

Senggiling Shipwreck: Underwater Archaeological Remains on the North Coast of Bintan Island

Kapal Karam Senggiling: Tinggalan Arkeologi Bawah Air di Pesisir Utara Pulau Bintan

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Abstract

The Senggiling Shipwreck has been researched since 2019, and the result of the research was published in 2020. In 2021, further research was conducted, and new data was obtained. The research in 2021 shows an update regarding the identity of the Senggiling Shipwreck, which includes the ship's cargo, structure, and historiography. This research aims to update information related to the Senggiling Shipwreck site, which was studied in 2020. The data sampling was carried out using underwater archaeological survey techniques, while the analysis was carried out on aspects of form, type, space and date to obtain information about the various types, forms and times of manufacture of the ship and its load. In addition, this research also uses archives and documents to trace shipping activities on the island of Bintan. The results of the latest identification show that the Senggiling Shipwreck is a wooden ship whose raw materials for its manufacture come from mainland Europe and Central to South Asia. The manufacturing technology originated after 1832 AD from Europe, which transported trade commodities from China and Europe.

Kapal Karam Senggiling telah diteliti sejak tahun 2019 dan dipublikasikan tahun 2020. Pada tahun 2021 dilakukan penelitian lanjutan yang menghasilkan data baru. Berdasarkan hasil penelitian tahun 2021 tersebut menunjukkan adanya pembaharuan terkait identitas Kapal Karam Senggiling yang meliputi muatan kapal, struktur kapal, serta historiografinya. Tujuan penelitian untuk memperbaharui informasi terkait situs Kapal Karam Senggiling yang telah diteliti tahun 2020. Pengambilan sampel data menggunakan teknik survei arkeologi bawah air. Analisis dilakukan pada aspek bentuk, jenis, keruangan dan pertanggalan untuk mendapatkan informasi mengenai ragam jenis, bentuk dan masa pembuatan kapal tersebut dan muatannya. Selain itu penelitian ini juga menggunakan arsip dan dokumen untuk menelusuri kegiatan pelayaran di pulau Bintan. Hasil

identifikasi terbaru Kapal Karam Senggiling merupakan kapal kayu yang bahan baku pembuatannya berasal dari daratan Eropa dan Asia Tengah hingga Selatan. Teknologi pembuatannya berasal dari Eropa setelah 1832 yang mengangkut komoditas perdagangan dari China dan Eropa.

Keywords: Bintan Island, European Ship Technology, Senggiling Shipwreck, Trade Commodities

Introduction

In the 5th century AD, the sea became an essential means of trade. This trend has been ongoing since the 3rd century and has played an integral part in creating markets located around the South China Sea (Wolters 2011). The development of the maritime-based kingdom of Srivijaya from the 7th century AD to the 11th century AD brought prosperity to the polities on the coast of Sumatra Island and the small islands around it, including Bintan Island. Trade from the South China Sea to the Straits of Malacca in the past was no less busy than the trade in Mediterranean waters, and it developed into an array of systematic exchange networks (Guillot et al. 1998). The archipelago was a bustling global trading area in the past. Maritime commerce in this area grew as the archipelago was the primary producer of high-value spices for the global market. One of the maritime routes used for the spice trade at that time consisted of the North Natuna Sea, which connects to the Singapore Strait, Malacca Strait, and the Indian Ocean. It links Southeast Asia to India, West Asia, Africa, and Europe.

From the 16th century, the arrival of the Europeans, namely the Portuguese, Spanish, Dutch, and British traders, began to change the dynamics of maritime trade in the archipelago (Iskandar 2005: 176). During the 16th century, the Portuguese began their expedition in this region. Their initial arrival started with a trade mission that eventually expanded into the Malacca Kingdom and the Malay-Riau Kingdom. However, the Portuguese influence did not last long because the Dutch eventually supplanted their position in the region during the 17th century. The power of the Sultans, who ruled the area since the 15th century, was further reduced after the London Treaty agreement between the Netherlands and England. The agreement led to the demarcation of colony boundaries along the Singapore Strait. As a result, the British laid claim over the Malay Peninsula, while areas south of the strait, which include the Riau Islands, were placed under the Dutch sphere of influence (Lapian 2008).

Shipping activity and maritime trade in the North Natuna Sea were intense, as evident from the underwater archaeological remains in these waters. Therefore, several researchers have carried out maritime archaeology studies around Bintan Island. For example, Manguin (2019) examined early Southeast Asian ship construction technology in the area. One of the latest researches conducted around Bintan Island focuses on a 13th-century Southeast Asian shipwreck located in the waters of Tanjung Renggung, south of the island (Adhityatama and Sulistyarto 2018: 127). The most recent finding is the Senggiling shipwreck site.

The discovery of the Senggiling wreck should not come as a surprise. The area where the wreck is situated is one of the busiest shipping lanes since antiquity. Bintan Island is located at the entrance to the Singapore Strait from the South China Sea. Mount Bintan, the tallest hill on the island, has been an important landmark for seafarers since the 15th century (Mills 1970; Miksic 2013: 369).

Despite the island's importance in maritime trade, the area is also littered with navigational hazards; thus, reports of shipwrecks or ships stranding on shoals, rocks, and reefs were uncommon. While mount Bintan may be a significant landmark, its surrounding peripheries contain numerous hazards that threaten shipping within the area. In 1811, James Horsburgh (1811), a cartographer, wrote descriptions of the Singapore Strait and the sailing directions to traverse through the strait safely. The hill was also prominently featured as a landmark. In the book, he provided descriptions of the features around the island. Some of the hazards identified include the reefs and rocks around Point Romania at the tip of peninsular Malaysia, Pedra Branca, Middle Rocks and South ledge in the middle of the strait, and shallows around the Northeast part of Bintan. Pedra Branca, for instance, has claimed two ships, one 14th century ship and the other an 18th Country ship, *Shah Muncher* (Flecker 2022a; Flecker 2022b). The recently discovered wreckage and remains of these ships were¹ are a testament to the dangers that lurk in that area. The Senggiling wreck provides yet another piece of material evidence about the treacherous waters in that area.



Fig. 1 The location of the Senggiling shipwreck in North Bintan Island, Indonesia. Source: Stanov Purnawibowo, 2021.

Senggiling shipwreck is located in Sri Bintan Village, Teluk Sebong District, the administrative region on the northern part of Bintan Island, Bintan Regency, Riau Islands Province (Figure 1). Archaeological surveys in Senggiling Waters were carried out in 2019, 2020 and 2021. This

¹ Ng, Keng Gene 'Centuries-old shipwrecks discovered in Singapore waters; artefacts to be displayed in museums', *The Straits Times*, June 24, 2021, obtained from <https://www.straitstimes.com/singapore/centuries-old-shipwrecks-discovered-in-spore-waters-artefacts-to-be-displayed-in-museums>. Obtained on January 24, 2022.

research is one of the working programmes under the auspices of the Archeology Center of North Sumatra, Indonesia (Balar Sumatera Utara, or Balar Sumut). The site is located about 400 to 500 meters from the uninhabited coast of Senggiling. The discovery of the Senggiling shipwreck can be credited to one of the community leaders living in Pengudang Village, east of Senggiling.

Archaeological remains at this site consist of the ship's cargo overlying a preserved hull section. The artifact deposits cover an 18 x 10 meters area at a depth of 9 to 12 meters. The seabed where the shipwreck is situated consists of sand and mud sediments. Diving conditions are good as the surrounding waters offer good visibility.

In 2020, the conclusion derived from the research findings obtained during the 2019 and 2020 surveys suggested the need to focus on identifying the shipwreck. Based on this research premise, the Archeology Center of North Sumatra, Indonesia, updated its research objectives for the 2021 field season accordingly. Thus, this article hopes to present the results of the latest research on the identification of underwater archaeological objects at the Senggiling Shipwreck site and update the information from the 2020 publication.

Method

This research uses four stages: initial literature study, underwater exploration, analysis, and synthesis. First, a literature review was carried out to search for the identity of the Senggiling Shipwreck site, which is still unknown. Next, the library data search was carried out by examining old maps related to shipping activities in the waters of Bintan Island. In addition, archival research was conducted on newspapers in Singapore that reported shipwrecks that sank in these waters in the 19th century. Finally, this literature data was analyzed to narrow the identity of the Senggiling ship. Underwater archaeological research uses underwater methods following the principles of the UNESCO Manual for Activities directed at Underwater Cultural Heritage (Maarleveld et al. 2013). Underwater site recording will be carried out with underwater data recording techniques. Measurements were carried out according to the baseline, quadrant, and grid techniques to obtain a more detailed site distribution map (Bowens 2009). The archaeological remains of this site were left in situ, and only the samples needed for identification and laboratory analysis were taken.

C14 Radiocarbon dating was done to determine the absolute age of the archaeological remains found at the Senggiling Site. The technique used is the Accelerator Mass Spectrometry (AMS) technique. This technique allows for more accurate results with less sample weight than radiometric dating techniques. AMS dating analysis was carried out by sending samples to the BETA Analytic Testing Laboratory in Florida, United States. Only one timber sample from the Senggiling Site was sent.

Furthermore, a species analysis was also carried out to determine the type of wood used in one of the ship's components and the origin. Slices of timber samples were examined for anatomical characteristics qualitatively and quantitatively. They were also examined based on the characteristics recommended by the International Committee of the Association of Wood Anatomists (Wheeler et al. 1989). Then with the South East Hardwood Microscopic Identification Key application developed by Xylarium Bogoriense and a combination of The Inside Wood Database (<https://insidewood.lib.ncsu.edu/>), the identification process is carried out. The recommended wood types are then compared with the original wood collection at Xylarium Bogoriense, Ministry of Environment and Forestry, to determine the genus/type of wood.

The composition of the metal artefact from this site was examined using a portable XRF apparatus from the Bruker S1 Turbo D series by grasping it, directing the X-ray source and detector at the original clean specimen, and firing it. The types of findings studied were in the form of metal fasteners connected to timber planks. This analysis was conducted at the Central Geological Survey Laboratory in Bandung, West Java, Indonesia.

Ceramic artifact samples were obtained during the survey for further analysis. The sample was randomly chosen but represented the diversity of ceramic remains found at the site. The ceramics from the site are analyzed based on visual examination and production methods. Examination of the ceramics' stylistic attributes provides information on the ceramic production origins and relative dating. This was done by comparing and cross-referencing the ceramics with other contemporary ceramic finds from ceramic catalogues and terrestrial and maritime archaeological sites.

Archival Research

Preliminary archival research was conducted to identify the ships that sank in that area during the early 19th century. The archival research centred on the early 19th century because the artefacts found at the site were similar to those found on other contemporary shipwrecks in the area and access to available records. The Chinese porcelain found on the wreck can be comparable to the Qing Dynasty (1644 – 1911), specifically between the eighteenth and nineteenth centuries. The wreck also contains elements of European ship design and materials. Thus, based on the observations above, it is possible to conclude that the shipwreck was possibly a European-designed ship that sank during the early 19th century with a certain amount of confidence.

Relying on the old Singapore newspaper reports and charts, it was noted that a total of 20 ships were recorded to have wrecked or met with mishaps around Bintan Island between 1829 to 1899. The number of ship losses was too high to be ignored. It prompted the authorities in Singapore to take action. Actions to mitigate the ship losses included a proper survey of the Singapore straits and the construction of the Horsburgh Lighthouse on Pedra Branca in 1853 to help guide the ships away from the hazards and lead them safely through the straits². Despite the availability of sailing instructions, charts and a lighthouse, the area remained dangerous to shipping as reports of ships sinking in the area persisted.

The 20 ships identified faced various outcomes upon wrecking or stranding around Pedra Branca and Bintan. Some of these ships were refloated, while some were left to the natural elements and eventually became wrecked. One of the ships on the list may likely be the true identity of the Senggiling wreck.

Information obtained from Charts

The first critical information on early 19th-century wrecks at Bintan came from an 1846 hydrographic chart produced by John Turnbull Thompson. He was a cartographer who surveyed the Singapore straits during the mid-19th century. According to an 1855 edition of the chart, five shipwrecks were located at the Northeast point of the island. The five ships were *Bishop Heber*, *Sylph*, *Gleneira*, *Parsee* and *Venus*. *Sylph* sank in 1835; *Bishop Heber* sank in 1839; *Gleneira* sank in 1842; *Parsee* and *Venus* sank in 1845 (Figure 2).

² 'Untitled', *The Singapore Free Press and Mercantile Advertiser*, December 15 1836, p. 2..

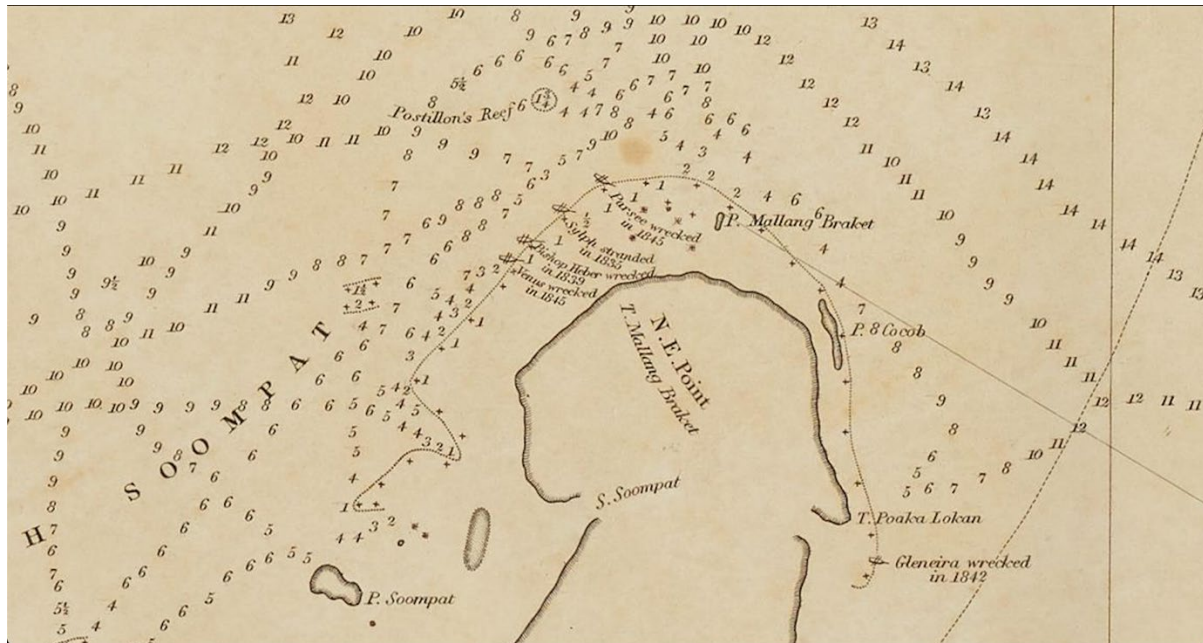


Fig. 2 The five shipwrecks, Bishop Heber, Sylph, Gleneira, Parsee and Venus, highlighted in the 1855 edition of the Survey of the Straits of Singapore off the north-eastern point of Bintan Island. [Is Respectfully Inscribed To The Honourable Colonel Butterworth, C.B.]. Source: National Museum of Singapore, National Heritage Board.

Information obtained from Archival Newspaper Records

Information on the five ships mentioned above can also be found in old newspaper records from the Singapore archives (Table 1). The information on these ships included the type of ship, how and where the ships were wrecked and their eventual outcomes. When *Bishop Heber*, *Gleneira*, *Parsee* and *Venus* were wrecked³. There were attempts made to rescue these ships and salvage their goods⁴. The wreck sites were visited on several occasions, and the newspaper records also provided when the wreck sites could be last seen. *Sylph* was the only ship on the list successfully refloated and subsequently re-used⁵. Therefore, it is certain that the *Sylph* could not be the identity of the Senggiling wreck.

It is important to note that the other four shipwrecks may not be the true identity of the Senggiling wreck as their locations did not correspond with the area where the Senggiling wreck is located. These shipwrecks are located in the Sumpat Bay area at the northeastern part of Bintan Island called Tanjung Berakit. The ships may have sunk at the northeast point of Bintan Island. However, their locations may not be accurate as the cartographer had to rely on past information and possibly newspaper accounts to ascertain their location. The locations of these ships were somewhat uncertain as there were insufficient details provided in the newspapers on their location as they eventually succumbed to the environment. Therefore, the four shipwrecks highlighted in Figure 2 should still be considered contenders to the Senggiling wreck's identity.

³ 'Untitled', The Singapore Free Press and Mercantile Advertiser, March 8 1847, p. 1.

⁴ 'Page 1 Advertisements Column 2', The Singapore Free Press and Mercantile Advertiser, January 2 1840, p. 1 (Bishop Heber); 'The Free Press', The Singapore Free Press and Mercantile Advertiser, November 24 1842, p. 3 (Gleneira); 'Untitled', The Straits Times, December 10 1845, p. 2 (Parsee); 'The Free Press', The Singapore Free Press and Mercantile Advertiser, January 30 1845, p. 3 (Venus).

⁵ 'Singapore', Singapore Chronicle and Commercial Register, September 12 1835, p. 3.

S/ N	Ship's Name	National ity of ship	Type of ship	Gross tonnage (Tons)	Captain/s	Date Wrecked	Departed from	Destination
1	<i>Sylph</i> ⁶	British	Barque	305	R. Wallace	February 7 1835	Singapore	Unknown
2	<i>Bishop Heber</i> ⁷	British	Unknown	450	Thomas	December 26 1839	Unknown	Unknown
3	<i>Gleneira</i> ⁸	British	Unknown	360	Newby	November 14 1842	Siam	Singapore
4	<i>Venus</i> ⁹	British	Schooner	Unknown	G.B. Browne	January 30 1845	Singapore	Borneo
5	<i>Parsee</i> ¹⁰	British	Barque	Unknown	Chivas	November 22 1845	Singapore	Shanghai

Table 1 List of ships as mentioned above can also be found in old newspapers,

⁶ Wallace Robert 'The Sylph – Captain Wallace', *Singapore Chronicle and Commercial Register*, August 1 1835, p. 1.

⁷ 'Page 1 Advertisements Column 2', *The Singapore Free Press and Mercantile Advertiser*, January 2 1840, p. 1.

⁸ 'The Free Press', *The Singapore Free Press and Mercantile Advertiser*, November 24 1842, p. 3.

⁹ 'The Free Press', *The Singapore Free Press and Mercantile Advertiser*, January 30 1845, p. 3.

¹⁰ 'The Straits Times', *The Straits Times*, November 22 1845, p. 2.

Further archival research on reports of wrecks in the vicinity of Bintan indicated another 15 ships. The following table (Table. 2) is a list of the ships reported in chronological order:

S/N	Ship's Name	Nationality of ship	Type of ship	Gross tonnage (Tons)	Captain/s	Date Wrecked	Departed from	Destination
1	<i>Dourado</i> ¹¹	Portuguese	Brig	Unknown	M.R.Gondin (1827) - A.J.Ferraz / A.J. Ferrar (1828) ¹²	January 26 1829	Macau	Bombay
2	Unnamed Chinese Junk ¹³	Unknown	Junk	375	Unknown	June 29 1830	Singapore	Sung Hai
3	<i>Glenelg</i> ¹⁴	British	Unknown	867	C.S Gover (1827) / R.Lungley/R.Lan gley (1836)	October 26 1837	Hong Kong	Singapore
4	<i>Henry Davidson</i> ¹⁵	British	Unknown	600	W.R. Macdonnell	September 3 1842	Bombay	China
5	Unnamed Siamese Tope ¹⁶	Unknown	Tope	Unknown	Unknown	March 15 1845	Siam (Banjipan)	Unknown
6	<i>Mars</i> ¹⁷	British	A1 Barque	317	A.Brooks	August 30 1845	Singapore	Liverpool
7	<i>Johns</i> ¹⁸	Hamburg	Barque	Unknown	J.P. Gagzo	January 1 1847	Singapore	(Heading East)
8	<i>Ann</i> ¹⁹	Unknown	Barque	356	Gamble	February 26 1851	Singapore	China

¹¹ 'Singapore', *Singapore Chronicle and Commercial Register*, January 29 1829, p. 1.

¹² 'Shipping', *Singapore Chronicle and Commercial Register*, February 14 1828, p. 4.

¹³ 'Census', *Singapore Chronicle and Commercial Register*, July 15 1830, p. 2.

¹⁴ Jardine, W, Hiue, J, Blenkin, W, Dent, L, Bridgman, EC, Rastomjee, D, Archer, J 'China', *The Singapore Free Press and Mercantile Advertiser*, April 5 1838, p. 1.

¹⁵ Macdonnell WR 'Correspondence', *The Singapore Free Press and Mercantile Advertiser*, September 8 1842, p. 3.

¹⁶ 'The Free Press', *The Singapore Free Press and Mercantile Advertiser*, March 20 1845, p. 3.

¹⁷ 'The Free Press', *The Singapore Free Press and Mercantile Advertiser*, September 11 1845, p. 2.

¹⁸ 'The Free Press', *The Singapore Free Press and Mercantile Advertiser*, January 7 1847, p. 2.

¹⁹ 'Untitled', *The Singapore Free Press and Mercantile Advertiser*, March 5 1851, p. 2.

S/N	Ship's Name	Nationality of ship	Type of ship	Gross tonnage (Tons)	Captain/s	Date Wrecked	Departed from	Destination
9	<i>Metropolis</i> ²⁰	English	Barque	Unknown	Penny	September 12 1851	Whampoa	Halifax
10	<i>Charles</i> ²¹	American	Unknown	Unknown	Andrews	February 3 1853	Singapore	Batavia
11	Unnamed Junk ²²	Unknown	Junk	Unknown	Unknown	December 14 1856	Chinese port near Japan	Swatow
12	<i>Mercurius</i> ²³	Dutch	Barque	439	Smith	December 16 1856	Amoy	Singapore
13	Unnamed Junk ²⁴	Unknown	Junk	Unknown	Unknown	January 4 1857	Canton	Singapore and Penang
14	<i>Royal Lily</i> ²⁵	Unknown	Unknown	Unknown	Unknown	January 1 1860	Unknown	Unknown
15	<i>Susannah</i> ²⁶	Hamburg	Barque	Unknown	Russ	February 19 1862	Unknown	Falmouth

Table 2 List of Ships Reported to Have Sunk Along the Bintan Coast in chronological order.

²⁰ 'The Free Press', *Singapore Free Press and Mercantile Advertiser*, September 12 1851, p. 2.

²¹ 'The Overland Free Press', *Singapore Free Press and Mercantile Advertiser*, February 3 1853, p. 1.

²² 'The Free Press', *Singapore Free Press and Mercantile Advertiser*, February 19 1857, p. 3.

²³ 'Untitled', *The Straits Times*, December 23 1856, p. 4.

²⁴ 'The Free Press', *Singapore Free Press and Mercantile Advertiser*, February 19 1857, p. 3.

²⁵ 'The Singapore Free Press', *Singapore Free Press and Mercantile Advertiser*, January 3 1861, p. 2.

²⁶ 'Shipping News', *Singapore Free Press and Mercantile Advertiser*, February 21 1862, p. 1.

The ships mentioned in table 2 met with different outcomes after the wrecking at Bintan. Most of them were left to wreck at the location as refloating the wreck was impossible. Salvage attempts were made on these wrecks to obtain a portion of the cargoes and ship's parts before they succumbed to the environment. According to the newspaper reports, *Glenelg*²⁷, *Ann*²⁸ and *Metropolis*²⁹ were refloated. Therefore, these two ships could not be the identity of the Senggiling wreck.

Amongst the list of wrecks includes four Asian ships. They were identified as Junks or Topes. There were few details about these ships except for their cargo or passengers. They are also unlikely to be the possible identity of the Senggiling wreck because of the analysis conducted on the wood. The analysis results suggest that the Senggiling wreck could not have been an Asian ship. The wooden remains were more commonly associated with European ship construction.

To further narrow the number of ships associated with the Senggiling wreck, there will be a need to cross-reference the contextual information obtained from the site, the circumstances of the wrecking process, and details about the wreck right after the accident. By comparing the location of the Senggiling wreck and the approximate location reported in the newspaper records, it is possible to narrow the list of ships further. Based on the newspaper accounts of the ship *Mars*, it is doubtful *Mars* sank in the same area as the Senggiling wreck. According to a newspaper account dated September 11, 1845³⁰:

The HC Steamer *Diana*, having visited the spot where the *Mars* was lost on the 30th ultimo, we are informed that she was found to be perfectly upright with her head west towards Bintang shore, and the head of her mizzen topmast and short fore top-gallant mast just above water in 16 fathoms. Soundings were taken with great care all round to some distance, which gave 16 fathoms with a soft bottom.

Although *Mars* was reported to have sunk near the shore of Bintan, the account suggests that *Mars* sank in waters with a depth of 16 fathoms, which was 29.2 meters. *Mars* sank in much deeper waters than the Senggiling wreck, located in 10 to 12 meters of water. Moreover, the area around the Senggiling wreck has a relatively sandy bottom, unlike the seabed description where *Mars* sank.

Therefore, after discounting the refloated ships, Asian-type ships and ships located in a different environment from the Senggiling wreck, seven ships may be the true identity of the Senggiling wreck. *These seven ships are Dourado, Henry Davidson, Johns, Charles, Mercurius, Royal Lily, and Susannah.* Further archival research and information are still required to reveal the identity of the Senggiling wreck. Most newspaper reports provided information on the ship's exposure after wrecking. That information can be cross-referenced with the depth of the water in the area to further narrow down the identity of the Senggiling wreck. The current archival research relies entirely on newspaper accounts from Singapore, and they may not account for all the ships and their relevant details. Despite the need to verify newspaper sources, this information source should remain an essential resource for identifying shipwrecks from the eighteenth to the nineteenth century.

²⁷ 'The Free Press. Singapore, Thursday, July 9 1838', *The Singapore Free Press and Mercantile Advertiser*, July 19 1838, p. 2. The article did not mention that the ship was recovered. However, the ship seemed to be repaired and seaworthy to embark on China.

²⁸ 'Shipping News', *The Singapore Free Press and Mercantile Advertiser*, May 31 1851, p. 6.

²⁹ 'The Overland Free Press', *The Singapore Free Press and Mercantile Advertiser*, October 6 1851, p. 1.

³⁰ 'The Free Press', *The Singapore Free Press and Mercantile Advertiser*, September 11 1845, p. 2.

Result

Underwater Exploration at Senggiling Site

In Purnawibowo's (2020) report, the wooden hull structure appears to be found in the west and extends to the east to what is considered part of the bow (Figure 4). The stern has not been discovered. The ship's timber structure fragments were arranged in three layers, held together by three visible metal fasteners. The three layers of timber comprise the ship's frames and hull plankings. The ship's timber fragments were deposited in a northeast-southwest and northwest-southeast orientation and were identified as part of the hull structure.

Excavations carried out in 2019, and 2021 reveal the structural parts of the shipwreck. The initial condition of the area comprises mounds created from accumulated shiploads that were scattered randomly and were dominated by marble tiles, andesite stone blocks, and ceramic fragments. Based on the consideration that the site conditions have been heavily disturbed; the focus of the excavation was to uncover the ship's structure and expose the surface of the hull structure using water blasting. Measurements were obtained using a 26-meter long-baseline oriented from east-west 120° - 300° with a datum point set up at number 0 (Figure 4). This process aims to accelerate the process of revealing the matrix in fine sand clay and cargo fragments the ship structure. In addition, during the last dive in 2021, the team made a datum point and took timber samples from the ship's structure, namely the treenail, which connected the planks and the planks to the frame. Finally, a photogrammetric recording of the site was carried out.

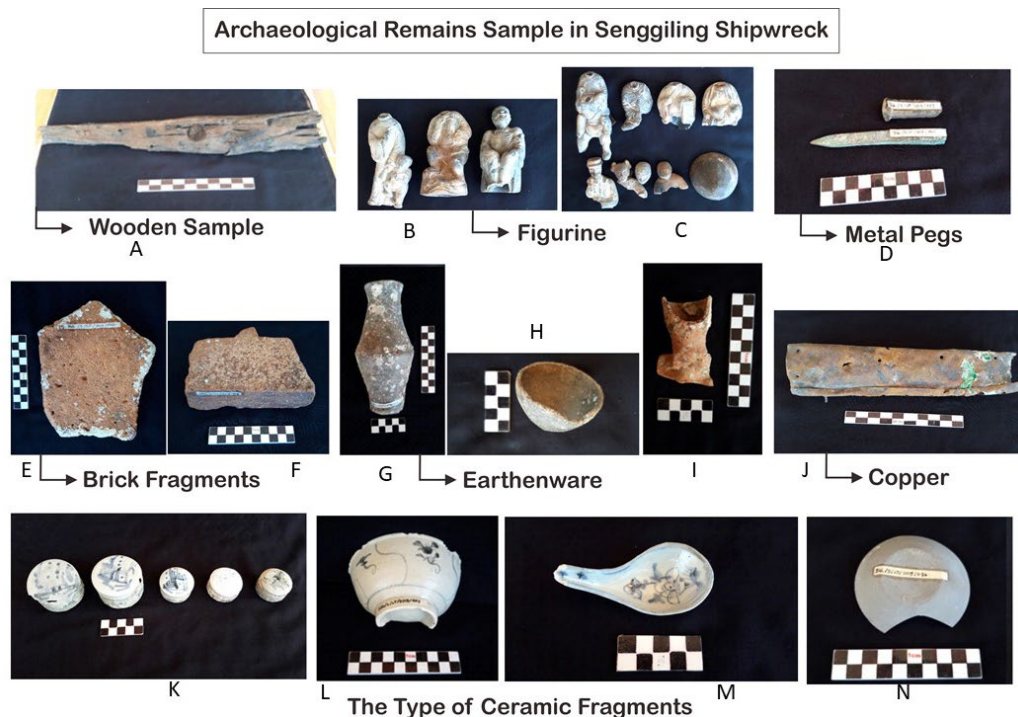


Fig. 3 Archaeological remains sample in Senggiling Shipwreck. Source: Stanov Purnawibowo, 2021.

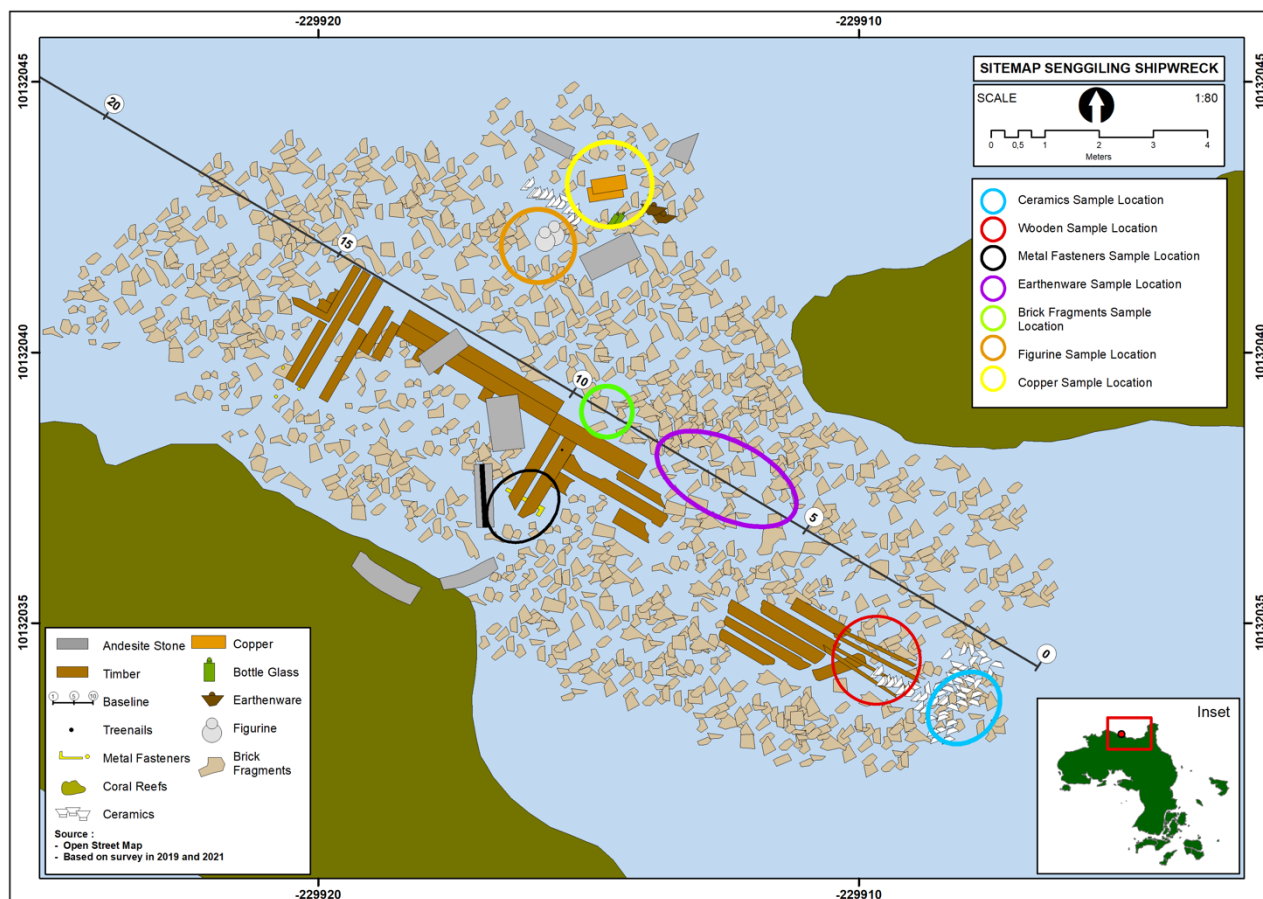


Fig. 4 Sitemap of ship structure position and cargo distribution. Source: Stanov Purnawibowo, 2021.

These excavation activities recorded and mapped the wooden structure and the distribution of archaeological remains at the Senggiling Site. Four segments of the ship's frame structure were found, each consisting of two timber frames connected with copper alloy fasteners and a treenail attached to the hull planks. The three timber frames at the 15 meters mark on the baseline are each 120 cm long. In addition, outcrops were found on the hull in the middle of the baseline and in the southeastern part. Unlike the previous outcrop, there is no frame in this section. Nevertheless, what is interesting about this section is the presence of a timber plank that runs across the ship's hull. In addition, there are timber planks that are perforated and form a rectangular profile with rounded edges.

The exposed part of the hull plank is 30 cm wide, 3-4 cm thick, and the exposed area is 8 meters long. Meanwhile, the ship's frame is about 23 cm wide and thick, and the length of the exposed area is 2 meters—the copper alloy fasteners secure the ship's frame to the hull plank (Figure 7). The fastening pattern between the planks is still unknown. In addition, copper alloy sheathing was found attached to some sections of the ship's hull exterior. These copper alloy sheathing can also be found widely scattered around the site.

This research also succeeded in identifying the cargo that covers the shipwreck structure. The artifact's position is spread around the left and right of the baseline. The various types of cargo that cover the ship's structure are terracotta floors, figures, glass bowls, metal slabs, bricks, glass bottles, jars, stone mortars, mortar, and pestles in a large amount. In-situ ceramics were concentrated in the

southeastern part of the ship's structure. They were covered with sediment composed of cargo fragments and sand (Figure 9).

Timber Analysis

The wood fragment samples were obtained from the ship structure located to the southeast near the concentration of ceramic fragments. The timber ship structure consists of various types of wood. In the 2020 study, only one sample (SGL/S/LT/2019/075) was analyzed for RC14 and its species (Figure 5A). The result of the timber fragment identification indicates that the wood from the Senggiling ship site is made of:

<i>Species</i>) – <i>Family</i>
<i>Quercus</i> sp. – Fagaceae

Quercus acutissima (SAWTOOTH OAK) can be found in Europe and temperate Asia (Figures 5 A-D). This type of wood was widely used for European ship construction in the 19th century. The ship may have been built in Europe or Asia, as this type of tree grows on both continents.

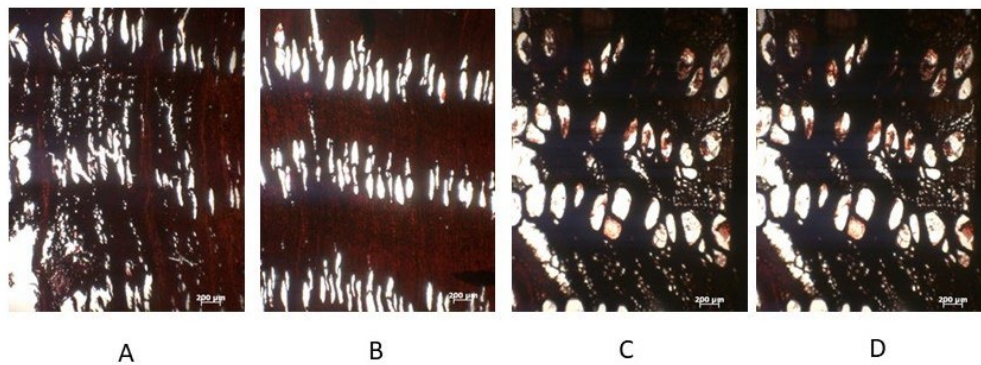


Fig. 5 Microscopic Identification on timber sample from Senggiling Site. Source: Stanov Purnawibowo, 2021.

¹⁴C Analysis

Analysis from the BETA Analytic Testing Laboratory showed the following results:

No	Sample Number	Conventional Radiocarbon Ages	Calendar Year	Probability
1	SGL/S/LT/2019/075	180 +/- 30 BP	1725 – 1814 cal AD	95.4%

Table 3 Results of Analysis from the BETA Analytic Testing Laboratory.

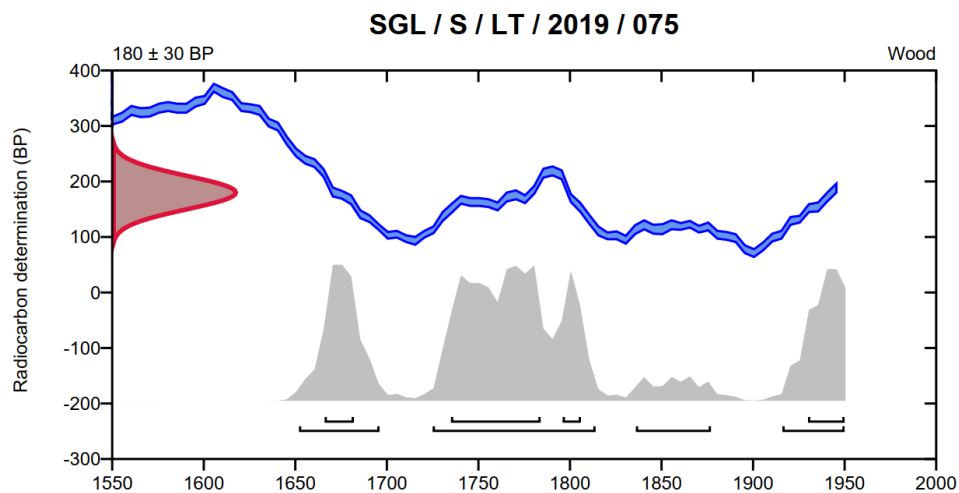


Fig. 6 Results of Analysis from the BETA Analytic Testing Laboratory. Source: BETA Analytic, 2020.

Based on the procedures and the result obtained from laboratory tests, it is known that the sample from the Senggiling Site is from the 18th to 19th centuries (Fig 6); The samples were obtained from the wooden structure of the southeastern part of the ship.

Ship Structures

The wooden ship structure was located beneath the cargo, interspersed with coarse sand and mud, and primarily overgrown by various coral reefs. The ship structure is located at 9 meters to 11 meters. The exposed wooden hull was observed from the west and to the east. The eastern section of the ship structure is suspected to be the ship's bow. The three layers of hull planking were fastened by three copper alloy fasteners (Figure 3D). Along the seabed surface were the exposed timber frames, and hull planks were observed beneath the frames. The timber fragments likely associated with the shipwreck were found in a northeast-southwest and northwest-southeast orientation. The fastening technique can be deduced from the placements of fasteners on the ship planks. The metal fasteners were arranged in rows, indicating a butt fastening system. According to McCarthy (2005: 84-85), butt fastenings consist of three or more fasteners placed in two rows next to each other. The butt fastening construction method was prevalently used during the 19th Century (Figures 7 and 8).

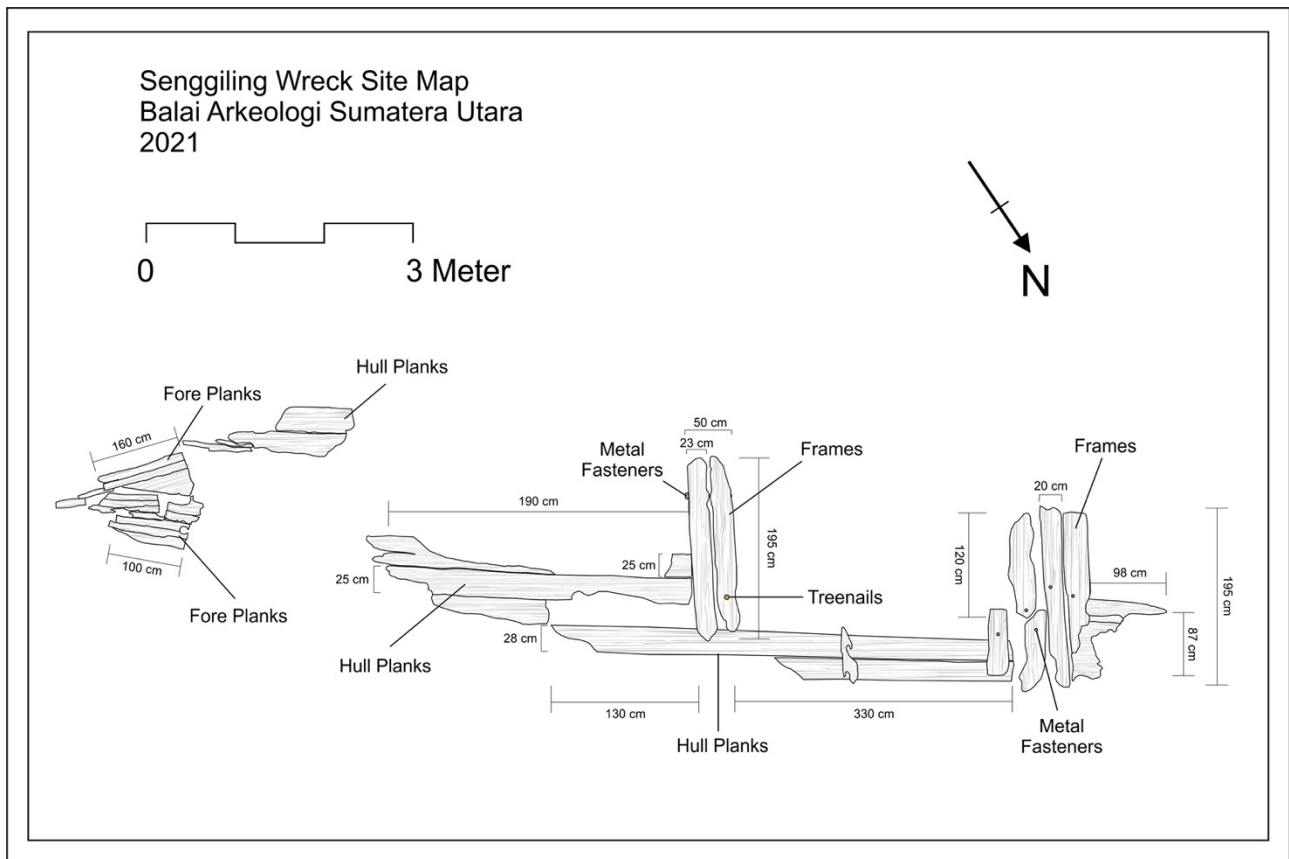


Fig. 7 Site Map and distribution position of wooden boat structures at the Senggiling site. Source: Stanov Purnawibowo et al. (2021).

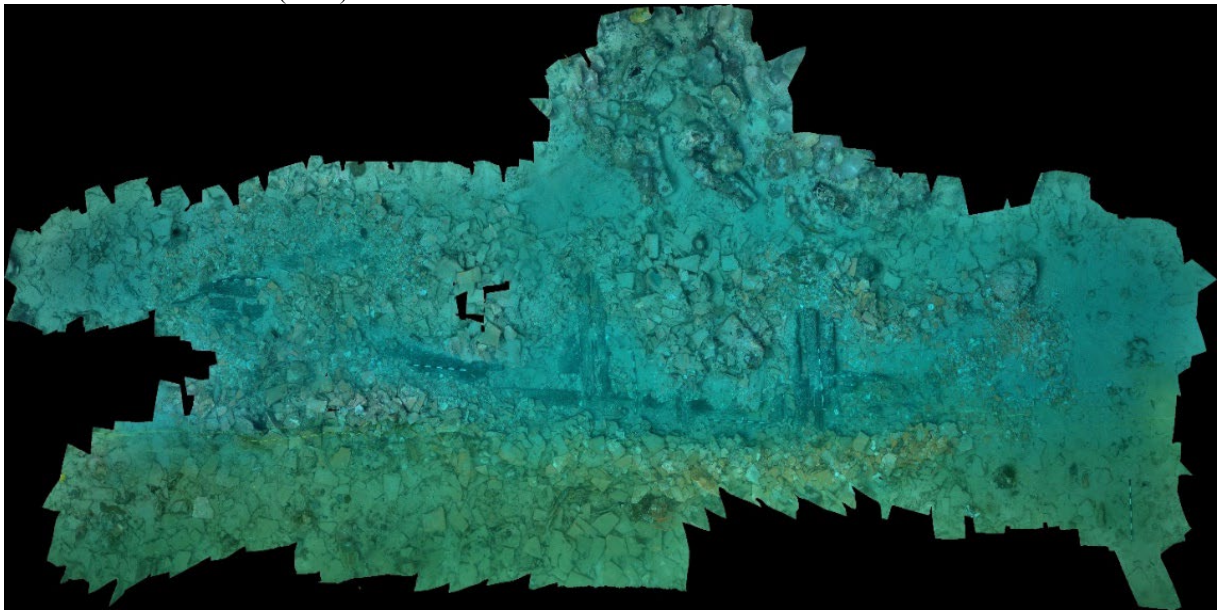


Fig. 8 The condition of the Senggiling site after being excavated based on photogrammetry image. Source: Stanov Purnawibowo et al. (2021).

A piece of loose timber was found at the site of the wreck. A wood species analysis was conducted on the timber, and it was identified as *Quercus acutissima*, also known as Sawtooth Oak. The timber has three identifiable small square holes (1.9 cm). These holes may be made by fastening tacks. This suggests something else may be fastened onto this piece of timber. In addition, a suspected treenail (1.8 cm) can also be observed on the timber (Figure 7). A cross-wedge can be

observed on one of its sides. Treenails and metal fasteners are often found in ship timbers. They can either be found together on a similar piece or in different pieces separately. According to McCarthy (2005: 25), the function of a treenail is to fasten planks to the ship's frames. It is unsure whether this timber piece belongs to the frames or the remains of a ship's plank. Cross-wedge treenails were found on the ceiling planks of the *Edwin Fox*, an 835 tons ship constructed in Salkea, India, in 1835. The diameter of these treenails is between 33 – 34mm, and the cross-wedge measures 4mm wide by diameter (Bennett 2021:27).

Metal Analysis

A handheld X-ray fluorescence device was used to detect the composition of a copper alloy sheath found at the Senggiling wreck. Copper alloys were used to sheath onto ships' hulls to protect them from fouling by marine organisms. Copper sheathing was first used on Dutch ships during the 1620s and on British ships in 1708 (Duivenvoorde 2015; Staniforth 1985). Subsequent trials and tests were undertaken using different copper alloys to find the best method for sheathing a ship's hull. During the 1830s, G. F. Muntz developed Muntz metal, an alloy of copper and zinc found suitable for sheathing. It was economically more viable and practical than sheathing ships with alloys containing a higher percentage of copper. A patent for Muntz metal was secured in 1832, and private ship owners adopted the method more readily than the navy. Based on the results of laboratory analysis of timber samples and analysis of the Muntz patent metal coating, it is estimated that the Senggiling wreck was made after 1832. By 1846, the patent had run out, but the Muntz company managed to occupy a significant market share for sheathing metal. The method was widely used and adopted by foreign and colonial-built vessels during the 1840s and 1850s (Staniforth 1985).

The result was subsequently compared with the metal composition of the copper alloy hull sheathing on the *Edwin Fox*. Although the ship was constructed in India, the copper sheathing used for the anti-fouling features of the ship was confirmed to be Muntz metal which shares similarities with the result obtained from the Senggiling shipwreck. Moreover, Muntz metal sheathing exhibits patent stamps which could help in the relative dating of a site. Therefore, according to Bennett (2021), the hull metal sheathing on the *Edwin Fox* is confirmed to be Muntz metal based on the presence of the sheathing stamp and the metal composition analysis. (Bennett 2020:237, 245–246).

Table 4 below shows the comparison in metal composition between both ships. It was found that both shared comparable metal compositions. Historical records have indicated that Muntz metal should consist of Copper and Zinc with a proportion of 60:40 (Anon. 1833:128; Anon. c.1932; Carlson et al. 2011:109). Likely, the Senggiling wreck could also be sheathed with the Muntz metal. However, this observation is still preliminary. This is because no identifiable markings were observed on this sample. Moreover, Muntz metal was produced by several companies worldwide, and they vary subtly in their composition. In addition, some copper alloy sheathing found on other contemporary ships exhibited both Muntz metal characteristics, but they have not been positively identified (Bingeman 2018).

The readings of the copper alloy sheath are obtained from a handheld X-ray fluorescence device. A more accurate reading can be obtained by analyzing the sample using Scanning Electron Microscope to confirm its composition.

	<i>Edwin Fox</i>	Senggiling wreck
Composition	63.52–66.22% Cu: 33.63–35.75% Zn: trace elements of Pb	61.39% Cu: 33.55% Zn
Sheet thickness (mm)	1.1	1.1

Table 4 Result of copper compositional analysis Senggiling wreck.

Ceramic Analysis

Chinese Ceramics

Chinese ceramics were found at the site of the wreck. Most Chinese ceramics were obtained were primarily blue-and-white wares. Only one piece of greenware celadon was recovered as a sample. Amongst the Chinese ceramic collected were bowls, covered jars, spoons and teacups. The ceramic on the Senggiling wreck can also be found on other contemporary shipwrecks around the region and Singapore. The ceramics found at this site were in-situ and exhibited cargo stowage even though they were fragmented (Figure 9).



Fig. 9 In-situ condition at the Senggiling Site at the southeastern wooden ship structure. Source: Stanov Purnawibowo et al. 2021.

Bowls

Four types of blue and white porcelain bowls can be observed from the samples collected from the site. The first type is a woodblock print bowl imprinted with 'Shou' or '寿', which means longevity in Chinese (Fig 10). The entire bowl, including the base, is glazed. The design can be attributed to the Dehua, '德化' kilns in China, producing blue-and-white porcelain pottery with similar motifs. This bowl measures approximately Base Diameter 6 cm; Rim Diameters 12 cm; high 6.2 cm; thick 0.2 cm.

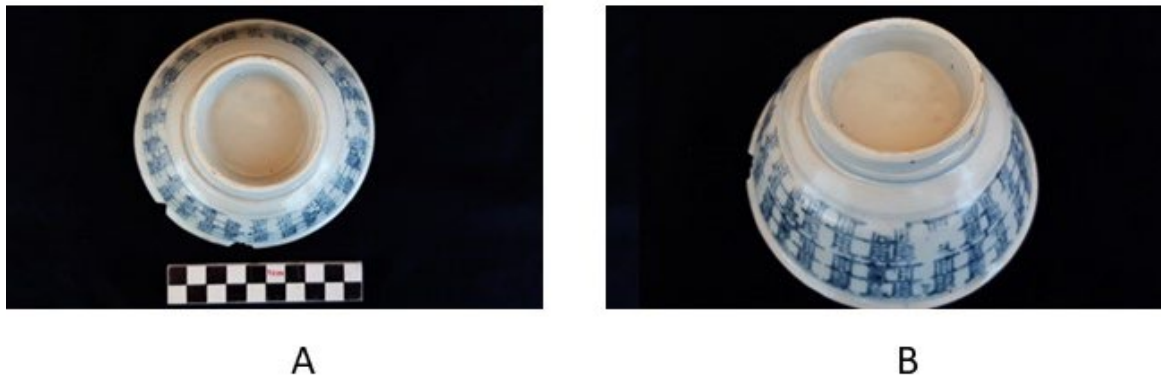


Fig. 10 The woodblock print bowl imprinted with 'Shou'. Source: Stanov Purnawibowo, 2019.

The second blue and white porcelain bowl exhibit a fungus type or 'Lingzhi' or '灵芝' design (Figure 11A, B). It is often regarded as the fungus of immortality design. The exterior and interior of the bowl are adorned with the fungus motif. Apart from the fungus motif, the bowl's interior exhibits a spiral design. The entire bowl, including the base, is glazed. This bowl measures approximately (Diameter base 6 cm; rim 12 cm; height 5.7 cm; thick 0.4 cm). Bowls with similar designs can be found at Pulau Saigon, an archaeological site in Singapore. Pulau Saigon was a former island within the Singapore river, which has been reclaimed. Most of the artefacts obtained from the site were dated to post eighteenth century (Barry 2000). The design featured on the bowl might be attributed to the Dehua, '德化' kilns in China, as they produce blue and white porcelain pottery with similar motifs. However, similar type designs can also be found at Jingdezhen, '景德镇' kilns (Huang and Zheng 2003; Sukkam et al. 2021; 中国陶瓷编辑委员会 [Chinese Ceramics Editorial Committee] 1988).



Fig. 11 Blue and white porcelain bowl exhibit a fungus type. Source: Stanov Purnawibowo, 2019.

The third blue and white porcelain bowl type show a slight variation of fungus type or 'Lingzhi' or '灵芝' design on its exterior (Figure 12). The bowl's interior has three concentric blue underglaze rings—one along the rim and a double ring along the edge on the base. The entire bowl, including the base, is glazed. This bowl measures approximately (Diameter base 6 cm; rim 12 cm; height 5.2 cm; thick 0.3 cm).

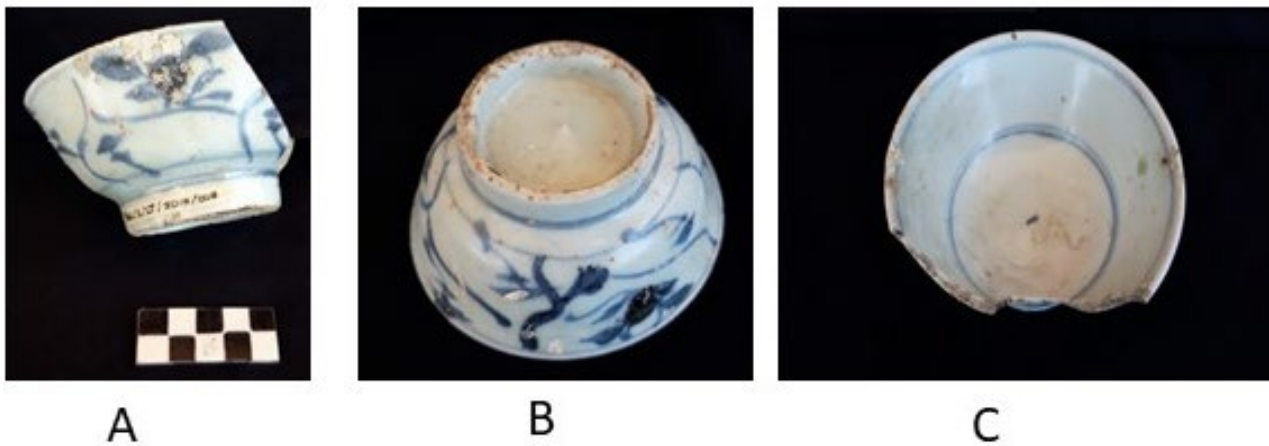


Fig. 12 Blue and white porcelain bowl type show a slight variation of fungus type. Source: Stanov Purnawibowo, 2019.

The fourth type of blue underglaze bowl is encrusted with marine encrustations. Thus, making it challenging to decipher the design beneath (Figure 13). Despite this, it exhibits some woodblock print design. The bowl may be imprinted with 'Shou' or '寿', which means longevity in Chinese. Alternatively, it could also be a double happiness motif. Removing a portion of the marine encrustation can aid in properly identifying the design. Finally, the entire bowl, including the base, is glazed. Bowls with similar designs can be found at Pulau Saigon (Barry 2000). This bowl measures approximately (Diameter base 10 cm; height 11.5 cm; thick 0.1 cm).



Fig. 13 Blue underglaze bowl is encrusted with marine encrustations. Source: Stanov Purnawibowo, 2019.

Covered Jars

Five blue-and-white covered jars were found at the site (Figure 14). Two different sizes of jars were observed. Blue underglaze floral decorations can be found on the lids. The larger covered jars measure approximately (Diameter Rim 6 cm; Diameter Base 6 cm; height 4.9 cm; thick 0.4 cm) while the smaller ones measure approximately (Diameter Rim 4 cm; Diameter Base 4 cm; height 2.45 cm; thick 0.2 cm). The interior of the jars is not glazed. Covered jars from the *Tek Sing* also exhibited similar vessel types though there is a slight difference in the designs on the lid (Pickford et al. 2000).



Fig. 14 Blue and white porcelain covered jars were found at Senggiling Site. Source: Stanov Purnawibowo, 2019

Spoons

One spoon with blue underglaze decorations was obtained from the site (Figure 15). The spoon has blue underglaze floral decorations. Blue underglaze decorations can also be observed on the other side of the spoon.



Fig. 15 Porcelain spoon with blue underglaze decorations at Senggiling Site. Source: Stanov Purnawibowo, 2019

Cups (Wine or Tea)

Five porcelain cups were discovered and recovered from the site (Figure 16). The cups are glazed, including the base. Only one cup has blue underglaze geometric decorations. The other four cups were glazed and plain. One of the plain cups is slightly larger than the other three. The cup with the blue underglaze geometric decorations can also be found on the Desaru shipwreck, which is believed to have sunk around the mid-19th century (Sjostrand 2003). According to Sjostrand (2003), this cup may be produced in Dehua, ‘德化’ Kilns in China.

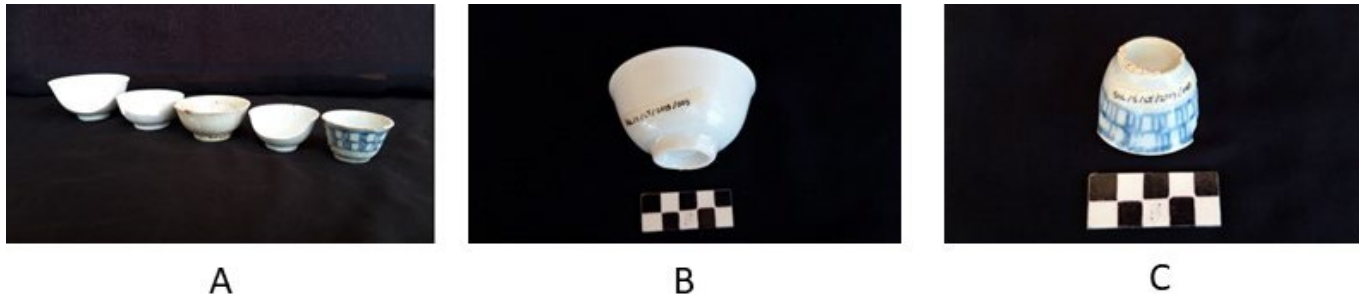


Fig. 16 Porcelain cups at Senggiling Site. Source: Stanov Purnawibowo, 2019.

Celadon Jar Rim Sherd

One piece of celadon jar rim sherd was recovered from the site (Figure 17). It exhibits a carved floral and leaves motif. Both interior and exterior are glazed.



Fig. 17 One piece of celadon jar rim sherd at Senggiling Site. Source: Balar Sumut, 2019

Other ceramics found at the wreck include earthenware and stoneware potteries (Figure 18). The earthenware potteries found include a jar with a carination in the middle of the vessel and flared rim, a possible crucible, an earthenware sherd and a possible handle of a pot. The provenance of these earthenware potteries has yet to be determined.

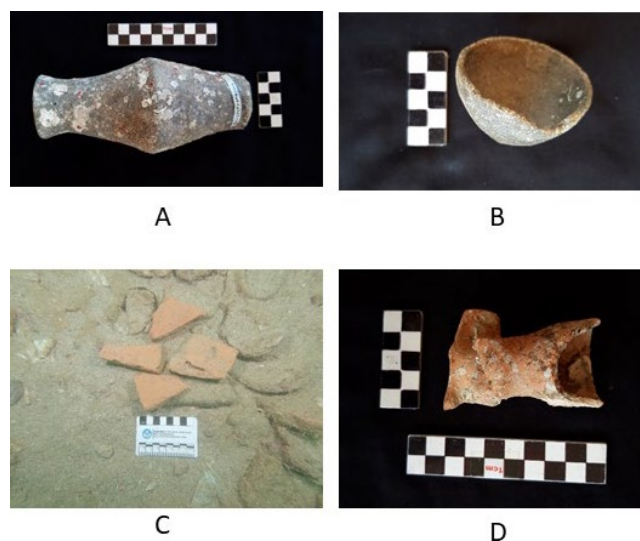


Fig. 18 Earthenware Jar with carination and flared rim (A), earthenware crucible (B), a piece of earthenware pottery sherd (C), earthenware handle of a pot (D). Source: Balar Sumut, 2019.

Stoneware potteries consist of two different types of bowl (Figures 19 and 20) and the rim of a jar with a straight neck (Figure 21). One of the stoneware bowls is unglazed and has a pronounced base. The other bowl did not have a pronounced base, and it seemed glazed or slipped. The jar rim is also spotted with glaze.

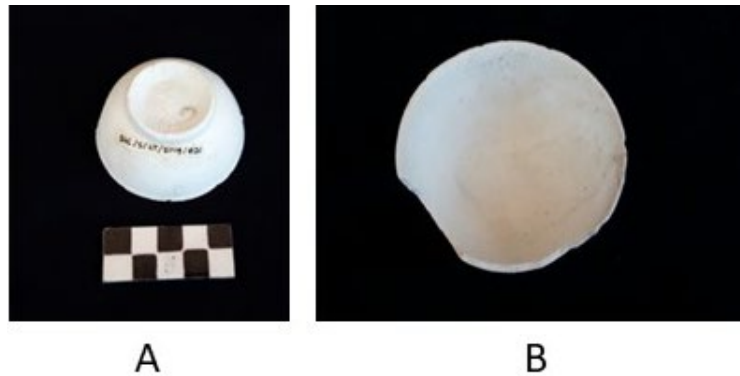


Fig. 19 Unglazed stoneware bowl with pronounced base. Source: Stanov Purnawibowo, 2021.

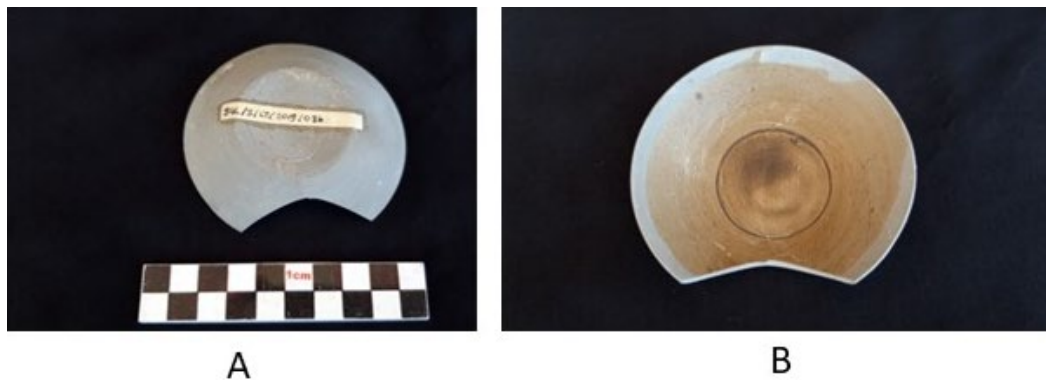


Fig. 20 Stoneware bowl without a pronounced based and possible slip or glazed in the bowl's interior. Source: Stanov Purnawibowo, 2019.



Fig. 21 Glazed stoneware jar rim sherd. Source: Balar Sumut, 2019.

Most of the ceramic potteries found on the Senggiling wreck were produced during the end-Qing Dynasty (1644-1911). This analysis is based on the design features of the blue and white porcelain found on that wreck. The greenware celadon does exhibit Longquan greenware characteristics but cannot be confirmed. This is because it is difficult to discern the provenance of the greenware celadon. After all, there were instances of Ming period Longquan greenware celadon found on an eighteenth shipwreck, such as those found on the *Tek Sing* (Sukkhram et al. 2021).

Chinese ceramic played a vital role in maritime trade from the eighteenth to the nineteenth century. After the establishment of the Qing Dynasty in 1644, Chinese blue and white wares remained one of the famous exports from China (Lim 2020). Contemporary Chinese export porcelain can be found in terrestrial archaeological sites around various parts of the world, including but not restricted to Singapore and Australia (Barry 2000; Staniforth 1996). Temples in Thailand were also adorned with similar period ceramics (Sukham 2015). It even permeates into various parts of European society; for example, eighteenth-century blue and white ware could be found on a British naval shipwreck, HMS *Swift*, which sank in 1770 off Patagonia, Southern Argentina (Elkin et al. 2007).

Various contemporary shipwrecks around the Singapore Straits region and beyond have similar Chinese export porcelain types to those found on the Senggiling wreck. Examples of these shipwrecks include *Diana*, *Tek Sing*, *Shah Muncher*, *Desaru*, and *Xiaobaijiao I* have exhibited a similar type of ceramics cargo (Ball 1995; Deng 2016; Flecker 2022a; He et al. 2021; Pickford et al. 2000; Sjostrand 2003; Sukkam et al. 2021). These ships can be categorized into two groups. The first group, *Diana* and *Shah Muncher*, are examples of Country ships licensed by the East India Company only to conduct trade east of the Cape of Good Hope. The other groups are possible Asian ships or Chinese Junks like *Tek Sing*, *Desaru* and *Xiaobaijiao I*. These two groups of ships are essential representations of maritime trade and seafaring between the eighteenth and nineteenth centuries. It also shows that maritime trade involved diverse types of ships and involved people from numerous cultural backgrounds during this period. These ships may be different, but the cargo, such as the ceramic potteries, shares similarities with terrestrial sites in Southeast Asia. The ceramic potteries discovered at the Senggiling wreck thus have the potential to improve the current eighteenth to nineteenth-century maritime trade and seafaring narrative.

Bricks

A large number of bricks were found at the site. Each brick measured an average of 9.6 cm wide, 14.4 cm long and 5 cm thick and weighed 3 kg (Figure 3E, F). The mention of bricks can be found on another contemporary period ship manifest. A ship, *Pascoa*, stranded off Point Romania, was recovered and towed back to Singapore. It was reported that divers recovered 50,000 China bricks within the cargo hold during the salvage of this wreck³¹. According to the report:

“The purchasers, two Arabs, have since recovered from the wreck by means of divers the whole of the sunken property, consisting of 50,000 China bricks, 2 large and 2 small guns, 35 tons iron kentledge, and a small quantity of shingle ballast.”

The Senggiling wreck may be carrying China bricks for trade, similar to *Pascoa*. There is also a likely chance that the bricks may have been used as a form of ballast. However, there seemed to be other materials which were also prominently stated as ballast, such as the shingle ballast³². Similar bricks can be found at the current terrestrial site at the Istana Kota Marhum Kantor located on Penyengat Island, Tanjung Pinang City, located in the southern part of the Senggiling site about 30 km away. The materials used in the bricks found in Senggiling and Penyengat Island have almost the same composition, without a mixture of calcium (Ca).

³¹ ‘Singapore, Saturday Evening, 2nd.Sept.1837’, *Singapore Chronicle and Commercial Register*. September 2, 1837, p. 2

³² A mass of small rounded pebbles, especially on a seashore. *Oxford languages*. Obtained on 1 January 2022

Ceramic Figurines

A unique and relatively rare find at shipwreck sites in Indonesian waters is cargo goods in figurines. Eleven (11) figurines were recovered from the site (Figure 22). These figurines were found to be incomplete, largely missing sections of heads or the lower part of the body. Preliminary analysis conducted on these figurines suggests that they may be made from low-fired clay and were unglazed. Most of the figurines exhibited primarily observable Chinese or oriental features based on the type of dressing, Asian facial features and hairdo found on them. Only one particular figurine exhibits a more European influence. It seems to be wearing a 'boater' hat, dressed in a jacket, a waistcoat and a cravat around the neck. There are two unidentifiable figurines. The first one has a head and shoulder, but its features are unclear. The second one is just a head of a figurine with human facial features. Figurines of animals made from low-fired clay can be found in *Diana* and *Shah Muncher* (Ball 1995; Flecker 2022a). They are glazed and were in the form of dogs, parrots, roosters and *Makara*, a legendary creature. So far, human figurines made from low-fired clay have yet to be found on other contemporary shipwrecks. It is unknown whether these figurines were trade commodities or personal items of the crew.



Fig. 22 Ceramic Figures Finding at Senggiling Site (under). Source: Stanov Purnawibowo et al. (2021).

Conclusion

The Senggiling Wreck is about 400-500 meters from the Senggiling Coast, Bintan Island and is located at a depth of 10-12 meters below sea level. During the 2021 field season, the team successfully recorded and mapped four sections of the hull structure. Each hull structure consisted of two timber frames fastened by copper alloy fasteners, and treenails were observed on the hull plankings. The three layers of wood are fastened using the butt fastenings system (reinforcement between the bases of the wood) using copper alloy fasteners composed of copper (Cu) and zinc (Zn). Copper alloy sheathing was also observed on the hull exterior, which helped protect the ship's structure from marine organism infestation.

The variety of artifacts found at the site concluded that the Senggiling Wreck was a cargo ship. Most of the cargo was lying on top of the ship's structure. The in-situ ceramics above the ship's

structure were found at the site's largest concentration of artefacts. The ceramic cargo was composed mainly of Chinese ceramics, indicating that the ship's last port of call could be China. These Chinese ceramic cargoes included blue-and-white ware, greenware, and stoneware, which could function as medicinal containers, spoons, bowls and plates. In addition to Chinese ceramic cargo, 19th-century European glass bottles, ceramic figurines, glass bowls, metal plates, stones, and bricks were also found. These items could belong to the ship's crew. Other types of cargo included blocks made from igneous rock and terracotta bricks, which may be building materials that were prevalently used in the construction of buildings during the 19th century.

The variety of trading commodities suggests that the ship was reasonably large. Based on the information obtained from the timber species analysis and ship construction, Senggiling Shipwreck would have been constructed in Europe after 1832 as Muntz metal was only prevalently used after that date. Senggiling Shipwreck can be categorized as a sizeable transcontinental cargo ship as it exhibited fairly thick ship timbers and a variety of commodities it carried. Moreover, the ceramic cargo was predominantly Chinese. Therefore, it would have most likely left a Chinese port before it sank. By comparing these results from the artefact analysis and archival research, the possible identity of the ships can be narrowed down from seven to three. The three ships are *Mercurius*, *Royal Lily*, and *Susannah*. *Mercurius* have the highest possibility to be the identity of the Senggiling shipwreck as the vessel departed from a Chinese port, Amoy, and based on the year it sank, it was most likely sheathed in Muntz metal during one of its refittings. Although there is currently insufficient information on the *Royal Lily* and *Susannah* voyages, they could still be associated with the Senggiling shipwreck. This current identification is merely a preliminary hypothesis as many unknowns are yet to be unraveled. Further investigations on the ship structure, artefact analysis and more extensive archival research could finally reveal the true identity of the Senggiling Shipwreck.

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