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ORIGINAL ARTICLE

Unearthing South Australia's Oldest Known Shipwreck: The Bark *South Australian* (1837)

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Abstract In early 2018, a collaborative team composed of maritime archaeologists, museum specialists, and volunteers from the South Australian Department for Environment and Water, South Australian Maritime Museum, Silentworld Foundation, Australian National Maritime Museum, MaP Fund, and Flinders University surveyed for and located the shipwreck site of the bark *South Australian*. Lost at Rosetta Harbor (at the western end of modern-day Encounter Bay) in December 1837, *South Australian* is South Australia's oldest documented shipwreck. Its significance also derives from its use as one of the earliest immigration ships to ferry European settlers to the colony of South Australia, as well as careers as a postal packet and "cutting-in" vessel for shore-based whaling activities. *South Australian*'s historical background is addressed, as are efforts to locate and confirm the identity of its wreck site via archaeological investigation.

Resumen A principios de 2018, un equipo colaborativo compuesto por arqueólogos marítimos, especialistas en museos y voluntarios del Departamento de Medio Ambiente y Agua de Australia Meridional, el Museo Marítimo de Australia Meridional, la Fundación Silentworld, el Museo Marítimo Nacional de Australia, el Fondo MaP y la Universidad de Flinders inspeccionaron y localizaron el sitio del naufragio del barco South Australian. Perdido en Rosetta Harbour (en el extremo occidental de la actual Encounter Bay) en diciembre de 1837, el naufragio del South Australian es el naufragio documentado más antiguo de Australia Meridional. Su importancia también se deriva de su uso como uno de los primeros barcos de inmigración para transportar a los colonos europeos a la colonia de Australia Meridional, así como de su uso como paquete postal y barco de "intrusión" para actividades balleneras en tierra. Se abordan los antecedentes históricos de Australia Meridional, así como los esfuerzos para localizar y confirmar la identidad del sitio del naufragio a través de una investigación arqueológica.

Résumé Au début de 2018, une équipe collaborative se composant d'archéologues maritimes, de spécialistes de musées et de bénévoles issus du Dépar-

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tement pour l'environnement et l'eau d'Australie du Sud (South Australian Department for Environment and Water), du Musée maritime d'Australie du Sud (South Australian Maritime Museum), de la Silentworld Foundation, du Musée maritime national australien (Australian National Maritime Museum), de l'organisation MaP Fund et de la Flinders University ont conduit une étude et localisé le site de l'épave du trois-mâts South Australian. Perdu à Rosetta Harbor (à la pointe occidentale de l'actuelle Encounter Bay) en décembre 1837, le South Australian est l'épave la plus ancienne d'Australie du Sud ayant été documentée. Son importance découle aussi de son utilisation comme l'un des tout premiers navires d'immigration pour transporter des colons européens vers la colonie d'Australie du Sud, ainsi que de ses carrières en tant que vaisseau de colis postaux et de « découpe » pour les activités de pêche à la baleine en bordure des côtes. Les antécédents historiques du South Australian sont exposés, ainsi que les efforts entrepris pour localiser et confirmer l'identité du site de l'épave via une enquête archéologique.

Keywords South Australia · shipwreck · immigration · postal packet · whaling

Introduction

In April 2018, a research consortium located and identified the shipwreck site of the bark *South Australian* near the town of Victor Harbor, South Australia (Fig. 1). The team comprised archaeologists, museum specialists, students, and volunteers from the Silentworld Foundation (SWF), South Australian Maritime Museum (SAMM), South Australian Department for Environment and Water (DEW), MaP Fund, Flinders University, and Australian National Maritime Museum (ANMM). *South Australian* was lost in a gale on 7 December 1837 while operating as an offshore whale-carcass processing platform (or "cutting-in" vessel) for a shore-based whaling station at Rosetta Harbor (at the western end of modern-day Encounter Bay). Prior to its whaling role, the vessel operated as a Falmouth packet, and was later used to transport free settlers from Europe to the fledgling British colony of South Australia, which had been proclaimed at Holdfast Bay (modern-day Glenelg) in December 1836. *South Australian* is South Australia's oldest known European shipwreck, was one of its earliest immigration vessels, and is currently one of only two examples of a purpose-built British 19th-century sailing packet to have been archaeologically investigated anywhere in the world.

The effort to locate and identify *South Australian* is the first of a multiyear collaborative initiative to investigate historical shipwreck sites associated with South Australia's early colonization and settlement. Dubbed the "South Australian Immigration and Labourer Shipwrecks Project" (SAILS), it has identified a number of shipwrecks of interest, including those of the "First Sixteen" vessels used to transport free settlers to South Australia in 1836 and 1837, as well as subsequent ships that carried such diverse groups as skilled tradespeople searching for new business opportunities (*Marion*), Irish female migrants fleeing famine (*Nashwauk*), and Chinese laborers bound for gold fields in the former Australian colony of Victoria (*Phaeton*, *Koning Willem de Tweede*, and *Sultana*). Although wreck sites within South Australia are the initiative's primary focus, a number are in other Australian states, as well as overseas. For example, the wreck of HMS *Buffalo*, the flagship of the first colonization fleet that landed at Holdfast Bay in 1836, is located at Mercury Bay on New Zealand's North Island (Bennett, this issue).

Historical Background

South Australian was launched as *Marquess of Salisbury*[1] at Falmouth, England in 1819. Originally rigged as a ship, it was one of only a handful of three-masted vessels to enter service as a Falmouth packet, a unique class designed to carry mail between Great Britain and overseas ports within its far-flung empire. Its builder, owner and master, Thomas Baldock, was a former Royal

[1] Although officially named *Marquess of Salisbury*, the vessel is listed in some archival sources—including *Lloyd's Register of Shipping*—as "*Marquis*" *of Salisbury*. The variation in spelling is likely a common transcription error in which the French "Marquis" was used in place of the English "Marquess." *Marquess of Salisbury* was named for the 7th Earl of Salisbury, James Cecil, who was bestowed the title 1st Marquess of Salisbury in 1789. Cecil served as joint postmaster general from 1816 to 1823 and oversaw the Falmouth Packet Service during his tenure.

Fig. 1 Map of Victor Harbor, South Australia, showing the location of *South Australian*'s wreck site within Rosetta Harbor. Inset: Map of Australia, showing the locations of South Australia and Encounter Bay. (Map courtesy of the South Australian Department for Environment and Water.)

Navy officer who served with distinction in North America during the War of 1812 and was invalided in 1816 (O'Byrne 1849:41–42). *Marquess of Salisbury* was registered at Falmouth on 13 November 1820 and had an overall length of 87 ft. 2½ in. (26.6 m), breadth of 25 ft. 2 in. (7.7 m), and carrying capacity of $235^{75/94}$ tons O.M. (old measurement) (Pawlyn 2018:1). According to the vessel's first entry in *Lloyd's Register*, its loaded draft was 13 ft. (4.0 m), and the hull was sheathed in copper (Society for the Registry of Shipping 1821). It was outfitted with two decks, and the height between them was 6 ft. (1.8 m) (Pawlyn 2018:1).

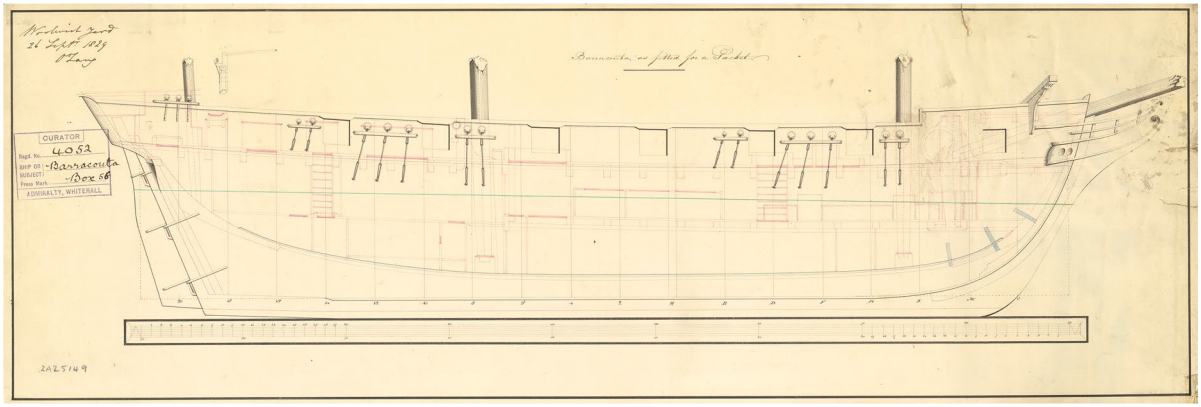

Fig. 2 Inboard profile of HM Packet Brig *Barracouta* (1829), showing the hull form and mast arrangement typical of early 19th-century naval packets, such as *Swallow* (ex-*Marquess of Salisbury*). (Image courtesy of the Royal Museums Greenwich.)

Career as a Packet

In 1821, *Marquess of Salisbury* embarked upon the first of three transatlantic voyages, departing Falmouth for Halifax, Nova Scotia on 20 April. It returned to Falmouth four months later, after stops in New York and Bermuda. These same ports of call were visited again toward the end of 1822. The vessel's final transoceanic run as a civilian packet commenced in November 1823, this time under acting command of Lt. Robert Bradley Roe (National Archives 1870:272). Following multiple transits during which it again delivered mail to Halifax, New York, and Bermuda, *Marquess of Salisbury* returned to Falmouth on 12 March 1824 (Olenkiewicz 2018:93–98).

Shortly thereafter, the vessel was purchased by the Royal Navy, renamed *Swallow*, and commissioned as a packet in the Admiralty Packet Service. According to the 1827 *Navy List*, the vessel was armed with six guns, and although the type and caliber are not specified, they were most likely carronades (Admiralty Office 1827:65,68). *Swallow* is also identified as a "brig," although *Lloyd's Register* notes it retained three masts and was alternately rigged as a bark or a ship while in naval service (Society for the Registry of Shipping 1824, 1825, 1826, 1827, 1828, 1829, 1830, 1832, 1833; Lloyd's of London 1835). The terms "brig" and "packet brig" were both used by the Royal Navy to describe packets, with the latter generally referring to three-masted vessels with bark rigs, such as HM Packet Brig *Barracouta* (Fig. 2).

The Admiralty took control of the Falmouth Packet Service from the General Post Office in April 1823 to keep surplus naval vessels and crew employed and "ready for active service in the future" following the end of the Napoleonic Wars (Laakso 2007:84; Webb 2009:3). Under the new regime, existing agreements between Falmouth packet captains and the Post Office were transferred to the Navy Board, and naval packets gradually replaced privately owned vessels as each contract expired. However, the replacements were often armed brigs and sloops that were repurposed as packets, and ill-suited to the role. Their poor sailing qualities, particularly in heavy weather, resulted in the loss of nine vessels between 1827 and 1840, three of which disappeared during the period 1827–1828 and resulted in the deaths of 102 officers and crew and 19 passengers (House of Commons 1843:3; Arnell 1980:89–90; Howat 1984:30; Laakso 2007:84). Unsurprisingly, naval packets of this type were referred to as "death ships," and public outcry prompted the Admiralty to enact a shipbuilding program for larger, more seaworthy packet brigs during the 1830s (Arnell 1980: 89–90; Howat 1984:30; Laakso 2007:84). The fact *Marquess of Salisbury* was accepted into the Admiralty Packet Service rather than replaced suggests its design, construction, and sailing qualities met—or exceeded—the Royal Navy's expectations.

Baldock was reappointed a lieutenant in the Royal Navy in September 1824 and put in command of his former ship shortly thereafter (O'Byrne 1849:42). On 14 September 1825, *Swallow* departed Falmouth on

the first of seven transatlantic voyages to North and Central America and the Caribbean as a naval packet. The vessel's hull had recently been reclad in copper sheathing and outfitted with two proved-iron cables (Society for the Registry of Shipping 1825; Coppack and Jolin 2012:13). Baldock commanded the vessel on four voyages that included stops in Bermuda, New York, and Halifax (Olenkiewicz 2018:102–107). In 1829, *Swallow* commenced operating between Falmouth and South America, with additional stops in Mexico, Cuba, and British possessions in the Caribbean (*United Service Journal* 1829:638; 1830:247,379; 1831:121). The move to predominantly tropical waters likely explains why its hull was clad in a new layer of copper sheathing the same year (Society for the Registry of Shipping 1830).

Baldock departed *Swallow* in 1832[2] and was replaced by Lt. Smyth Griffith (*United Service Journal* 1832:130). Griffith's inaugural voyage as commander was to South America in late 1832, followed by another to Halifax during the latter half of 1833 (*United Service Journal* 1833a:443; Olenkiewicz 2018:118). Between the two voyages, *Swallow* underwent a "good repair and ... thorough refit" at Devonport and was back in Falmouth by the end of April 1833 (*United Service Journal* 1833b). The vessel was then assigned to the North America and West Indies Station at the beginning of 1834 and made a round-trip voyage between Falmouth and Halifax between April and June (*United Service Journal* 1834a:283, 1834b:572).

It was during the latter half of 1834 that *Swallow* nearly met its end. Having taken aboard a consignment of specie worth $800,000 in Veracruz, Mexico, the vessel departed on 11 September for Tampico. It returned to Veracruz and was bound for Havana and then Falmouth when it encountered what was alternately described as a "terrific gale" or "very severe hurricane" on 16 October about "six leagues" (33 km) north of Veracruz (*London Morning Post* 1834:7; *Standard* 1834:3; Loudon 1835:137; *Nautical Magazine and Naval Chronicle* 1835:61). The tempest put *Swallow* on its beam ends, and Griffith ordered the fore and mizzen masts cut away and all guns thrown overboard to prevent it from capsizing (*London Morning Post* 1834:7; Loudon 1835:137). The crew rigged jury masts and sailed the crippled vessel to Havana so its hull could be repaired at the naval shipyard there and "properly righted" (*Standard* 1834:3). *Swallow* finally arrived back in Falmouth on 15 January 1835 (*Nautical Magazine and Naval Chronicle* 1835:189)

Only two months later, *Swallow* was again bound for the Caribbean. It returned to Falmouth in May 1835 and departed for South America on 10 July (*Nautical Magazine and Naval Chronicle* 1835:253,575; *United Service Journal* 1835:140). While in Rio de Janeiro, the vessel's hull was recaulked between 11 and 19 September by crewmen from the South America Station's flagship HMS *Dublin* (Huntington Library 1835a). It then took aboard one passenger, four prisoners, and a consignment of "treasure" with a combined value of £8,756 before departing for England at the beginning of October (Huntington Library 1835b, 1835c). This would prove to be *Swallow*'s final voyage as a naval packet; following its return to Falmouth at the end of 1835, the vessel was placed in ordinary at Plymouth and paid off on 14 January 1836 (*Naval & Military Gazette* 1836a:2–3). It was reportedly still in commission on 1 February, but no longer classed as a packet (*United Service Journal* 1836:283). Years of transoceanic voyaging had undoubtedly taken a toll on *Swallow*'s nearly two-decade-old hull, and the Royal Navy's investment in a new fleet of purpose-built packet brigs meant its days as a naval asset were numbered.

On 1 September 1836, *Swallow* was put up for sale at Plymouth by order of the Admiralty. Seven days later, it sold for £1,000 to a "Mr. Wheeler" (*Naval & Military Gazette* 1836b:3). This was almost certainly Edmund John Wheeler, the manager of the South Australian Company, a British mercantile enterprise developed in 1835 with the purpose of establishing a colony of free European settlers in what is now South Australia. *Swallow* was sold with the proviso that the hull "be broken up, and all articles marked with the broad arrow ... returned to Dock-yard and paid for according to a certain scale" (*Naval & Military Gazette* 1836b:3; *Nautical Magazine and Naval*

[2] Baldock would later serve as one of three British naval officers appointed in 1836 by the Admiralty to organize the Royal Navy's department responsible for steam propulsion and steam-powered vessels, and was made superintendent of the packet service at Dover in 1846. He retired from naval service as a rear-admiral in the 1860s and died on 11 March 1871 (O'Byrne 1849:41–42; *Broad Arrow* 1871:10; *Observer* 1871).

Chronicle 1836:763). However, this condition was negotiated and ultimately cancelled, and ownership officially transferred to the South Australian Company on 20 October 1836 (Pawlyn 2018:2).

South Australian Company Vessel

After the South Australian Company acquired *Swallow*, it was refitted and renamed *South Australian* (South Australian Company [SAC] 1837:9). The hull underwent some repairs and was clad in felt and a new layer of copper sheathing (Lloyd's of London 1837). Although "admirably fitted ... for the conveyance of passengers" to Australia, the South Australian Company's ultimate intention was to send the vessel to the British Southern Whale Fishery in the South Pacific Ocean upon its arrival in the colony (State Library of South Australia [SLSA] 1836; SAC 1837:9; Zapor 2020:52). *South Australian* departed Plymouth on 22 December 1836 under the command of Alexander Allen, with a contingent of 70 British and German emigrants, including David McLaren (the South Australian Company's second commercial manager) and Henry Richard Mildred (superintendent of the colony's first shipyard). Skilled laborers were included among the passengers, and at least three of *South Australian*'s crew were listed as "harpooners" to remain with the vessel once the passengers were discharged and its whaling activities commenced (SAC 1837:10–11,14; Durrant 2014:19–20).

Following a largely uneventful voyage, *South Australian* arrived at Kangaroo Island's Nepean Bay on 23 April 1837. The passengers and cargo were discharged, after which the hold was cleaned, and the vessel prepared for whaling (SLSA 1837:24 April–22 May). On the morning of 23 May, *South Australian* departed Kangaroo Island for Rosetta Harbor, where it would serve as a cutting-in vessel for the South Australian Company's shore-based whaling station. The crew "fired a gun" to mark the vessel's departure, which suggests it was armed with a complement of artillery, or at the very least outfitted with a signal gun (SLSA 1837:23 May).

"Cutting-In" at Encounter Bay

Twelve hours after its departure from Kangaroo Island, *South Australian* arrived at Encounter Bay. The bark's two bower anchors were deployed, and a hawser was bent on the kedge, which was placed astern. The following day was spent mooring the ship and attending to sails. Although first mate John Anthony disembarked from *South Australian* at Nepean Bay, most other hands and several passengers stayed on to work at the whale fishery. Fourteen of *South Australian*'s crewmen worked as whalers and were joined by two passengers (SLSA 1837:29 April). Alexander Allen died of a "severe and protracted illness" four months later, and command of *South Australian* passed to John Boyd Thorburn MacFarlane, a headsman[3] at the South Australian Company Fishery (SLSA 1837:30 September).

On 25 May, several activities were undertaken in preparation for whaling, including discharging tryworks bricks and grinding harpoons. Preparations made to the whaleboats may have included checking the caulking in their hull planking, and certainly would have required stocking them with harpoons, neatly coiled ropes, lances, buckets for bailing, and anchors (SLSA 1837:25 May). *South Australian*'s topgallant masts and yards were sent down and the fore and mizzen topmasts were struck (Fig. 3). Cutting blocks and falls were also fitted to the vessel's mainmast, readying it for its role as a cutting-in platform during the whaling season (SLSA 1837:26 May).

Cutting-in, or flensing, was the process of removing blubber from whales, and in 1837 *South Australian* was used exclusively for this purpose (*South Australian Record* 1837a:13–16, 1837b:6; Wyatt 1837; Durrant 2014:6). Dead whales were brought alongside the vessel, and the crew used blubber spades to cut 4 ft. (1.2 m) wide strips of blubber, called blanket pieces, from the carcass. A rope attached to tackle on the main yard was used to pull the blubber on deck as the whalers cut it free. For each large strip cut away, the carcass turned a full revolution. The oil-rich tongue and a thick piece of blubber from the underside of the whale's jaws were removed, and finally baleen was cut from the gums.

South Australian was part of a network of interrelated localities within the maritime extractive landscape of Encounter Bay. Blanket pieces were towed to a blubber room onshore where they were cut into

[3] A "headsman" was responsible for steering a whaleboat until a whale was harpooned, at which point he moved to the bow, took the boat-steerer's position, and killed the whale with a lance.

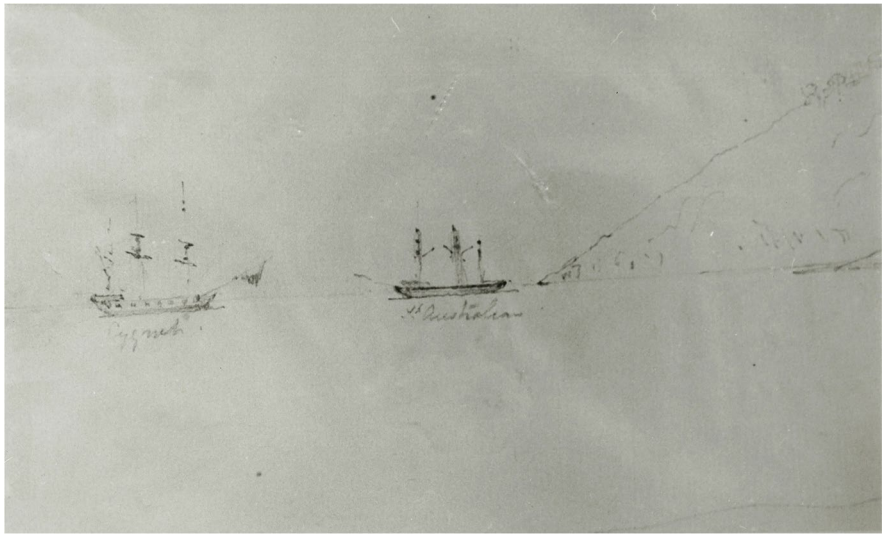

Fig. 3 Sketch by Col. William Light of *South Australian* moored at Rosetta Harbor in 1837. The bark's main- and mizzenmast topmasts and topgallant masts have been struck for its cutting-in role. (Image courtesy of the South Australian Department for Environment and Water.)

smaller "horse pieces" and sliced with a mincing knife to help release the oil from the fat. The minced blubber was rendered in the tryworks, a small brick furnace with large cast iron trypots, built on the foreshore. There were two trypots at the South Australian Company Fishery, one of which was unloaded from *South Australian*. Blanket pieces were difficult to handle on land and became coated in sand, which contaminated the oil. Consequently, from 21 July 1837, additional processing was carried out aboard *South Australian* in which blubber was cut into smaller horse pieces before delivery to shore for rendering (SLSA 1837:21 July). During the four months it was stationed at Encounter Bay, *South Australian*'s crew removed the blubber from 24 whales.

Incarceration of Reppindjeri

Aboriginal people's relationship with and connection to shore-based whaling is well documented but not fully understood (Staniforth et al. 2001; Russell 2012). The story of Reppindjeri is significant to the historical, political, and legal history of South Australia's early fisheries and whaling industry, as it was the first killing of a European by an Aboriginal person following the establishment of the colony of South Australia (Pope 1989, 2011). It also has a direct association with *South Australian*. European whaler John Driscoll was allegedly murdered by an Aboriginal man named Reppindjeri, or Reppeenyere, also referred to as "Elick," "Alick," and "Ronculla" in historical sources (SLSA 1837; Wyatt 1837; *Southern Australian* 1839:2–3; Durrant 2014; Shultz 2017; Paterson and Wilson 2019). *South Australian*'s logbook records the incident occurred approximately 14 km from the bark's anchorage at Encounter Bay (SLSA 1837:21 July; Durrant 2014:182).

At the time he was killed, Driscoll was reportedly living with one of Reppindjeri's wives, Popalbe, in an arrangement to which the Aboriginal man consented (Paterson and Wilson 2019:92). Durrant (2014:28) notes: "Driscoll had arranged that Reppindjeri should guide him to Adelaide," and it was during this overland journey that the murder allegedly took place. On 21 July 1837, two of *South Australian*'s crewmen boarded their vessel with Reppindjeri, a female Aboriginal consort, and Abraham Clegg, the steward of the South Australian Company Fishery. In an effort to apprehend the accused without raising the ire of a "great number of [Aboriginal people] … close by [the fishery's] Tryworks," bread was offered to entice him aboard *South Australian* (SLSA 1837:21 July). Once there, Reppindjeri "assented to" being placed in irons (SLSA 1837:21 July). On the following morning representatives of the South Australian Company were guided by another of Reppindjeri's wives to Driscoll's body at a spot called "Mooteparinga" in the Hindmarsh Valley (SLSA 1837:22 July; Durrant 2014:28).

Reppindjeri was held in *South Australian*'s 'tween decks and provided "plenty to eat and to drink … [as well as] a sail for a bed," but had chains placed around his neck after breaking one of the padlocks

to his manacles (SLSA 1837:23–24 July). By early August, Reppindjeri had "repeatedly endeavoured to escape" *South Australian*, but the crew nonetheless paid "strict attention to all his wants" and attempted to strike a humane balance to his incarceration by securing him "by a chain round his waist, allowing … his hands and feet to be at liberty" (SLSA 1837:10 August). He was formally arrested by Dr. William Wyatt, a whaler and the colonial government's nominated "Protector of Aborigines" (Paterson and Wilson 2019:93). Wyatt's criminal investigation and subsequent report revealed Reppindjeri had significant grounds for provocation as "Driscoll had apparently molested his wife" (Pope 1989:13). According to Pope (1989:41), Aboriginal people, "being British subjects ... were not explicitly banned from testifying, but longstanding requirements relating to the admissibility of evidence in English (and therefore colonial) courts effectively prevented them from so doing." In this case, the two witnesses to the alleged murder were non-Christian Aboriginal people and could not speak English, which created significant challenges in the application of existing British legal doctrine.

In early November 1837, Reppindjeri was transferred to Kangaroo Island and the South Australian Company billed the colonial government for *South Australian*'s role in his incarceration. On 14 December, Company representatives reported Reppindjeri's escape from custody the previous night and noted "to the relief of the law officers, no further action was taken over Driscoll's death" (Durrant 2014:39). Wyatt (1837) reported the Aboriginal man's "being at large [was] not at all likely to be productive of any injurious effects, as the natives ... always condemned him for the act and considered him deserving of punishment." Reppindjeri's whereabouts and fate following his escape are unknown.

Loss

In the early morning hours of 8 December 1837, *South Australian* was struck by a strong southeasterly gale while moored in the southwest corner of Encounter Bay near Rosetta Head. The bark was in the final stages of preparation for departure to Kangaroo Island, and riding on its two bower anchors, which were outfitted with proved-iron cables. The chain attached to the starboard bower anchor parted shortly after 5 A.M., and the crew used one of the boats to deploy the stream anchor to "prevent the ship from swing[ing] on [nearby] shoals" (Royal Geographical Society of South Australia [RGSSA] 1837:8 December). To reduce top hamper, MacFarlane ordered the yards, topmasts and topgallant masts lowered to the deck. Despite these measures, *South Australian* "labour[ed] and pitch[ed] very heavy" and dragged anchor as the storm's intensity increased over the course of the day (RGSSA 1837:8 December). At 5:30 P.M., the vessel struck Black Reef—a line of rocks that bisects Encounter Bay from northeast to southwest—which caused the hawser attached to the stream to break. The remaining chain to the starboard bower was bent on to the port bower cable and veered out to keep the vessel's bow pointed seaward as it bounced over the reef.

Crippled, but still afloat, *South Australian* was driven into calmer waters in the lee of Black Reef. Shortly thereafter, the port anchor cable parted, and the vessel drifted toward shore. It briefly turned "broadside on for a few minutes" before grounding in shallows in front of the Fountain Inn, one of the few permanent structures then standing along Rosetta Harbor's shoreline (RGSSA 1837:8 December). The stern struck first, with enough force that it "unshipped the rudder and carried away the pintles and gudgeons" (RGSSA 1837:8 December). Three prominent passengers, David McLaren, John Hindmarsh, Jr. (son of South Australia's first governor, Sir John Hindmarsh), and Sir John Jeffcott (the first judge appointed to South Australia's Supreme Court) were aboard *South Australian* when it wrecked. Once the vessel went hard aground, a boat was lowered and the passengers and their luggage were ferried ashore, followed by the crew. By 8:30 P.M., *South Australian* had heeled over on its port beam ends and was driven "farther up on shore" as the night wore on (RGSSA 1837:8 December). The logbook notes the wreck was extensively salvaged over subsequent weeks, but also that the lower hold was flooded, and the crew encountered "great difficulty" recovering casks of provisions and other articles stowed there (RGSSA 1837:17–18 December).

Archaeological Investigations

Following the crew's salvage activities in December 1837, *South Australian*'s wrecked hull was condemned and ultimately abandoned. What remained

Fig. 4 Watercolor of Rosetta Harbor by E. C. Frome, 1841, showing *South Australian*'s wrecked hull in nearshore waters at *center left* of the image. (Image courtesy of the Art Gallery of South Australia.)

of the vessel was still visible above the water's surface for a few years, as evidenced by its appearance in a watercolor painted by artist E. C. Frome when he visited Rosetta Harbor in 1841 (Fig. 4). Although no supporting evidence is known to exist in historical sources, there is little doubt the wreck was targeted for opportunistic salvage and scavenging by the crews of nearby whaling stations, as well as local Aboriginal people and the earliest inhabitants of Yilki, the area's first permanent European settlement.

By the 1850s, *South Australian* had completely disappeared from view, as it does not appear on hydrographic charts of Encounter Bay produced from the mid-19th century onwards. However, anecdotal evidence indicates the wreck's location was long known to local fishers. This suggests at least some structure intermittently protruded above the seafloor and created a suitable habitat for marine life. These periods of exposure alternated with burial episodes, as hull elements were visible as recently as the 1940s but completely covered until shortly before the site's discovery in 2018. It was complete burial of *South Australian*'s remnants that in part thwarted two concerted efforts to locate the site during the 1990s.

1994 Survey

In April 1994, maritime archaeologists led by South Australia's then–Department of Environment and Heritage (DEH) conducted a magnetometer survey in nearshore waters southwest of the community of Yilki. Two promising magnetic targets were detected but subsequent ground-truthing did not reveal shipwreck material. Metal detector surveys were attempted in the vicinity of the anomalies but thwarted by faulty equipment. The magnetometer also detected a generally linear cluster of anomalies extending southward from the northwest corner of the search area, but subsequent examination of these targets returned a negative result (Department for Environment and Water [DEW] 1994).

The 1994 survey confirmed local fishers were aware of *South Australian*'s location but kept knowledge of its existence and whereabouts to themselves. In May of that year, members of the DEH survey team spoke to a local resident who informed them the wreck site was "about 300 [to] 400 yards straight out to sea from the residence next to [the] Fountain Inn at the line between brown and blue water in 8 to 9 feet of water" (DEW 1994:6). He recalled swimming "out to the *South Australian* when he was a child 50 years previously" and

"used to hook an anchor on the keel bolts and pull them up as they were good for soldering" (DEW 1994:6). The fisherman assured the team the wreck site's location was not widely known and had never been visited by recreational divers (DEW 1994:6).

1996 Survey

DEH maritime archaeologists conducted another search for *South Australian* in January 1996 (DEW 1996). The first area investigated was parallel to, but seaward of, the 1994 survey and centered around a linear object observed by snorkelers at the beginning of the project. Although a handful of small magnetic anomalies were detected near the object, closer inspection did not reveal shipwreck material. The object was ultimately identified as naturally occurring "fingers of calcium/limestone" (DEW 1996:2). The second survey area was located adjacent to the shoreward side of the zone investigated in 1994. A single large anomaly detected within it was identified as an engine block that was probably used as a mooring (DEW 1996:3).

SAILS Project

Armed with the results of the 1990s surveys and information derived from archival sources, the SAILS team identified a new search area in 2018 (Bullers 2019:10–11; Hunter and Hosty 2020:26). Accounts of *South Australian*'s loss in both South Australian Company correspondence and the bark's second logbook indicated the wreck was in nearshore shallows off the Fountain Inn. This was reinforced by archival depictions, including a crude map drawn by Henry Mildred in January 1838, and the 1841 watercolor by Frome (Fig. 5). All lines of evidence pointed to *South Australian*'s location somewhere in the vicinity of the Fountain Inn, approximately 200–300 m offshore in the 3–4 m depth interval. The 2018 survey area ultimately comprised twelve 100 × 100 m search grids numbered in order of priority, with Grid 1 representing the highest probability of containing the wreck site (Fig. 6).

April 2018 Survey and Discovery

SAILS commenced its initial search for *South Australian* on 16 April 2018. Due to inclement weather the first three days of the survey concentrated on inshore reef flats and intertidal areas. A combination of pedestrian searches and metal detector sweeps located and plotted shipwreck material, with the goal of identifying a debris field. Several artifacts were observed, including iron fasteners, and fragments of copper sheathing and hull timber, some with adhering sheathing tacks. When plotted, their distribution formed a "fan" of shipwreck material that increased in size as it extended away from the southeast corner of Grid 1 toward shore (Bullers 2019:10,26; Hunter and Hosty 2020:26).

A magnetometer survey commenced on 20 April and focused on the zone immediately to seaward of the reef edge. A large, multicomponent magnetic anomaly was detected almost directly offshore from the Fountain Inn, as were several smaller adjacent contacts. Divers investigating one of the latter anomalies encountered a concreted iron object tentatively identified as standing rigging. Approximately 50 m southwest of the anomaly, a team of snorkelers identified the source of the large multicomponent contact: a partially exposed wooden-hulled shipwreck with copper-alloy fasteners located a short distance outside the inshore reef in 3 m (9.8 ft.) of water. The team conducted a baseline-offset survey to generate a preliminary site plan and record details of the exposed hull timbers, artifacts, and features (Bullers 2019:10,23–25; Hunter and Hosty 2020:26–29).

Subsequent Investigations (May 2018–June 2019)

A follow-up inspection commenced on 7 May 2018 that included a detailed baseline-offset survey of the bow section and acquisition of additional photographic stills and footage. Several recently exposed features were observed, including articulated hull timbers, iron structural elements, and scattered small finds. A third inspection conducted two months later was plagued by poor water clarity and inclement weather and limited to visual observation of site changes complemented by photography and videography. More of the hull was uncovered, as were several artifacts (Hunter and Hosty 2020:29).

In June 2019, SAILS team members undertook additional fieldwork to determine the full extent of the wreck site, as well as the degree, nature, and rate of sediment movement and deposition across it. The condition of exposed hull timbers was assessed, and samples collected to determine their wood species.

Fig. 5 Henry Mildred's 1838 sketch map of Rosetta Harbor, showing *South Australian*'s loss location (circled). The associated caption reads: "I. South Australian's position on the rocks." (Map courtesy of the State Library of South Australia.)

These tasks were carried out to assist DEW with development of management strategies for the site, as well as inform future investigations and possible mitigation works. Newly exposed site components, which primarily comprised the articulated bow section, were documented. The hull was also documented extensively with digital photography for 3-D reconstruction purposes. Metal detectors were used to systematically

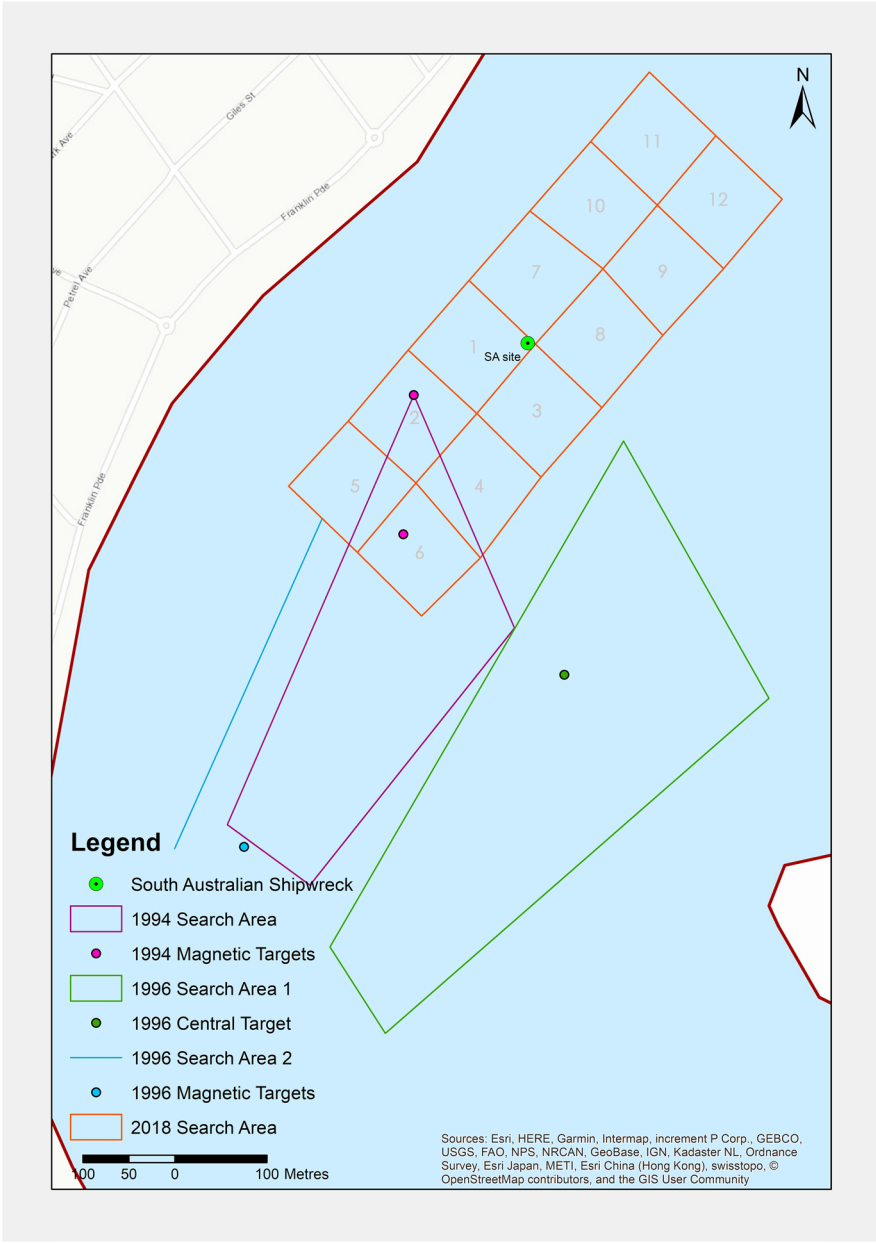

Fig. 6 ArcGIS map of the 1994, 1996, and 2018 survey areas, including 2018 search grids and the location of *South Australian*'s wreck site. (Illustration by Irini Malliaros; courtesy of SAILS.)

sweep the seabed surrounding *South Australian*'s visible articulated hull, but no significant targets were noted (Hunter and Hosty 2020:29).

Timber samples were acquired from a variety of *South Australian*'s structural elements. Timbers selected for sampling were thoroughly documented, and the specific area where each sample was collected was photographed in situ and subsequently sealed with underwater epoxy. Four 1.5 m (4.9 ft.) tall sediment monitoring stations were installed at various locations around the site. Sediment levels were recorded with a combination of visual inspection and photography and will be used as a benchmark for future observations. Clear evidence of existing sediment deflation was also noted when reviewing site imagery captured in July 2018. The final task of the 2019 investigations was composed of in situ recording and recovery of a small number of exposed diagnostic artifacts. These items are addressed in detail in the "Small Finds" section.

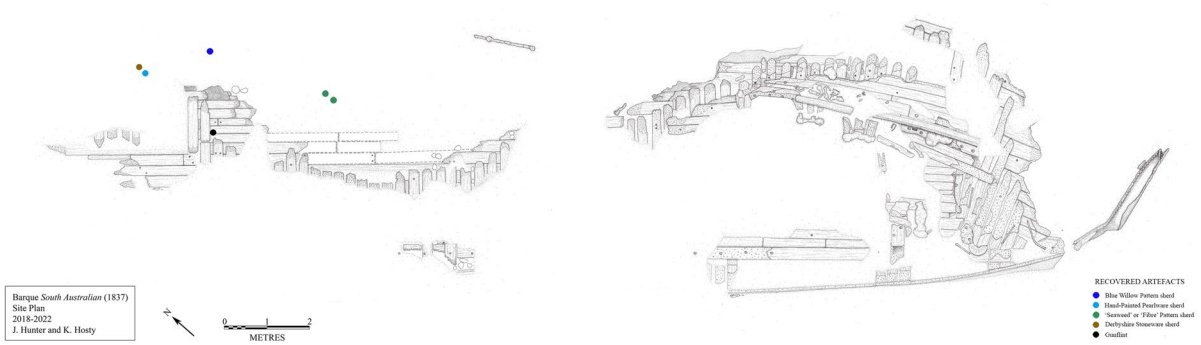

Fig. 7 Site plan showing *South Australian* as it appeared in November 2022. Hull planks with dotted lines disappeared from the site between 2019 and 2022. In situ locations of artifacts within the interface between the midships and stern sections are indicated. (Illustration by James Hunter, 2022; courtesy of SAILS.)

Ship's Architecture

South Australian's preserved articulated hull includes most of the lower port side up to and beyond the level of the lower deck (Fig. 7). Less of the starboard hull is visible, but the presence of a line of floors immediately to starboard of the exposed centerline suggests additional articulated structure exists but is currently buried. Hull components observed during the 2018 and 2019 surveys include floors, futtocks, cant frames, filling pieces, hull planking, sacrificial planking, ceiling, lodging knees, remnants of the foremast step, portions of the stem assembly, and sections of the keelson. The centerline is also marked by a line of large copper bolts that protrude above the seabed in the approximate midships area.

Twenty-one eroded frame ends were observed along the surviving port side of the hull. All are located too far from the vessel's centerline to be floors, but because they are also largely obscured by articulated ceiling planking or the seabed, it is unclear whether they represent first or second futtocks. By contrast, five starboard framing timbers immediately adjacent to the keelson were positively identified as floors. Eight cant frames form the shape of the bow along the wreck site's port side, while only two cant frames were observed on the starboard side. Other starboard cants are likely present but were obscured at the time the site was surveyed. Two filling pieces were noted on the port side of the hull, one each located between a pair of futtocks in the bow section.

Preliminary examination of exposed elements revealed general information about *South Australian*'s framing design and assembly. While a specific framing pattern could not be definitively established, the hull exhibits clear evidence of deliberate craftsmanship and considerable forethought and expense in its construction. All visible framing components appear to have been carefully fashioned, and most conform to relatively uniform scantlings that vary by less than a couple of centimeters across the entire assemblage. For example, floors average 27 cm (11 in.) molded and 22 cm (9 in.) sided, while futtocks along the hull's port side exhibit molded and sided dimensions that average 18 cm (7 in.) and 20 cm (8 in.), respectively. Consistency is also evident in the space between exposed frames, which averages 12 cm (5 in.). Timber samples collected from floors and futtocks were identified as English oak (*Quercus robur*). Treenails averaging 3.5 cm (1 in.) in diameter appear to have been the primary mode for fastening frames to ceiling and hull planking, although some iron concretions and square-shaped voids for iron spikes are also present.

South Australian's bow is formed from an assemblage of radial cant frames with average molded and sided dimensions of 18 cm (7 in.) and 22 cm (9 in.) (Fig. 8). Like the futtocks along the wreck's port side, they feature extensive use of 3.5 cm (1 in.) diameter treenails but are spaced on average only 3 cm (1 in.) apart. Where visible, their wedge-shaped butt ends rest against the keelson and apron. Adopted by British shipwrights after 1715, cant frames (or "cants") were used to simplify the complex and difficult task of constructing the bow of full-bodied vessels, and the construction technique persisted into the first half of the 19th century. By the 1820s, shipwrights modelled most cant frame arrangements on a "radial

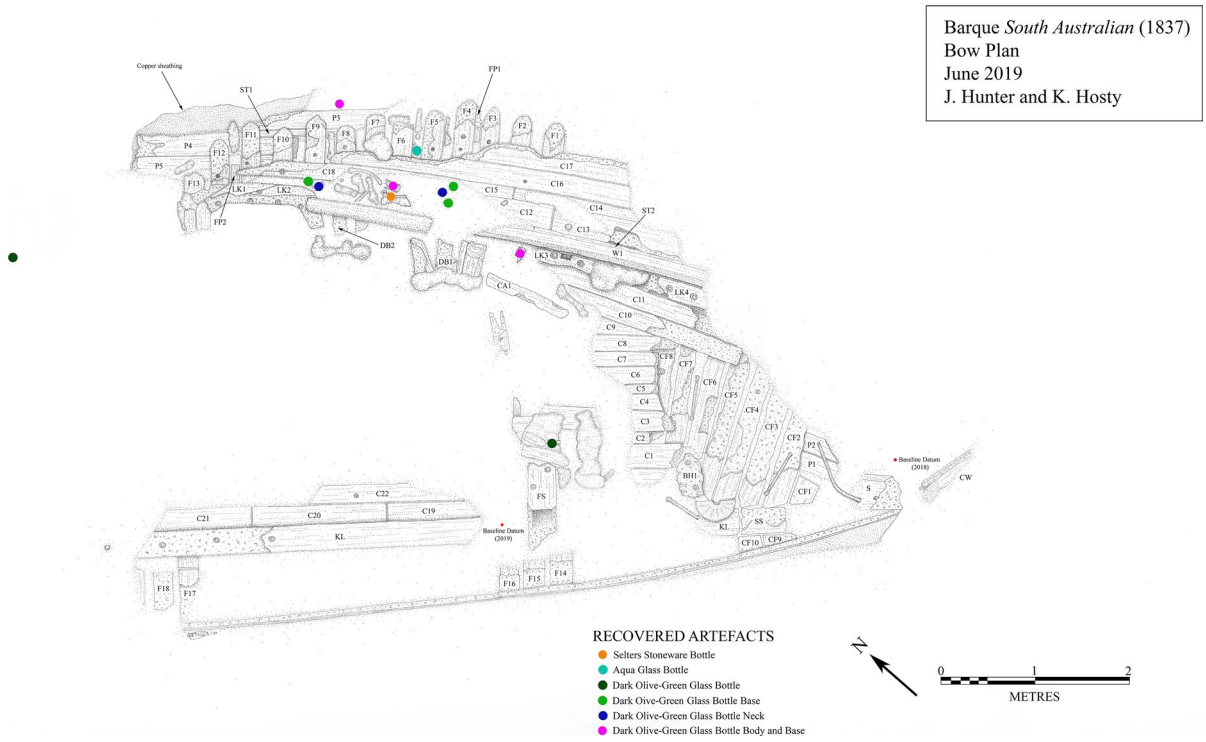

Fig. 8 Site plan of *South Australian*'s bow section, June 2019. In situ locations of artifacts are indicated. (Illustration by James Hunter; courtesy of SAILS.)

pattern" developed from earlier forms (Morris et al. 1995:127–129, figure 3.4).

Early 19th-century variations of the radial pattern, such as that exhibited by *South Australian*, featured cants that directly abutted the vessel's centerline timbers and were angled forward in a more linear arrangement that allowed for a sharper bow and finer entry (Goodwin 1987:23; Steffy 1994:178–180,268; Morris et al. 1995:129–130). Several late 18th- and early 19th-century shipwrecks feature similar cant frame assemblages (Crisman 1989:281; Turner 1995:36–37; Tidewater Atlantic Research 1996a, 1996b; Jones 2004:38,51–53; Sabick 2004:86,99; Cassavoy 2005:27–36; Atauz et al. 2006:25; Walker 2006:59–60; Gordon 2009:110–118; Horrell and Borgens 2014:3,5–6). The fine entry represented by *South Australian*'s bow cants is unsurprising, given it was originally constructed as a Falmouth packet, a vessel type typically designed for speed.

Where visible, the keelson in the bow section measures 14 cm (5½ in.) molded by 28 cm (11 in.) sided and was hewn from English oak. It is through-bolted to the keel with 5 cm (2 in.) diameter copper bolts at every other floor, locking the entire assembly together and contributing to the overall strength of the hull. Goodwin (1987:28) states British vessels constructed during the latter half of the 18th century usually incorporated a fastening pattern in which iron pins were bolted through the keel at every other floor. After 1800, this practice was gradually superseded by the technique of through-bolting at every floor. In *South Australian*'s case, the earlier fastening pattern—but incorporating copper instead of iron bolts—was clearly retained. This indicates a build date closer to the beginning of the 19th century. It also suggests a transitional design that combined older, established shipbuilding techniques with emerging use of newer materials and technologies.

It is unclear whether the keelson's fastener pattern persists for the remainder of its length, but at least one significant variation was noted in the approximate midships area. A line of five 70 cm (27½ in.) long copper bolts, and two others of similar length that are slightly offset from the centerline, protrude

from the seabed at the location where the vessel's mainmast step is thought to have been located. Their significantly greater length suggests they may have once affixed a robust saddle mast step assembly—and perhaps an associated rider keelson—to the keelson's upper sided surface. Similarly sized copper bolts are present in the shipwreck's forward section and are associated with breasthook and stem structure that is no longer present.

South Australian's surviving stem assembly includes the lower portion of the stem itself, as well as part of the stemson, and a collapsed section of the vessel's gripe or forefoot. Both the stem and stemson have eroded away to the approximate level of the keelson's upper sided surface, while the apron appears to have disappeared entirely. The stem's maximum preserved molded and sided dimensions are 40 cm (16 in.) and 30 cm (12 in.), while the stemson measures 30 cm (12 in.) sided and 50 cm (20 in.) long. A prominent feature of the stem is a 70 cm (27½ in.) long copper bolt that extends diagonally from the timber toward the stern. The hole left by a copper bolt of identical diameter (5 cm, or 2 in.) is also present in the stem. Both were part of an assemblage of fasteners that held the stem assembly together, and indicate its various timbers were of substantial size.

The collapsed section of gripe/forefoot is located on the seabed just forward of the stem and extends away from the hull for 80 cm (31 in.) before disappearing into the seabed. It has preserved molded and sided dimensions of 15 cm (6 in.) and 10 cm (4 in.), and its forward edge is covered in a thin strip of lead sheet held in place by copper tacks with 1 cm (1/4 in.) diameter heads. Given *South Australian*'s lower hull is extensively sheathed in copper, the presence of lead sheet on the gripe/forefoot is certainly notable. Borelli (2020:3) observes that sheet lead in definable forms, such as lead strips or small patches known as "tingles," were intended primarily for shipboard maintenance and repair.

In the case of English ships, lead sheet was applied specifically to repair breached or damaged areas of the hull (Oppenheim 1896:103; Mainwaring and Gordon 1922:177; Perrin 1930:23; Salisbury 1961:86–87). *South Australian* was involved in a collision with the steamship *City of Limerick* shortly before departing Plymouth, and its "head and Cutwatter" were damaged (SLSA 1837: 29 November 1836). Quick repairs to the cutwater were made by "three ship Wrights" while the vessel remained anchored in Plymouth Harbor, and the sheet lead on the gripe/forefoot is almost certainly evidence of the collision damage and efforts to fix it (SLSA 1837:30 November, 1 December 1836).

While details of the mainmast step's location, design and construction are unknown, remnants of *South Australian*'s foremast step were identified and extensively documented. It is located 4 m (13 ft.) abaft the stem and straddles the keelson in a transverse saddle arrangement that was designed to spread the load from the mast as widely as possible (Steel 1812:68). Originally fashioned from a single piece of timber, approximately half of the step has been destroyed by natural processes. The surviving section is 1 m (3 ft. 4 in.) across, and has preserved molded and sided dimensions of 15 cm (6 in.) and 30 cm (12 in.), respectively. Remnants of the mortise indicate it was rectangular, with a width of 20 cm (8 in.) and depth of 13 cm (5 in.). Two 5 cm (2 in.) diameter copper bolts pass through the foremast step's portside "arm" to the floors beneath; a pair of corresponding bolts likely affixed the starboard arm in the same manner but are no longer present.

Saddle mast steps were a common feature of British vessels constructed during the latter half of the 18th century. Examples of British (or British colonial) shipwrecks outfitted with saddle mast steps during this period include the sloop *Boscawen*, India trader *Sydney Cove* and the Soldier Key Wreck (Crisman 1985:365; Nash 2009:96,126–127; Wilson 2010:59–60). The type persisted into the early 19th-century on British-built vessels, as well as watercraft influenced by a legacy of British shipbuilding (such as those constructed in the fledgling United States). This is evidenced by the presence of saddle mast steps on several British, American, and Australian wreck sites from the period (Henderson 1979:16–17, 1983:246–247; Crisman 1987:147, 1989:296–298; Whitesides 2003:29–30,33; Sabick 2004:102; Vezeau 2004:41,50; Cassavoy 2005:29–30; Walker 2006:73; McCarthy 2011:142; Veth et al. 2013:6,10).

Like *South Australian*'s framing components, its exposed runs of ceiling and hull planking exhibit dimensions that are largely consistent. Ceiling plank widths in the bow section range between 10 cm (4 in.) and 28 cm (11 in.); however, the vast majority average 19 cm (7½ in.) wide and 5 cm (2 in.) thick. Timber samples collected from ceiling were identified as

English oak. Hull planks in both the bow and midships/stern sections also vary in size, but are larger overall than the ceiling, with an average width and thickness of 22.5 cm (9 in.) and 6 cm (2½ in.), respectively. The hull planking was hewn from English elm (*Ulmus procera*) and clad in a layer of 5.5 cm (2 in.) thick Swiss pine (*Pinus cembra*) sacrificial planking overlaid with copper sheathing.

Architectural elements associated with *South Australian*'s lower deck were also recorded. All are in the bow section and include a waterway, lodging knees, remnant deck beams, and a carling. Approximately 2.5 m (8 ft.) of the waterway's overall length was exposed; it extends 9 cm (3½ in.) above the adjacent ceiling planking and is 5 cm (2 in.) thick. One set of lodging knees are located beneath the waterway and were partially visible in 2019. Both are hewn from grown timber; the larger example has a body that measures 70 cm (28 in.) long and 20 cm (8 in.) wide, while the other knee is slightly smaller, with a body length and width of 65 cm (26 in.) and 12 cm (5 in.), respectively. The arms of both lodging knees are encased in iron concretion and could not be documented. A small mortise that measures 11 cm (4 in.) wide by 6 cm (2 in.) high is let into the smaller knee's body and likely supported a ledge.

Another set of grown lodging knees is located 2.1 m (6 ft. 10 in.) abaft the first pair. They appear to have collapsed downward but are still largely articulated, based on their alignment with the run of the waterway (which is missing at the point where it crosses the knees). The bodies of both knees are nearly identical in size, joined by a diagonal scarph, and together form a long, shallow U shape. The smaller knee's body has a length of 80 cm (31 in.), while that of its arm is 30 cm (12 in.). Both the arm and body are 15 cm (6 in.) thick. The larger knee's body is slightly longer and measures 82 cm (32 in.), while the length of the arm (32 cm, or 13 in.) and overall thickness (15 cm, or 6 in.) are roughly the same as the smaller knee. The throat of both knees measures 23 cm (9 in.). Parts of two additional lodging knees are located between the two visible sets but were largely buried in sediment and not documented. All visible lodging knees are affixed to the hull with 8 cm (3 in.) diameter copper bolts spaced an average of 30 cm (12 in.) apart.

Stumps of two partially collapsed deck beams were observed among *South Australian*'s port-side deck support structure. The best-preserved example is 30 cm (12 in.) sided, while the other is badly degraded and only 15 cm (6 in.) of its sided dimension survives. Both beams are positioned between the arms of adjacent lodging knees and spaced apart on 1.1 m (3 ft. 7 in.) centers. A large iron concretion encapsulates the broken end of the best-preserved deck beam and is similar in size and appearance to the concretion that covers the forwardmost set of visible lodging knees. A 60 cm (24 in.) long iron bolt was noted at the end of the other deck beam stump and suggests the concretions may contain similarly sized iron bolts that were transversely installed to affix the deck beams to the arms of their adjacent lodging knees.

Material Composition of Ship's Fasteners and Hull Sheathing

Metallurgical analysis of hull sheathing and ship fasteners is one method to help identify and date the archaeological remains of vessels. The history of metal fasteners and the introduction and use of metal sheathing is well researched and documented (Staniforth 1985; Bingeman et al. 2000; McCarthy 2005; Bingeman 2018). This allows for analysis of their elemental composition to help secure a date range for a specific vessel's construction and use (e.g., pre- or post-1832). Knowledge of the temporal range for a vessel's construction and operation, when used in conjunction with other data sets, such as timber species identification, hull construction, and the artifact assemblage, allows researchers to establish positive associations between these features and historic vessels. In the case of *South Australian*, analysis of the wreck site's structural elements and artifact assemblage—including the metallurgical composition of ship fasteners and hull sheathing—provides compelling evidence for its identity (Zapor 2020; Van Duivenvoorde 2021).

Metallurgical analysis of three bolts and three sheathing fragments recovered from *South Australian* in 2019 was performed at Adelaide Microscopy using scanning electron microscopy (SEM) with a SDD EDS detector. The semi-quantitative analysis revealed the sheathing and bolts are composed of an estimated 97.35%–99.13% copper. The copper is quite pure; it is not alloyed with zinc or other metals (Van Duivenvoorde 2021). Additionally, two keel bolts registered as having been recovered from *South Australian* and housed at South Australia's Heritage Collection

Storage Facility were analyzed. Results show they were manufactured with a copper-zinc alloy composed of 65%–69% copper, 31%–35% zinc (Van Duivenvoorde 2021). This indicates these fasteners are unlikely to be associated with *South Australian* and may have originated from another historic shipwreck in Encounter Bay dating to the mid- to late 19th century.

European experimentation with the application of metal sheathing to cover ships' hulls first occurred during the Age of Sail, and the use of lead for this purpose was common practice for Dutch East India ships dating to the early 17th century. The use of copper hull sheathing below the waterline can be credited to the Dutch West India Company (Van Duivenvoorde 2015b:354). European navies followed suit and started to regularly apply copper sheathing to warships by the second half of the 18th century (Kemp 1976:777; Staniforth 1985; Bingeman et al. 2000:220; McCarthy 2005:102). In 1761, the fifth-rate frigate *Alarm* was the first fully coppered warship in the British Royal Navy; however, the practice did not become widespread on British vessels until the 1780s (Kemp 1976:777; Staniforth 1985; Bingeman et al. 2000:220; McCarthy 2005:102).

Pure copper was used in European hull sheathing until at least 1832, when George Fredrick Muntz patented "Muntz metal" (also known as "yellow metal"), a 60:40 copper-zinc alloy (Flick 1975:74). The widespread use of copper sheathing by European shipbuilders and owners at the end of the 18th century, and transition to Muntz metal by the British in the mid- to late 19th century provides useful temporal ranges for the dating of hull sheathing. It also provides a basis for establishing probable construction periods for shipwreck assemblages that contain copper and copper-alloy sheathing. Archaeological case studies of several wrecked and abandoned vessels—*Snow Squall* (1851–1864), an unidentified 19th-century wreck at Koombana Bay, Western Australia, a late 19th-century Australian-built shipwreck on the Gold Coast in Queensland, Australia, and the Puerto Pirámides I shipwreck in Argentina—have utilized metallurgical analysis to establish initial temporal ranges for the dating of ship remains (O'Guinness Carlson et al. 2010; McAllister 2012; De Rosa et al. 2015; Van Duivenvoorde et al., this issue).

All four case studies used SEM to examine sheathing fragments and fasteners, and in each instance the results indicate a form of Muntz metal alloy was used in their manufacture. The results also point to probable production dates during the latter half of the 19th century. *South Australian*'s sheathing remains, by contrast, comprise almost pure copper, and indicate vessel construction and operation dates that precede the widespread use of Muntz metal. While some copper alloys were used to sheathe ships before 1832, and pure copper was occasionally employed in the mid- to late 19th century, it is unlikely British shipbuilders would have utilized a specific 60:40 copper alloy in the early 19th century when the use of pure copper sheathing was so prolific and well documented (Bingeman et al. 2000:224; Van Duivenvoorde 2015a: 119–124,152,169,176,180–182, 2015b; Bennett 2020:186–188,209–210,289–290).

It is also unlikely that British shipwrights would have continued to use pure copper sheathing once superior alternatives like Muntz metal entered common use. *Marquess of Salisbury*'s construction in 1819 falls squarely within the period when pure copper sheathing would have been widely used on British-built vessels, and well before the advent of Muntz metal. The results also correlate well with the final entry for *South Australian* in *Lloyd's Register*, which notes the vessel was clad in copper in 1836 shortly before its departure for Australia (Lloyd's of London 1837). The key to the same edition of the *Register* also features "Yellow Metal" as a sheathing category, and no doubt would have included it in *South Australian*'s entry had the distinction been necessary.

Small Finds

Six ceramic artifacts were observed and documented on *South Australian* between April 2018 and June 2019, one of which was recovered for further analysis. Except for a broken stoneware jug, which was located among a cluster of intact and broken glass bottles within *South Australian*'s surviving bow, all ceramic items were found scattered among articulated port side hull structure at the approximate interface between the wreck site's stern and midships sections (Fig. 7). A total of 60 glass artifacts were recovered from *South Australian* in June 2019, all but one of which comprise dark olive-green or "black" glass

bottles or bottle fragments. Elements of what appears to be an intact black glass bottle were found imbedded within an iron concretion and documented in situ, while another complete bottle manufactured from light aqua-green glass was recovered. All bottle glass was located within *South Australian*'s bow section, with a large concentration located atop ceiling planking between frames F3 and F10 (Fig. 8). The iron concretion containing the second intact black glass bottle is located immediately adjacent to the foremast step's portside arm. Two flint artifacts were observed within *South Australian*'s port stern-midships area in May 2018, one of which—a gunflint—was recovered in July 2019 for analysis. The other object, which was left in situ, is larger than standard gunflints manufactured for use with early 19th-century small arms and may have been used instead with a wall gun or as a strike-a-light.

Refined Earthenware

Four fragments of decorated ceramic were observed on *South Australian*, three of which were left in situ, and the other recovered in June 2019 for analysis. All four were located at the interface between the wreck site's midships and stern sections. One in situ fragment was an example of hand-painted blue-and-white pearlware that may have originated from a teacup or small lid (e.g., for a sugar bowl or teapot). Both surfaces were covered in a clear, shiny glaze, and the exterior featured a brilliant underglaze cobalt blue hand-painted decoration that comprised part of a floral motif at one end, and a trellis band with a repetitive dot-diaper pattern at the other (Fig. 9).

The two other fragments left in situ appear to be examples of either "Seaweed" or "Fibre" pattern transfer-printed ceramics that originated from a bowl, cup, or similar form of tableware (Fig. 10). Both are mostly embedded in iron concretion, but what remains visible features pale blue underglaze decoration atop a white refined earthenware body. The blue underglaze appears hazy or blurred and may represent a form of flow-blue transferware design. One sherd features a delicate, dark brown dotted or "stippled" dendritic design atop the blue underglaze, while the other retains part of a plain vessel rim. Both are covered in a clear lead glaze that exhibits extensive cracking.

Fig. 9 Sherd of hand-painted blue-and-white pearlware in situ. (Photo by Irini Malliaros; courtesy of SAILS.)

The recovered ceramic fragment is somewhat larger and appears to have originated from the body of a wide, straight-sided vessel, such as a washbasin or chamber pot. Like the smaller sherd, it is covered in transparent shiny glaze on both its interior and exterior surfaces; however, its exterior is decorated with a transfer-printed "Blue Willow" pattern riverine landscape (Fig. 11). The sherd's interior surface is undecorated, and its bright white paste strongly suggests it is a form of whiteware.

Transfer-printed Blue Willow pattern ceramics were first introduced around 1790 and are characterized by a riverine landscape that depicts a bridge and large pagoda in the foreground, several small pagodas or houses on

Fig. 10 Seaweed- or Fibre-pattern transfer-printed ceramic sherd in situ. Note the encapsulating iron concretion. (Photo by Irini Malliaros; courtesy of SAILS.)

Fig. 11 Sherd of transfer-printed Blue Willow pattern ceramic recovered from *South Australian* in June 2019. (Photo by Katarina Jerbic; courtesy of SAILS.)

islands in the background, willow trees, and one or more boats on the water (Noël Hume 2001:248–249; Neale 2005:74; Portanova 2012:6). The design appeared on both pearlware and whiteware during the early 19th century, with the former manufactured between 1784 and 1840, and the latter produced from 1830 until the present day (South 1977; Sussman 1977; Copeland 1990:14,35–39; Miller 1991; Samford 1997). Noël Hume (2001:248) notes the original "standard" version of Blue Willow—which is usually printed in a lighter shade of blue and features design motifs identical to those on the sherd recovered from *South Australian*—reached peak production between 1825 and 1840.

Hand-painted blue-and-white pearlware was manufactured by numerous English potteries between 1775 and 1840. After 1820, pearlware was embellished with bold, hand-painted blue floral designs that enjoyed a period of popularity over other contemporary Chinoiserie-decorated ceramics (Noël Hume 1970, 2001; South 1977; Sussman 1977; Miller 1991). Rim designs vary for hand-painted blue-and-white pearlware, but documented examples recovered from a variety of late 18th and early 19th-century archaeological sites often feature trellis bands that incorporate a repetitive diaper motif with either a cross-shaped lozenge or single central dot.

Transfer-printed wares featuring both the Seaweed and Fibre patterns emerged during the 1820s and 1830s and were immensely popular in Great Britain and its colonies during that period (Ward 2006b:36). Ceramic artifacts with both designs have been recovered from early to mid-19th-century colonial sites throughout Australia and New Zealand (Brassey 1989:80; Macready and Goodwyn 1990:13, figure 3-C8,21; Brassey and Macready 1994:41,61, figures 30a–b; Plowman 2000:93; Bickler et al. 2005:156; Ward 2006a:29, 2006b:36; Campbell and Furey 2007:92–93). While both patterns comprise similar tendril-like motifs, the Seaweed design is also often characterized by the inclusion of small flowers—an attribute notably absent from the sherds observed on *South Australian* (Macready and Goodwyn 1990:13, figure 3-C8; Bickler et al. 2005:156).

Ceramics featuring flow-blue decoration were first manufactured in Staffordshire in the early 1830s (Williams 1984; Samford 1997:24). Flow blue's softer visual appearance was immensely popular and long-lived, and ceramic tableware bearing the design appeared on regional colonial Australian sites by the end of the decade (Lawrence et al. 2009:71). Samford (1997:24) notes early flow-blue patterns tend to incorporate Chinoiserie themes, including "florals" composed of plants that could have included Seaweed and Fibre patterns.

Stoneware

Remnants of a salt-glazed stoneware jug were located during the June 2019 survey, immediately adjacent to the waterway within *South Australian*'s port bow section (Fig. 8). Although broken, the jug appears mostly intact, but was embedded within iron concretion and consequently left in situ (Fig. 12). Its color, ceramic composition, and overall form closely resemble stoneware jugs manufactured for German mineral-water producers, such as Selters and Tolles, during the early 19th century. Due to its perceived therapeutic properties, German mineral water was immensely popular throughout Europe, and was shipped to myriad European colonies during the 18th and 19th centuries (Krivor et al. 2010:137). Neither a handle nor seal—features common on German mineral-water jugs—were observed on the example found on *South Australian* but may be obscured by concretion.

Diagnostic attributes of German mineral-water jugs changed over time and by 1780 brown to brownish orange had become the predominant color (Krivor

Fig. 12 Broken stoneware mineral-water jug in situ in *South Australian*'s bow section. (Photo by Irini Malliaros; courtesy of SAILS.)

Fig. 13 Basal fragment of Derbyshire stoneware jug in situ. (Photo by Irini Malliaros; courtesy of SAILS.)

et al. 2010:139). Their overall form changed as well, evolving into a cylindrical shape with vertical sides by the second quarter of the 19th century. Jug height diminished as well, shrinking to 25–30 cm by 1800 (Krivor et al. 2010:139). The *South Australian* example has an estimated overall length of 22 cm, and this attribute—as well as others, including vessel, neck, and lip forms—correlates well with post-1835 Selters mineral-water jugs, as well as an example manufactured between 1806 and 1830 recovered from a shipwreck site in the Baltic Sea in 2014 (Archaeology 2014; Vyšohlíd 2014:428).

A complete basal fragment of another salt-glazed stoneware vessel was located within the midships/stern interface but not recovered (Fig. 13). Its gray/buff paste and honey-brown colored external glaze most closely approximate Derbyshire stoneware produced during the first quarter of the 19th century (Oswald and Hughes 1974; Hildyard 1985:82). The sherd features a dark colored internal glaze that suggests it was produced after 1825, when olive green lead glazes were added internally to Derbyshire stoneware jars and bottles, but before 1835, when they were replaced by clear Bristol glazes (Askey 1998).

Dark Olive-Green Bottles

The complete dark olive-green bottle has a long, relatively narrow cylindrical body and measures 29 cm in overall height. The bottle's neck is approximately one-third the length of the body and bulges at its approximate halfway point to a maximum diameter of 3.8 cm before tapering and ending in an applied "down-tooled" lip and flattened string rim. The base measures 8.2 cm in diameter and features a steep conical push-up that terminates in a pronounced pontil scar. No mold seams are evident on the bottle, and the base features a "rounded heel" like that described by Jones (1986:91–95) for wine and beer bottles dating to the first quarter of the 19th century.

In terms of overall form, the bottle most closely approximates British "wine-style quart" bottles manufactured with the dip-mold technique between ca. 1790 and 1820 (Van den Bossche 2001:82; Jones 2010:97,146–147). British wine bottles from this period exhibit an average height and diameter of 27.5 cm and 8.5 cm respectively, feature down-tooled or flattened lips that are equal to or slightly larger than the string rim, and have an average estimated carrying capacity of 801 mL (Jones and Smith 1985:18; Jones 1986:80, 2010:97). Wine bottles and bottle fragments of similar size and appearance have been noted on other early 19th-century shipwrecks (Cooper 2012; Horrell and Borgens 2014; Irion et al. 2014; Romey 2019; Bureau of Ocean Energy Management 2021). This includes the ship *Solway*, which wrecked at Rosetta Harbor only a couple of weeks after *South Australian*'s loss. Among the glass artifacts recovered from *Solway* was a nearly identical dark olive-green wine bottle base measuring 8 cm in diameter (Coroneos 1997:37).

The eight complete bottle bases vary from 7.7 to 9.6 cm in diameter and exhibit characteristics

consistent with the intact wine bottle, including glass color and transparency, a steep conical push-up, and similar overall dimensions. The two intact bottle necks have maximum diameters of 3 cm and 3.4 cm, respectively, and feature attributes consistent with the intact bottle, including a bulged neck and thick, applied down-tooled lips and down-tooled or flattened string rims. These traits are all indicative of post-1820 manufacture (Jones 1986:68–69).

Visible elements of the second intact dark olive-green bottle include the neck and part of the shoulder. The exposed neck measures 7.6 cm in overall length and bulges at its approximate midpoint to a maximum diameter of 3.2 cm. Although largely concreted, the top of the neck terminates in an applied string lip and rim, the latter of which—where visible—appears to be down-tooled. The bottle's sloping shoulder is mostly free of concretion and measures 7.6 cm in diameter, which correlates well with the other black glass bottle and bottle neck and basal fragments in the assemblage.

Intermittent narrow strands of concretion extend up the side of the neck and terminate in a small, dome-shaped concretion attached to the rim that may contain a metal bottle closure, such as a cork capsule, composition head, or sprinkler. The thin strands of concretion are unusual and could represent remnants of wire used to hold the closure in place. Metal closures were commonly used in association with a variety of early 19th-century bottle types, including those that contained alcoholic beverages (Jones and Sullivan 1989:150–151).

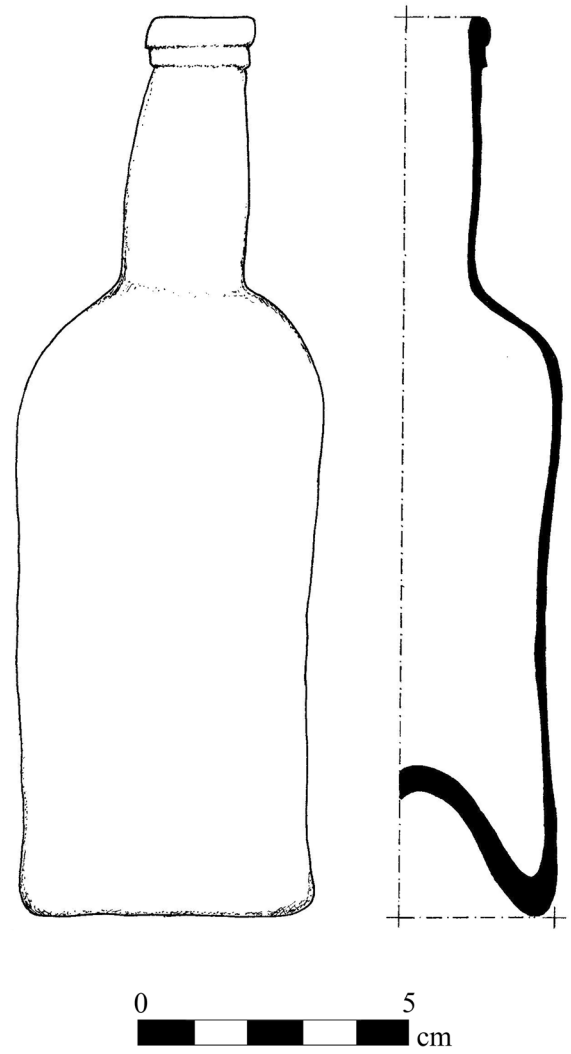

Fig. 14 Scale drawing of the intact aqua-green bottle recovered from *South Australian*'s bow section. (Drawing by Katarina Jerbic; courtesy of SAILS.)

Aqua-Green Bottle

The other intact bottle recovered from *South Australian* is manufactured from light aqua-green glass, and approximately half the size of the dark green example, but otherwise shares many diagnostic attributes (Fig. 14). It has an overall height of 16.5 cm, and maximum base and neck diameters of 5.6 cm and 1.5 cm, respectively. The bottle's body is relatively long and narrow and features a base with a slightly bulged heel and steep, conical push-up. A pontil scar is not evident, suggesting the bottle was manufactured with the use of a "sand pontil," a method specific to English bottle makers that was gradually replaced by the "snap" technique from the late 1830s onwards (Jones 1971:69–70, 1986:103–105). Both the rim and lip are down-tooled, although the latter appears somewhat flatter in profile. No mold seams are evident, suggesting the bottle was likely produced in a dip mold.

It is presently unclear what the bottle originally contained at the time of *South Australian*'s loss. Early 19th-century aqua and aqua-green glass bottles came in a variety of forms, including those used to store and transport medicine, bitters, soda/mineral water, and ink, as well as fruit jars and condiment containers (McKearin 1970; Jones and Smith 1985: 65,90–94; McDougall 1990:64–70). Although less common,

aqua and aqua-green glass was also used in the production of alcoholic beverage bottles, specifically those used for beer, ale, and ginger beer (Lindsey 2020; von Mechow 2020). Several examples of a later variant of aqua ginger-beer bottle have been noted on the wreck site of *Leven Lass*, a colonial Australian trading vessel lost off the north coast of Phillip Island, Victoria, in 1854 (Colwell-Pasch 2014:62).

Flint Artifacts

The gunflint recovered from *South Australian* appears to conform to the general morphology of de Lotbiniere's (1984) "English gunflints" that Ballin (2012) has more recently labeled "rectangular blade gunflints." These gunflints have a rectangular shape, and four beveled edges that produce a large lower surface and smaller, concave upper surface or "platform." The sides are beveled with clean fractures that have been retouched along the lower edges to obtain a straight side edge (de Lotbiniere 1984). The gunflint's heel features a much less acute angle than the firing surface (or "leading edge"), which has a more pronounced wedge shape. A "single-edge" gunflint of this type could only be oriented in one direction in a flintlock's cock-jaws.

While the artifact's identification as a gunflint seems relatively straightforward, classifying its intended use and origin is not. It measures 3.7 cm long by 3.2 cm wide and is 1.2 cm thick. This is larger than the standard gunflint size for muskets, although the *South Australian* example predates Skertchly's standard sizes by at least 40 years and may not be uncommon for the early 19th century (Skertchly 1879; de Lotbiniere 1984; Ballin 2012). Indeed, de Lotbiniere (1984) concedes flintlock rifle gunflints from archaeological contexts have measured as large as 1½ × 1¼ in. (3.8 × 3.2 cm), a size that correlates well with the *South Australian* gunflint.

The gunflint could also have been used or intended for use with heavy ordnance, such as the carronades *South Australian* mounted during its tenure as the naval packet *Swallow* (and may still have been armed with at the time of loss). According to de Lotbiniere (1984), Royal Navy cannon flints were likely of similar size to musket gunflints for purposes of interchangeability. It is not possible at this stage to state with any degree of certainty whether *South Australian*'s gunflint was used for small arms or artillery or, because the flints were found within *South Australian*'s lower hold, whether they were intended for shipboard use, part of the vessel's cargo, or supplies for shore-based whaling. An analysis of use-wear patterns may shed light on this aspect.

Although mostly cream colored, the gunflint features a dark blue marbleized pattern interspersed with patches of a yellowish hue. It has been slightly water-rolled and recorticated. A very superficial examination of typical sources for British gunflints suggests the coloring present in the *South Australian* example does not match a known source and is almost certainly not original to the artifact (Ballin 2012; Torben B. Ballin 2021, pers. comm.). Marked color change is a typical byproduct of immersion in seawater and/or weathering, and an initial interpretation is that the coloration in the *South Australian* example cannot be used as a diagnostic indicator because it does not compare to flint's natural appearance. To date, research related to the recovered gunflint has been limited to its morphological characteristics to define its purpose. However, additional avenues of inquiry—such as investigation of production methodology, source, and use-wear characteristics—are necessary, and their results may inform as-yet unknown aspects of these artifacts and their use(s) aboard *South Australian*.

The second flint observed on *South Australian* differs from the first, most notably in size. It appears to be much larger than usual, measuring approximately 4–5 cm long on each of its four sides (Fig. 15). The bevels of both the heel and leading edge appear to have a similar angle, suggesting it is a possible "double-edge" gunflint, while the bevels on the two sides are more acute and demicones are apparent on the side edges of the platform (de Lotbiniere 1984). While not conclusive, the apparent size of this flint precludes its use in standard small arms or artillery, and more closely matches gunflints for wall pieces, as per Skertchly (1879). However, the greater likelihood is that it was used as a strike-a-light/fire starter (J. Ferguson and Torben B. Ballin 2018, pers. comm.; Torben B. Ballin 2021, pers. comm.).

Site Management and Significance

South Australian was listed on the South Australian Register of Historic Shipwrecks in 1988, the year DEW established the register, and was declared

Fig. 15 Possible flint strike-a-light or fire starter in situ. (Photo by Irini Malliaros; courtesy of SAILS.)

an historic shipwreck under South Australia's Historic Shipwrecks Act 1981 in 1996 (*South Australian Government Gazette* 1996; Coroneos 1997). On 5 July 2018, a 30 m radius protected zone was declared around the site due to its location in shallow waters near a well-populated regional community, and the potential for it to be detrimentally affected by human impacts (*South Australian Government Gazette* 2018). The protected zone prohibits all vessels from entering it or conducting any underwater work, including diving, without a permit. Compared to other historic shipwreck protected zones around Australia, the size of *South Australian*'s is relatively small, but is sufficient to cover all articulated remains and much of the site's disarticulated debris, whilst causing minimal disruption to local recreational activities, such as boating, fishing, and diving.

The size of *South Australian*'s protected zone was intentionally kept small to avoid alienating the local fishing community and tap into the civic-mindedness of Encounter Bay residents to report illegal activities. DEW produced two regulatory/interpretive signs to inform boat operators, fishers, divers, snorkelers, and swimmers of the restrictions associated with the protected zone. One was installed at a popular boat ramp near Rosetta Head ("The Bluff"), and the other on the foreshore overlooking the site (Fig. 16). Other measures included a site-specific Webpage on Heritage South Australia's Website and media releases generated by both state and local media outlets.

South Australian's research potential was immediately apparent to SAILS and to guide the planning and conduct of future initiatives, as well as the site's management generally, DEW—with input from SAILS team members—prepared a Conservation Management Plan (CMP) (Bullers 2019). Although the historical significance of the site was well established prior to discovery, the preservation of articulated hull remains, as well as the number and variety of in situ artifacts, substantially elevated its scientific and archaeological significance. The CMP featured a detailed site heritage significance assessment and accompanying statement of significance (Bullers 2019:35). *South Australian* constitutes one of only three known examples of British-built post-office packets to have been

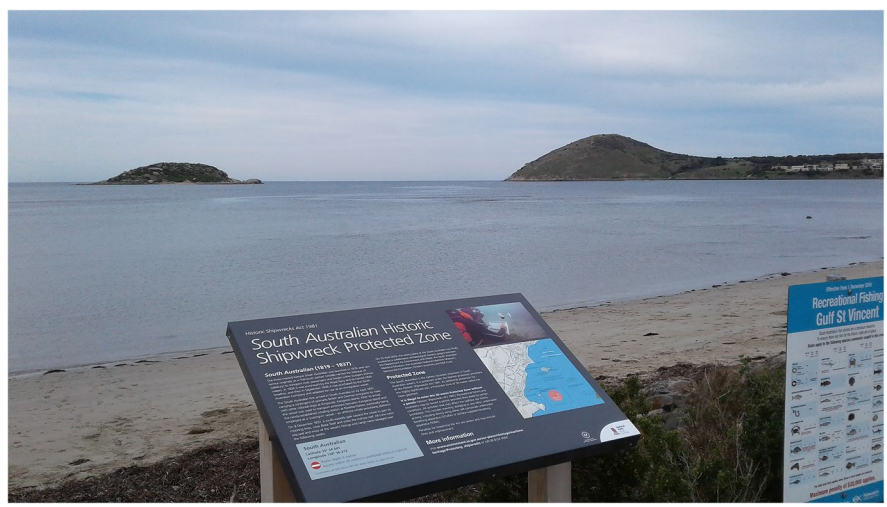

Fig. 16 Interpretive signage overlooking *South Australian*'s wreck site on the Encounter Bay foreshore. (Photo by James Hunter; courtesy of SAILS.)

archaeologically investigated anywhere in the world, which elevates its heritage significance to an international level. The two other confirmed wreck sites are *Lady Mary Pelham*, lost at Port Fairy, Victoria, in 1849, and *Hanover*, wrecked in Cornwall, England, in 1763 (Parham et al. 2009, 2013; Heritage Council Victoria 2020). Wreck sites of two other packets may also have been located—*Nancy Packet*, wrecked in the Isles of Scilly in February 1784, and *Josephine Willis*, lost off Folkstone, England, in February 1856—although their respective identities have yet to be confirmed (Davenport 2016; Scilly Divers 2018).

During the July 2019 investigations, four sediment monitoring stations were installed, one adjacent to each side of the surviving hull's bow and stern sections. The stations are a means of determining the amount of sediment movement and coverage over the site, with the goal of assessing the risk to the surviving hull from marine borers and other natural processes.

Conclusion

Archaeological investigation has confirmed *South Australian*'s identity by highlighting several aspects of the wreck site that align with historical accounts of the vessel's career and loss. Its location and disposition, in shallows directly offshore from the Fountain Inn with its hull heeled well over to port and stern pointing shoreward, correlate exactly with descriptions of the wrecking event chronicled in the logbook and other archival sources. Similarly, the recorded length of the visible hull closely approximates that of *South Australian*'s overall length, while its construction indicates a vessel built in a British shipyard during the first decades of the 19th century, when shipbuilders were transitioning from iron to predominant use of pure copper fasteners, hardware, and sheathing. The use of European timber in the vessel's construction also points to *South Australian*, as only two European-built vessels are known to have wrecked in Encounter Bay during the 19th century (the wreck site of the other, the ship *Solway*, was located and identified in the 1970s). With its sharp bow and robust, uniformly designed hull architecture, it is clear the vessel was built for speed and to standards that suggest a strong naval influence. Some features associated with the hull, such as the lead patching on the stem, can be associated with specific incidents recorded in *South Australian*'s logbook. Others, including the hull sheathing and teak treenails, speak to later general repairs to the vessel's aging hull.

Although relatively scant, the site's diagnostic artifacts all point to a period of manufacture and use during the early 19th century, and the majority are British in origin. All decorated ceramics within the assemblage reached peak use during the 1820s and 1830s, which correlates exactly to the span of *South Australian*'s sailing career (and that of its prior identities as *Marquess of Salisbury* and HMS *Swallow*). Even the undecorated stoneware artifacts exhibit diagnostic traits indicative of early 19th-century origins, and the Selters jug hints at an association with the small contingent of Germans who embarked aboard *South Australian* at Plymouth in December 1836. The intact bottles and bottle glass found in the bow section also point to British manufacture ca. 1820–1830, and further reinforce the site's identity.

South Australian's historical and archaeological significance cannot be overstated. As South Australia's oldest recorded European shipwreck, and one of its earliest immigration vessels, it has the potential to enhance our understanding of the state's initial colonization and occupation—including the establishment of extractive mercantile activities, such as shore-based whaling and interactions between European colonists and Aboriginal people. Similarly, the site's distinction as one of only two (former) 19th-century British sailing-packet shipwrecks to undergo archaeological scrutiny brings an international dimension to its significance. While a sizable percentage of *South Australian*'s surviving fabric remains buried, recent seabed changes are uncovering the site at an alarming rate. This has reinforced the need for additional investigation and inquiry and underscores the urgency with which site stabilization efforts should be adopted and enacted.

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Declarations

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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