* saw considerable action. It was involved in the Battle of Greece (March 1941), Battle of Cape Matapan (March 1941), Battle of Crete (May 1941) and the Syria-Lebanon Campaign (Pfennigwerth, 2007: 85–118; Carlton, 2010: 180–232).

During these various engagements *Perth* sustained damage to its hull plating, oil tanks, starboard propeller shafts and its aftermost ('Y') turret. It also suffered penetration damage to its hull and superstructure that fractured ventilation trunking, damaged communication wiring, and rendered the ship's 6-inch and 4-inch control tables inoperable. On 30 May 1941, *Perth* was hit by a bomb just abaft the foremast that penetrated the galley and blacksmith's shop before entering 'A' Boiler Room and detonating. The bomb killed two cooks and two sailors, as well as nine soldiers of a contingent of 1188 Allied troops that were being evacuated from Sphakia on Crete. With the boiler room and Forward Engine Room out of action, *Perth* was only able to operate at a maximum

speed of 20 knots (37km per hour), and it was targeted by several more concentrated aerial attacks prior to the arrival of Allied air support from Alexandria, Egypt (Pfennigwerth, 2007: 150–154; Carlton, 2010: 290–295).

In Alexandria, preliminary inspection of the damage revealed the Forward Boiler Room was effectively destroyed, while deformation of the ship's hull had opened plate seams and created a number of leaks. The ship's gyro compass was blown off its mountings and the starboard inner propeller shaft was bent. *Perth* also no longer had a blacksmith shop or galley, there was a substantial hole in its main deck, and many of the ship's electrical systems—including the degaussing coils—were defective or inoperable. Given that the damage was substantial and could not be effectively repaired in Alexandria, *Perth* was replaced by HMAS *Hobart* and departed the Mediterranean for much needed repairs in Sydney (Pfennigwerth, 2007: 144–154, 168; Carlton, 2010: 297–300).

*Perth* arrived at Sydney in August 1941 and entered the Sutherland Dock at Cockatoo Island for an extensive refit. The vessel's starboard propeller shafts had to be drawn out and realigned, and the 'A' frames and palm plates—the structural components that supported the shafts outside the hull—were realigned as well. Stern plating and internal frames were replaced, the armoured belting in the vicinity of the after shell room was repaired and the hull plating beneath it



Figure 2. *Perth* arriving at Sydney Harbour in March 1940 (Image courtesy Australian National Maritime Museum).

repaired. All of *Perth's* weapons were surveyed and additional armament, most likely 0.5-inch machine guns and associated ready-use lockers, were fitted atop the 6-inch gun turrets and on the quarterdeck. The boilers were refurbished, the steam turbines re-bladed, and the 4-inch fire control table was replaced with one taken from the Gunnery School at the Flinders Naval Depot (Pfennigwerth, 2007: 180–182; Carlton, 2010: 324).

Other work carried out included replacement of the port generator's bed plate, repairs to both masts, reinstatement of the aircraft retrieval crane, repair and replacement of *Perth's* degaussing coils and additional repairs to wiring looms and piping in the boiler rooms (Pfennigwerth, 2007: 180–182; Carlton, 2010). The ship's old but functional Type 286 radar system was also removed. Despite numerous requests by *Perth's* commander Captain Hector 'Hec' Waller, it was never replaced. This shortcoming in *Perth's* ability to detect approaching enemy warships was to have a disastrous effect on the vessel's combat capability in February and March of 1942 (Pfennigwerth, 2007: 190).

After completing refit on 22 November 1941, *Perth* underwent sea trials and training exercises before returning to Sydney for orders and possible redeployment. The cruiser was still in Sydney on 5 December 1941 when news reached Australia of the coordinated Japanese aerial attacks on Malaysia and Pearl Harbor. More bad news followed when the Renown-class battle cruiser HMS *Repulse* and battleship HMS *Prince of Wales* were sunk off Kuantan on the east coast of Malaya on 10 December with the loss of more than 850 lives.<sup>1</sup>

#### ***Operations in Indonesian waters and loss***

Following the capture of Singapore on 15 February 1942, *Perth* was ordered to join the American, British, Dutch and Australian (ABDA) military forces at Tanjong Priok, the principal port of Batavia (present-day Jakarta, Indonesia) (Pfennigwerth, 2007: 201–202). A combined ABDA naval fleet under the command of Dutch Rear Admiral Karel Doorman was to patrol the northern coast of Java in an attempt to thwart an anticipated Japanese invasion of the Dutch East Indies (Indonesian archipelago) (Pfennigwerth, 2007: 206–207; Royal Australian Navy, 2017).

On 27 February 1942, ABDA vessels intercepted a Japanese invasion fleet consisting of two heavy cruisers, two light cruisers, 14 destroyers, and ten transports. The Allied force consisted of *Perth*; HM Ships *Exeter*, *Jupiter*, *Electra*, and *Encounter* of the British Royal Navy; the Dutch vessels HNLMS *De Ruyter*, HNLMA *Java*, HNLMS *Kortenaer* and HNMLS *Witte de With*; and American warships USS *Houston*, USS *Alden*, USS *John D. Edwards*, USS *John D. Ford* and USS *Paul Jones* (Pfennigwerth, 2007: 210–218; Royal Australian Navy, 2017).

Although both fleets were evenly matched in terms of firepower, the ABDA force was hampered by communication difficulties and a lack of air support. In addition, only six of *Houston's* 8-inch guns were operable because its aft turret had been damaged during a prior Japanese air raid. The engagement, now known as the Battle of the Java Sea, proved a disaster for ABDA. Within seven hours *De Ruyter*, *Java*, *Kortenaer*, and *Jupiter* were sunk and *Exeter* was

badly damaged and attempting to escape to Ceylon (Sri Lanka) accompanied by *Encounter* (Pfennigwerth, 2007: 207–208, 218–219).

*Perth* and *Houston* were the only two large Allied ships to survive the engagement, and retreated to Tanjong Priok, where they took on limited supplies of fuel oil and ammunition. Both vessels departed the port during the evening of 28 February 1942 and set a course for Sunda Strait in an attempt to flee to Australia (Cassells, 2000: 94; Pfennigwerth, 2007: 218–219; Royal Australian Navy, 2018). Unbeknownst to the officers and crew aboard *Perth* and *Houston*, a second Japanese invasion fleet—consisting of five cruisers, 12 destroyers, one light carrier, one seaplane carrier, one minelayer, and 58 troopships—had assembled at Banten Bay near the eastern entrance to Sunda Strait. This overwhelming naval force was effectively blocking the Allied vessels' escape route (Bastock, 1975: 128; Cassells, 2000: 94; Pfennigwerth, 2007: 218–219; Royal Australian Navy, 2017).

At around 23:00 on 28 February 1942, *Perth* and *Houston* were sighted by the IJN destroyer *Fubuki*, which notified the Japanese fleet. Waller responded immediately and ordered *Perth's* forward turrets to fire on the fleeing destroyer. Shortly thereafter, multiple Japanese warships appeared, surrounded *Perth* and *Houston*, and opened fire (Bastock, 1975: 128; Cassells, 2000: 94; Pfennigwerth, 2007: 218–219; Royal Australian Navy, 2017).

*Perth* sustained limited damage until 23:50, when a Japanese shell entered the starboard side of the Ordinary's Seamen's Mess Deck, near the waterline in the ship's forward section (National Archives of Australia [hereafter NAA] MP1185/8, 1932/2/20). Shortly thereafter, *Perth* was struck again on the starboard side by a torpedo that damaged the Forward 'A' Boiler Room, Forward Engine Room, and destroyed the Forward Damage Control Position. The blast also upset the forward gyrocompasses—vital to the guidance of the ship's main armament—from their gimbals. The damage was exacerbated by a second torpedo strike to the starboard hull under 'A' Turret. The resulting explosion destroyed its associated magazine and shell room, caused a hull breach near the bridge, and trapped crewmen working in the 4-inch Magazine.

A third torpedo struck *Perth* well aft on the starboard side beneath 'X' Turret and dismounted both 6-inch barrels from their trunnions. Shortly thereafter, a fourth and final torpedo hit *Perth's* port side. The ship, which by this time was listing to starboard as it settled in the water, briefly righted and then heeled over to port and sank around 00:25 on 1 March 1942 (Pfennigwerth, 2007: 224–225; NAA-MP1185/8, 1932/2/20). *Houston*, which engaged the Japanese at the same time as *Perth*, fought on alone for a brief period, but was also struck by a series of torpedoes and sank just two miles (3.7km) from where *Perth* disappeared beneath the waves.

At the time of *Perth's* loss, the cruiser's crew comprised 681 officers and ratings. This number included 671 naval personnel, six Royal Australian Air Force aircrew and four civilian canteen staff. Three-hundred-and-fifty-three crew were killed in the Battle of Sunda Strait. Of the 328 survivors, 324 were later captured and detained as Japanese prisoners-of-war (POWs). One-hundred-and-six *Perth* POWs died in captivity, and the remaining 218 survivors returned home to Australia after the war (Pfennigwerth, 2007: 227–234; Royal Australian Navy, 2017).

## Discovery, early salvage, and souveniring

Australian diver David Burchell discovered *Perth* in 1967. The shipwreck was located in Banten Bay, approximately three nautical miles (5.56km) north-east of St Nicholas Point on Java's north-west tip, and well within the territorial seas of the Republic of Indonesia. While Burchell's description of *Perth* at the time of discovery is helpful in formulating a baseline assessment of its original condition, it is important to note that some details he provided—such as the wreck-site's depth and surrounding seabed environment—were intentionally misleading and intended to discourage potential salvage and souveniring by other divers. Burchell (1971: 87–95, 99–105) reported that *Perth* was almost intact—with the exception of shell and torpedo damage—and rested on its port side on a relatively flat sandy seabed in about 35m of water (Fig. 3a). The vessel's bow was intact and pointed towards the north-east. The starboard side of the vessel was located in approximately 21m of water. Burchell (1971: 87–90) also noted a massive torpedo hole below the waterline on the starboard side of the ship. The opening, situated beneath 'A' Turret, measured approximately 12m across. By contrast, the rest of *Perth's* starboard side appeared undamaged and its numerous portholes were still *in situ* and intact.

*Perth's* starboard-side propeller shafts and propellers were still in place, as were the vessel's four 6-inch gun turrets. 'A' Turret was trained forward, and 'B' Turret—with its armoured access hatch open—was trained hard to port with most of the length of its gun barrels buried in the seabed. 'X' and 'Y' Turrets were both aimed approximately 45 degrees to starboard and pointed towards the water's surface. In the ship's forward section, the anchors were still in place and *Perth's* distinctive cruiser bow swept down to the keel in one clean and unbroken line. The Walrus seaplane was gone but its retrieving crane—with its open-web steel work—was lying on the seabed immediately below its original position on *Perth's* midships superstructure (Burchell, 1971: 87–90).

On the 4-inch Gun Deck the barrels of the guns pointed in different directions and the aft starboard 4-inch turret (S2) showed clear signs of a direct hit. Complete shell casings and live 4-inch shells lay scattered around the gun deck. *Perth's* port

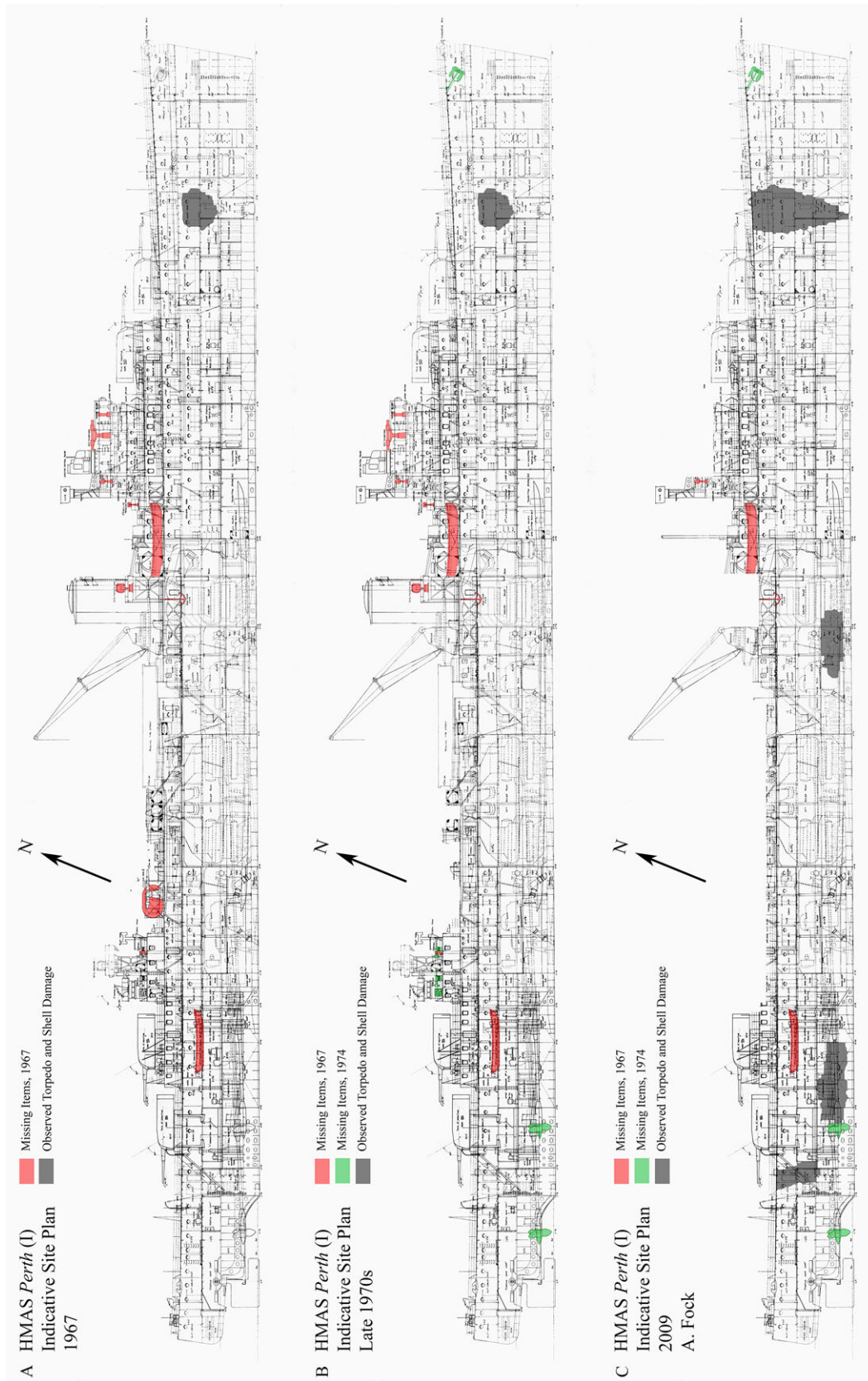


Figure 3.

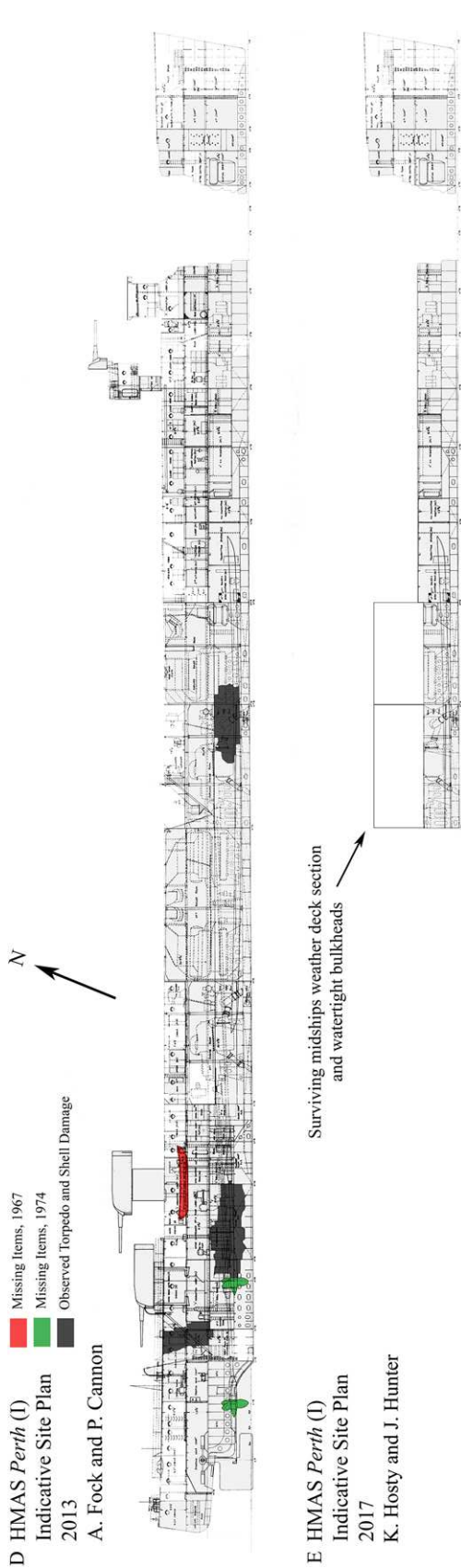


Figure 3. Indicative site plan of *Perth* adapted from original elevation schematic showing, from top, the shipwreck in: A: 1967; B: late 1970s; C: 2009; D: 2013; and E: 2017 archaeological survey (Image courtesy ANMM and ARKENAS).

torpedo tubes were observed lying underneath the port side of the ship, and the starboard-side tubes were trained outboard, with all their torpedoes missing and presumably discharged. The superstructure and bridge deck were still relatively intact and attached to the main deck, although their exterior port sides were suspended approximately 1m above the adjacent seabed. The bridge showed signs of severe shell and shrapnel damage; numerous penetration holes and associated torn plating were evident, and the standard compass and most of *Perth's* navigational instruments were noticeably missing (Burchell, 1971: 87–90).

Working with members of the Indonesian Navy, and with permission from both the Australian and Indonesian governments, Burchell recovered a number of items from *Perth*, including voice tubes, gyro compass repeaters, a compass binnacle, bridge signalling lamp, compass indicator, and starboard range finder. He also retrieved several portholes and 4-inch shell casings (Burchell, 1971: 109–119). These items were later presented to the Australian War Memorial, the RAN, and branches of Australia's Returned Services League (*The Canberra Times*, 13 November 1967).

According to Winslow (1984: 186–187), in July 1973 salvage divers authorized by the Indonesian Government and led by retired Indonesian Major General Soehardi discovered the shipwreck site of USS *Houston* and recovered one of its bells. The bell was later presented on behalf of the Indonesian people to American Ambassador Francis J. Galbraith. Around the same time, salvage work also occurred on *Perth* and resulted in removal of all of the wreck-site's 4-inch guns, some of the bridge structure, and at least two phosphor-bronze propellers, likely from the starboard, or uppermost, side of the shipwreck. Most, if not all of these items had disappeared by the early 1970s (Fig. 3b). One of *Perth's* bells was also recovered, most likely by the Soehardi-led salvage team, and later presented to the Australian War Memorial in 1974 (*The Canberra Times*, 25 November 1974). The other *Perth* bell was recovered sometime during the late 1970s or early 1980s, and subsequently acquired by the City of Perth in Western Australia. This bell is now on display in the foyer of Perth's City Hall (Royal Australian Navy, 2017).

With the advent of scuba diving and cheaper international airfares, *Perth* and *Houston* became popular technical-diving attractions by the mid 1990s. Several hundred divers visited both sites each year, and many published images of their visits in diving magazines such as *Scuba Diver*, *Triton* and *Advanced Diver Magazine* (Denley, 2006: 26–29). However, others chose to keep their visits to *Perth* and *Houston* confidential out of concern that what they were doing violated each shipwreck's sanctity as a 'war grave':

When I dived *Perth* back in 1993, we kept it quiet because of that concern and because wrecks like *Perth* or *Repulse*

and POW [HMS *Prince of Wales*] were then off limits. They now feature as regular dive trips; if they're war graves, then they should be off limits. Indonesia's a poor country and having spent 15 years living in Asia, I've seen many examples of foreigners pillaging historical Asian wrecks, as well as souvenirs from the *Perth* and other Allied war grave sites like *K17*. We shouldn't be too self-righteous about this. (Robertson, 2012)

Although it is hard to quantify the number of divers who visited *Perth* between its discovery in 1967 and commencement of large-scale commercial salvage activities in 2013, a desktop survey of diver-oriented websites was initiated to develop a general figure. Sources consulted included:

- Online forums such as 'DiveOz' (DiveOz, 2012);
- Dive charter operators (Tech Asia, 2013);
- Diving clubs and associations (Royal Australian Navy Communications Branch Association, 2012);
- Personal websites (Faltot, 2002 and Constable, 2015);
- Facebook posts; and
- YouTube and Vimeo uploads (see tjm1356, 2010; Robertson, 2012; King, 2013; Nama, 2015a-b; Livingseas Asia, 2016a-d).

Collectively, these sources indicate that not only did an increasing number of divers visit *Perth* during this period, but the impact of those divers on the wreck-site was significant. Small-scale salvage activities initiated by visiting divers, such as removal of portholes, cabin fittings, loose 4-inch and 6-inch shell casings, and personal artefacts, were exacerbated by associated activities including penetration dives, grabbing and grasping wreck structure, anchoring, use of shot lines, and attachment of buoys and downlines.

Despite these activities, and the battle damage sustained by *Perth* in 1941, the majority of YouTube uploads and online posts reveal *Perth's* remarkable state of preservation during this period (Fig. 4). The sheer size and grandeur of the 6000-ton cruiser is evident, with most of its hull and superstructure largely intact and proud of the seabed, and the barrels of 'X' and 'Y' Turrets still *in situ* and pointing upwards towards the surface (Hosty *et al.*, 2017: 54–66).

In 2009, Australian technical diver Andrew Fock visited *Perth* and described the wreck-site in a report to the Royal Australian Navy and the Naval Attaché at the Australian Embassy in Jakarta. He noted that the ship was essentially complete, with all 6-inch turrets still *in situ* and their associated gunhouses intact (Fig. 3c). The notable exception was the Oerlikon machine gun tub atop 'B' Turret, which was missing and had either fallen off or been intentionally removed. Damage inflicted on *Perth* during the Battle of the Sunda Strait was still discernible, particularly in the areas around Frames 23 and 180 where the ship had been struck by torpedoes. The bow structure forward of the torpedo damage at Frame 23 was still largely intact, with the hawse pipes and Forecastle Deck



Figure 4. *Perth's* 'X' Turret *in situ* (top) and one of the torpedo launchers in the surrounding debris field (bottom) demonstrate that the shipwreck was largely intact and in a relatively good state of preservation as recently as 2010. Both of these features have since been completely removed from the site (Images courtesy Andrew Fock).

in their original positions. Other elements of ship's architecture, equipment and armament that remained *in situ* included the superstructure aft of 'B' Turret, foremast, aircraft crane and catapult, port torpedo tubes, and Admiral's accommodation area forward of 'X' Turret (Fock and Cannon, 2013a: 22–23).

Fock also noted areas where extensive salvage had occurred during the 1960s and 1970s. These included the bridge, which 'was stripped of most of its equipment, voice pipes, rangefinders etc. as well as its outer shell which contained 15 and 20Ib bullet-proof plating' (Fock and Cannon, 2013a: 23). Another area impacted by salvage was the 4-inch Gun Deck, which was intact but missing all of its twin Mark XIX mountings. The adjacent After Control position



and searchlight platform were also absent. While the pedestals for the Director Control Tower (DCT) and High Angle Director Tower (HADT) were still *in situ*, the HADT itself was missing. What remained of the DCT was lying inverted on the seabed beneath the bridge (Fock and Cannon, 2013a: 22–23).

### Large-scale destruction (2013–2017)

By late 2013 *Perth*'s condition had radically changed and visiting divers notified the Australian Federal Government that the shipwreck appeared to have been salvaged by commercial divers (Fig. 3d). These activities resulted in removal of the cruiser's entire superstructure along with its forward 'A' and 'B' Turrets, the aircraft catapult, portside crane, and forward deck (Fock and Cannon, 2013b: 6–8).

News of these salvage activities was immediately picked up by Australian national media, as well as international media outlets. Many people, including those whose family members perished on the cruiser, were dismayed to learn that *Perth* was not considered a war grave or protected under any national or international heritage legislation (*ABC News Online*, 13 December 2013; Bancroft, 2013; *News Limited*, 14 December 2013; *SBS News Online*, 13 December 2013; *The Herald Sun*, 23 January 2014).

Alarmed that the wreck of a sovereign Australian warship was being heavily salvaged, and such activities were likely to disturb or destroy the remains of RAN sailors lost during the Battle of Sunda Strait, Australia's then-Chief of Navy, Vice Admiral Ray Griggs, immediately wrote his counterpart Admiral Dr Marsetio, the Chief of the Indonesian Navy, and asked for assistance. At the same time, the RAN approached ANMM and asked that it lead a maritime archaeological survey of *Perth*. The purpose of the survey would be to assess the site, document alleged damage to its surviving hull and associated artefacts, and to develop a case for declaring it a protected asset under Indonesian cultural heritage legislation.

In Indonesia, the reports of illegal salvage motivated the *Pusat Penelitian Arkeologi Nasional* (National Archaeological Research Centre, or ARKENAS) and the Directorate PCBM (Conservation and Museums Office) to carry out an archaeological inspection of *Perth*. They were accompanied by a team of divers from the US Navy (USN) and Indonesian Navy (TNI-AL), who were participating in a Cooperation Afloat Readiness and Training exercise in Indonesia in 2014 (*The Jakarta Post*, 26 May 2014; *The Republic*, 20 August 2014). The survey indicated obvious signs of disturbance had occurred along *Perth*'s bow and superstructure, but the shipwreck's midships and stern sections were still intact (see United States Naval History and Heritage Command, 2014; Adhityatama, 2014). In addition, both aft 6-inch gun houses were still present and complete.



Figure 5. Damage to *Perth*'s 'A' Turret gun house, as observed during the 2015 DIVEX survey (Image courtesy Arthurgwain Marquez/US Navy).

In October 2015, the USN and TNI-AL again conducted several survey dives on *Perth* as part of another military exercise, DIVEX 2015 (Marquez, 2015). The results of these dives were discussed at the International Conference on World War Two Maritime Heritage hosted by the Australian, British, and United States Embassies in Jakarta later that month. The conference was attended by Indonesian, Australian, British and American law enforcement and military personnel, archaeologists, and cultural heritage advisers.

Video footage acquired during the DIVEX 2015 survey revealed several large breaches along *Perth*'s starboard hull, as well as torn and buckled plating, damage to the forward 6-inch gun housings, and significant deposits of small artefacts that appear to have been disturbed by salvage activity (Fig. 5). The upper deck was still intact, but no evidence remained of the vessel's superstructure. Both 'X' and 'Y' Turrets were still intact, and at least one starboard-side propeller shaft and hanger remained *in situ* at the vessel's stern. However, some hull plates were torn and/or missing along the main deck at the stern near the starboard fairlead (Marquez, 2015)

### Survey and assessment (2016–2017)

Although *Perth* and *Houston* were inspected by ARKENAS, TNI-AL, and the USN in 2014 and 2015, the Australian-led archaeological survey of *Perth* (planned for the same period) was delayed by a number of unforeseen issues (Hosty *et al.*, 2017; see also Ministry of Research, Technology and Higher Education, 2015; *ABC Lateline*, 29 April 2015). Consequently, ANMM and ARKENAS were unable to undertake a preliminary remote sensing investigation of both sites until November 2016, when each was the focus of multi-beam echo sounder (MBES) and sidescan sonar (SSS) surveys.

Analysis of the MBES and SSS data indicated the presence of a 60m-long linear void within *Perth*'s

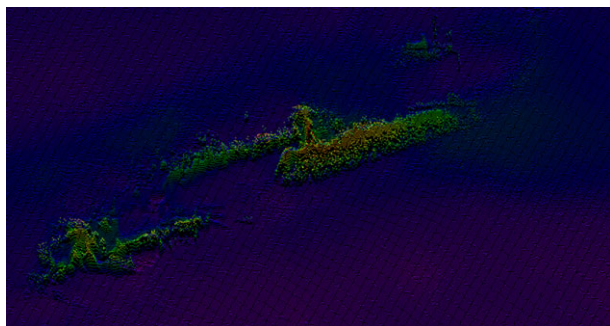


Figure 6. Multi-beam Sonar and Echo Sounder image of *Perth's* shipwreck site, as recorded in December 2016. Note the large linear anomaly in the centre of the surviving hull. This was later confirmed to be a void caused by large-scale salvage activities (Image courtesy Australian National Maritime Museum and ARKENAS).

surviving hull (Setiawan and Kel, 2016: 24–27). Although this anomaly could have been caused by a build-up of seabed sediments, it also potentially indicated structural collapse or complete absence of hull structure (Fig. 6). The site's overall dimensions were also smaller than anticipated and suggested that either a 70m section of hull had become completely buried by sand or sediment, had collapsed to the seabed, or was removed as a result of salvage activities (Setiawan and Kel, 2016: 24–27).

In the wake of the 2016 remote sensing survey, ANMM maritime archaeologists travelled to Indonesia in May 2017 to conduct an in-water survey of *Perth*. They were joined by Indonesian archaeologists from ARKENAS, the *Kementerian Kelautan dan Perikanan* (Indonesian Ministry of Maritime Affairs and Fisheries) and *Balai Pelestarian Cagar Budaya* (Cultural Heritage Preservation Office). The team was rounded out by a TNI-AL Security Officer and two local dive guides from the nearby city of Serang.

The survey was conducted from a fishing vessel that operated from the small fishing port of Karangantu, which is located 11km north of Serang City in western Java's Banten Province. GPS data obtained from the 2016 survey was used to direct the boat captain to *Perth's* location; however, the team found the site already marked by a makeshift buoy and intermittent slicks generated by bubbles of fuel oil leaking from the shipwreck's surviving hull. Using the line attached to the buoy as a readymade shot line, the survey team carried out a series of dives over the course of four days. One-and-a-half days were spent investigating the cruiser's bow section, and the remainder focused on the surviving midships and stern.

In terms of depth, *Perth's* surviving starboard side is located in 22m of water and the deepest point in which remains of the port side are located is 38m. Consequently, the site is not considered a particularly deep dive, but is subject to a seasonal oceanographic phenomenon known as the 'Indonesian Throughflow'

(Pandey and Pandey, 2006; Sprintall *et al.*, 2009). This strong (2–3 knots) current passes through Sunda Strait and makes swimming difficult, if not impossible at times. In addition, underwater visibility is often reduced to a few metres. To circumvent the latter issue, the survey team carried cave reels as it navigated around the site.

### 2017 survey results

*Perth's* bow has largely collapsed to the seabed, most likely as a consequence of a Japanese torpedo strike on this section of the ship during the Battle of Sunda Strait, and subsequent natural deterioration of the damaged hull. The remains of the bow, which consist of deck and hull plating, steel hull frames (floors, side brackets and margin plates) and remnants of the starboard deck capstan, lay scattered on the seabed in 36m of water. Other than the Cable Locker, no evidence exists of intact internal hull compartments that once comprised the forward section, including the Lower Mess, Shipwright's Store, Paint Store, Lamp Room, Aviation Spirit Compartment and Compressor Room (Hosty *et al.*, 2017: 91–92).

Aft of the surviving bow, the starboard hull is relatively intact in places, and rises between 6–16m off the seabed. However, *Perth's* two forward Mark XXI, 6-inch twin turrets ('A' and 'B')—which weighed more than 95 tons apiece—have now completely disappeared from the site (Frame, 1993: 16). Their absence is undoubtedly the result of salvage activities that occurred sometime after 2013 and before 2015 when the site was inspected by ARKENAS archaeologists and USN divers (Hosty *et al.*, 2017: 92–93).

Evidence of forward internal compartments such as the Stokers' Mess, Auxiliary Wireless Office, or the 6-inch and 4-inch magazines, ammunition lobbies, and shell rooms, was not noted during the 2017 survey. However, numerous 4-inch projectiles—without their associated cartridge cases—and one 6-inch projectile were observed either atop or adjacent to surviving starboard hull plating (Fig. 7). This strongly suggests the magazines and/or ammunition lobbies and shell rooms were breached and their contents removed or displaced sometime after 2013.

The team compared its observations with video and still imagery from past dives and determined that approximately 60% of *Perth's* starboard hull plating was removed between October 2015 and December 2016. The missing hull covers an area from just below the main deck to immediately above the turn of the bilge (between Frames 76 and 151). Missing hull plating roughly corresponds with the portion of starboard hull that was originally protected by a belt of 3-inch (76mm) thick armour plate. The armour belt was installed over 1-inch (25mm) thick hull plates in the ship's machinery spaces, while 2-inch (50mm) thick armour plating covered 1-inch (25mm) thick hull plates below the waterline in the area of the 4-inch and 6-inch magazines (NAA, MP551/1, 137/P47). In terms of

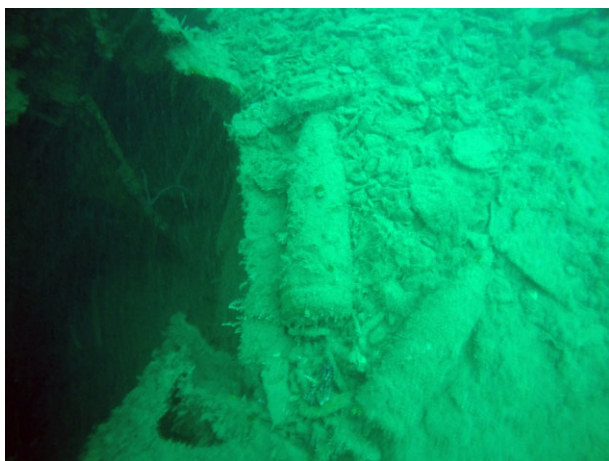


Figure 7. 4-inch and 6-inch projectiles found scattered throughout *Perth*'s surviving hull suggest the magazines have been breached as a consequence of large-scale salvage activities (Image courtesy Australian National Maritime Museum and ARKENAS).

overall size, the affected area measures approximately 43m in length, and 8m in width. *Perth*'s armour belt was strategically placed to protect its forward and aft steam turbine (engine) rooms and boiler rooms from damage (Hosty *et al.*, 2017: 93).

Deliberate removal of *Perth*'s armour belt, underlying hull plating, and most of the vessel's internal steel frames, bulkheads, and decks has radically altered the overall appearance of the site. Once relatively intact and recognizable as a warship, the cruiser's hull has now been reduced to a three-sided box (Fig. 3e). It is now possible to descend directly from the surviving outer starboard hull plating to the inner port hull plating 16m beneath it. During this transit, one passes through the gutted remnants of the ship's internal compartments and cellular double bottom (Hosty *et al.*, 2017: 93).

While corrosion and battle damage could account for the absence of some armour belting and hull plating, the majority of missing hull components have been deliberately removed by commercial salvage. Similarly, small areas of what appear to be stockpiled copper and copper-alloy cable and piping were noted atop the surviving starboard hull. These items appear to have been systematically removed and set aside for later recovery. The most likely rationale for removal of the above items is that they are being targeted for their metallic content. Because *Perth*'s internal architecture has been so detrimentally affected, its surviving deck plating is starting to peel away from existing bulkheads and will very likely collapse to the seabed at some point in the future (Hosty *et al.*, 2017: 94).

Since October 2015, *Perth*'s internal compartments have been systematically salvaged, and many of its bulkheads, decks, and internal fittings removed. Additionally, three of the vessel's four Parsons geared

steam turbine sets—consisting of a low-pressure astern turbine, a high-pressure turbine, and a cruising turbine—three condensers, and four Admiralty-type three drum boilers, have been removed. Individually these are extremely large and heavy pieces of machinery that would have required considerable resources and effort to displace and recover. There is no possibility that they could have been completely removed via natural processes; consequently, they must have been deliberately targeted and removed through salvage activities (Hosty *et al.*, 2017: 94–95).

Approximately 70m of *Perth*'s articulated stern has also disappeared since October 2015. This section of hull extended forward from the sternpost to the aftermost engine room bulkhead and comprised between 2800 and 3000 tons of steel alone. Absent too are the vessel's four propeller shafts, two aftermost ('X' and 'Y') 6-inch gun turrets, 6-inch shell magazines, ammunition lobbies, officers' wardroom and cabins, gyro room, and steering gear compartment. Again, the removal of these elements of armament and ship's architecture is clearly a deliberate act of salvage and must have been carried out using substantial equipment, such as a crane-operated grab or claw mounted on a barge of significant size (Hosty *et al.*, 2017: 95).

Evidence of ongoing small-scale salvage was also noted in the form of lifting slings wrapped around various hull components, a chain block, water-dredge hose, and a hammer and chisel (Fig. 8). These activities, while damaging, are relatively small scale when compared to the industrial-scale salvage that has also occurred and would not have caused the vast majority of damage observed by the survey team.

## Discussion

According to MacLeod (1987), the approximate rate of corrosion of iron and steel in seawater is 0.1mm per year, 1mm every ten years, or 10mm every 100 years. This rate can more than double if the vessel was wrecked or lost in shallow water and if the pH, dissolved oxygen, and water temperature in the vicinity of the shipwreck site are high. In the case of *Perth*, the vessel's hull plating was approximately one inch (25mm) thick, and the armoured belting that protected the steam turbine rooms and boiler rooms was approximately three inches (75mm) thick, while the armour plating below the water line protecting the 4-inch and 6-inch shell rooms and magazines was two inches (51mm) thick. *Perth*'s superstructure, along with many of its internal room and cabin partitions, was of lighter construction. The notable exceptions were the vessel's 23 watertight and oil-tight bulkheads (Commission of Inquiry, 2009).

Following an examination of the 2016 MBES and SSS survey data, the team expected to see some damage to *Perth*'s stern and midships sections, as well as impacts to starboard hull plating. Of more pressing concern was the apparent absence of a sonar return from *Perth*'s



Figure 8. Evidence of small-scale salvage activities observed on the *Perth* shipwreck site in 2017 included a hammer and chisel (top) and small chain block (bottom) (Image courtesy Australian National Maritime Museum and ARKENAS).

adjacent engine and boiler room areas. While damage was anticipated, the team did not expect to encounter the complete absence of the vessel's stern section, stern gun houses, propeller shafts, engine, and boiler room components, as well as the near-complete removal of internal bulkheads and decks. Given that many of *Perth's* missing components—including armoured belting, magazines, watertight and oil-tight bulkheads and gun turrets—were manufactured from steel at least 25mm thick, metal corrosion alone clearly does not explain the loss of so much structural material.

### **Human remains**

Archaeological and historical data indicate that both ancient and modern shipwrecks that are located in areas of heavy sedimentation, have been quickly buried, or otherwise sealed within a deoxygenated environment, and have not been subjected to excess current, provide favourable environments for the survival of human skeletal material (Bell and Elkerton, 2007; MacLeod, 2008). In the case of *Perth*, there is high probability that human skeletal remains were, and in some cases still are, present in areas of the ship that sustained heavy shell

and torpedo damage, and where crew members were reported to have been killed, injured, or trapped. These areas include the now missing 'A' Turret; 4-inch Gun Deck and Flag Deck; the 4-inch Magazine, where battle damage prevented crewmen working in this area from escaping; Forward Steam Turbine (Engine) Room; Aft Boiler Room; and the Forward Damage Control Room and adjacent workshop space (NAA: MP1185/8, 1932/2/20).

Fock and Cannon (2013b: 19–21) state that human remains may also have been present in *Perth's* Sick Bay and Signal Distribution Office, as well as both 6-inch magazines and their respective ammunition lobbies, and shell and handling rooms. While no human remains were observed during the 2017 survey, seabed conditions noted by the team strongly suggest human remains exist within and around the remains of *Perth's* hull. This is especially true of areas that retain significant deposits of silt and other fine-grained sediments. Areas of heavy sedimentation observed during the 2017 survey include the inner port hull plating of the Aft Engine Room, Aft Boiler Room, Forward Engine Room and adjacent Forward Boiler Room (between Frames 86 and 151), and the inner port hull plating between Frames 53 and 71. The latter area is adjacent to the 4-inch Magazine and 'B' Turret Shell Room.

Environments featuring heavy concentrations of silt and other fine-grained sediments have fostered preservation of skeletal remains on several submerged Japanese Second World War shipwreck sites at Chuuk (Truk) Lagoon (see Jeffery, 2004: 118; Edney, 2006: 204). Even aircraft crash-sites of the period with less overall sedimentation have proven conducive to skeletal preservation, including an American B-24 Liberator recently investigated off the Croatian coast (Katz, 2017). Skeletal remains have also reportedly been encountered during recent salvage of Battle of the Java Sea shipwreck sites, which share a number of general attributes with *Perth*—including water depth, seabed environment, sediment matrix, and geographic locale (*The Guardian*, 28 February 2018).

### **Artefacts**

Prior to 2013, before substantial, invasive, and destructive commercial salvage of *Perth* commenced, the site would have contained significant quantities of artefacts associated with the ship and its crew. Because the vessel is lying on its port side, the majority of this material would have been deposited—as a consequence of gravity—on the inner port side of surviving longitudinal bulkheads. Areas where dense concentrations of artefacts are expected to have collected include the inner port side of both magazines and shell rooms, both engine and boiler rooms, *Perth's* various mess areas, the Officers' Aft Baggage Room, Officers' and Warrant Officers' Cabins and Wardrooms, Engineers' Workshop, Sick Bay, Seaman's Cloak Room and Recreation Space (Hosty *et al.*, 2017: 100).



Figure 9. One of many artefact-rich sediment deposits observed on the *Perth* shipwreck site in 2017. This deposit was located atop a longitudinal bulkhead immediately forward of Frame 80 and contained buckles, buttons, a rubber Wellington boot, and a pair of spectacles (Image courtesy Australian National Maritime Museum and ARKENAS).

During removal of the ship's superstructure in 2013, and subsequent destruction of the 'tween deck compartments in 2015 and 2016, the vast majority of artefacts would have either been destroyed by salvage activities or completely removed from their original contexts by salvage crews or strong currents that frequently affect the site. Although damage to *Perth's* archaeological deposits has been tremendous, the 2017 survey team nonetheless observed significant, complex, and deep deposits of artefact material. These deposits mostly comprise silt and fine-grained sediments and contain a variety of small finds, including uniform buttons, buckles, a pair of spectacles, leather shoes, rubber boots, cotton clothing fragments, a glass deck light, ceramic tiles, firebricks, and small-arms ammunition. The areas of highest artefact density include the inner port side hull plating of the Forward Engine Room, Forward Boiler Room, (between Frames 86 and 151), as well as the inner port side hull plating between Frames 53 and 71 (adjacent to the 4-inch Magazine and 'B' Turret Shell Room) (Hosty *et al.*, 2017: 101).

The largest and most diverse concentration of artefacts was noted atop a longitudinal bulkhead immediately forward of Frame 80, next to either the Number One Gunner's Store or the 4-inch Magazine (Fig. 9). It contained coverall buckles, uniform buttons, a rubber wellington boot, and a pair of spectacles. Another artefact concentration was observed in the Forward Engine Room, just forward of *Perth's* only remaining steam turbine. The deposit was located atop surviving starboard hull plating, where artefacts had settled after having been disturbed and moved by salvage activity. The most fragile artefact encountered during the survey—a cotton glove—was observed partly buried within a deep silt deposit that had fostered



Figure 10. Localized oil slick created by bubbles of fuel oil floating to the water's surface above the *Perth* shipwreck site (Image courtesy Australian National Maritime Museum and ARKENAS).

the deoxygenated environment necessary for its survival (Hosty *et al.*, 2017: 101).

### **Fuel oil**

The 2017 survey team observed and documented fuel oil escaping from *Perth's* surviving hull (Fig. 10). These contaminants present significant environmental and health hazards for divers that visit the site, as well as the local fishing community and the broader population that lives along Banten Bay's coast. In 1941, *Perth* had a total fuel oil capacity of around 1768 tons. This figure included 1535 tons of furnace oil and 233 tons of diesel oil for the ship's generators. *Perth* also stored an unknown quantity of aviation spirits. The fuel oil and aviation spirits stores were retained in 27 fuel oil tanks and one aviation fuel tank. When *Perth* departed Tanjong Priok in late February 1942, it was carrying an estimated 900 tons of fuel (NAA: MP1185/8, 1932/2/20). Fock and Cannon (2013b: 21–23) state:

It is estimated that three tanks, A2, A4 and Y3 were ruptured during the battle... Furthermore, it is possible that any combination of another eight tanks, A1, A3, A8, X1, X2, Y1, Y2, and Y4 may also have been breached. It must be noted that while X1 was in the direct vicinity of the torpedo hit that destroyed 'A' Boiler Room and the Forward Engine Room, the depth of this hit and comparatively small hole is not conclusive evidence of a breach. This leaves the unknown contents of 16 tanks unaccounted for.

*Perth's* aviation spirits storage area was located forward in close proximity to the torpedo strike in the bow, and it seems likely these tanks were ruptured and their contents released at the time of the vessel's loss. Other tanks may have been damaged as well, given that Burchell noted seepage of fuel oil when he discovered the wreck-site in 1967. Recent salvage activities at the wreck-site have certainly breached or destroyed many of the vessel's remaining fuel storage areas. However, the midships section of *Perth's* cellular double bottom is still substantially intact, as is the lower section of the

ship's starboard hull. There is a high probability that fuel oil is still trapped within these areas of the site.

There are several options available to host and flag states that wish to mitigate the release of fuel and oil and other pollutants from Second World War shipwrecks. These include ongoing monitoring and *in situ* conservation of the shipwreck and oil, sourcing the leak and capping fuel/oil contaminants using oil resistant silicon fillers and adhesives, and entombing the wreck and offloading the fuel/oil by 'hot tapping' the oil source. All options have costs associated with them. Barrett (2011) states that average recovery/mitigation costs are in the region of \$US 2.25 to \$US 200.00 per US gallon (3.78 litres).

### **Unexploded ordnance**

According to an archival account of *Perth's* sinking, *The Loss of HMAS Perth*, the ship was armed with 1042 rounds of 6-inch Common Pointed Ballistic Cap (CPBC) shells at the beginning of the Battle of Sunda Strait (NAA: MP1185/8, 1932/2/20). The ammunition was divided more or less evenly among the four 6-inch shell rooms and two 6-inch magazines. *Perth* also had 30 rounds per gun (60 rounds per turret) of High Explosive (HE) 6-inch shells. At 23:45 on 28 February, the gun crews of 'A' and 'B' Turrets reported they only had five or six rounds per gun remaining. At about midnight, both 'A' and 'B' Turrets had expended all CPBC and HE shells, and 'B' Turret was firing practice projectiles. The gun crews of 'X' and 'Y' Turrets reported only eight rounds per gun remaining.

As regards the 4-inch secondary armament, *Perth's* gunnery report prior to the Battle of Sunda Strait notes all switches on the 4-inch guns were left at 'HA' (High Altitude) due to the possibility of aircraft attack during the night (NMM: MP1185/8, 1932/2/20). P1 (Port side No.1 4-inch) and S1 (Starboard-side No.1 4-inch) fired star (illuminating) shells as directed by *Perth's* Fire Direction Officer. All illuminating shells (170 rounds) were expended by about 00:02 on the morning of 1 March 1942.

P2 (Port side No.2 4-inch gun) and S2 (Starboard-side No.2 4-inch gun) fired either Low Level Air Defence or possible LADDER salvos under the direction of *Perth's* Fire Direction Officer. Eighty-six rounds of this type were expended by 23:40 on 28 February before the crews switched to HE rounds and set their fuses to the greatest possible distance. Approximately 150 shells per gun were expended, totalling 600 rounds (NMM: MP1185/8, 1932/2/20). The same report goes on to state that all eight of *Perth's* torpedoes were discharged during the engagement, and that once the order to abandon ship was announced the depth charges at the stern of the ship were disarmed and released.

In the case of the remaining ammunition aboard *Perth*, there is a high likelihood that both the 4-inch and 6-inch shells used SC (solvent-less cordite/solvent-less carbamate) made up of nitrocellulose, nitro-glycerine,

and centralite as a propellant. This substance was incorporated within each 4-inch shell casing, or the propellant cartridge for each 6-inch round (DiGiulian, 2009). Both of the vessel's stores of 4-inch and 6-inch shells used a combination of picric acid and guncotton (Lyddite), or toluene and ammonium nitrate (Amatol), in their HE shells.

Since 2013, the ship's 4-inch magazine and its two 6-inch cartridge magazines and associated shell rooms have been breached, and some of their contents have been salvaged or dispersed elsewhere throughout the site. Nonetheless, the site still retains a significant quantity of exposed 4-inch and some 6-inch projectiles (Fig. 7). Their dispersal indicates human rather than natural intervention; in the case of the 4-inch shells, the brass cartridges have likely been specifically targeted for their metallic content and the less-valuable, and considerably more dangerous, projectiles have been left on site. Some of the shells are clearly leaching picric acid—a chemical component of the fuse used to detonate them—that makes them not only extremely toxic but also highly unstable (DiGiulian, 2009; National Institute for Occupational Safety and Health, 2007).

Modern safety standards recommend storing picric acid-based explosives wet or in an aqueous solution, as dry picric acid is very sensitive to shock and friction. Picric acid also reacts to the presence of copper, lead, zinc, and other metals, as well as to salts. When exposed to salts, picric acid can form into metal picrate salts that are shock sensitive and extremely hazardous. It is highly recommended that shipwrecks that contain picric acid-based munitions not be disturbed (Albright, 2012).

### **Why salvage? Why now?**

Historical data and the results of the May 2017 site inspection indicate four general stages of salvage activity have occurred on *Perth's* wreck-site since its discovery in 1967. These include:

- 1) Historic salvage that commenced with Burchell's discovery of the site in 1967, and ended with the recovery of *Perth's* 4-inch guns and starboard propellers in the mid 1970s;
- 2) Recreational/technical diver salvage and souveniring that has occurred from the mid 1980s to the present;
- 3) Opportunistic and small-scale salvage by local fishermen that has occurred from the mid 1980s to the present and;
- 4) Planned, large-scale commercial salvage that has occurred from 2013 to the present.

While all salvage and artefact recovery—including archaeological excavation—is destructive in nature, the greatest impact to *Perth* has been caused by planned, ongoing, large-scale commercial salvage of the site that was first observed in 2013. Underwater salvage is a complex, risky, and expensive commercial

enterprise. Costs associated with such work would seem to outweigh any profit made from the sale of corroded steel, iron, and copper-alloy metals. While the motives behind large-scale salvage of *Perth's* remnants remain unclear, the possibility exists that the work is related to current demand for 'low-background' metals.

Historic shipwrecks—and particularly those of large, steel-hulled warships sunk prior to July 1945—are one of the world's few reliable sources of 'low-background' steel, lead, and copper-alloys. These shipwrecks contain thousands of tons of steel, lead and copper that has been isolated from increasing amounts of atmospheric radiation caused by above-ground atomic detonations that commenced with the Trinity atomic bomb test in July 1945 (Van der Vat, 2012; *The Guardian*, 3 November 2017, 28 February 2018).

Although atmospheric radiation levels have gradually decreased since the *Partial Test Ban Treaty* of 1963, modern metal foundries—especially those that use blast furnace technology—are affected by remnant radioactive particles. Consequently, modern steel cannot be used to manufacture or house finely calibrated scientific and medical instruments such as Geiger Counters, Whole Body Counters, Lung Counters, Photonics and aeronautical and space sensors (Butler, 2006: 229; Baddeley, 2017).

As stated previously, recent salvage of pre-1945 warships is not limited to Indonesian waters. Similar events have recently occurred in Malaysia, Borneo and in Europe (*The Guardian*, 9 February 2017; *Tirto*, 22 January 2018; *The Guardian*, 28 February 2018). In 2016, McCartney (see also 2017a: 196–204, 2018) noted that unofficial salvage operators from Holland had specifically targeted the propellers, propeller shafts, steering engines, condensers, fresh water plants, turbine engines, and boilers on 16 out of 25 First World War warships sunk during the Battle of Jutland. Like *Perth*, all of these shipwrecks would be considered sovereign immune under international law and cannot be legally salvaged without the permission of either the United Kingdom or Germany.

#### **Site management and protection**

When large-scale commercial salvage of *Perth* was first discovered in late 2013, many Australians were surprised that the site had no legislative protection, either as a 'war grave', an historic shipwreck, or under Indonesian cultural heritage legislation. The Imperial War Graves Commission (IWGC)—now the Commonwealth War Graves Commission (CWGC)—was established in 1917 to ensure that the more than 1.7 million Commonwealth service personnel who died during the First World War would never be forgotten. This objective is achieved through the establishment and maintenance of cemeteries and memorials at 23,000 locations in 154 countries. In addition to commemorative sites, the CWGC conducts research, creates records, and develops databases that record details of those interred or memorialized. In some cases,

the CWGC initiates recovery of service personnel from the location(s) where they fell, attempts identification of recovered remains whenever possible, and reinters those remains at an authorized Commonwealth War Grave, Memorial, or Cemetery (see Summers, 2007: 30; Signoli and de Verines, 2011: 712; Commonwealth War Graves Commission, 2018).

In Australia, the CWGC falls under the purview of the Office of Australian War Graves, which is within the Department of Veterans' Affairs. The CWGC currently maintains seven War Graves and Memorials in Indonesia. These include the Ambon Memorial, Ambon War Cemetery, Jakarta (ANCOL) Netherlands Field of Honour, Jakarta (MENTENG PULO) Netherlands Field of Honour, Jakarta War Cemetery, Kembang Kuning Netherlands Field of Honour, and the Pandu Field of Honour, Bandung. Three of *Perth's* casualties are buried in the Jakarta War Cemetery. As *Perth* is not a designated war cemetery attached to a plot of land, the CWGC has no legislative control over *Perth's* wreck-site. Further, the shipwreck—like most other sunken warships—has no formal war grave status. As it lies outside Australian territorial waters, *Perth* is also not eligible for listing under either the Australian *Military Memorials of National Significance Act* (2008) or the *Historic Shipwrecks Act* (1976).

The anomaly regarding sunken sovereign vessels and their war grave status led the British Government to enact the *Protection of Military Remains Act* (1986), which provides protection for the wreckage of military aircraft and designated military vessels as either 'protected places' or 'controlled sites'. Under the Act, 12 vessels—including a German submarine—are listed as 'controlled sites' where all diving is banned. Fifty-five vessels are listed as 'protected places' where divers can visit the site but not remove, damage, or interfere with the vessel and its remains. Seventeen of these vessels are recorded as wrecked in international waters or, in the case of HMS *Prince of Wales* (1941) and HMS *Repulse* (1941), the waters of another Sovereign State—Malaysia (Ministry of Defence, 2001 and 2008; Office of Public Sector Information, 9 February 2017). Unfortunately, the *Protection of Military Remains Act* has no real legislative capability outside the waters of Great Britain and Northern Ireland and has provided little protection to *Prince of Wales* and *Repulse*, both of which have been extensively salvaged in recent years.

The United States has similar legislation in place. The *Sunken Military Craft Act* (2004) applies to all sunken United States military ships and aircraft wherever they are located around the world. The law also applies to all sunken foreign warships and aircraft in US territorial waters. The Act preserves the sovereign status of all sunken US military vessels by codifying both their protected sovereign status and permanent US ownership (Staniforth *et al.*, 2009: 15). Unfortunately, like the *Protection of Military Remains Act*, the *Sunken Military Craft Act* has no real legislative capability

outside American territorial waters and those of its protectorates and territories. Australia currently has no legislation similar to either the *Protection of Military Remains Act* or *Sunken Military Craft Act*.

### **Indonesian cultural heritage legislation**

While Indonesia has no specific legislation that covers underwater cultural heritage, it does have general cultural heritage legislation such as *Undang-Undang Republik Indonesia Nomor 11 Tahun 2010 Tentang Cagar Budaya (The Republic of Indonesia Act No 11 of 2010 Considering Cultural Heritage)*. This law can be applied to protect shipwreck sites such as *Perth* as a *Situs Cagar Budaya* (Cultural Heritage Site). Under the Act, natural or cultural heritage items including buildings, sites and landscapes both on land and under water can be protected, managed and preserved for their historical, archaeological, scientific, cultural, religious or educational significance so long as they are assessed and can meet the criteria for protection at either a National, Provincial or Municipal level (Fitri *et al.*, 2015).

Under the Indonesian *Regional Government Act No22/1999*, such protection requires the approval and support of the local Provincial Government. In the case of *Perth* and *Houston*, the supporting authority would be the Banten Provincial Government (Setyawati, 2014). The *Republic of Indonesia Act No 11 of 2010 Considering Cultural Heritage* currently protects sites such as the Borobudur Temple Compounds, Prambanan Temple Compounds, the Sangiran Early Man Site, Komodo National Park, Historical City Centre of Yogyakarta, the Old Town of Jakarta (Batavia) and the Historic and Marine Landscapes of the Banda Islands (Fitri *et al.*, 2015).

Following the *Perth* site assessment and production of an archaeological report (see Hosty *et al.*, 2017), the Australian Embassy in Jakarta—supported by ARKENAS—made a formal approach to His Excellency Wahidin Halim, the Banten Provincial Governor, to have *Perth* declared a *Situs Cagar Budaya* at the provincial level. The Australian Embassy, ARKENAS, Indonesian Ministry of Marine Affairs and Fisheries (responsible for marine, coastal, and fisheries resource management, control, monitoring, research, conservation and coastal community empowerment) and the Banten Provincial Government collaborated closely to have *Perth* declared a Local Maritime Conservation Area under *Indonesian Law No. 31 Year 2004 on Fisheries and its amendments* or *Indonesian Law No. 27 year 2007 on Management of Coastal and Small Island Areas*. This law regulates the planning, management, supervision and control of coastal regions and small islands (Setyawati, 2014).

## **Conclusion**

The destruction of HMAS *Perth* (I) is by no means a recent phenomenon, and indeed the genesis of the

wreck-site's decline can be traced to its discovery in 1967. While the 2016 and 2017 archaeological surveys documented extensive damage related to large-scale commercial salvage that occurred between 2013 and 2015, a review of archival and contemporary sources reveals that *Perth* has endured sporadic episodes of opportunistic salvage and souveniring for nearly five decades. Sadly, the sum total of these activities is that the wreck-site is now a shadow of its former self and has lost much of its value as an archaeological site and heritage asset (Fig. 3). Further, damage to the shipwreck has resulted in the exposure and dispersal of significant quantities of unexploded munitions, fuel oil, and other contaminants. Perhaps most importantly, the site's sanctity as the final resting place of Australian and British military personnel who perished aboard *Perth* during the Battle of Sunda Strait has been irrevocably disturbed.

Results of the 2016 and 2017 investigations reveal approximately 60% of *Perth's* surviving structure—including elements of the hull, superstructure, and primary and secondary armament that were largely intact as recently as 2013—was removed as a consequence of industrial-level salvage. Further, it is evident these components disappeared over a period of approximately two years, attesting to the speed and intensity of the salvage operation. While the exact identity of those responsible for large-scale damage to *Perth* remains unclear, the primary instigator(s) appear to be a syndicate based in mainland Asia (*Tirto*, 18 January 2018, 22 January 2018). Indonesians have been employed to perform most of the manual labour associated with the operation, including removal of shipwreck material and subsequent processing at onshore sites (*Tirto*, 18 January 2018). At least one of the vessels engaged in commercial salvage of *Perth's* wreck-site was interdicted and impounded by the TNI-AL in 2015, and its crew charged for operating illegally in Indonesian waters (*Tirto*, 22 January 2018).

Although largely negative, the destruction of *Perth* has also resulted in a few positive outcomes. Foremost among these has been the development of a strong collaborative relationship between ANMM, ARKENAS, and an array of relevant Indonesian Government agencies. This in turn has helped foster improved relations between the Australian and Indonesian governments. For example, *Perth* was one of the subjects of a February 2017 joint statement between Australian Prime Minister Malcolm Turnbull and Indonesian President Joko Widodo, which states in part:

Leaders acknowledge the 75th Anniversary of the sinking of HMAS *Perth* on 1 March. They reaffirmed their commitment to work together to strengthen cooperation in the area of maritime cultural heritage in accordance with respective national policy, laws and regulations (Office of the Prime Minister of Australia, 26 February 2017).



As evidenced by its recent interdiction of an illegal salvage vessel, the TNI-AL is taking a more proactive role in protecting *Perth*. Similarly, the RAN and Australian federal government have expressed a stronger commitment to the site's ongoing protection. Finally, and perhaps most significantly, Indonesia's Banten Province recently integrated *Perth* within the

spatial planning of its Marine Conservation Area, while the Ministry of Maritime Affairs and Fisheries declared the wreck-site (Core Zone) and an associated 100-hectare buffer (Zone of Limited Exploitation) the nation's first Maritime Conservation Zone on 28 February 2018—the 76th anniversary of *Perth*'s loss (Minister for Maritime Affairs and Fisheries, 2018).

## Acknowledgements

The effort to document and preserve HMAS *Perth* (I) would not have been possible without the contributions and support of Captains Katja Bizilj and Nick Hart, RAN (former Naval Attachés, Australian Embassy, Jakarta), Dr Andrew Fock, Dr I. Made Geria (Director, ARKENAS), His Excellency Dr H. Wahidin Halim (Banten Provincial Governor), Professor Ronny Rachman Noor (former Education and Cultural Attaché, Embassy of the Republic of Indonesia, Canberra), Her Excellency Ibu Susi Pudjiastuti (Indonesian Minister of Maritime Affairs and Fisheries), and Kevin Sumption (Director, ANMM). Special thanks are also due to the other members of the 2017 survey team: Yusuf Arief Afandy (*Kementerian Kelautan dan Perikanan*) and Turmudi M. Hum (*Balai Pelestarian Cagar Budaya*, Serang).

## Note

1. The shipwreck sites of HMS *Repulse* and HMS *Prince of Wales* were designated as Protected Places in 2002 under the United Kingdom's *Protection of Military Remains Act* (1986). Unfortunately, the designation does not appear to have deterred illegal salvage operations, as *The Telegraph* (26 October 2014) reported in October 2014 that both sites had been extensively damaged.

## References

- ABC Lateline*, Australia withdraws Ambassador to Indonesia after executions, 29 April 2015 (<http://www.abc.net.au/lateline/australia-withdraws-ambassador-to-indonesia-after/6432352>), accessed 14 June 2017.
- ABC News Online*, HMAS *Perth*: WWII warship grave stripped by salvagers, 13 December 2013 (<http://www.abc.net.au/news/2013-12-13/outrage-as-warship-grave-stripped-by-salvagers/5156320>), accessed 23 June 2015.
- Adhityatama, S., 2014, Survey of historical shipwreck of HMAS *Perth* in Banten Bay, Indonesia. *Varuna—Jurnal Arkeologi Bawah Air* **8**, 83–89.
- Albright, R., 2012, *Clean-up of Chemical and Explosive Munitions: Location, Identification and Environmental Remediation*. New York.
- Baddeley, B., 2017, Low background steel—so hot right now. *Hackaday* (<https://hackaday.com/2017/03/27/low-background-steel-so-hot-right-now/>), accessed 16 June 2017.
- Bancroft, C., 2013, ABC 24: HMAS *Perth* wreck being salvaged for scrap metal (<https://www.youtube.com/watch?v=UVGAbhXv5OY>), accessed 20 September 2015.
- Barrett, M., 2011, Potentially polluting shipwrecks: Spatial tools and analysis of WWII shipwrecks. Unpublished Master's thesis, Duke University, Durham.
- Bastock, J., 1975, *Australia's Ships of War*. Cremorne.
- Bell, L. and Elkerton, A., 2007, Unique marine taphonomy in human skeletal material recovered from the medieval warship *Mary Rose*. *International Journal of Osteoarchaeology* **18**, 5, 523–535.
- Burchell, D., 1971, *The Bells of Sunda Strait*. Adelaide.
- Butler, D., 2006, *Distant Victory: The Battle of Jutland and the Allied Triumph in the First World War*. Westport.
- Carlton, M., 2010, *Cruiser: The Life and Loss of HMAS Perth*. North Sydney.
- Cassells, V., 2000, *The Capital Ships: Their Battles and Their Badges*. East Roseville.
- Commission of Inquiry, 2009, *The Loss of HMAS Sydney II: Evidence and Conclusions*, Canberra.
- Commonwealth War Graves Commission, 2018, CWGC: About us (<https://www.cwgc.org/about-us.aspx>), accessed 22 June 2017.
- Constable, B., 2015, A brief history of the Australian cruiser HMAS *Perth* (<http://www.perthone.com/perth.htm>), accessed 10–15 August 2015, 25 April 2017.
- Date, J., 1989, HMAS *Perth*. Garden Island.
- Denley, K., 2006a, The Ghosts of Sunda Strait, Java Sea. *Advanced Diver Magazine* **23**, 26–29.
- Denley, K., 2006b, The Ghosts of Sunda Strait: The wrecks of HMAS *Perth* and USS *Houston*. *Sportdiving Magazine Australia* **118**, 54–59.
- DiGiulian, T., 2009, Naval propellants: A brief overview, *NavWeaps: Naval Weapons, Naval Technology and Naval Reunions* ([http://www.navweaps.com/index\\_tech/tech-100.php](http://www.navweaps.com/index_tech/tech-100.php)), accessed 22 June 2017.
- DiveOz, 2012, Dive original HMAS *Perth*, Sunda Strait, Indonesia, (<http://www.diveoz.com.au/index.php/diveoz-discussion-for-ums/dive-destinations-overseas-diving-destinations/24875-dive-original-hmas-perth-sunda-strait-indonesia.html>), accessed 14 August 2015.
- Dromgoole, S. (ed.), 1999, *Legal Protection of the Underwater Cultural Heritage: National and International Perspectives*. London.

- Dromgoole, S., 2006, United Kingdom, in S. Dromgoole (ed.), *The Protection of the Underwater Cultural Heritage: National Perspectives in Light of the UNESCO Convention 2001*, 313–350. Leiden.
- Edney, J., 2006, Impacts of recreational scuba diving on shipwrecks in Australia and the Pacific: A review. *Micronesian Journal of Humanities and the Social Sciences* 5.1, 201–233.
- Faltot, D., 2002, Diving in Sunda Strait ([http://www.asiaticfleet.com/diving\\_in\\_the\\_sunda\\_strait.htm](http://www.asiaticfleet.com/diving_in_the_sunda_strait.htm)), accessed 10 August 2015.
- Faltot, D. and Dinsley, B., 2004, Diving for the USS *Houston* in the Sunda Strait, Part II ([http://www.asiaticfleet.com/faltotca30\\_2.html](http://www.asiaticfleet.com/faltotca30_2.html)), accessed 10 August 2015.
- Fitri, I., Ahmad Y. and Ahmad, F., 2015, Conservation of tangible cultural heritage in Indonesia: A review of current national criteria for assessing heritage value. *Procedia—Social and Behavioural Sciences* 184, 71–78.
- Fock, A., 2013, *HMAS Perth (I): Condition of the Wreck (Part 2), Bow to After Turret Group*. Jakarta.
- Fock, A., 2014, *HRMS O-16 and HRMS K XVII: Site Report*. Melbourne.
- Fock, A., 2016, *Survey of Naval Wreck Sites in the Java Sea, 2016*. Melbourne.
- Fock, A. and Cannon, P., 2013a, *HMAS Perth (I): Condition of the Wreck (Part 1)*. Jakarta.
- Hosty, K., Hunter, J. and Adhityatama, S., 2017, *HMAS Perth Project 2017, Sunda Strait, Republic of Indonesia*. Jakarta.
- Jeffery, B., 2004, World War II underwater cultural heritage sites in Truk Lagoon: Considering a case for World Heritage Listing. *IJNA* 33.1, 106–121.
- Katz, B., 2017, Bones recovered from wreckage of WWII plane may belong to missing airmen, *Smithsonian* (<https://www.smithsonianmag.com/smart-news/human-remains-may-have-been-uncovered-wreckage-wwii-plane-180964081/>), accessed 4 June 2018.
- King, B., 2013, USS *Houston* & HMAS *Perth* (<https://www.youtube.com/watch?v=fO6Ag75OSe4>), accessed 20 March 2014.
- Livingseas Asia, 2016a, *Deep Inside... The HMAS Perth* (<https://vimeo.com/138584098>), accessed 25 May 2017.
- Livingseas Asia, 2016b, *HMAS Perth—Behind the Camera* (<http://vimeo.com/13858408>), accessed 25 May 2017.
- Livingseas Asia, 2016c, *HMAS Perth—Coming Into the Light* (<https://vimeo.com/138584094>), accessed 25 May 2017.
- Livingseas Asia, 2016d, *HMAS Perth—The Fate of HMAS Perth* (<https://vimeo.com/139828029>), accessed 25 May 2017.
- MacLeod, I., 1987, Conservation of corroded metals from shipwrecks, in M. McCarthy (ed.), *Iron Ships and Steam Shipwrecks: Papers from the First Australian Seminar on the Management of Iron Vessels and Steam Shipwrecks*, 93–104.
- MacLeod, I., 2008, Shipwreck graves and their conservation management. *AICCM Bulletin* 31.1, 5–14.
- Marquez, A., 2015, *USS Houston Dive Exercise, HMAS Perth B-Roll*. Washington, DC.
- McCartney, I., 2016, *Jutland 1916: The Archaeology of a Naval Battlefield*. London.
- McCartney, I., 2017a, The Battle of Jutland's heritage under threat: Commercial salvage on the shipwrecks observed 2000–2016. *The Mariner's Mirror* 103.2: 196–204.
- McCartney, I., 2017b, The Opening and Closing Sequences of the Battle of Jutland 1916 Re-examined: archaeological investigations of the wrecks of HMS *Indefatigable* and SMS *V4*. *IJNA* 46.2 317–329.
- McCartney, I., 2018, Scuttled in the Morning: the discoveries and surveys of HMS *Warrior* and HMS *Sparrowhawk*, the Battle of Jutland's last missing shipwrecks. *IJNA* 47.2.
- Minister for Maritime Affairs and Fisheries, 2018, *HMAS Perth Maritime Conservation Area, Number 21/KEPMAN-KP/2018*. Jakarta.
- Ministry of Defence (UK), 2001, Maritime military graves to receive greater protection ([https://www.operations.mod.uk/onthisday/newsItem\\_id%3D1111.htm](https://www.operations.mod.uk/onthisday/newsItem_id%3D1111.htm)), accessed 12 June 2018.
- Ministry of Defence (UK), 2008, Ten military shipwrecks protected as final resting places, (<https://www.mod.uk/DefenceInternet/DefenceNews/HistoryAndHonour/TenMilitaryShipwrecksProtectedAsFinalRestingPlaces.htm>), accessed 12 June 2018.
- Ministry of Research, Technology and Higher Education (Indonesia), 2015, Online Foreign Research Permit Application (<https://frp.ristekdikti.go.id>), accessed 24 February 2015.
- Nama, S., 2015a, FROGDive—wreck HMAS *Perth*—Sunda Strait—Java (<https://www.youtube.com/watch?v=yTGCpFBQI08>), accessed 25 May 2017.
- Nama, S., 2015b, FROGDive Ops *Houston 2*—wreck HMAS *Perth*, Sunda Strait (<https://www.youtube.com/watch?v=JfYo5QmlxmM>), accessed 25 May 2017.
- National Archives of Australia, Canberra. *The Loss of HMAS Perth*. MP1185/8, 1932/2/200.
- National Archives of Australia, Canberra. *HMAS Perth, Plan of Armour and Protection (as Fitted)*. MP551/1, 137/P47.
- National Institute for Occupational Safety and Health, 2007, *NIOSH Pocket Guide to Chemical Hazards*. Pittsburgh.
- Office of Public Sector Information (UK), *The Protection of Military Remains Act 1986 (Designation of Vessels and Controlled Sites) Order 2017*, 9 February 2017 (<http://www.legislation.gov.uk/uksi/2017/147/contents/made>), accessed 12 June 2018.
- Office of the Prime Minister of Australia, *Joint Statement between The Government of Australia and the Government of the Republic of Indonesia*, 26 February 2017 (<https://www.pm.gov.au/media/joint-statement-between-government-australia-and-government-republic-indonesia>), accessed 1 March 2017.
- Pandey, V. and Pandey, A., 2006, Heat transport through Indonesian throughflow, *Journal of Indian Geophysical Union* 10.4, 273–277.
- Peck, M., 2016, Japan's super torpedo was the hypersonic missile of World War II, *The National Interest* (<http://nationalinterest.org/feature/japans-super-torpedo-was-the-hypersonic-missile-wwii-15541>), accessed 22 June 2017.
- Pfennigwerth, I., 2007, *The Australian Cruiser Perth, 1939–1942*. Dural.
- Radio New Zealand*, Sunken navy ship grave looted, 15 December 2013 (<http://www.radionz.co.nz/news/world/230913/sunken-navy-ship-grave-looted>), accessed 30 June 2015.
- Republic of Indonesia, 2010, *Undang-Undang Republik Indonesia Nomor 11 Tahun 2010 Tentang Cagar Budaya* (Republic of Indonesia Act No 11 of 2010 considering Cultural Heritage). Jakarta.

- Roach, J., 1996, Underwater archaeology and the *Titanic*: The legal considerations, in A. Jarvis *et al.* (eds) *Proceedings, IXth International Congress of Maritime Museums*. Greenwich.
- Roach, J., 1997, Sovereign immunity, in J. Delgado (ed.), *Encyclopaedia of Underwater and Maritime Archaeology*, 398–399. London.
- Robertson, S., 2012, HMAS *Perth* Wreckpedition: Scuba diving on the wreck of the HMAS *Perth*, sunk on March 1, 1942 (<https://www.youtube.com/watch?v=fO6Ag75OSe4>), viewed 10 August 2015.
- Royal Australian Navy, 2017, HMAS *Perth* (I) (<http://www.navy.gov.au/hmas-perth-i>), accessed 15 July 2015, 10–15 August 2015.
- Royal Australian Navy Communications Branch Association, 2012, Sunda Strait dive—Aug. 2012 ([http://www.rancba.org.au/Sunda\\_Strait\\_Aug2012](http://www.rancba.org.au/Sunda_Strait_Aug2012)), accessed 14 August 2015, 25 May 2017.
- SBS News Online, HMAS *Perth* damaged by salvagers, 13 December 2013 (<https://www.sbs.com.au/news/hmas-perth-damaged-by-salvagers>), accessed 10 August 2015.
- Setiawan and Kel, 2016, *Wreck Inspection Survey: HMAS Perth and USS Houston*. Banten.
- Setyawati, 2014, Managing marine protected areas in Indonesia. *Journal of the Marine Biological Association of India* **56**.1, 13–18.
- Signoli, M. and de Verines, G., 2011, Burials related to recent military conflicts: Case studies from France, in M. Marquez-Grant and L. Fibiger (eds), *The Routledge Handbook of Archaeological Human Remains and Legislation: An International Guide to Laws and Practice in the Excavation and Treatment of Archaeological Human Remains*, 711–717. Oxon.
- Sprintall, J., Wijffels, S., Molcard R. and Jaya, I., 2009, Direct estimates of the Indonesian Throughflow entering the Indian Ocean, 2004–2006. *Journal of Geophysical Research: Oceans* **114**, 1–19.
- Staniforth, M., Hunter J. and Jateff, E., 2009, International approaches to underwater cultural heritage, in J. Harris (ed.), *Maritime Law: Issues, Challenges and Implications*, 1–25. Hauppauge.
- Summers, J., 2007, *Remembered: The History of the Commonwealth War Graves Commission*. London.
- Tech Asia, 2013, Diving the Sunda Straits August 2013—the wrecks of HMAS *Perth* and USS *Houston* ([http://www.asiadivers.com/technical-diving-philippines/images/techasia\\_diving/expeditions/Java\\_MoreInfo.pdf](http://www.asiadivers.com/technical-diving-philippines/images/techasia_diving/expeditions/Java_MoreInfo.pdf)), accessed 14 August 2015.
- USS *Houston*, Scavengers looting the wreck of HMAS *Perth* in Sunda Strait, 14 December 2013 (<http://www.news.com.au/scavengers-looting-the-wreck-of-hmas-perth-in-sunda-strait/news-story/0c6912e4017deb2965dcb30dcec31cf2>), accessed 30 June 2015.
- The Canberra Times*, 300 remember war dead, 13 November 1967.
- The Canberra Times*, *Perth* bell, 25 November 1974.
- The Guardian*, Images reveal three more Japanese WWII shipwrecks torn apart for scrap, 9 February 2017 (<https://www.theguardian.com/world/2017/feb/09/images-reveal-three-more-japanese-wwii-shipwrecks-torn-apart-for-scrap>), accessed 9 February 2017.
- The Guardian*, The world's biggest grave robbery: Asia's disappearing WWII shipwrecks, 3 November 2017 (<https://www.theguardian.com/world/ng-interactive/2017/nov/03/worlds-biggest-grave-robbery-asias-disappearing-ww2-shipwrecks>), accessed 8 November 2017.
- The Guardian*, Lost bones, a mass grave and war wrecks plundered off Indonesia, 28 February 2018 (<https://www.theguardian.com/world/2018/feb/28/bones-mass-grave-british-war-wrecks-java-indonesia>), accessed 5 March 2018.
- The Herald Sun*, Bid to save warship grave from rogue poachers, 23 January 2014 (<http://www.heraldsun.com.au/news/law-order/bid-to-save-warship-grave-from-rogue-poachers/news-story/9a099c380829c13f7a11c12d837daff6>), accessed 10 August 2014.
- The Jakarta Post*, More thefts of sunken objects occur in Batam, Fadli, 26 May 2014 (<http://www.thejakartapost.com/news/2014/05/26/more-thefts-sunken-objects-occur-batam.html>), accessed 28 May 2014.
- The Republic*, Divers identify sunken vessel as World War II wreck of USS *Houston* where 700 troops perished, 19 August 2014. (<http://www.therepublic.com/view/story/0da05f51b6924f68b067952af6dbfbd1/US-U>), accessed 20 August 2014.
- The Telegraph*, Celebrated British warships being stripped bare for scrap metal, 25 October 2014 (<http://www.telegraph.co.uk/news/worldnews/asia/malaysia/11187603/Celebrated-British-warships-being-stripped-bare-for-scrap-metal.html>), accessed 15 July 2015.
- The Telegraph*, Wreck of HMS *Repulse* 'rigged with scrap metal merchants' explosives', 23 April 2015 (<https://www.telegraph.co.uk/news/worldnews/asia/malaysia/11556924/Wreck-of-HMS-Repulse-rigged-with-scrap-metal-merchants-explosives.html>), accessed 31 May 2018.
- Tirto*, Misteri Raibnya Bangkai Kapal Perang Belanda di Laut Jawa, 18 January 2018 (<https://tirto.id/misteri-raibnya-bangkai-kapal-perang-belanda-di-laut-jawa-cDph>), accessed 23 January 2018.
- Tirto*, Menjarah Bangkai Kapal, Kenapa Kapal Chuan Hong 68 Dibebaskan?, 22 January 2018 (<https://tirto.id/menjarah-bangkai-kapal-kenapa-kapalnbpschuan-hong-68-dibebaskan-cDAh>), accessed 23 January 2018.
- Tjm1356, 2010, HMAS *Perth* dive (<https://www.youtube.com/watch?v=DqzAngxg4Y8>), accessed 20 March 2014.
- United States Naval History and Heritage Command, 2014, *Interim Assessment 2014: USS Houston (CA-30)*. Washington, DC.
- Van der Vat, D., 2012, *The Grand Scuttle: The Sinking of the German Fleet at Scapa Flow in 1919*. Edinburgh.
- Varmer, O., 2006, United States of America, in S. Dromgoole (ed.), *The Protection of the Underwater Cultural Heritage: National Perspectives in Light of the UNESCO Convention 2001*, 351–386. Leiden.
- Winslow, W., 1984, *The Ghost That Died at Sunda Strait*. Annapolis.