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THE *TEMASEK WRECK* (MID-14TH CENTURY), SINGAPORE

PRELIMINARY REPORT

MICHAEL FLECKER

TEMASEK WORKING PAPER SERIES

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Michael Flecker

Dr Michael Flecker has overseen some of the most important shipwreck excavations in Asia over the past 30 years. They include the 9th century *Belitung (Tang)*, 12th century *Flying Fish*, 13th century *Java Sea*, 14th century *Temasek*, 15th century *Bakau*, c.1608 *Binh Thuan*, c.1690 *Vung Tau*, and the 1796 *Shah Muncher*. He earned his PhD at the National University of Singapore based on the excavation of the 10th century *Intan Wreck*, which resulted in a book published under the British Archaeological Report Series (2002). Other works include the books *Porcelain from the Vung Tau Wreck* (2001), *Early Voyaging in the South China Sea: Implications on Territorial Claims* (2015), chapters in *Southeast Asian Ceramics: New Light on Old Pottery* (2009), *Ancient Silk Trade Routes* (2015), and *The Tang Shipwreck: Art and Exchange in the 9th Century* (2017), along with many articles in international journals. As a maritime archaeologist specialising in ancient Asian ship construction and maritime trade, Dr Flecker has been a Visiting Fellow at the ISEAS – Yusof Ishak Institute repeatedly since 2015. He has been directing shipwreck excavation in Singapore waters on behalf of the National Heritage Board since 2016.

Cover Image:

A newly exposed blue-and-white porcelain dish and stem-bowl from Jingdezhen, together with a Longquan celadon dish, wedged between boulders at the *Temasek Wreck* site.

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The *Temasek Wreck* (mid-14th Century), Singapore. Preliminary Report

By Michael Flecker

FOREWORD

The National Heritage Board and the ISEAS – Yusof Ishak Institute announced on 16 June 2021 the successful archaeological excavation of two historic shipwrecks within Singapore Territorial Waters around Pedra Branca. The first shipwreck was discovered in 2015 in the course of salvage work on a barge which had run aground on Pedra Branca. The National Heritage Board commissioned the Archaeology Unit of the ISEAS – Yusof Ishak Institute to investigate and excavate the wreck in 2016. This *Preliminary Report* by the excavation's Project Director Michael Flecker details the process of excavating shipwreck 1—now designated the *Temasek Wreck*—, highlights the artefacts recovered, and provides a historical context to the wreck.

Michael Flecker brought thirty years of experience and expertise as a marine archaeologist to the excavation of this shipwreck as well as another one in the eastern approaches to Singapore, the *Shah Muncher,* on which a separate report has been published (Flecker 2022). In 1987 he joined Pacific Sea Resources for the two-year excavation of the Manila Galleon, *Nuestra Senora de la Concepcion* in Saipan. Since then, he has participated in and directed the excavation of several historic shipwrecks. These include the 9th-century *Belitung (Tang) Wreck* (Flecker 2017), the cargo of which is now exhibited in the Asian Civilisations Museum in Singapore; the 10th-century *Intan Wreck,* the report and analysis of which was the basis of a doctoral thesis submitted to the National University of Singapore (Flecker 2002); the 13th-century *Java Sea Wreck* (Mathers and Flecker 1997); the 15th-century *Bakau Wreck*; the c.1608 *Bin Thuan Wreck* (Flecker 2004), which was headed towards Johor; and the c.1690 *Vung Tau Wreck*. Most recently, Flecker has excavated the Northern Song *Flying Fish Wreck* off Sabah (Flecker and Tai 2019).

Like all other shipwrecks excavated, from the 9th-century *Belitung Wreck* to the *Shah Muncher,* a country trader ship launched in 1789, the *Temasek Wreck* carried large quantities of mass-produced Chinese ceramics (Kwa 2012). Some 50,000 Changsha bowls were recovered from the *Belitung Wreck*. The manifest of the *Shah Muncher* recorded it was loaded with 20 tonnes of 'China ware'. However, what is unusual and significant about the cargo of the *Temasek Wreck* is, as Flecker points out, the unusually large quantities of underglaze blue-and-white ceramics compared to the ceramics recovered from other contemporary wrecks. The intact vessel, perhaps a hookah base, with a tall neck and a flanged rim is one of the more spectacular and unusual artefacts recovered from the *Temasek Wreck*. It indicates that the Jingdezhen kilns had in the first half of the fourteenth century mastered the art of painting on porcelains from Jizhou, a necessary skill to paint

the intricate cobalt glaze designs on porcelains (Gerritsen 2020: 88–113), and were obtaining cobalt in quantities sufficient to glaze not only porcelains to meet domestic demands, but also to export it in the quantities we have recovered from the *Temasek Wreck*.

It would appear that there was an appreciation and demand for blue-and-white porcelains in the 14th-century Islamicate World. The Ottomans collected them, and thirty-one Yuan blue-and-white porcelains survive in the Ṭopḳapu Sarāyı today (Pope 1970). The Ardebil Collection has thirty-two examples of Yuan blue-and-white wares among its collection of several hundred pieces of Chinese porcelains (Pope 1981). A pit filled with fragments of Yuan blue-and-white wares was discovered in 1960 in a corner of the garden of the Firozshah Kotla fortress of the Delhi Sultan Firozshah Tughlaq (1351–88 CE), suggesting he may have been dining off blue-and-white porcelains (Gaskin, Sharma and Smart 2021). The Archaeological Survey of India reconstructed some forty porcelains which they exhibited in 2017 (Archaeological Survey of India 2017). Nearer Temasek, Yuan blue-and-white wares have been identified in the Majapahit capital of Trowulan (Dupoizat and Harkantiningsih 2007).

Nothing remains of the hull of the *Temasek Wreck*. What has been recovered of the artefacts that the crew, passengers and merchants would have used for their daily life are Chinese in origin. The absence of Southeast Asian artefacts leads Flecker to infer that the ship was a Chinese vessel. The location of the wreck suggests that the ship was headed towards 14th-century Temasek, rather than southwards to a Java seaport of Majapahit. Some thirty-seven years of archaeological excavations on and around Fort Canning have revealed significant quantities of similar Yuan blue-and-white porcelains among the larger quantities of celadons and white-wares and several tons of coarse stoneware jars from China along with local earthenware. 14th-century Temasek must have been a significant entrepot to be trading (and consuming) the quantity of blue-and-white wares that the *Temasek Wreck* was conveying to its harbour.

With its large cargo of Chinese porcelains, however, the *Temasek Wreck* raises a fundamental issue about the nature of Asian trade. J.C. van Leur (1955) argued in his 1930 studies that Asian trade was, as in medieval Europe, essentially a small-scale peddling trade, in which traders with their consignment of handicrafts and bags of pepper boarded a ship to trade at ports the ship would call at. Van Leur discounted bulk trade in low-value commodities, such as comestibles. This has been challenged by M.A.P. Meilink-Roelofsz (1962), who pointed out that Melaka as described in the Portuguese records, especially by Tomé Pires, was heavily dependent upon the bulk trade in everyday staples including rice, vegetables, sugar, and fermented foods. The manifests of Asian ships inform us that traders, van Leur's 'peddlers', boarded ships not with a few bags of pepper, but tonnes of pepper and other staples.

Van Leur (1955: 133) also argued that, as in other Asian ports, the ruler and aristocracy, as well as the (rich) merchants (*orang kaya*), dominated the trade of their ports, imposing levies and tolls, enforcing stapling and, as in medieval Europe, investing on *commenda,* in which they would invest or fund a trader or captain of a ship to trade on their behalf. Tomé Pires (1515: 284) provides a fairly clear description of Melaka's version of a *commenda*:

> If I am a merchant in Malacca and give you, the owner of the junk, a hundred *cruzados* of merchandise at the price then ruling in Malacca, assuming the risk myself, on the return they give me hundred and forty and nothing else; and the payment is made, according to the Malacca ordinance, forty-four days after the arrival of the junk in port.

Pires is here referring to the *Undang-Undang Melaka* (Laws of Melaka), chapter 33 on 'Rules on the Supplying of Capital to Someone' (Liaw 1976: 147):

> (If) a provider of capital says to his agent: 'Take *dinars* (or) gold or silver and use it for business, the profit for you is such and such an amount', the profit derived from the sale (transaction) must be fixed beforehand. Meanwhile if the capital is lost or if there were losses, he (the agent) need not be compensated for (the loss of) the business or the loss of the property, (provided that) it was not due to any negligence on his part.

An earlier chapter 24, clause 2 deals with the 'rules governing consignment' of valuables and other goods in the context of family affairs but would be applicable to consignment of trade goods between traders and their financiers. *Commenda* trade was, as Meilink-Roelofsz (1962: 48–52) has documented, practised by other sultans in the Indonesian archipelago.

The Dutch apparently found it useful to continue this local practice of *commenda*. Researcher Peter Potters found in the VOC archives documents relating to the wreck Flecker excavated off the coast of Binh Thuan Province (Flecker 2004). Among them is the *cedula* (legal agreement) which the VOC factor Victor Sprinckel based at Patani and one Hendrik Janssens concluded with the Chinese merchant Em Po, providing him with 410 elephant tasks for a return cargo of fine silk, with the Dutch merchants covering the risk of the outward and return voyages. The 'respectable *orang kaya* Sirenarre Wanxsa' and Em Po were guarantors of this *cedula*. Flecker (2004: 12–3) has attempted to link the *Binh Thuan Shipwreck* to a 21 July 1608 report by the VOC factor Abraham van den Broecke (based at Batu Sawar up the Johor River) to Banten, that 'we have received news that I Sin Ho, the Chinese merchant, while returning with his junk (to Johor) was lost at sea somewhere about Cambodia. For that reason, the VOC loses 10 piculs of raw silk and other Chinese goods.'

An aspect of our understanding of Temasek on which the *Temasek Wreck* bears is: who would have underwritten this order of Chinese ceramics for sale or redistribution in Temasek? Were its *raja*s and their *orang kaya* sufficiently wealthy to fund a trader to go to Jingdezhen, the City of Blue and White (Gerritsen 2020), to purchase this consignment of Chinese ceramics? Would this funding have been in some form of coinage, or silver? Or, perhaps more likely, as in the case of the Dutch funding I Sin Ho, was it in valuable local produce, such as hornbill casques, lakawood and cotton prints, for which the 14th-century Quanzhou trader Wang Dayuan recorded Temasek to be a notable port of supply?

Another aspect of the *Temasek Wreck* that is relevant for our understanding of Temasek is the distribution and sale of its large consignment of porcelains and other cargo, which never reached the Singapore River harbour of Temasek. Temasek, like later Melaka and Banten, would have had a major marketplace, as visualized by archaeologist Aaron Kao in his sketch which forms the endpapers of *1819 & Before: Singapore's Pasts* (Kwa 2021). Van Leur's small-scale peddlers would have rented a stall at the marketplace to display and sell their goods. But was there also a section of the market for the wholesale distribution of large cargoes, as at 16th-century Banten and other pre-modern Southeast Asian port-cities (Reid 1993: 90–3)? Can we visualize the consignment of ceramics and other cargo from the *Temasek Wreck* being unloaded and transferred to this wholesale section of Temasek's market where it would be sold to individual traders to peddle at the next harbour settlement they called at?

This *Preliminary Report* by Michael Flecker of his careful archaeological excavation of this 14th-century shipwreck in Singapore waters opens up new vistas to our understanding of Singapore's maritime history. We look forward to a fuller report to get a better grasp of the implications of this shipwreck for Singapore's history.

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REFERENCES

Archaeological Survey of India

2017 *Hoard of Chinese Porcelain (A Rare Discovery from Firozshah Kotla).* New Delhi: Archaeological Survey of India.

Dupoizat, M.-F. & N. Harkantiningsih

2007 *Catalogue of the Chinese Style Ceramics of Majapahit.* Paris: Association Archipel.

Flecker, M.

2002 *The Archaeological Excavation of the 10th Century* Intan Shipwreck. BAR International Series 1047. Oxford: Archaeopress.

2004 *The Binh Thuan Shipwreck*, in *Christie's Australia, The Binh Thuan Shipwreck, Melbourne 1 & 2 March 2004.* Melbourne: Christie's.

2017 'The Origin of the Tang Shipwreck: A Look at Its Archaeology and History', in *The Tang Shipwreck: Art and Exchange in the 9th Century*, A. Chong & S.A. Murphy (eds.), pp. 22–39. Singapore: Asian Civilisations Museum.

2022 'The Wreck of the *Shah Muncher* (1796), Singapore. Preliminary Report', *Temasek Working Paper Series* No. 3. <https://www.iseas.edu.sg/wp-content/uploads/2022/01/Flecker_TWPS03-_Final-FINAL-revised-28Jan2022.pdf>

Flecker, M. & Y.S. Tai

2019 *Flying Fish Wreck: Northern Song (960–1127).* Petaling Jaya: Innovation Media Shd. Bhd.

Gaskin, S.P., A. Sharma & E.S. Smart

2021 'For the Love of Broken Porcelain: The Effort to See, Study, and Share the World's largest Collection of Yuan-dynasty Blue-and-White Porcelain', *Orientations* 52/5 (September–October):54–6.

Gerritsen, A.

2020 *The City of Blue and White: Chinese Porcelain and the Early Modern World.* Cambridge: Cambridge University Press.

Kwa, C.G.

2012 *Locating Singapore on the Maritime Silk Road; Evidence from Maritime Archaeology, Ninth to Early Nineteenth Centuries.* Nalanda-Sriwijaya Centre Working Paper No. 10. https://www.iseas.edu.sg/wp-content/uploads/pdfs/nscwps10.pdf

2021 (ed.) *1819 & Before: Singapore's Pasts.* Singapore: ISEAS – Yusof Ishak Institute.

Leur, J.C. van.

1955 *Indonesian Trade and Society: Essays in Asian Social and Economic History.* Hague/Bandung: W. van Hoeve.

Liaw, Y.F.

1976 *Undang-Undang Melaka: The Laws of Melaka.* The Hague: M. Nijhoff.

Mathers, W.M & M. Flecker (eds.)

1997 *Archaeological Recovery of the Java Sea Wreck.* Annapolis: Pacific Sea Resources, Inc.

Meilink-Roelofsz, M.A.P.

1962 *Asian Trade and European Influence in the Indonesian Archipelago between 1500 and about 1630.* The Hague: M. Nijhoff.

Pires, T.

1515 *The Suma Oriental of Tome Pires: An Account of the East, From the Red Sea to Japan, Written in Malacca and India in 1512–1515.* Transl A. Cortesao. New Delhi: Asian Educational Services 1990 (reprint of 1944 Hakluyt Society edition).

Pope, J.A.

1970 *Fourteenth-century Blue-and-White. A Group of Chinese Porcelains in the Topkapu Saray Muzesi, Istanbul.* Washington: Freer Gallery of Art, Occasional Papers. First published 1952.

1981 *Chinese Porcelains from the Ardebil Shrine,* Second Edition. London: Sotheby Parke Bernet. First published 1956.

Reid, A.

1993 *Southeast Asia in the Age of Commerce 1450–1680, Vol. Two: Expansion and Crisis.* New Haven: Yale University Press.

ABSTRACT

While salvaging a steel barge off Pedra Branca in early 2015, commercial divers noticed intact ceramic plates on the seabed. Samples were brought to the ISEAS – Yusof-Ishak Institute where they were identified as 14th-century Longquan green-ware. An archaeological survey later confirmed an extensive shipwreck site, now designated the Temasek Wreck, *with not just green-ware but also blue-and-white porcelain,* shufu-*ware and* qingbai-*ware from Jingdezhen, and brown-ware from Guangdong or Cizao in Fujian province. An excavation carried out in stages over four years resulted in the recovery of approximately 4.4 tonnes of ceramics, mostly shards, and a handful of non-ceramic artefacts. None of the ship's structure had survived.*

Without any hull remains it is impossible to conclusively identify the type of ship. However, from circumstantial evidence such as an exclusive Chinese cargo and an absence of non-Chinese artefacts, there is a high probability that the ship was a Chinese junk. She contained more Yuan dynasty blue-and-white porcelain than any other documented shipwreck in the world. From an analysis of this rare and important cargo element it would seem that the wreck dates between 1340 and 1371. From the location of the wreck, the many parallel finds from Singapore terrestrial sites, and importantly a common dearth of large blue-and-white plates, the ancient port of Singapore (Temasek) was the most likely intended destination.

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1 All images are by the Archaeology Unit of the ISEAS – Yusof Ishak Institute unless otherwise stated.

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1. THE DISCOVERY

On the last day of 2014 the Maritime and Port Authority of Singapore (MPA) announced that a barge, *POE Giant 12*, had run aground on Pedra Branca, located approximately 40 km east of the mainland. After initial attempts to refloat the barge failed, a salvage company was commissioned to remove the wreck.

Fig. 1: The barge *POE Giant 12*, grounded on Pedra Branca.
Green-ware plates were first discovered in the bottom left corner of this image. (Credit: Ramdzan Salim)

On 18 May 2015, one of the contracted salvage masters, Ramdzan Salim, contacted the Archaeology Unit (AU) at the ISEAS – Yusof Ishak Institute (ISEAS) to tell of a new shipwreck discovery 'in Singapore waters'. Emailed photographs depicted up to a dozen coral-encrusted green plates on the deck of a workboat, having just been recovered from the sea. A meeting was held on 22 May, attended by Salim, one of the contract divers named Ahmad Qamarulhazman, and ISEAS personnel, including the author of this report.

Fig. 2a and b: Longquan green-ware plates as first recovered by the salvage divers.
(Credit: Ramdzan Salim)

Salim explained that having completed the wreck removal, a dive team was deployed to survey the surrounding seabed for any steel debris that may have been missed. During this inspection, Qamarulhazman noticed a plate embedded in coral between the rocks. Further investigation resulted in the discovery of more plates, with some concreted together in stacks. The water depth was said to be only 8 to 12 m, with little sediment in the vicinity. The lighthouse was 'very near'.

Four complete ceramic plates, one bowl, and a small lead disk were brought to the meeting. The ceramics were readily identifiable. They originated from the Longquan kiln complex in Zhejiang Province, China, and dated to around the 14th century. By sheer coincidence, they were contemporary with the ancient port city of Temasek. If this was the first ancient shipwreck to be discovered in Singapore waters, rather than a pile of jettisoned pottery, it had the potential to be of immense historical significance. Salim generously agreed to leave the finds with ISEAS for further research.

Judging from the relatively light encrustation of hard and soft corals on every piece photographed just after recovery, they had all been exposed on the seabed, at least in recent times. This was consistent with the reported lack of sediment in the vicinity. From the Admiralty chart, the granite outcrop of Pedra Branca is surrounded by coarse sand, gravel, and broken shells. Mud can be found some distance to the south and east, but the finer sediments had perhaps been washed out by strong currents in the vicinity of the rocks. Large boulders continue out to at least the 15 m contour.

From the divers' description, and analysis of the Admiralty chart, there was reason to believe that more shipwreck material lay buried beneath the sand at the base of the primary rock outcrop. In fact, for the eternally optimistic, there was a chance that most of the wreck, including part of the wooden hull, was still protected by deeper sediments. The salvage divers had not used any excavation equipment, such as airlifts or water-dredges, during their brief interlude.

2. THE SURVEY

After the meeting, ISEAS contacted the National Heritage Board of Singapore (NHB). A briefing was quickly arranged for 5th June 2015. Having conveyed the circumstances of the discovery, ISEAS advocated an archaeological survey to confirm whether this was indeed a wreck-site or just cargo that had been jettisoned to help refloat a stranded ship. NHB readily concurred. The survey commenced on 12 April 2016.

A small team from ISEAS boarded a chartered fishing boat and made their way to Pedra Branca. The 10 m cruiser was loaded with a diving compressor, tanks, still and video cameras, measuring tapes, rope reels, and an underwater scooter. Both Salim and Qamarulhazman kindly agreed to come along to point out the location of their discovery.

On arrival at Pedra Branca, it took the salvage divers no more than 15 minutes to relocate the site. They surfaced with large shards of stoneware jars and Longquan greenware. The location was buoyed with a taut rope, and a GPS fix was taken. After radial searches determined the approximate extent of the site, they were superseded by radial mapping of features such as significant artefacts, the inshore high boulder area, and the offshore basins. The results were plotted on a detailed bathymetric chart to produce a site plan of sufficient accuracy to plan and initiate an excavation.

Sample artefacts were photographed and videoed in-situ before being recovered and documented on a 'Maritime Artefact Finds Recording Form'. Observations made during each dive were recorded on an 'Archaeological Dive Log'.

Having noted that the greatest concentrations of surface shards occurred in basins of sediment between boulders and low rocks, test excavations were undertaken to determine the depth of sediment, the concentration of buried shards, signs of stratigraphy, and the presence of hull remains. With only half a metre of sediment overlying bedrock in most areas, the underwater scooter proved to be an effective excavation tool when used as a blower.

Fig. 3: The map of the wreck-site produced during the survey. For illustration purposes only.

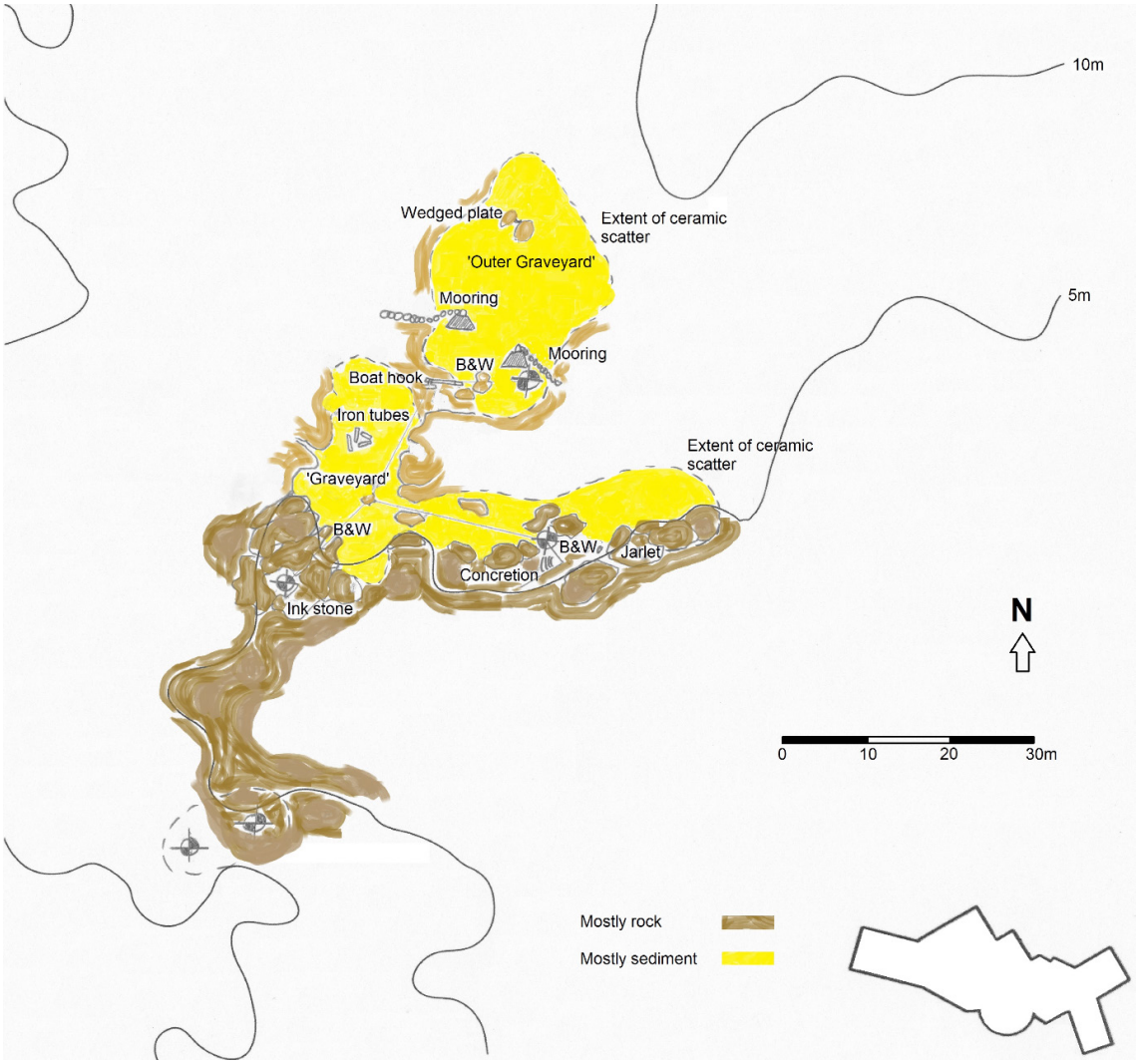
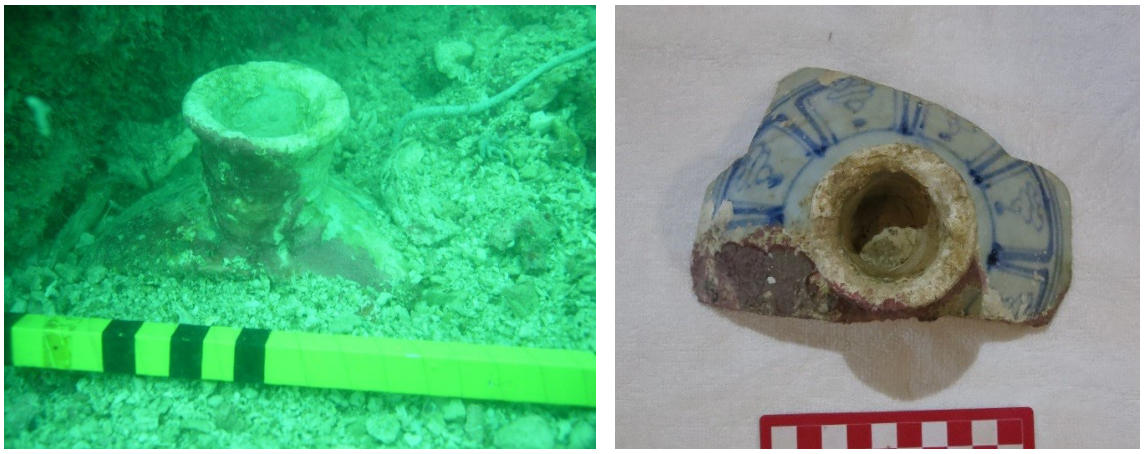


Fig. 4a and b: The first blue-and-white porcelain find in-situ (left), and after some cleaning on deck (right).



A total of 106 artefacts were recovered and recorded during the five-day survey, ranging from intact ceramics to small shards, along with a few non-ceramic objects. Longquan green-ware predominated, as had been expected, mostly in the form of plates and bowls. However, blue-and-white porcelain had not been expected so the discovery of a broken stem-bowl, decorated with mandarin ducks in a lotus pond, came as a wonderful surprise.

Non-ceramic finds were very limited. They included a lead disk and a lead 'washer', both approximately 10 cm in diameter, and a Chinese ink stone. Apart from an etched line around the border, the ink stone was unadorned, although chisel marks could be discerned on the base.

The larger shards were observed at three distinct locations in amongst the shallow inshore boulders. The first was to the south of a shallow ridge, in the same area as the lead artefacts. Interestingly, there were virtually no ceramic shards observed in the sediment deposits just seaward of this area.

Some 30 m to the north, on the other side of the shallow ridge, several large green-ware shards were found with the ink stone. Concentrations of smaller shards had accumulated in sediment-filled basins further north of this point. These basins were labelled the 'Graveyard' and the 'Outer Graveyard' during the survey, collectively referring to the final resting place of the ship. The names stuck. The blue-and-white stem bowl was found at the inshore extremity of the Graveyard, near the sand-rock interface. A nearly intact blue-and-white bowl and a base were recovered from the Outer Graveyard, and a nearly intact green-ware plate was observed in the same area, more than 50 m north of the first discoveries.

Following the shallow boulders 30 m to the east revealed the third area of large shards. Two nearly intact blue-and-white bowls, a blue-and-white jar lid, and a small intact green-ware bowl were also found in this location. The remnants of stacks of green-ware plates were discovered adhering to the rocks, concreted by coral and highly corroded iron.

The wide distribution and great quantity of exposed ceramic shards confirmed that this was indeed a shipwreck site. The range of Longquan green-ware potentially linked the wreck to 14th-century Temasek. The discovery of rare Yuan dynasty (1271–1368 CE) blue-and-white porcelain elevated the significance of the site even further. It was designated the *Temasek Wreck*, being of the same period.

THE EXCAVATION

Broadly speaking, maritime archaeological excavation involves accurately documenting the position and context of artefacts before they are permanently removed. It is a destructive process, and it assumes that the relics have reached a state of near equilibrium with their surroundings.

The *Temasek Wreck* site was not in a state of near equilibrium. It was highly dynamic. There were indeed some artefacts in near equilibrium, such as ceramics wedged between rocks beneath the sediment. However, the vast majority lay on or within a layer of sediment that was in a constant state of flux. Ceramic shards were found throughout the layer, and all displayed the same degree of coral encrustation. Therefore, they had all been exposed from time to time over the centuries, facilitated by a specific gravity similar to that of the sand, silt, shell grit, and coral rubble that constituted the sediment.

From the survey it was evident that there was no stratigraphy and very wide dispersal. Distribution had been overwhelmingly driven by gravity, dynamic forces, and bathymetry, so relatively little was going to be learnt of cargo stowage, vessel specifications, or wreck orientation from fine-grained documentation. Consequently, a 5 × 5 m rope grid system was chosen to record the distribution, in the hope that a pattern could still emerge to provide insights into the wrecking process, and perhaps the original ship configuration.

On the other hand, artefacts that survived intact or nearly intact in amongst the shallow boulders, or wedged between rocks, must have remained in the same location since shortly after the initial wrecking incident. These few artefacts could tell us inordinately more than the vast majority of mobile finds in the sediment-filled basins, and therefore warranted individual position recording.

3.1 Dive Support Vessel

Conventional practice for a remote site is to mobilise a self-sufficient spread to complete the excavation in one or more prolonged campaigns. This was not an option at Pedra Branca. The weekly cycle of moderate currents during neap tides and strong currents during spring tides allowed for only six to eight days of productive diving in one stretch. The cost of mobilising and then demobilising a full spread on alternative weeks would have been prohibitive.

Instead, the excavation crew remained shore-based. They boarded their Dive Support Vessel (DSV) before the eastern horizon began to lighten and returned to the dock after sunset, allowing them just enough time to get home, eat and sleep, before making their way back to the boat the following morning. With transit times of over 3 hours each way, only 6 to 7 hours of dive time could be achieved per day.

For the first two expeditions Ardent Global (Singapore)[2] graciously provided their DSV, crew, and commercial divers. The divers worked with surface-supplied equipment, including helmet-mounted video cameras, under the supervision of the ISEAS archaeologists who used scuba. However, more divers were needed to improve productivity. With the shallow water at the wreck-site, the decision was made to switch to highly experienced

2 Ardent acquired Svitzer Salvage, the company that salvaged the barge that grounded on Pedra Branca. It was the Svitzer divers who discovered the *Temasek Wreck* site.

scuba divers working from a larger DSV. OPL Services provided several of their vessels at a competitive rate, and always with a competent and friendly crew. With an average of six scuba divers now deployed, including the two ISEAS archaeologists, it was possible to have three pairs of divers carrying out two one-hour dives each per day.

3.2 Excavation Equipment

With large areas of sediment to excavate it was necessary to deploy either an airlift or a water-dredge to expose the underlying artefacts. While an airlift, with its smaller and sturdier supply hose, would have been considerably easier for divers to deploy, the uncontrolled discharge of dredged material in rapidly shifting currents initially ruled this solution out. Instead, a water-dredge was used as the discharge could always be directed to an area that was devoid of artefacts or that had already been excavated. Unfortunately, the negatively buoyant supply hose of the dredge proved to be a major problem with changing currents. It frequently ripped on sharp coral, and in one incident it parted altogether. This issue was rectified by tying the hose to the mooring line during deployment each morning—no mean feat in anything more than a light current. Once deployed, however, and with restraining ropes attached, the water dredge performed well. When excavation reached the narrow Outer Graveyard, it was possible to switch to an airlift as the discharge could then be directed to either side of the work area.

Table 1: Excavation configuration for each expedition, or Dive.

Dive	Dates	Days[3]	DSV	Dive System	Excavation System
1	8 – 11 Aug 2016	4	*Ardent Responder*	Surface supplied	Water dredge
2	5 – 13 Sept 2016	9	*Ardent Responder*	Surface supplied	Water dredge
3	7 – 14 Oct 2016	8	*OPL 55*	Scuba	Water dredge
4	22 – 28 Oct 2016	7	*OPL 55*	Scuba	Water dredge
5	29 Aug – 4 Sept 2017	7	*OPL Express 1*	Scuba	Water dredge
6	27 Sept – 3 Oct 2017	7	*OPL Express 1*	Scuba	Water dredge
7	6 – 13 Sept 2019	8	*OPL Express 3*	Scuba	Airlift
8	6 – 11 Oct 2019	6	*OPL Express 3*	Scuba	Airlift
9	19 – 25 Oct 2019	7	*OPL Express 3*	Scuba	Airlift
10	2 - 8 Nov 2019	7	*OPL Express 3*	Scuba	Airlift

3.3 Excavation Methodology

It was most fortunate that two abandoned concrete mooring weights lay within the boundary of the wreck-site. They both rested just offshore of the imaginary line that divided the Graveyard from the Outer Graveyard.

For each expedition, or Dive, when first arriving at Pedra Branca a mooring rope was attached to the westernmost mooring weight. Unfortunately, the two mooring weights

3 Some days were lost due to vessel or equipment breakdowns, and lay days.

were too close together to permit two-point mooring, which would have made hose deployment easier by preventing pivoting.

A heavy rusted chain attached to the western mooring weight served as the northern boundary of the first grid square. The first longitudinal grid line (oriented 20°/200°) ran from this chain to the southern boundary of the Graveyard, as delineated by high boulders. The second paralleled the first, 5 m to the east and just touching the mooring weight. Accumulations of boulders formed natural boundaries to the west and east of these lines. Two additional longitudinal lines were run northwards through the Outer Graveyard. Transverse grid lines were run at 5 m intervals throughout the Graveyard and Outer Graveyard areas. Grids were labelled with white plastic tags at their southern boundaries. The grid numbering system allowed for expansion of the site if it was found to be more extensive than plotted during the survey. Grid numbers ascended to the north, while grid letters ascended to the east.

The single-point mooring rope also served as the diver down-line. One diver in each pair was charged with operating the excavation gear while the other supported him or performed various other tasks. Apart from general excavation and supervision, the ISEAS archaeologists documented the work with measurements, sketches, and still and video photography, particularly when unique artefacts were found. Divers brought down weighted plastic baskets as necessary and deployed them adjacent to the dredge or airlift head. The baskets were labelled according to the grid being excavated. They were recovered when about two-thirds full, or at the completion of a grid square. Lift bags and a messenger line were used to assist in recovery.

Table 2: Typical equipment deployed for excavation.

Item	Description
1	High Pressure (HP) diving compressor
2	25 KVA portable generator (to supply HP compressor)
3	Scuba tanks and equipment
4	Petrol-driven water pump, 2" lay-flat hose, and 6" water-dredge × 2
5	175 cfm Low Pressure (LP) compressor, hose, and 6" air lift × 2 (alternative)
6	Emergency oxygen supply
7	Underwater still and video cameras
8	Measuring tapes and rope reels
9	Lift baskets—weighted
10	100 kg lift bags

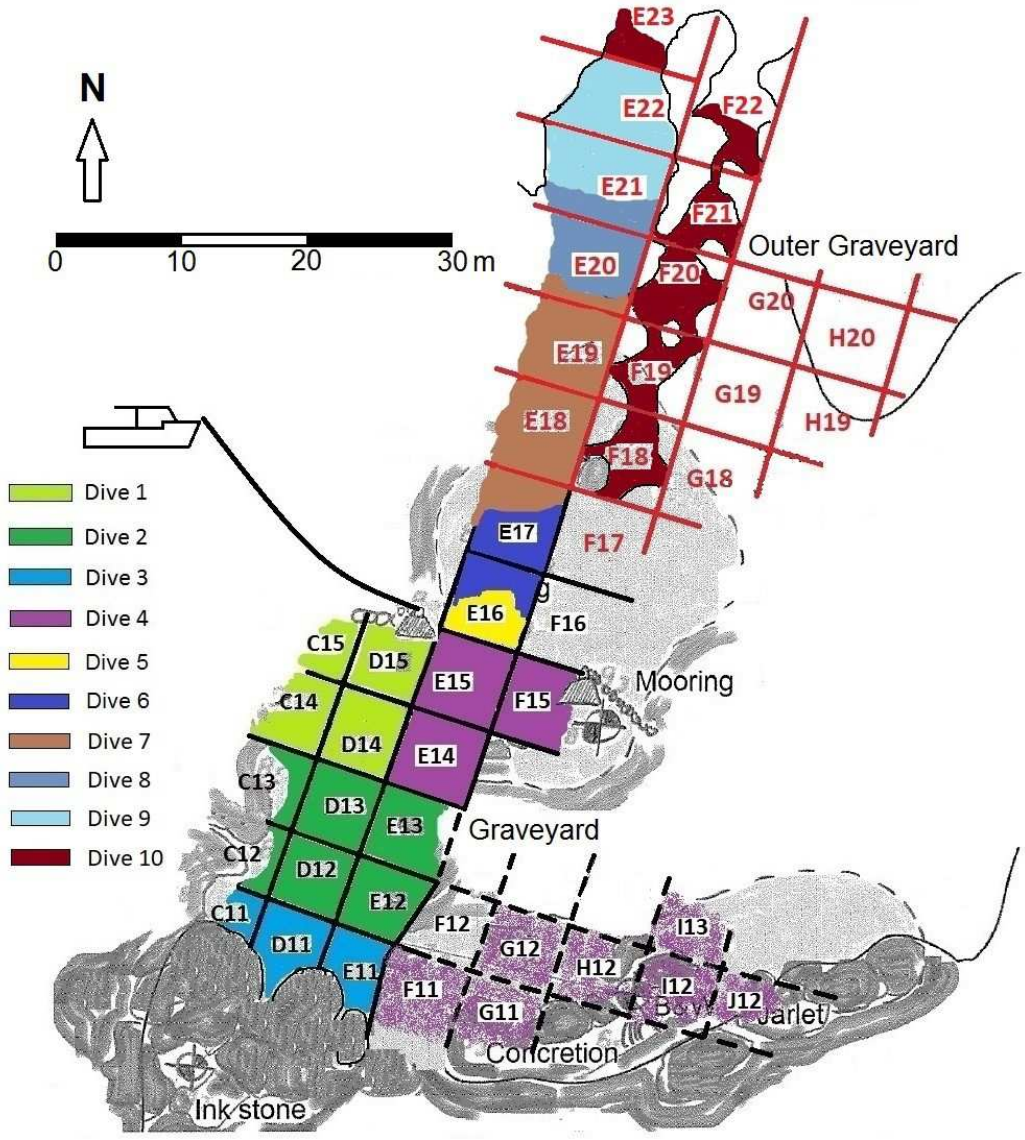
At the end of work each day, the excavation gear was shut down but left in place, and the supply hose was recovered. The artefact baskets were sent to the surface and lifted on board. The ladder was pulled inboard, and the buoyed mooring rope released. These tasks were repeated day after day throughout each Dive.

Excavation commenced adjacent to the mooring weight, in Grid D15. Over the course of the first three Dives, work progressed to the south-southwest, through the Graveyard towards the inshore rocky ridge, in the mistaken belief that this was the area of highest ceramic concentration. During Dive 4 excavation took place in two areas. Just

south of the mooring weights, several grids with exposed bedrock contained minimal sedimentary material. All visible artefacts were collected from these grids prior to excavating small pockets of sediment by hand fanning. Further to the east, along the inshore ridge, the thin layer of sediment was found to be almost devoid of artefacts. This came as a surprise as it was the assumed area of initial impact. Stacks of concreted green-ware plates and nearly intact blue-and-white bowls had been found here during the Survey. It is possible that this area had been the focus of looters.

The next two Dives stood in stark contrast to Dive 4. Working into the Outer Graveyard and towards the north-northeast, deep sediment deposits were encountered, with heavy concentrations of shards. Rather than a basin, this area became a gently sloping gulley, barely 5 m wide. This gulley bifurcated further north, with the eastern arm proving less profuse. By the end of the project an area measuring 65 m long by a maximum of 18 m wide had been excavated.

Fig. 5: Schematic diagram of the grid layout, highlighting completed grids (dark shading) and surface shard recovery (light shading). For illustration purposes only.



4. THE WRECKING PROCESS

Unless a coral-encrusted shard, when cleaned in future, is found to be an exception, all of the recovered ceramics are Chinese in origin. So is the inkstone. Material analysis may later confirm the origin of other non-ceramic artefacts, but none so far are obviously non-Chinese. This suggests that the ship was travelling directly from China without engaging in regional trade. If so, it was almost certainly voyaging during the northeast monsoon. Itinerant trade was carried out year-round.

In a wrecking scenario consistent with the distribution of artefacts, the ship would have struck the rocks just to the north of the western extremity of Pedra Branca. The northeast monsoon winds, and the wind-driven waves would have quickly smashed the hull as it was driven westward along a rocky promontory. A relatively small amount of cargo, including ironware, spilled out to the east of the Graveyard, so the ship must have stayed at least partially intact while grinding along the rocks for 40 m or so. The complete absence of artefacts to the west of the Graveyard indicates that this is as far as she got before lodging in the rocks and eventually breaking apart. A semi-buoyant section of wreckage seems to have washed over the rocky promontory and deposited a small part of the cargo some 30 m to the south, there being no artefact trail across the shallows and no wider spread further offshore.

Valuable ceramics would probably have been securely packed in wooden crates or barrels. From the observed stacks of green-ware dishes near the initial point of impact, they have remained in place long enough to be concreted together by coral and/or iron corrosion. This is quite remarkable given the shallow, high-energy environment. Fragile blue-and-white ceramics must have been particularly well-packed in order to remain intact, or nearly intact, in among the shallow rocks. Once the packing rotted away, protection was only afforded to the ceramics that became wedged between or under rocks, or those that rapidly concreted to the rocks. Any ceramic item that remained mobile had no chance of surviving intact.

It is possible that at least part of the ceramics cargo was stowed in barrels. If this was the case, it is also possible that entire barrels rolled into the basins or gullies where they later broke up or rotted. Intact ceramics found in the Outer Graveyard support this theory. Most ceramics were probably smashed in the shallows and then widely distributed over the centuries.

The northeast monsoon is far more boisterous than the southwest. For four months of every year, from roughly mid-November until mid-March, winds and associated waves batter Pedra Branca. The southwest monsoon blows from May until August, with transition periods in between. But the winds during the southwest monsoon are lighter and more variable, often blowing from the southeast, and as there is virtually no fetch to the south and southwest of Pedra Branca, there is little wave action. Logically, artefact distribution would be expected to be driven more by the northeast monsoon than the southwest. But this is not the case. The spread of artefacts is in one direction only, to the north-northeast.

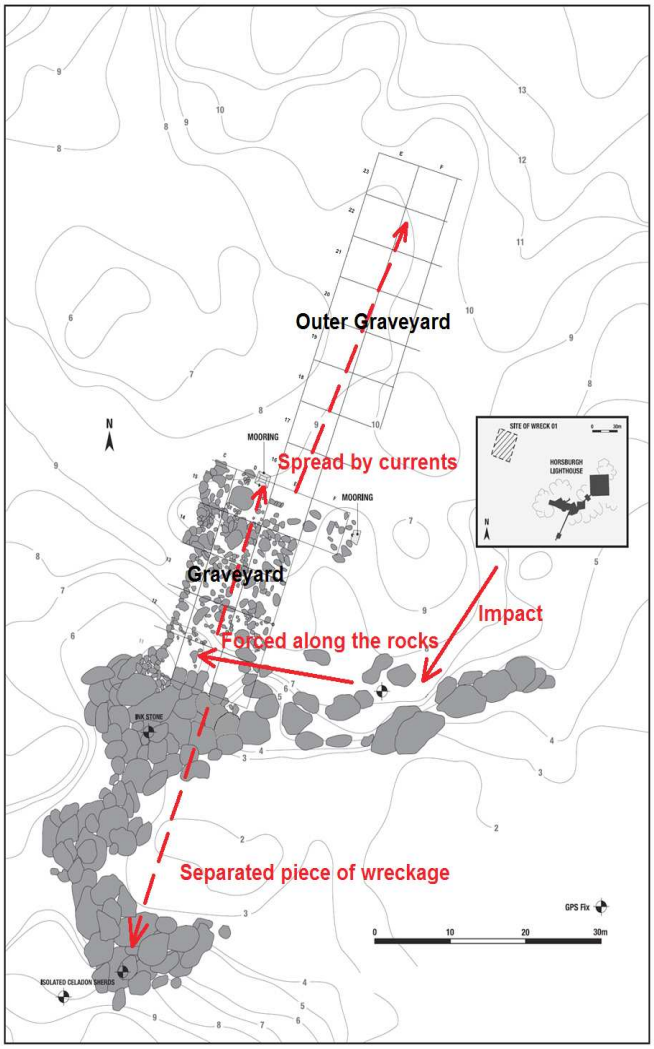
While monsoon wind-induced currents do occur in the South China Sea, the tides are the driving factor at Pedra Branca. During spring flood tide the current is from the northeast, however the rocks of Pedra Branca and the underwater promontory to the west deflect the current and reduce its strength. At the wreck location the resultant current is less than one knot from the east. Even if this degree of current was sufficient to move

shards, higher ground just to the west of the wreck-site blocks spread in that direction. The area to the southwest is completely in the lee, so there is no impetus for shards to be transported in that direction.

During spring ebb tide, the current flows from the southwest. In the lee of Pedra Branca there is no current, however the rocky promontory to the west actually accelerates the current well above 2 knots and deflects it towards the north-northeast. This clearly explains the spread of ceramics in this direction. The tumultuous current at this point was often witnessed during the excavation, even during neap tides. Just 100 m to the south, the sea remained calm. During the northeast monsoon, the long period swell would churn the seabed sediments. When spring ebb tides coincided with this swell, as they do throughout the monsoon, the strong counter-current would exacerbate the swell and drive the newly exposed ceramics towards the Outer Graveyard.

The Outer Graveyard is a gully which progressively deepens to the north-north-east. Shard concentrations slowly diminish in this direction as wave energy decreases, but surface shards could still be found more than 80 m from the likely resting place of the shattered hull.

Fig. 6: Schematic diagram showing the Temasek Wreck grid layout and bathymetry, with the wrecking process superimposed. Adapted from schematic diagram by Aaron Kao. For illustration purposes only.



With minimal sediment coverage, strong currents and heavy wave action, there was no chance for hull remains to become permanently buried. Without the anaerobic protection of fine and stable sediments, the timbers would have quickly been eroded or consumed by the wood boring bivalve, *Teredo navalis*.[4] Nothing of the hull has survived.

5. CERAMIC FINDS OVERVIEW

Until the estimated 4.4 tonnes of ceramic shards are fully cleaned of coral encrustation and then categorised by type, shape and decoration, it will not be possible to provide a quantitative analysis. Instead, this overview focuses on the few pieces that have been cleaned, or at least have a discernible decoration. A complete inventory will be published in due course. For the moment, some interim pictorial evidence must suffice.

5.1 Blue-and-White Porcelain

Blue-and-white porcelain made at the Jingdezhen kilns in China during the later part of the Yuan dynasty is arguably the most impressive type of all mass-produced ceramics. The cobalt that created the spectacular blue was sourced from Persia. The highest quality pieces, made in select kilns, were reserved for the Emperor. But many pieces only marginally less refined were traded throughout half of the ancient world, from eastern Java to Morocco.

The remarkable repertoire of blue-and-white shapes and decorations from the *Temasek Wreck* will only be fully appreciated after all the shards have been cleaned. However, the quantity already observed is more than has been recovered from any other documented shipwreck in the world to date.

Fig. 7a and b: Variations in the most common design, 'mandarin ducks in a lotus pond', usually on bowls.

4 *Teredo navalis* is a species of saltwater clam, a marine bivalve mollusc.

Fig. 8a and b: A fine foliated dish with 'ducks in a lotus pond' (left), and a variation on a bowl with 'herons in a lotus pond' (right).

Fig. 9: A stem-bowl with 'ducks in a lotus pond'.

Fig. 10: A typical bowl with lotus flowers and petals on the exterior and 'ducks in a lotus pond' on the interior.

Fig. 11a and b: A unique bowl with bands of differing motifs on the interior and exterior.

Fig. 12a and b: A dish shard (left) and a nearly complete dish (right) featuring a central phoenix motif.

Fig. 13a, b and c: Shards of three different stem-cups with dragon, scroll work, and *vajra* designs.

Fig. 14a and b: A unique flat knob from a lid (left), and a double-spout (right).

Fig. 15a and b: A bowl shard with a moulded floral *qingbai* interior.

Fig. 16a and b: A small chrysanthemum cup, interior and exterior.

Fig. 17a and b: A large bowl shard with a peony decoration (left) and another with lotus flowers (right).

Fig. 18a and b: Two bowl shards decorated with the same dragon design.
The painting on the left is of exceptionally high quality, while that on the right is relatively crude, with cross-hatching instead of individual scales.

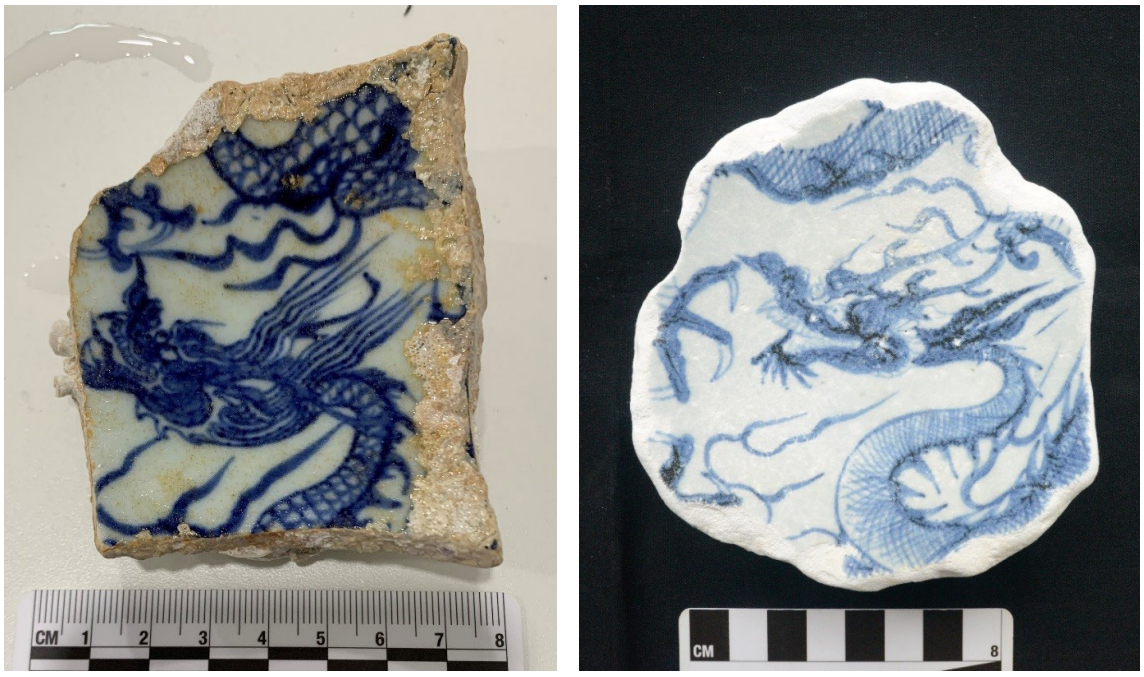


Fig. 19: The neck and shoulders of a vase with a 'ducks in a lotus pond' motif.

Fig. 20a and b: A vase base with a flaming pearl decoration, and a jarlet shard with an ear handle.

Fig. 21: Large blue-and-white jar shard with a band of peony above lotus petals and flowers.

Fig. 22: A very rare fully intact vessel, perhaps a hookah base.

5.2 Longquan Green-Ware

Longquan green-ware was produced at a wide range of kilns in southwestern Zhejiang province, from the 12th to the mid-16th century. The repertoire of shapes found on the *Temasek Wreck* is relatively limited when compared to the shapes that were produced during the 14th century. The thicker porcelaneous stoneware of the green-ware is more robust than the blue-and-white porcelain, and consequently more has survived intact.

Some of the wares that have so far been classified as Longquan may in fact be Fujian-type blue-grey green-ware. With an eroded glaze, the subtle differences are difficult to detect.

Fig. 23: A foliated Longquan green-ware plate freshly extricated from the sediments.

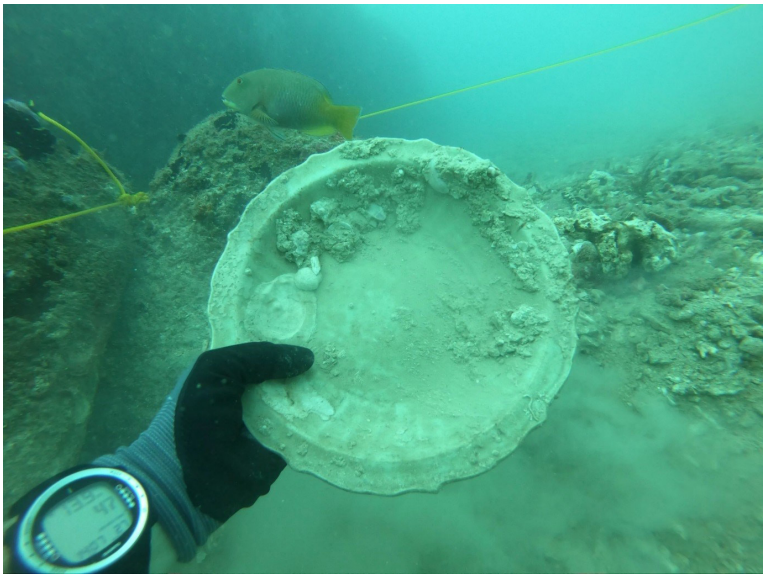


Fig. 24: Two foliated plates newly arrived on deck, illustrating the range of sizes.

Fig. 25a and b: A large foliated Longquan plate, interior (left), and base with pontil mark (right).

Fig. 26a and b: A medium Longquan foliated dish, with a rare impressed phoenix among scrolling foliage.

Fig. 27a and b: Two large Longquan plates with a plain rim, incised decoration and an impressed floral decoration in the interior centre.

Fig. 28a and b: Large Longquan plate with an everted rim and an incised wave decoration in the cavetto (left), and a Longquan dish with detailed moulded decoration throughout the interior (right).

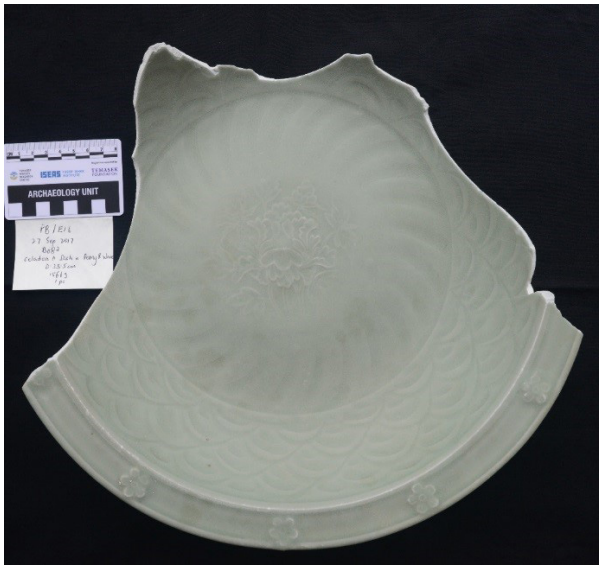


Fig. 29a and b: Two intact Longquan bowls, one with a slightly everted rim and one with straight sides.

Fig. 30a and b: A medium Longquan bowl with a moulded floral decoration on the cavetto and the lid of a *guan*-type jar.

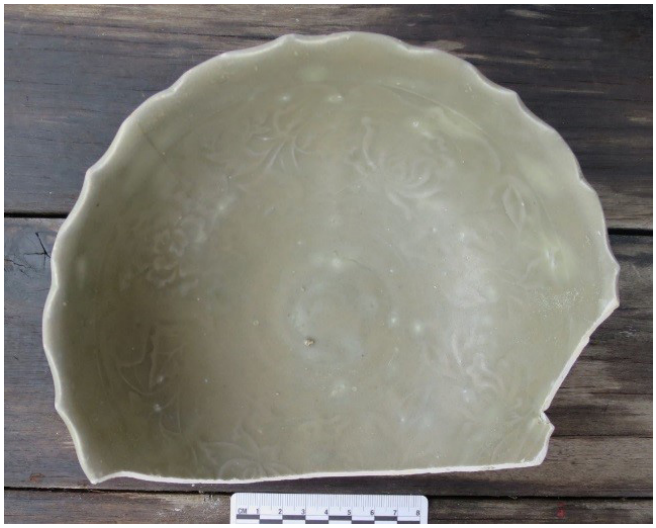


Fig. 31a and b: A Longquan bowl base with an elegant impressed lotus motif and another with a twin-phoenix decoration.

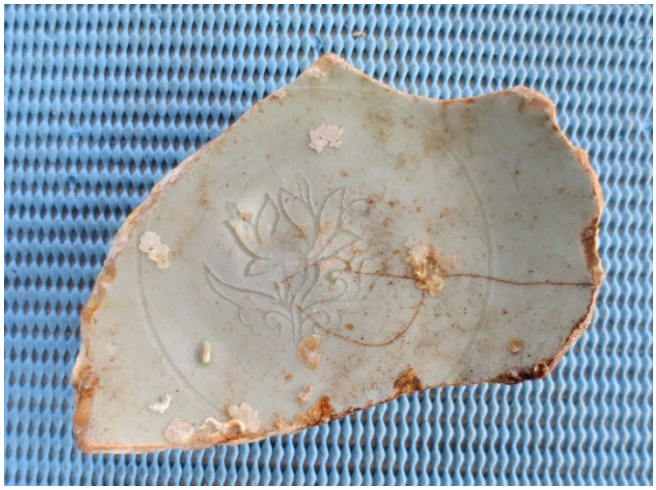
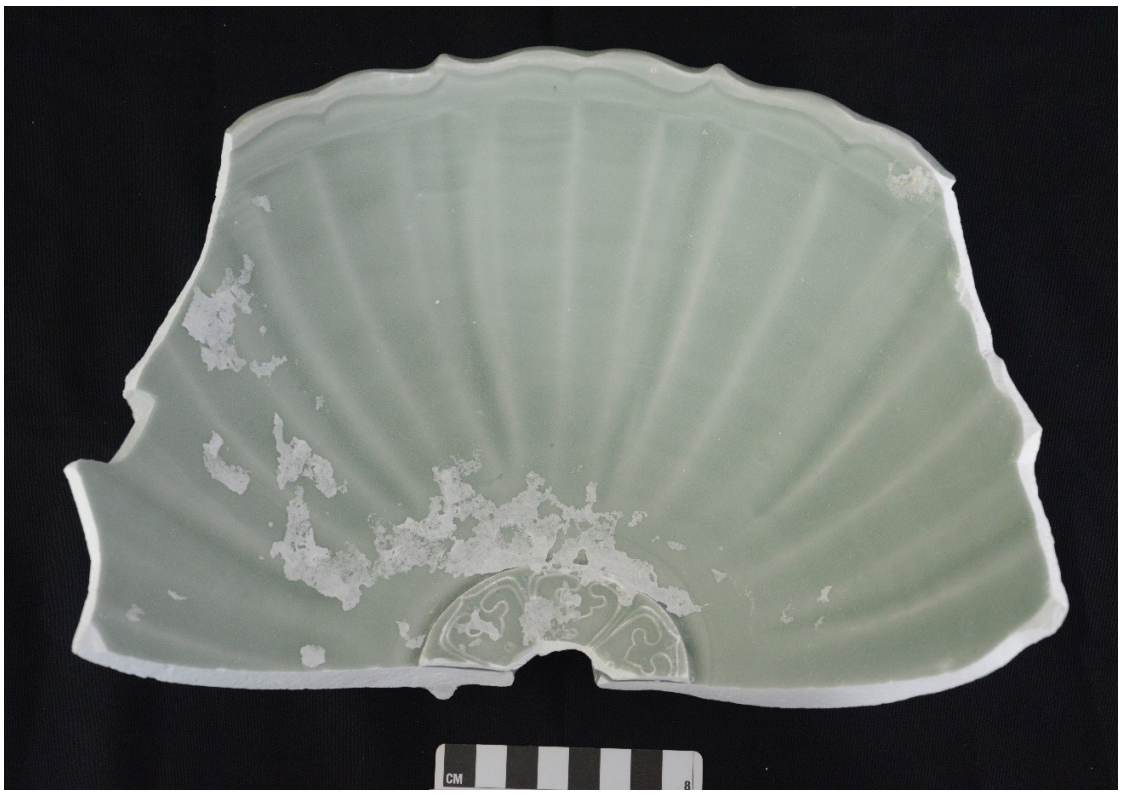


Fig. 32a and b: Applique dragon motifs in the centre of Longquan plates, the one below in biscuit.

Fig. 33: Peony decoration with the character 'shou' on a Longquan dish.

Fig. 34: A large foliated bowl shard, with a thin disc applied over a hole in the base, in the manner of Middle Eastern metal bowls.

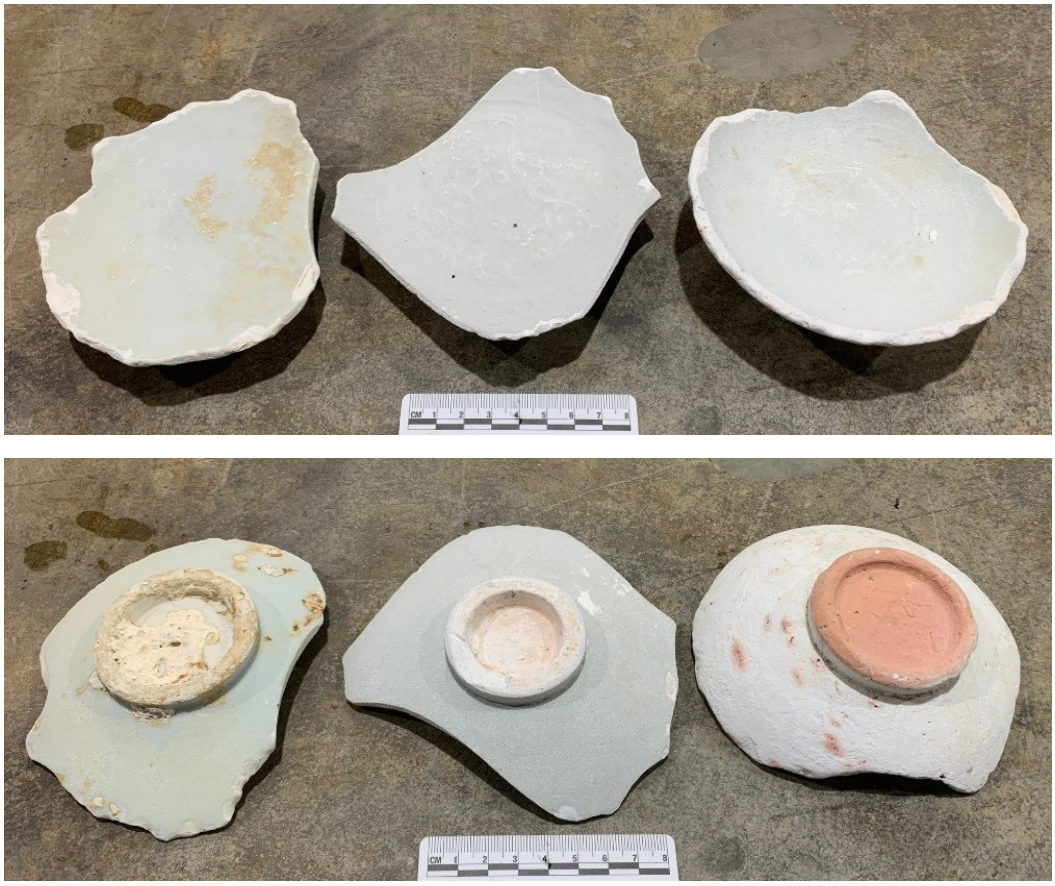


5.3 *Qingbai*-Ware

While occasionally more greenish than pale blue, some wares are clearly not from the Longquan kilns. Some of these may be from Fujian kilns, however those with impressed or moulded decorations are *qingbai*-ware from Jingdezhen. The vast majority are bowls.

Fig. 35: A *qingbai* dish with a finely moulded scrolling floral decoration.

Fig. 36a and b: The interior and base of three *qingbai*-ware bowls.

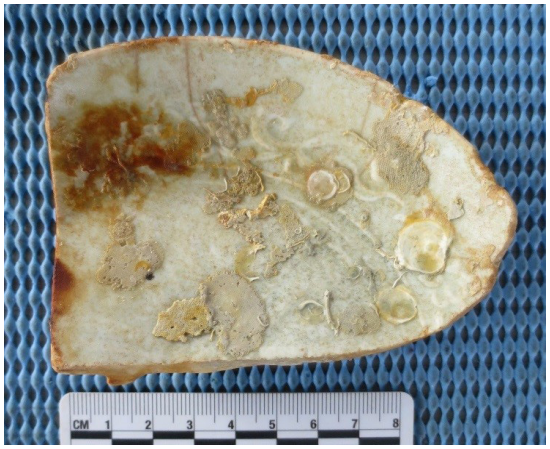


5.4 *Shufu*-Ware

Shufu-ware is so named as some pieces bear the characters '*shu fu*' meaning 'central palace' or, less literally, privy council. It is an off-white porcelain, with an unglazed base, made during the Yuan dynasty at Jingdezhen. *Shufu*-ware is thought to be the first type of porcelain ordered by imperial officials, and is considered rare.

Fig. 37a and b: *Shufu* bowl shard, interior and exterior.

Fig. 38: A shallow *shufu* bowl with a moulded scrolling floral rim.



5.5 White-Ware

It can be difficult to differentiate *shufu*-ware from white-ware, particularly with coral encrustation. However, there are a few recovered shards with a stark white glaze that do not have the off-white or pale blue tinge usually associated with *shufu*.

Fig. 39a and b: Two different examples of white-ware.

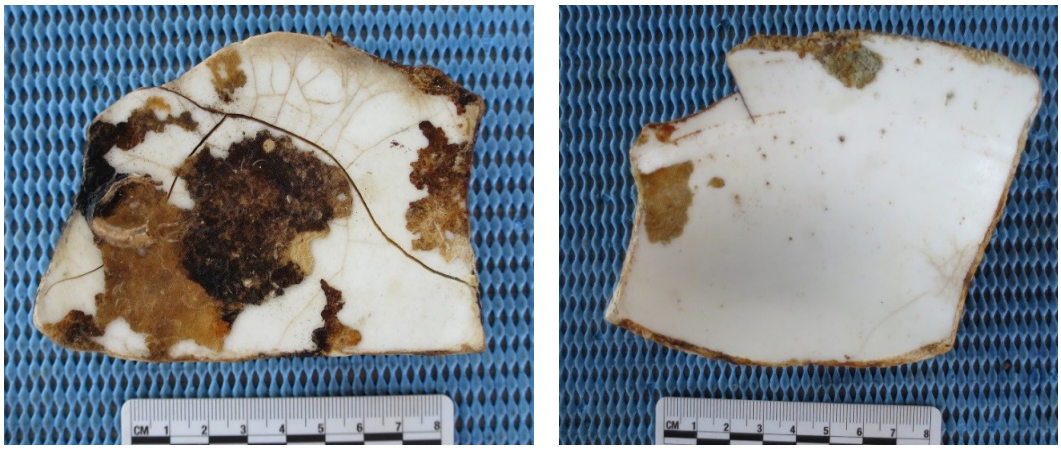
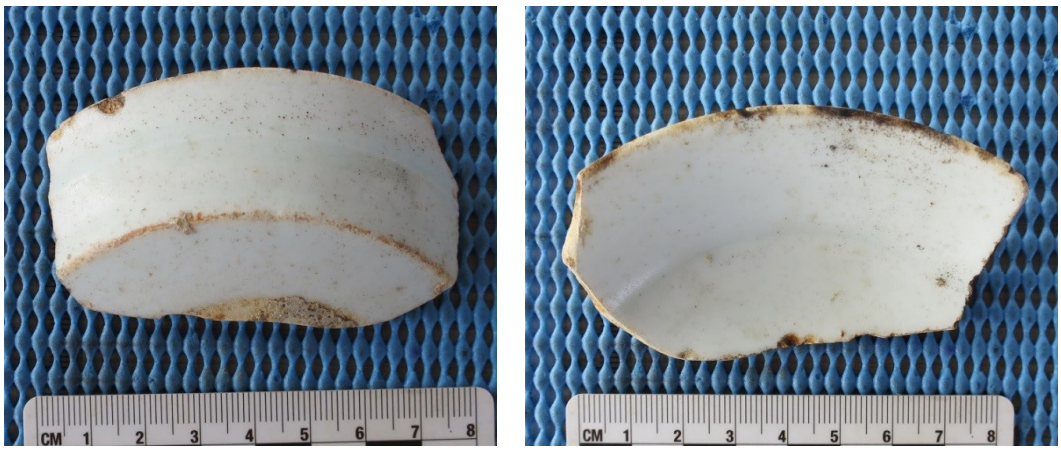


Fig. 40a and b: Small white-ware flat-bottomed bowl, exterior (left) and interior (right).



5.6 Brown-Ware

There are many shards of ubiquitous brown-ware storage jars (storage jars tended to be used as containers for liquid or organic cargo items, or for ship's stores, rather than being a trade item themselves).

Fig. 41: Mouth and shoulders of a brown-ware storage jar with lug handles.

5.7 Small Mouth Jars

Small mouth jars, traditionally but inaccurately referred to as mercury jars, were recovered in limited numbers. They typically come from the Cizao kilns of Jinjiang, Fujian Province, China, and were probably intended as receptacles for wine.

Fig. 42: The base of a small mouth jar.

6. NON-CERAMIC ARTEFACTS

Very few non-ceramic artefacts were recovered during the excavation of the *Temasek Wreck*.

6.1 Inkstone

Apart from an etched line around the border on the top, the single inkstone found on the wreck is unadorned. Parallel chisel marks can be discerned on the underside, so this is very much a utilitarian piece.

Fig. 43a and b: Inkstone, top, and underside showing chisel marks.

6.2 Lead Discs

A lead disc, some 10 cm in diameter and weighing 1.2 kg, was recovered by the commercial divers when they first discovered the wreck. During the Survey two more lead discs were found, one with a perforated centre and 13 cm in diameter. Both were wedged high in the rocks approximately 30 m due south of the inkstone. The commercial divers confirmed that the first disc was discovered in the same area. Associated shards from large Longquan green-ware bowls and dishes, and from stoneware storage jars, strongly imply that the lead discs are from the *Temasek Wreck*. They could be 'ingots', suggesting that the lead was being carried as a raw material, or commodity, rather than having a specific function. Alternatively, they could have been reserved for shipboard use.

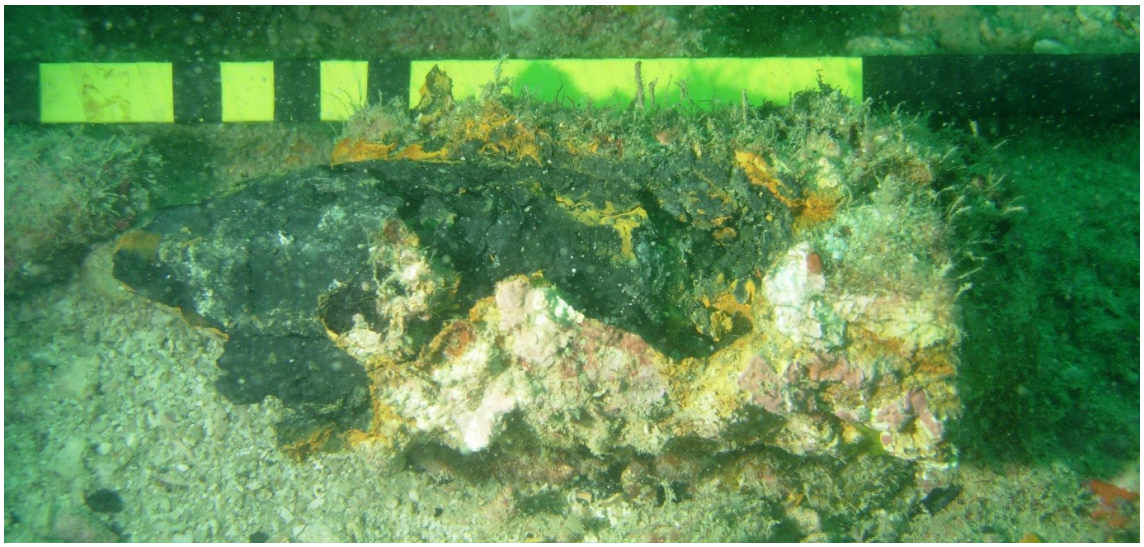
Fig. 44a and b: Two lead discs of varying diameter.

6.3 Iron

Several highly corroded and concreted tubular iron objects were observed in the middle of the Graveyard. They were originally thought to have been from the wreck, however the later discovery of associated angle-iron with fastenings, in similar poor condition, discounted this theory. Angle-iron is far more likely to date within the last hundred years or so.

However, among the inshore boulders to the east of the Graveyard a stack of green-ware dishes, which appears to have been severely damaged by looters, has been bonded to the rocks by an amorphous iron concretion. An adjacent object, virtually indistinguishable from the surrounding coral, was also found to be iron. The object was roughly cylindrical and about a metre long. It was impossible to make out the form of the original iron, whether wrought or cast, or even high-grade ore. Chipping away the outer coral layer from another smaller piece revealed an inky black interior, typical of highly deteriorated shipwreck iron. This is the likely point of initial impact of the ship. Iron cargo is usually stowed in the bottom of the hull to act as ballast, so it must have fallen out when the hull was initially breached.

Fig. 45: An unidentified iron artefact found adjacent to concreted ceramics.



Iron, both wrought and cast, is almost always shipped with Chinese ceramics. The 13th-century *Java Sea Wreck* contained no less than 190 tonnes (Flecker 2003: 392). The 15th-century *Phu Quoc Wreck* seemed to have a cargo of high-grade iron ore, or perhaps pellets that entrapped several large storage jars in amorphous iron concretions (Blake and Flecker 1994: 88). The *Binh Thuan Wreck* of c. 1608 had the bottom of every hold filled with cast iron pans, from stem to stern (Flecker 2004). It would come as a surprise if there had been no iron on the *Temasek Wreck*.

6.4 Copper Alloy Base

A copper alloy object with a decorated rim is 8.5 cm in diameter. It could have been the base or stand of a vessel. Concentric circles are bordered by a crude radial pattern.

Fig. 46: Possible base or stand of copper alloy.

6.5 Lead Sinker

A slender pyramidal lead artefact takes the form of a fishing sinker, and yet there is no hole for a line. It is impossible to fully confirm that it is from the wreck.

Fig. 47a and b: A possible lead fishing sinker.

6.6 Glass Beads

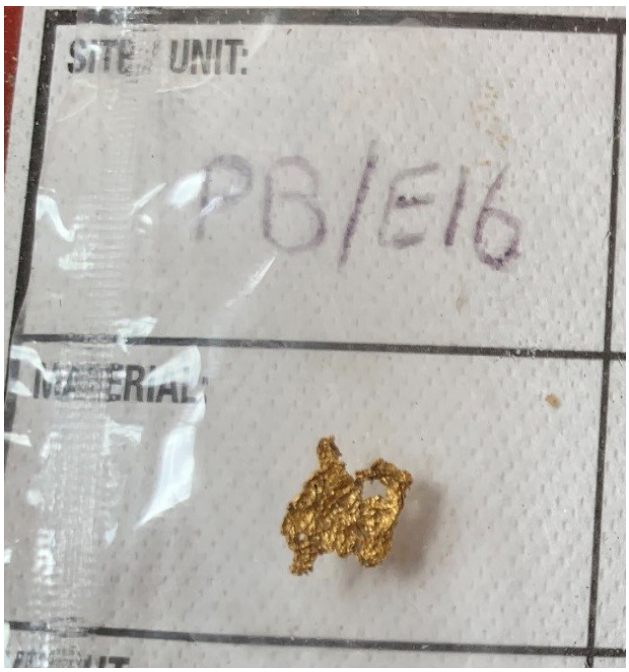
Several tiny blue glass beads were recovered. They are spherical with a hole through the middle and have many bubbles trapped within the glass. They are very similar to glass beads recovered from Singapore's Fort Canning.

Fig. 48: Blue glass bead.

6.7 Gold Foil

Two miniscule fragments of gold foil were recovered. Very similar fragments have been found at Singapore terrestrial sites.

Fig. 49: Tiny gold foil fragment.



6.8 Copper Alloy Rim

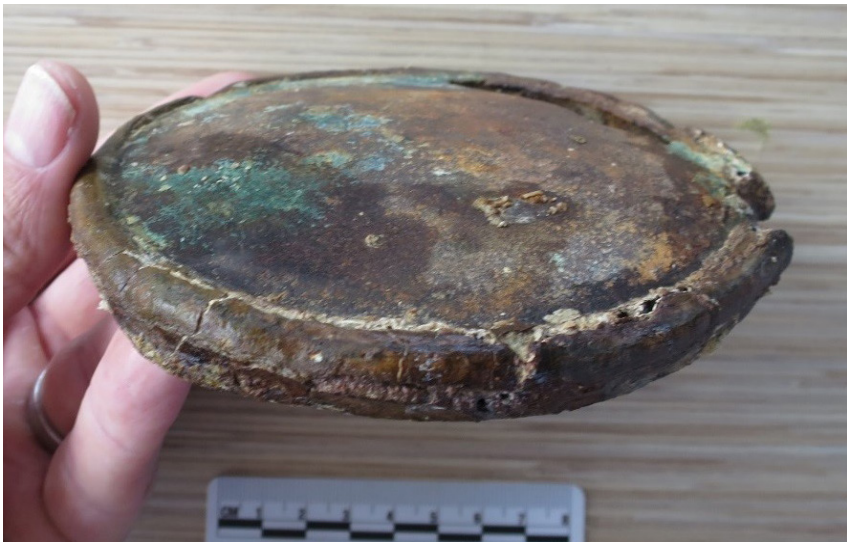
A copper alloy artefact appears to be the rim fragment of a vessel, given its slightly tapering form and decorative flange.

Fig. 50: Possible vase rim of copper alloy.

6.9 Copper Alloy Lid

An apparent copper alloy lid is made of several parts. The thickened rim is cracked in several places through a differential corrosion mechanism.

Fig. 51: A copper-alloy lid with a thickened rim.



6.10 Copper Alloy Spoons?

Two fragmented copper alloy spoon-like artefacts were found adjacent to each other. One has a handle, and while the other is missing a handle, the attachment point is evident. Both are flat, resembling tofu spoons. The larger artefact is similar in size and form to a handled Chinese mirror, however a mirror would be thicker and perfectly round.

Fig. 52a and b: Two possible spoons of copper alloy.

7. TEMASEK PARALLELS

It is extraordinary that the first ancient shipwreck ever found in Singapore waters is contemporary with 14th-century Temasek. It is all the more remarkable that specific artefact types are replicated at both the maritime and terrestrial sites. Examples include Longquan-wares such as bowls and large dishes, ubiquitous stoneware storage jars and small-mouth jars ('mercury jars'), and Jingdezhen blue-and-white bowls and stem-cups. Striking comparisons can be made between a large Longquan dish with a foliated rim from the Empress Place dig and those from the *Temasek Wreck*. The same can be said regarding green-ware dish shards from Fort Canning, with flowers in biscuit around the rim, and others with a wavy pattern on the cavetto. Blue-and-white porcelain bowl fragments from Fort Canning are also identical to many from the *Temasek Wreck*, displaying the classic Yuan 'ducks in a lotus pond' decoration. A green-ware bowl with stamped double fish in the centre is nearly identical to one recovered from the *Temasek Wreck*, although slight warping of the shipwreck piece has prevented the stamp from being fully impressed.

Fig. 53a and b: Blue-and-white 'ducks in a lotus pond' shard from the *Temasek Wreck* (top) and from Fort Canning (bottom). (Credit: NParks/Fort Canning Archaeological Project/John Miksic)

Fig. 54a and b: Blue-and-white shard with wave pattern from the *Temasek Wreck* (left) and from the St. Andrew's Cathedral site (right). (Credit: NUS/NTU/NHB Archaeology Database Project)

Fig. 55a and b: Longquan green-ware plate from the *Temasek Wreck* (left) and from Empress Place (right). (Credit: Asian Civilisations Museum, Singapore)

Fig. 56a and b: Longquan green-ware jarlet from the *Temasek Wreck* (left) and from the National Gallery site (right). (Credit: Archaeology Unit/ISEAS)

Fig. 57a and b: Longquan dish with stamped double fish motif from the *Temasek Wreck* (left) and from Fort Canning (right). (Credit: National Parks Board/Fort Canning and John Miksic)

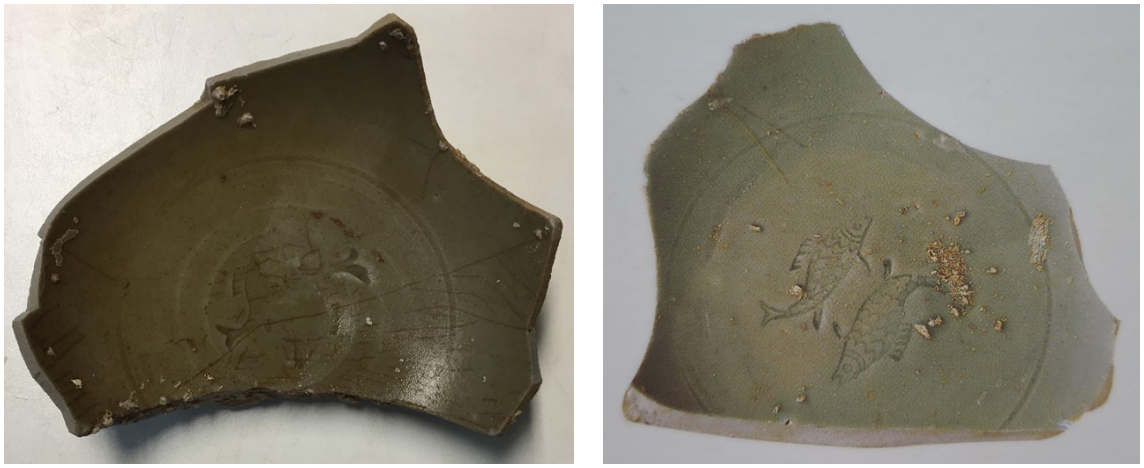


Fig. 58a and b: Longquan plate with a wave decoration on the cavetto from the *Temasek Wreck* (left) and the base of a Longquan jar with a similar pattern from Fort Canning (right). (Credit: National Parks Board/Fort Canning and John Miksic)

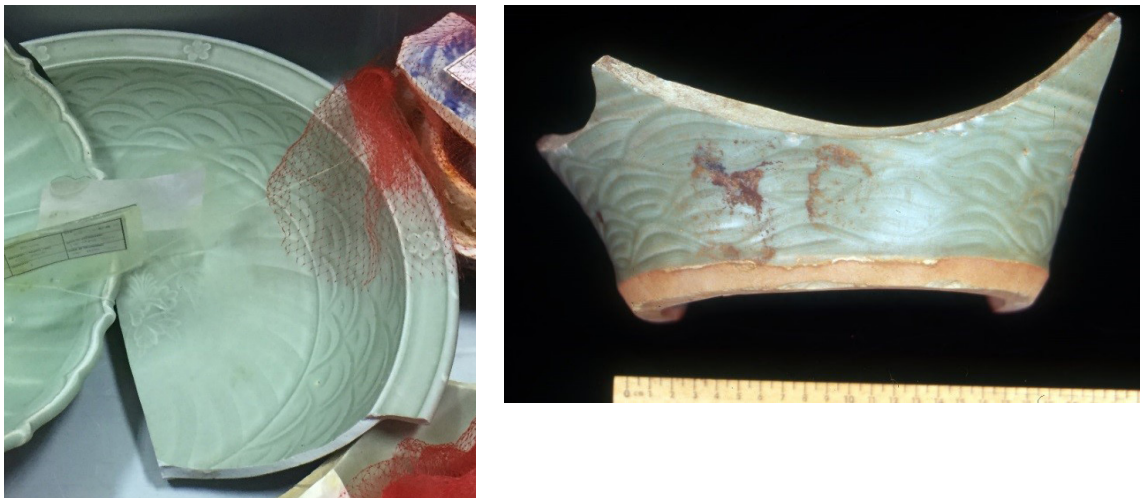


Fig. 59a and b: Longquan green-ware bowl with everted rim and carved lotus petal exterior from the *Temasek Wreck* (left) and from Fort Canning (right). (Credit: John Miksic)

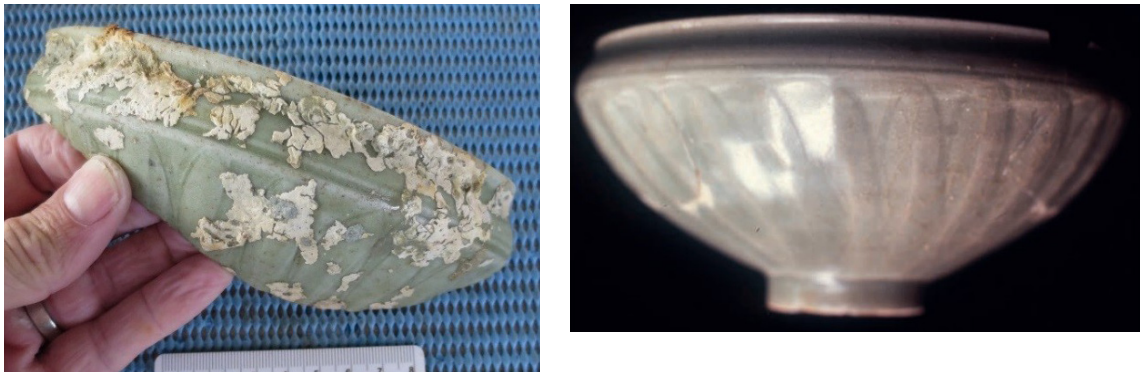
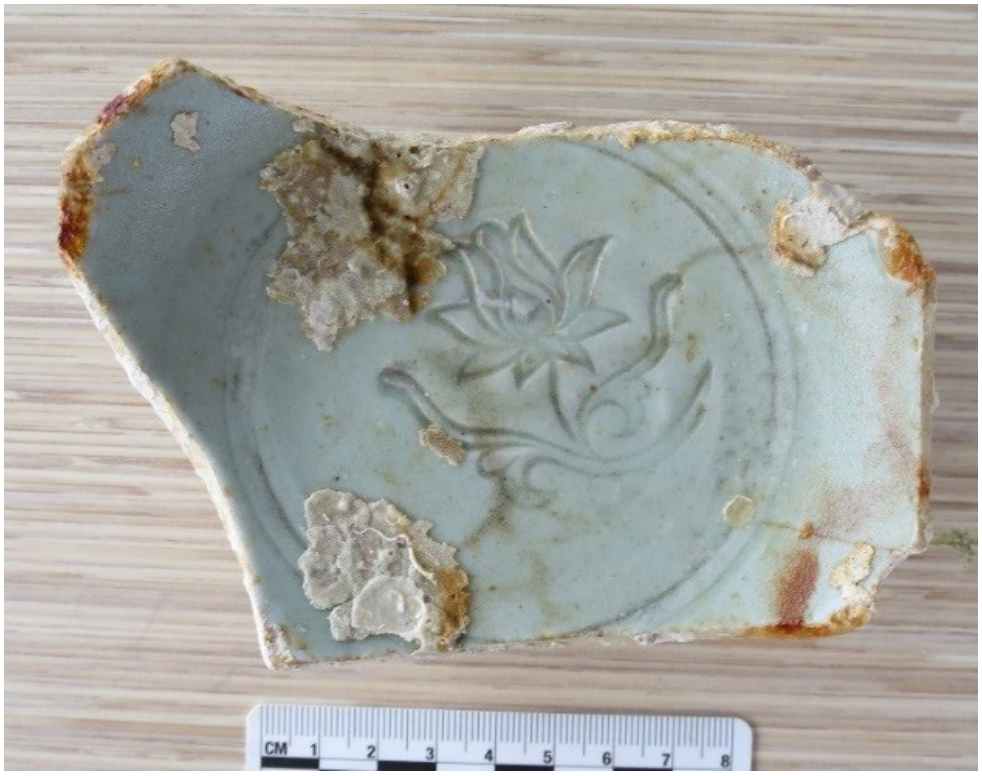


Fig. 60a and b: Longquan green-ware bowl with everted rim and carved lotus petal exterior from the *Temasek Wreck* (top) and from Fort Canning (bottom). (Credit: John Miksic)



8. DATING THE WRECK

Without coins or organic material, dating can only be attempted through the stylistic analysis of the ceramics cargo.

Longquan green-wares first appeared in the 12th century. They were favoured throughout most of the 13th century by the Song imperial court for their sumptuous jade-like attributes. During the 14th century the Longquan kilns expanded production to cater

to an ever-increasing demand for a wide repertoire of large moulded shapes from domestic and foreign markets. The success of the export market is evidenced by the presence, if not predominance, of this ware at major archaeological sites of the era throughout South Asia, Southeast Asia, the East African coast, and the Middle East (Barnes 2010: 332). Extensive excavations have shown that around the mid-12th century, Egypt was deluged with Longquan pottery of all shapes and sizes, far outnumbering all other Chinese wares (Guy 1990: 24).

The array of Longquan green-wares recovered from the *Temasek Wreck* is typical of the 14th century, but being more specific can be contentious due to the longevity of various decorative techniques and patterns. In the later part of the 14th century jade-like glazes gave way to unctuous sea-green and glassy pea-green (Barnes 2010: 332). However, subtle differences in hue could be due to firing variations or to chemical attack on the seabed, precluding such observations from refining a production date for the green-ware cargo from the *Temasek Wreck*.

Beside Longquan green-ware, other Chinese trade ceramics of this period include Jingdezhen blue-and-white porcelain, Jingdezhen *qingbai*-ware, white-wares from Dehua, Fujian-type blue-grey green-ware, Fujian (*temmoku*) teabowls (Jian-ware), Guangdong-type jars or pots with a dark brown glaze that served as containers for trade goods, and Jingdezhen porcelain with a thick white glaze, termed *shufu* (Yoh 2010: 552). Of these, only the *temmoku* are absent from the *Temasek Wreck* cargo. But it is the 14th-century Jingdezhen blue-and-white porcelain that is perhaps the most highly regarded ware, and arguably the easiest to date.

The *Temasek Wreck* blue-and-white displays the 'heaped and piled' blues and artistic motifs typical of porcelain produced during the Yuan dynasty. Elemental analysis confirms that the cobalt oxide (asbolite) applied to Yuan dynasty blue-and-white porcelain from Jingdezhen is the same as that used for the fabled Persian *minai* wares. The cobalt was probably mined in mountainous areas south of Kashan in Iran, where it was called *sulaimani*. In China it was called *sumali*, *sumani* or *suboni* blue (Wen and Pollard 2014). Traditional Western writers seem to prefer Muhummadan blue. A stable supply of Jingdezhen blue-and-white relied on well-established east–west trade, with no disruptions.

The origin and earliest production date for commercial quantities of blue-and-white porcelain have been widely researched, and yet they remain uncertain. Some advocate the theory that Middle Eastern potters played an active role in introducing the technique to the Jingdezhen potters. Others advocate independent innovation. Kiln sites have been excavated with close attention to stratigraphy. Dated tombs have provided key information for the *terminus ante quem* of various designs. And of course, dated inscriptions on the porcelain itself are lauded.

Until recently, the earliest known imperial blue-and-white porcelain came from the excavation of a kiln site at Doufulong in Jingdezhen. More than 90% of the finds were decorated with five-clawed dragons, a motif reserved for the emperor. As this was a rescue excavation, there was insufficient time to record stratigraphy and no dated pieces were found. However, 'literary sources as well as other discoveries suggest that the blue-and-white was made at the imperial kiln of Emperor Wenzong (1328–1332)' (Barnes 2010: 353).

A new find has since come to light. In an Asia Society talk in Hong Kong in 2014, May Huang, a lecturer at the School of Ceramic Art, Jingdezhen Ceramic Institute, suggested that a cluster of Yuan blue-and-white shards had a wider date range. These shards were discovered and excavated at the Hongwei Cinema in downtown Jingdezhen and

came from 15 stem-bowls. From an analysis of the archaeological strata and 'other research', they were said to be dated to the period between 1323 and 1336 (Huang 2014). This date range is much broader than the Doufulong finds and may shave five years off the earliest assumed production date.

Perhaps it is coincidence, but the 'other research' would seem to allude to the absence of blue-and-white on the 1323 *Sinan Wreck* (see below for details), in which case there is nothing new here. The *Sinan Wreck*, which has been accurately dated by means of surviving cargo tags, carried high quality Longquan ware. It has been tenuously argued by several scholars that blue-and-white porcelain would have been included in the cargo had it been produced for export at the time. But buyers in Japan, the most likely intended destination of the *Sinan* ship, may have had little interest in the relatively gaudy blue-and-white. By way of comparison, the *Shiyu 2 Wreck* (discussed below), which was found in the Paracels, contained Yuan blue-and-white porcelain but no Longquan green-ware, when the latter is known to have been a popular export to all regions. Until more conclusive evidence becomes available, 1323 should perhaps not be regarded as the *terminus ante quem* of blue-and-white production at Jingdezhen.

Indeed, Kessler (2012) argues at great length and with great strength that blue-and-white porcelain hitherto regarded as Yuan is actually a product of the Song dynasty. His contentions are manifold, but revolve around archaeological excavations in Inner Mongolia and of hoards said to predate the Mongol invasion of China. He goes as far as to state that ceramic production was marginalized during the Yuan due to the Mongol preference for metal vessels, specifically those of gold and silver.

While the author must humbly bow out of esoteric ceramic dating debates, Kessler's critique of Carswell's *Red Sea Shipwreck* conclusions (*ibid*.: 435) brings the discussion into the author's realm. His opening statement, 'It is clear from contemporary records that during the 12th century Chinese ships carried their wares to major ports such as Aydhab on the coast of the Red Sea', is highly problematic. As discussed in more detail in the Historical Voyaging section below, mention of a 'China ship' in contemporary records did not necessarily mean a Chinese junk. It could allude to any ship trading with China, or a ship with a Chinese cargo. The statement also flies in the face of Heng's assertion that it was impossible for Chinese junks to trade directly with the Indian Ocean littoral from the second half of the 11th century until the end of Song rule because by edict they were not permitted to remain abroad for more than nine months (Heng 2012: 51, 59).

Risking another *Sinan Wreck*-type negative argument, if blue-and-white porcelain was a product of the Song, why hasn't any been found on the ceramic laden shipwrecks of the 12th and 13th centuries voyaging from China to the Philippines or Indonesia where such wares were clearly in demand? A prime example is the *Nanhai I Wreck* of c. 1183 (Cui Yong 2020) with its massive cargo of utilitarian wares augmented with a ceramic selection of the highest quality. Another is the mid-13th century *Java Sea Wreck* (Mathers and Flecker 1997), with a cargo of up to a hundred thousand ceramics, including fine *qingbai*-ware from Jingdezhen. Both ships were probably bound for Java, and neither contained any blue-and-white porcelain.

While the ongoing dating debate demands an open-minded approach, the author must go with the scholarly consensus, particularly in light of the Temasek parallels highlighted in the preceding section. On the basis of archaeological and textual evidence, Miksic (2013) makes a very strong case for a dating of Temasek to the 14th century, while still leaving room for a late 13th-century founding of this port-city.

Returning to the question of origin, Guy (1990: 25) suggests that cobalt was imported at the direction of Persian merchants residing in China, who would in turn have been responsible for providing specifications and placing orders. Huang (2014) goes further, informing us that not only has elemental analysis of the Hongwei Cinema finds shown that the cobalt pigment was imported from the Middle East, but also that seven of the stem-bowls are decorated with Persian verses around the rim. After analysing these inscriptions, as well as the form, decoration, and the painting techniques of these wares, Huang surmises that they were made by Persian potters who came to Jingdezhen with the imported cobalt, thereby introducing this technique to local potters.

By arguing that Yuan blue-and-white porcelain has its origins in Persian underglazed cobalt blue pottery, Huang may be placing too much emphasis on colour. Apart from Longquan green-ware, the *Sinan* ship also carried some Jingdezhen underglaze pieces painted in copper-red and iron-brown. If these red and brown decorations are a precursor to cobalt-blue, it would suggest independent Chinese innovation.

In this vein, Liu (1992: 198) argues strongly against foreign influence, stating that with the breakthroughs achieved by Chinese potters in terms of glaze and clay matrices, and with their long history of underglaze decorative techniques, it is naïve to assume that the importation of a certain pigment could produce such a miraculous flowering within such a short space of time. Gerritsen (2020: 67) convincingly argues that Chinese underglaze iron pigment painting originated in the Cizhou kilns during the Northern Song (960–1127). During the course of the 12th century, the technology made its way south to the Jizhou kilns of Jiangxi province, where potters experimented with a variety of styles including underglaze painting on a white surface. With the decline of the Jizhou kilns in the late 13th and early 14th century, the potters and the technology made the short hop to Jingdezhen. With the arrival of cobalt, dull iron browns and unstable copper reds made way for vibrant blues. No technological or artistic innovation was necessary.

Looking now at the terminus of the short-lived Yuan porcelain production period, the imperial kiln in Jingdezhen is thought to have ceased operations by 1352 following the invasion of the Red Turban Army, composed of Chinese rebels fighting Mongol rule. The conflict lasted for over a decade. It was the escalating turmoil that led to the eventual fall of the Yuan Empire. One of the rebels, Zhu Yuanzhang, went on to form the Ming dynasty. Based on excavations of kiln and non-kiln sites at Luomaqiao in Jingdezhen, Weng and Li (2021: 90) conclude that non-imperial kilns were also shut down during the rebel invasion. But some may have persevered, perhaps at lower capacity.

While production may have continued until the end of the Yuan dynasty (1368), or even beyond, the export of Jingdezhen blue-and-white porcelain must have stopped by 1371. In that year Ming Emperor Hongwu ruled that all foreign trade was only to be conducted through official tribute missions. Brown (2009: 29) has observed that from the end of the Yuan until the Hongzhi reign (1488–1505) of the early Ming, blue-and-white porcelain is largely absent from both terrestrial and maritime sites.

The predominance of one particular design, usually painted in the centre of bowls, dishes, and stem-cups, may allow for more specific dating within the short period of Yuan production. The Wenzong Emperor's signature motif, reserved for his exclusive use from 1328 to 1332, was water birds, typically mandarin ducks, in a lotus pond. His wardrobe was embroidered with this motif and it eventually became the most popular depicted on Yuan blue-and-white porcelain. During the very short Tianli period (1328–29) this motif was

known as a 'pond full of beauty' and is mentioned in the following poem by the famous painter, Ke Jiunsu, grand scholar of the Star Literature Pavilion (Barnes 2010: 375):

> Looking at lotus [blossoms] on Taiyi [pond],
> we float [our] orchid oars,
> And [watching] kingfishers and mandarin ducks
> [as they] play in the green reeds,
> I tell my little daughter to remember
> That imperial dress is embroidered
> With 'a pond full of beauty'.

Since the motif of mandarin ducks was apparently the singular artistic property of the Wenzong Emperor during his reign, porcelain wares of imperial quality bearing the design are thought to date to no earlier than his ascension to the throne in 1328. Barnes (2010: 375) believes that in 1340, when the Shundi (Zhizheng) Emperor assumed full power, restrictions on the use of this motif probably ceased, leading to private kilns making a flood of such wares, with many for export. Yuan blue-and-white porcelain depicting this motif can be found in quantity not only in China, but in Mongolia, the Philippines, Indonesia, India, Iran, Turkey, and Egypt. It is the most common motif on the blue-and-white porcelain recovered from the *Temasek Wreck*.

Noting the four-clawed princely dragon motif on the Percival David Foundation vases, with an inscription stating that the pair was a gift from a Chinese family to a temple near Jingdezhen in 1351, Barnes (2010: 375) goes further in contending that any former imperial design could be used without restriction after the rebels shut down the imperial kilns. She believes that the volume of porcelain featuring the mandarin duck motif increased even more at this time.

So, we are at the mercy of ceramicists and art historians when it comes to dating the *Temasek Wreck*. While they continue to debate among themselves, it seems to be generally accepted that blue-and-white porcelain was not produced in large quantities much before 1323. The evidence for imperial production of the mandarin duck motif during Wenzong's reign from 1328 to 1332 seems weighty. While there was dynastic turmoil from then until 1340, when the Shundi Emperor assumed full power, it has been argued that restrictions on the use of the lotus pond motif probably remained in force. Assuming that restrictions were lifted in 1340, porcelain bearing this motif is likely to have entered mass production around this time.

If the rebels caused the closure of all Jingdezhen kilns when they shut down the imperial kilns, then mass production would also have ceased by 1352. But a great deal of porcelain featuring mandarin ducks in a lotus pond has been found in archaeological sites, collections, and shipwrecks from Southeast Asia to the Middle East. Could this extent of production and distribution have occurred over just 12 years? Could it have occurred over 31 years, assuming that the Jingdezhen kilns continued to export until Hongwu's ban on private trade in 1371? The phenomenon is remarkable either way, however the longer period makes the accomplishment more credible. The author is therefore of the conservative opinion that the *Temasek Wreck* dates sometime between 1340 and 1371.

9. CONTEMPORARY SHIPWRECKS

In her painstaking analysis of historical Asian shipwreck ceramics, Roxanna Brown (2004: 51) states: 'The fourteenth century is tricky, and the most spectacular possible discovery for the future would be a full cargo of the highly treasured Yuan dynasty blue-and-white ware.' To date there are only six documented wreck sites and two unprovenanced maritime finds featuring Chinese ceramics from the Yuan dynasty. Of these, only two documented wrecks contain examples of Yuan blue-and-white porcelain.[5] They are certainly not full cargoes.

According to Brown (2004: 51), the lack of Yuan blue-and-white cargoes is largely due to the short period of export, from 1328 at the earliest until 1352, when some archaeologists and art historians conclude that war caused the closure of the Jingdezhen kilns. A mere 24 years. Other scholars prefer a wider date range, 1323 to 1371 being the most conservative estimate, as discussed above. Forty-eight years is still a short period in the history of Chinese export ceramics. From the end of the Yuan until the Hongzhi reign of the early Ming (1488–1505), blue-and-white porcelain is relatively rare in both terrestrial and maritime sites. Brown (2009: 70) has adopted the term 'Ming gap' to refer to this lengthy period of deficiency, commenting that it could perhaps be attributed to 'an imperial hand in the production process at Jingdezhen'.

As a review of the hard evidence for ships voyaging throughout Asian waters with cargoes of ceramics during the 14th century, the known contemporary wrecks are listed here.

9.1 *Sinan Wreck*

The *Sinan Wreck* was found in Korean waters in 1975 (Li, Ziang and Guan 1980). Researchers have concluded that the vessel was a Chinese junk originally destined for Japan. Thanks to legible script on wooden cargo tags, it has been precisely dated to 1323. Apart from 28 tonnes of Chinese copper coins and a wide variety of artefacts, the wreck contained over 20,000 ceramic items. Most were green-wares from Longquan or related kilns in Zhejiang, with some being of exceptional quality. Other wares originated from various kilns in Fujian and from Jingdezhen. However, as discussed above, there was no blue-and-white porcelain. Such is the paucity of evidence for the earliest production of Jingdezhen blue-and-white that the date of the *Sinan Wreck* is cited by scholars as the *terminus post quem* due to the absence of blue-and-white from this otherwise rich cargo.

9.2 *Jade Dragon Wreck*

The *Jade Dragon Wreck* has been named after the most prized artefacts recovered from the site, jade-coloured Longquan green-ware plates with a central moulded dragon decoration (Flecker 2012). Most of the cargo consisted of Longquan green-ware, but unfortunately much of that was looted in the three short months between the initial discovery by fishermen off the northern tip of Sabah, East Malaysia, and the commencement of an archaeological survey.

5 Three intact Yuan blue-and-white pieces have been associated with a ship's hull found on a land site adjacent to a canal in Heze, Shandong Province, China. One is a very fine vase with a dragon decoration. However, from the location, the ship was used for riverine transport rather than oceanic voyages.

The green-wares were of high quality and consisted of large and small plates, bowls, jarlets, and *guan*-type jars. Apart from the few dragons, the large dishes were mostly decorated with floral designs, while small dishes tended to be decorated with appliqué twin-fish. Other ceramic types included green-glazed *kendi* from Cizao, brown jars from Quangzhou and others from various Guangdong kilns, and a few brown-on-white decorated shards from Cizhou.

Surviving planks, incorporating carved lugs and holes for edge-joining with dowels, confirm that the ship was of the Southeast Asian lashed-lug tradition. From the cargo and wreck location, she was probably bound from Wenzhou in China to Brunei or elsewhere on the northwest coast of Borneo.

Longquan plates with appliqué twin fish are generally attributed to the Southern Song, suggesting a late 13th-century wreck date when viewed in conjunction with the other ceramic finds. There were no blue-and-white ceramics in the cargo.

9.3 *Turiang Wreck*

The so-called *Turiang Wreck* was located some 100 nautical miles northeast of Singapore Strait, 43 m beneath the South China Sea (Sjostrand 2002). Bulkheads, iron fastenings, the absence of dowel edge-joining, and the identification of pine, a temperate timber species, implies that the ship was a Chinese junk. Brown (2009: 39) has dated this wreck from 1370 to 1400 through the stylistic analysis of the ceramic cargo. The ship carried a wide variety of ceramics: Sukhothai, Si-Satchanali and Suphanburi wares from Thailand; under-glazed iron decorated wares from Vietnam; green and brown glazed wares from Guangdong, and green-ware from Longquan, China. The lack of blue-and-white porcelain in the cargo may be explained by the curtailed production of the Jingdezhen kilns from 1371, when Ming Emperor Hongwu ruled that all foreign trade was only to be conducted through official tribute missions.

9.4 *Dalian Island Wreck*

Dalian Island is located at the northern entrance of Haitan Strait, Pingtan County, Fujian Province, China (Anon. a 2014). The wreck that takes its name from this nearby feature was excavated in 2006 and 2007. It yielded a cargo of Longquan green-ware, along with some earthenware and iron artefacts. The Longquan forms included plates, dishes, bowls, and jarlets, variously decorated with flowers, dragons, birds, figures, and appliqué twin-fish. Researchers speculate that the ship departed from either Fuzhou or Wenzhou and was bound for a port in Southeast Asia. It is assumed that the wreck is a Chinese junk. The attributed dating is mid to late Yuan dynasty. However, appliqué twin-fish plates and the lack of blue-and-white porcelain may be more indicative of early Yuan.

9.5 *Binh Chau Wreck*

In September 2012, fishermen discovered a wreck just 50 m off the beach near Binh Chau, Quang Ngai province, central Vietnam. As often occurs, there was much looting before police stepped in to protect the site. It was particularly vulnerable in water less than 4 m deep. The provincial government quickly appointed a commercial salvage company to

carry out an excavation on an artefact sharing basis. In a bold move, the wreck was encircled by a sheet-pile cofferdam so that it could be excavated dry.

While there do not seem to be any archaeological reports published so far, photos in the press clearly show the characteristics of a Chinese junk: bulkheads with adjacent frames; occasional vertical 'stiffeners'; and even a collapsed mast with a tabernacle mast-step. Over 5,000 artefacts are reported to have been salvaged, almost all ceramics. The ship carried Longquan green-ware, mostly in the form of plates, but there were also jarlets and incense burners. The plates were decorated with flowers, fish, deer and dragons. Green-ware of lesser quality originated from Fujian kilns. Brown-glazed jars and basins were from Guangdong. The few pieces of blue-and-white porcelain were clearly made at the Jingdezhen kilns, and are consistent with Yuan dynasty production They are in the form of bowls, cups, dishes, and a disproportionately large number of intact lids.

9.6 *Shiyu 2 Wreck*

In 2010, Chinese archaeologists discovered and partially excavated a shipwreck site in the Paracels, a series of islands and reefs to the southeast of Hainan (Anon. b 2011). The site was located in clear shallow water on the eastern extremity of Observation Bank, just north of Drummond Island, in the Crescent Group. Not surprisingly, in this exposed, typhoon-prone area, none of the hull timbers survived, and the ceramics cargo was fragmented and scattered far and wide. Extensive looting has added to the destruction. Of the 405 shards that were recovered during the official excavation, 103 were blue-and-white porcelain from Jingdezhen, which could be confidently dated to the Yuan dynasty. It is therefore the first, and so far only discovery of Yuan blue-and-white porcelain on a wreck-site in Chinese waters.[6]

The blue-and-white shapes include bowls, cups, vases, small mouth jars (*meiping*), jarlets, *kendi*s, pots, and lids. The 'ducks in a lotus pond' motif is the most common. There were also floral motifs, flames, and the character *shou* (longevity). Unlike the *Temasek Wreck* cargo, there were no Longquan green-wares. The non-blue-and-white ceramics are in fact quite crude, coming from a variety of Fujian kilns and probably intended for the Southeast Asian utilitarian market. Other ceramics were produced in several other regions: white-wares from the kilns of Dehua, green-wares from Cizao kilns, small mouth jars perhaps from Cizao or Quanzhou, and storage jars perhaps from Guangdong.

9.7 *Red Sea Wreck*

In his ground-breaking book *Blue and White: Chinese Porcelain Around the World*, Carswell (2000) has dedicated a chapter to Yuan ceramics purportedly salvaged from a shipwreck in the Red Sea. Intriguingly the pieces are stated to be the property of Sotheby's, an auction house not known to collect on its own behalf. Even though the wreck is undocumented, there is no doubt that the ceramics were recovered from the sea, most still displaying coral encrustation to a greater or lesser degree. There are no intact pieces, and very few pieces altogether: two from *guan*-type jars, four from bowls, and fourteen from plates. All are blue-and-white porcelain, apart from one green-ware bowl shard.

6 China occupies the Paracels, but the island group was previously occupied by Vietnam and is still claimed by that state.

The publication of this small, fragmentary and unprovenanced collection demonstrates the importance of Yuan blue-and-white and what it can tell us of early maritime trade. This is the first non-textual evidence of 14th-century shipping routes linking China to the Mediterranean. It explains how this highly valued porcelain was transported to Egypt, Turkey and Morocco, where there are significant terrestrial finds.

There are several similarities with the *Temasek Wreck* artefacts. For a start, the single Longquan green-ware bowl from the *Red Sea Wreck* is of the same rare design as a number of the *Temasek Wreck* pieces, and several pieces in the Ṭopḳapu Sarāyı collection in Istanbul. All are exemplified by a moulded medallion covering a hole through the base. Four of the twenty blue-and-white pieces have the famous 'ducks in a lotus pond' decoration. However, there are also some major differences. The majority of shards are from particularly large plates, which would have been up to 50 cm in diameter. No large blue-and-white plates have been identified in the *Temasek Wreck* repertoire to date.

9.8 *Nilaveli Wreck*?

The *Nilaveli Wreck*, if indeed it is a wreck, is another undocumented site revealed by Carswell (2000: 174). A concentration of water-worn Longquan green-ware shards was discovered on the beach near the village of Nilaveli, to the north of Trincomalee, Sri Lanka. Close parallels with the *Sinan Wreck* ceramics suggest an early 14th-century date. Two problematic shards hint at the prospect of very early blue-and-white, but without any form of systematic excavation no conclusions can be drawn.

9.9 *Samar Wreck*?

In a 1997 exhibition featuring Chinese and Vietnamese blue-and-white ceramics found in the Philippines, there is one Yuan piece that is said to be from 'an underwater site off Samar', an island to the southeast of Luzon (Gotuaco, Tan and Diem 1997: 36). It is an intact but eroded jar, decorated with fish and aquatic plants. No details of the site are provided.

Also discovered in the Philippines is the *Pandanan Wreck*, which went down around the mid-15th century. Interestingly, it was carrying two vintage Yuan blue-and-white pieces: a magnificent bowl decorated with a *qilin* and a phoenix on the interior; and the shoulder and neck of a large ovoid jar (*ibid*.: 7, 44).

10. SIGNIFICANT BRACKETING SHIPWRECKS

The pool of documented contemporary wrecks is so small that it is worth reviewing additional relevant sites from the late 13th and early 15th centuries to get a better picture of the types of ships that were trading during this period, and the cargoes they were carrying.

10.1 *Quanzhou Wreck*

The *Quanzhou Wreck* is extremely important in that it is the only documented example of a Chinese junk returning from the *Nanhai* (Li 1989). She sank in a harbour around 1273 with a cargo of Southeast Asian commodities such as fragrant wood and cowrie shells, along with small samples of ambergris, cinnabar, betelnut, pepper, and tortoise shell. The hull remains are 24 m long and 9 m wide. Twelve bulkheads are fastened to the hull plank-

ing by metal brackets and large frames. The hull planking itself is multi-layered in complex clinker-like steps.

10.2 *Ko Si Chang II Wreck*

Brown (2009: 39) gives a broad date range of 1370 to 1424 for this wreck, based on the few ceramics found on the site off Ko Si Chang, a small island in the Gulf of Thailand. They included Thai Sawankhalok, Sukhothai, and Suphanburi wares, and Chinese green-ware. Due in part to trawling and looting, only parts of the vessel structure survived, including sections of a double planked hull and bottom planks fastened together with wooden pegs and metal nails (Prishanchit 2000: 190). Green (2006: 106) comments extensively on plank edge-joining with diagonally driven iron nails, but does not mention dowels at all. This suggests that the *Ko Si Chang II Wreck* is a Chinese junk.

10.3 *Bakau Wreck*

This wreck was found off Bakau Island on the western edge of Karimata Strait, Indonesia (Flecker 2001). It contained a wide variety of ceramics from Thailand, China, and Vietnam, including many huge Thai storage jars with organic contents. The hull remains were 23 m long and 7 m wide, and displayed all the features typical of Chinese junk construction: bulkheads, adjacent frames, iron nail edge-joining, wood stiffeners, caulking made from a lime-based compound (*chunam*), and hull timbers of pine. She was flat-bottomed, the first and so far only example of such hull design found in a sea-going context (flat-bottomed junks are usually associated with coastal or riverine transport). The wreck has been dated to the early 15th century through carbon dating, stylistic analysis of ceramics, and Yongle (1403–24) coins found on board.

10.4 *Rang Kwien Wreck*

The *Rang Kwien Wreck* was excavated by the Thai Fine Arts Department from 1978 to 1981, after it had been heavily looted. It contained several tonnes of Chinese copper coins with the most recent attributable to the Hongwu reign (1368–98). Of the few remaining ceramics, some 50% consisted of earthenware, possibly Thai. About a quarter were Vietnamese underglazed blue or black wares. Only 10% were Chinese ceramics, with half of those being stoneware storage jars and the rest being crude green-wares. The balance consisted of Sawankhalok wares, a few Thai storage jars, and three shards of Chinese blue-and-white porcelain. As mentioned above, Roxanna Brown is of the opinion that two of the blue-and-white shards are intrusive to the site, apparently being of a considerably later date than the rest of the ceramics. From the coin dates and the stylistic analysis of the ceramics cargo, Brown (2009: 172) dates this wreck from 1400 to 1430.

Little coherent structure remained. There were no bulkheads evident, and the hull planks were edge-joined with dowels. According to Prishanchit (2000: 190) the hull planks were fastened to the frames with 'round headed wooden pegs'. If this was indeed the case, the ship could be an early example of a Southeast Asian *jong*, where dowels have replaced

the *ijok*[7] lashings of the traditional lashed-lug hull. Enigmatically, it has been reported that a Chinese mirror was embedded in the keel.

10.5 *Longquan Wreck*

The *Longquan Wreck* was located in 63 meters of water, well offshore between Terengganu and Kuantan on the east coast of Peninsula Malaysia. The hull measured more than 30 m in length and 8 m in width. She is of the South China Sea tradition. The site was destroyed by trawlers before a full excavation could take place. However, a rough estimate suggests that it contained 40% Chinese green-ware from Longquan and other southern kilns, 20% Thai Sukhothai underglaze decorated ware, and 20% Thai Sawankhalok green-ware.[8] The tentative date range is given as 1424 to 1440 (Brown 2009: 173).

10.6 *Nanyang Wreck*

The *Nanyang Wreck* was found at a depth of 54 m east of Pulau Pemanggil, off the east coast of Peninsula Malaysia in 1995. The ship is estimated to be 18 m long by 5 m wide, which is relatively small. Construction features include transversal bulkheads, and dowel edge-joined planks, both characteristics of the South China Sea tradition. The primary cargo is Thai green-ware from the Sisatchanalai kilns. Many pieces show scars from the use of spur discs, perhaps indicative of an early production technique. The tentative date of the *Nanyang Wreck* is thought to range between 1425 and 1450, just slightly later than the *Longquan Wreck* (Brown and Sjostrand 2002).

11. CONTEMPORARY SHIP DESIGNS

The shipwrecks listed above, spanning the late 13th to the early 15th centuries, are of several different types: the Southeast Asian lashed-lug ship, the Chinese junk, and the South China Sea tradition. If the description of the *Rang Kwien Wreck* is accurate, we may add the Southeast Asian *jong* to the list, as historically speaking it should be represented. It is worth taking a look at the construction and origin of these vessel types as they are all contenders for the *Temasek Wreck*.

11.1 Southeast Asian Lashed-Lug Ships

Lashed-lug ships were built by raising planks on each side of a keel piece that shows clear signs of having evolved from a dug-out base. The planks are edge-joined with wooden dowels, which in earlier examples are interspersed with internal stitching. Vegetal fibre stitches usually occur in pairs within the seam, not being visible from outside the hull. Over the centuries the number of dowels increased while the stitching decreased until the latter was eventually eliminated altogether, around the 9th or 10th century.

The planks are carved, rather than bent to shape, and incorporate protruding lugs, locally termed *tambuku*. Typically, a tree trunk is split lengthways with only one plank being made from each half. Holes are carved or drilled out of the lugs so that they may be lashed to frames and/or thwart beams. Apart from maintaining the cross-sectional shape

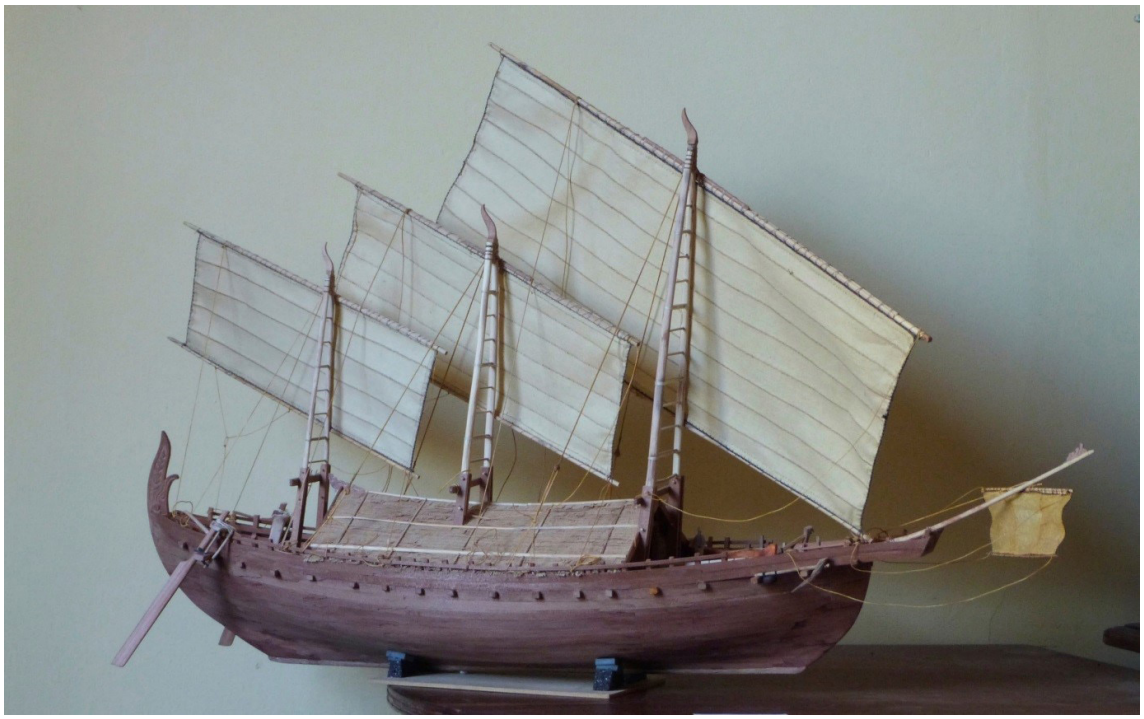
7 *Ijok* is sugar palm fibre.

8 The remaining 20% is not accounted for.

of the vessel, the frames provide shear and bending strength to reinforce the wooden dowels within the planks. Lashings between lugs and over the frames serve to hold the frames in place and to pull the planks together. Tiers of thwart beams, lodged above or below the lugs, contribute to the compressive forces that hold the planks tightly together despite the flexing of the hull. They also help to provide lateral support, preventing the hull from opening up or bending inwards.

These early Southeast Asian craft were steered by two quarter rudders, a system that survives to this day on many sailing vessels still plying the waters of Indonesia. They had up to four bipod or tripod masts and a bowsprit, with canted square-rig or lug sails.

Fig. 61: A model of the 13th-century *Java Sea Wreck*, a Southeast Asian lashed-lug ship. (Courtesy of Nick Burningham)



11.2 Chinese Junks

The ancient coastal and riverine craft of China tended to be flat-bottomed. While there are exceptions, sea-going junks seem to have adopted the Southeast Asian V-shaped hull in order to better navigate turbulent seas and shifting winds. The transom stem and stern were maintained, along with bulkheads that divided the ships into compartments. While there are many references to these compartments being watertight, the archaeological evidence of limber holes at the base of each bulkhead would seem to refute this. It seems that the Chinese used the bulkheads as cross-sectional templates around which they built the hull. Worcester (1947: 34) observed, 'The side planks are then placed longitudinally in position and hove down by a Chinese windlass, after which they are firmly nailed to the edges of the bulkheads.' The planks are edge-joined with diagonal iron nails driven through pre-prepared triangular notches, which are then filled with a lime-based caulk-

ing compound (*chunam*) to protect the iron from corrosion. In some cases wrought iron clamps are used (Li 1989: 279), and these too are smeared with *chunam*.

The Chinese are thought to have developed the axial rudder as early as the 1st century CE (Temple 1998: 185). Throughout the ages, Chinese rudders were held to the hull in wooden jaws or sockets that permitted free vertical movement, and, if large, suspended from above by tackle pulling on the shoulder so that the rudder could be raised and lowered. Chinese rudders were often slung well below the bottom of the ship to minimise leeway in lieu of a substantial keel, being raised when approaching shallow water. On one type of vessel the rudder was held in place against the drag of passing water by ropes running from the foot of the rudder under the bottom of the vessel to a windlass on the forecastle (Needham 1971: 404). Masts are stepped in tabernacle partners on the keel, and are generally canted forward. Smaller mizzen masts may be stepped on the deck, and sometimes off-centre. With a large cross-section and massive support at deck level, the masts can support the heavy battened sails without stays.

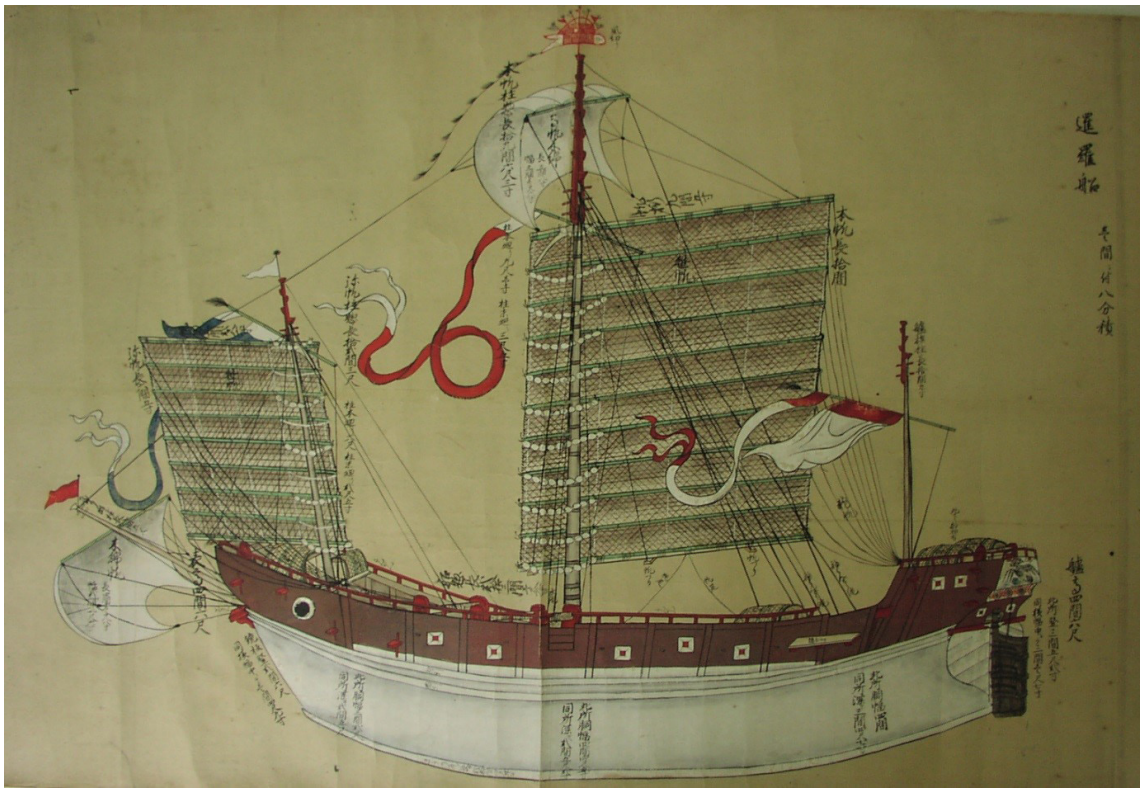
Fig. 62: 'A Chinese Junk—Canton River', engraved by W. Woolnoth after a picture by S. Prout, dated 1835. They have changed very little over time. (Image from Wikimedia Commons)

11.3 South China Sea Tradition

Vessels of the South China Sea tradition are typified by a V-shaped hull with a substantial keel. Regularly spaced bulkheads are held in place by a single adjacent frame. Hull planking is multi-layered, with the inner planking fastened to frames and bulkheads with square section iron nails. The outer planking is fastened to the inner planking by smaller nails, and often there is an additional sacrificial outer layer to protect the hull from toredo worm attack. Both hull and bulkhead planks are dowel edge-joined. Mast steps have twin recesses for tabernacle partners. They are steered with an axial rudder that is held in place in wooden sockets in the same manner as a Chinese junk. Teak seems to be the primary timber used for construction. While the non-perishable cargoes of these ships almost always include Thai ceramics, additional investigation is necessary to determine whether

these ships were made exclusively in Thailand. Arguably the hull shape, keel, multi-layering, and dowel edge-joining can be attributed to Southeast Asian traditions. Bulkheads, iron fastenings, rigging, and the axial rudder are contributions from China, and may indeed imply the participation of emigrant Chinese shipwrights. The author suspects that this hybrid design was utilised elsewhere in Southeast Asia, and from limited archaeological evidence, continued to be used after the decline of Thai ceramics production in the mid-16th century (Flecker 2007).

Fig. 63: Japanese scroll (*Tosen no Zu*) depicting a 'Siamese ship', probably dated to the early 18th century, in the Matsura Historical Museum. (Credit: Jun Kimura)



11.4 Southeast Asian Jong

The word *jong* first appears in a 9th-century Javanese inscription (Miksic 2013: 100), so it must have originally referred to the ubiquitous Southeast Asian lashed-lug ship. When the Portuguese arrived in Southeast Asia in 1509, they refer to a widely represented Southeast Asian trading ship as *junco* (Manguin 1993: 198). This term was later rendered 'junk' by the English, and strangely came to refer specifically to Chinese sailing craft.

The original *jong* has been adopted (and adapted) by Manguin (2020), to name the Southeast Asian ship type that superseded the lashed-lug design. While key features were retained, such as quarter rudders, multiple masts and canted or lug sails, with a bowsprit and a spritsail, the fundamental construction technique changed. Instead of lashing frames to the lugs that formed an integral part of the hull planks, dowels (treenails) were used to fasten strakes to frames. Knowledge of this 'new' design comes to us from early 16th-century Portuguese descriptions. From archaeological evidence, the lashed-lug design

seems to have petered out by the early 14th century. Unfortunately, there is no archaeological evidence of the all-dowelled *jong* during the intervening two centuries. Indeed, to date, there is no archaeological evidence of the *jong* at all, apart perhaps from the *Rang Kwien Wreck*.

Fig. 64: Jong replica. (Credit: Nick Burningham)

It stands to reason that the lashed-lug design was abandoned. Only sturdy maritime traditions saw it last as long as it did. Carving planks was extremely wasteful of timber in comparison to sawing them. While the hull shape, rig, and steering mechanism may have been maintained, the construction technique of the *jong* is so different to that of the lashed-lug ship that the transition cannot be regarded as an evolution. It is an entirely new technique, perhaps influenced by Indian Ocean dhows or Chinese junks. Both utilised sawn planking, although the plank thickness is much greater on a junk, largely because junks used soft woods such as fir and pine, while dhows used hardwoods like teak and rosewood.

If *jongs* came into being during the 14th century, they developed in tandem with the South China Sea Tradition. Until more evidence presents itself, it seems that the *jong* evolved in the Malay/Indonesian archipelago while the South China Sea Tradition evolved in the Gulf of Siam.

12. HISTORICAL VOYAGING

The 14th century is a very intriguing period in terms of regional shipping. Arab and Indian dhows, Chinese junks, and Southeast Asian craft plied the seas with all manner of commodities densely packed in their holds. For the Arabs and Indians their role was

waning. Chinese shipping, on the other hand, surged to a dominant position from relative obscurity, only to decline again on the back of state policy. Southeast Asian vessels were in the midst of a major transition. Lashed-lug ships, which had prevailed for over a millennium, finally made way for treenail-fastened *jongs*. In the latter part of the century, hybrid South China Sea Tradition craft, originating in the Gulf of Siam, became the predominant ceramic carriers. How did this come to be?

Throughout the first millennium CE, Southeast Asians dominated maritime trade and exploration. They famously sailed as far as Madagascar and the east coast of Africa at least as early as the 7th century. Cargoes consisted of jungle and sea products, spices, staples, and textiles. The Arabs added aromatics. The Indians led in the cotton and pepper trade. All three were major players in China's maritime trade from at least as early as the 8th century, when heavy ceramics began to win favour with distant consumers. In 750, the Buddhist monk, Kanshin, recorded that on the river at Guangzhou 'There are merchantmen [ocean going ships] belonging to the *Bolomen* [Indians], the *Posi* [Persians], and the *Kunlun* [Malays] … of which it is difficult to determine the number' (Guy 2011: 254). While foreign ships jostled to load Chinese cargoes, the Chinese themselves played no role in early sea transportation.

12.1 Chinese Shipping[9]

Manguin (1984: 199) comments: 'it is widely accepted that the Chinese did not possess large sea-going craft before the 8th century.' Wade (2013a: 93) asserts that Chinese ships were rarely used on the Southeast Asian routes until the 9th century. Wang (1998: 107) states that there are no Tang records of large Chinese junks sailing to the Nanhai. He says that neither Chinese traders nor coastal shippers were interested in the Nanhai and its trade per se. Neither would take the gambles necessary to advance the trade appreciably, least of all risk their lives in trading junks and foreign countries at the mercy of waves, pirates, and 'barbarian' officials (*ibid*.: 116).

Heng (2012: 30) concludes that Chinese shipping did not carry any of the trade between Southeast Asia and China throughout the first millennium CE. He pushes the inception even further ahead by stating that information on Chinese participation in maritime shipping to the Malay region is not forthcoming until the 11th century, when Chinese provincial accounts, particularly in Fujian and Guangdong, begin to mention Chinese sailing abroad for the purpose of trade (*ibid*.: 30). The passive stance of the Chinese courts in their diplomatic and economic interaction with maritime Southeast Asia appears to have greatly discouraged active Chinese participation in shipping between the two regions during this period (*ibid*.: 31).

To be more specific, in 989, the Song court began to permit Chinese private vessels to sail abroad for the purpose of trade. However, regulations were imposed requiring all Chinese traders to first register themselves at the mercantile shipping superintendency at the ports of Hangzhou and Mingzhou (*ibid*.: 42). During Emperor Renzong's reign (1023–65), the port of Guangzhou was added to the list. Chinese ships had to return to the ports at which they registered so that they could be subjected to customs inspection, a restriction that must have stifled early direct trade. Eventually, in 1090, the Song court decreed

9 Much of the following discussion on the advent of Chinese sea-going shipping is drawn from Flecker 2015.

that Chinese ships could officially register and depart from any prefecture. Within ten years, trade revenue doubled (*ibid*.: 48).

From as early as the second half of the 11th century, the Song court had ruled that Chinese vessels could not remain abroad for more than nine months (*ibid*.: 51). As they could only operate within a single monsoon cycle, it was impossible to trade directly with the Indian Ocean littoral. This restriction seems to have remained in force until the end of Southern Song rule (c. 1279) (*ibid*.: 59). As a result of the lifting of this restriction by the newly installed Yuan court, Heng (*ibid*.: 64) notes that Chinese shippers appeared to displace the Southeast Asians from their traditional role of transhipping products from the Indian Ocean and Middle East to China. As an indication of how far the Chinese had come, a Muslim merchant and maritime trade supervisor in Quanzhou, Pu Shou-geng, reported in 1281 that he had been ordered by the Yuan emperor to build 200 sea-going ships, of which 50 had been finished (Wade 2013b: 90).

In 1284, there was a major departure from the private trade policy implemented throughout the Song, when the Yuan court attempted a state monopoly on Chinese shipping (Heng 2012: 65). Much of the maritime trade during the Yuan was controlled by foreign, mainly Muslim, merchants residing in the southern ports, often in *ortogh* partnerships[10] with Mongol imperial family members or government officials. A joint venture system was established, combining government ships with merchant expertise.

In 1285, the Yuan government allocated 100,000 *ding* (more than 20 tonnes) of silver to build ships for joint ventures (Wade 2013b: 82). In the mid-Yuan, official attitudes toward commerce swung wildly back and forth, with the offices of maritime trade being shut down and re-opened four times between 1294 and 1322 (Miksic 2013: 132). Thereafter policy stabilised and private maritime trade was permitted for the next half century.

The Mongols, not being content with trade alone, attempted to force more formal submission. They invaded Korea repeatedly from 1231 until 1259, when the Goryeo Dynasty finally acquiesced to becoming a vassal state. In 1274, the Mongols invaded Japan but were eventually repelled. They tried again in 1281 only to have their fleet decimated by a typhoon, the fabled Kamikaze. In 1292, the Mongols invaded Java, apparently in response to the mutilation of an emissary. The Mongol incursion became immersed in local intrigue, so the fleet took advantage of the favourable monsoon to withdraw.

The first edict specifically banning private shipping from foreign trade was issued just after the collapse of the Yuan dynasty. In 1371 Ming Emperor Hongwu ruled that all foreign trade was to be conducted through official tribute missions. This was the first of the so-called *haijin* laws, aimed at countering Japanese piracy. The move was counterproductive.

By the time Emperor Yongle came into power in 1402, there were nowhere near enough sea-going junks to satisfy his ambitions. Wade (2004: 10) opines that Yongle intended to create legitimacy after usurping the previous emperor by an overt display of Ming might. He aimed to bring all the known polities into submission and to collect treasures for his court.

The fleets of the designated commander, Admiral Zheng He, had to be sufficiently imposing to cow any opposition. Wade (*ibid*.) enumerates the frenetic shipbuilding activities that took place to this end. In 1403, the Fujian Regional Military Commission

10 *Ortogh* partnerships were Mongol merchant associations which pooled their resources and spread their risks.

was ordered to build 137 sea-going ships. In the same year, various military units were ordered to build an additional 400 ships. In 1405, just after Zheng He departed on his first expedition, Zhejiang and other regional military commissions were ordered to build 1,180 sea-going ships.[11] By 1408, the Ministry of Works was required to build 48 'treasure-ships' or *bao-chuan*.[12] The various missions comprised between 50 and 250 ships, some voyaging for years before returning to China.

Zheng He's voyages drained the state coffers, and lost relevance when viewed against the renewed threat of invasion from the north. When his patron, Yongle, died in 1424, the emperor's successors, Hongxi (who only lasted for one year) and then Xuande ordered the cessation of overseas forays. Tribute missions were consolidated, and official trade continued. But without unfettered private trade, the quantity of Chinese exports and the number of Chinese ships carrying them went into rapid decline.

12.2 Indian Voyaging

Tamils appear to have been dominant amongst the earliest Indian traders operating in insular Southeast Asia, supported by successive kingdoms in southern India (Guy 2011: 248). Inscriptions from coastal sites throughout Southeast Asia demonstrate sustained contact from the 4th to the 7th centuries. Religion spread with trade. Hinduism predominated, although Buddhism also took hold in Srivijayan territory. Southeast Asia was a stepping-stone to China. By the mid-8th century, the Indian presence in the Chinese city of Guangzhou had expanded to the extent that three temples could be supported, complete with resident Brahman priests (*ibid.*: 254).

India continued to trade with Srivijaya and Java throughout the 9th and 10th centuries, and it is likely that ships from both India and Southeast Asian traversed the Bay of Bengal with holds loaded to capacity. The beginning of the 11th century saw the expansion of the Chola influence through a combination of military conquest and commercial acumen (*ibid.*: 254). In 1025, the Chola invaded Srivijaya, plundering but not occupying various cities and ports. They began sending diplomatic missions to China in 1015 and continued on an irregular basis until the close of the 13th century (*ibid.*). Hindu temples were built in Quanzhou, Fujian province, with a still extant ruin containing an inscription dated to 1281. Apart from this remnant, all temples had disappeared from the city landscape by the Ming period (*ibid.*: 257).

The Chinese presence in Tamil Nadu was acknowledged by the royal endowment of a Buddhist temple at Nagapattinam. A structure known as the 'Chinese Pagoda' was probably constructed under Chola patronage in the early 13th century. According to 14th-century writer Wang Dayuan, it was built in 1267 to encourage the visits of Chinese merchants (*ibid.*: 254).

Calicut became the most important port in southwest India during the late 14th and 15th centuries, riding on a key commodity, pepper (Ptak 1998: 81). Based on China's

11 In the author's opinion, this number is an exaggeration, but it does convey an idea of the massive amount of construction needed to support Zheng He's voyages.

12 The *bao-chuan* are frequently ascribed a length of 120 m or more, on the basis of one Chinese text. In the humble opinion of the author, and many other scholars and professionals, this is unsubstantiated. From consideration of naval architecture, sail-ability, archaeology, and history, the *bao-chuan* would have been a maximum of 50 m long. This size is still huge and imposing, and was not matched again by wooden sailing vessels until the arrival of the 1,100 tonne Dutch *retourships* in the 18th century.

navigational knowledge of southern India, and archaeological finds of various Chinese products in the Indian Ocean littoral, Ptak (*ibid*.: 82) concludes that commercial interests between South Asia and China had become interlinked before the voyages of Zheng He. His observations are based on early Ming texts from a very short period (1369–72) (*ibid*.: 91) that frequently mention Chinese envoys but do not specifically mention Chinese ships.

12.3 Arab Maritime Trade

Chinese traveller, I-Ching, who voyaged from China to Sumatra in 671, says: 'In the beginning of autumn … I came to the island of Kwang-tung, where I fixed the date of meeting the owner of a *po-sse* [Persian] ship to embark for the south … At last I embarked from the coast of Kwang-chou [Guangzhou]' (Hourani 1995: 46). In another Chinese account of 727, it is written: 'They [the Persians] also sail in big craft to the country of Han, straight to Canton for silk piece goods and the like ware' (*ibid*.: 62). And in an Arab text, the *Muruj al-Dhahab*, written in 956, we read: 'The ships from Basra, Siraf, Oman, India, the islands of Zabaj and Sanf came to the mouth of the river of Khanfu [Guangzhou] with their merchandise and their cargo [before 877-8]' (Guy 1990: 13).

From historical sources there can be little doubt that Arabs, Persians and Indians were sailing their own ships to China during the late first Millennium. But for Arab shipping, all doubt has been removed by the discovery of two dhows, the 9th-century *Belitung Wreck* in Indonesian waters (Flecker 2000, 2008), and the 8th-century *Phanom Surin* sister ship at a terrestrial site in the Gulf of Siam (Guy 2017).

The Persians and Arabs dominated trade at the height of the Tang dynasty (Guy 1990: 7). They established major settlements in Guangzhou, only to sack the city in 758. Persian and Arab settlements established in Yangzhou were sacked by the Chinese in 760 (Wang 1998: 76). In 878, the foreign settlements in Guangzhou were burned and pillaged by the Chinese. According to Arab geographer Abu Zaid, 'no less than 120,000 Muslims, Jews, Christians and Parsees perished' (Hourani 1995: 76). While a retreat to Tonkin had sufficed during the earlier skirmishes, it seems that after 878, Southeast Asian shipping took over, supplying entrepôts on the western shores of the Isthmus of Kra and further south.

There does not seem to be much of a resurgence in direct Arab trade until considerably later. According to Heng (2012: 123), the emergence of Middle Eastern and Persian traders as the beneficiaries of the change in China's maritime trade context in the Yuan period contributed to the establishment of Muslim traders as a powerful commercial force in Southeast Asia and the Indian Ocean from the late 13th century onwards. A local garrison, largely made up of soldiers from Persia and led by Persian merchants, took control of Quanzhou in 1357 (Miksic 2013: 133). They were ousted in 1366, and a few years later the Hongwu edicts severely limiting maritime trade came into effect.

12.4 Southeast Asian Seafaring

The very early appearance of Southeast Asian ships is reflected in the 1st century CE Chinese manuscript, *Han shu* (History of the Han Dynasty):

> The barbarian trading ships transfer them to where they are going [and those on the ships] also benefit from this trade, and sometimes rob and kill people. The traders also

> suffer from the winds and waves and sometimes drown. Those who survive will be several years on their return. (Wade 2013a: 84)

An oft-quoted description of early Southeast Asian ships is provided in a 3rd- century Chinese text, cited in the *Nanzhou Yiwuzhi*:

> The men from foreign lands call their boats *bo*. The large ones are over 200 feet long, and they are twenty to thirty feet high… they can hold 600–700 men, and a cargo of over 600 tonnes. The men from beyond our frontiers use four sails for their ships, varying with the size of the ships. These sails are connected with each other from bow to stern. There is a kind of lutou tree whose leaves are like lattice. These leaves are more than ten feet long, and are woven into sails. The four sails do not face directly forwards, but are made to move together to one side or the other, with the direction of the breeze…. When they sail, they do not avoid strong winds and violent waves, and therefore can travel very swiftly. (*ibid*.: 92)

Another 3rd-century text refers to Southeast Asian ships more specifically as *kunlun-bo*, or the ships of the people who lived in the South Seas (*ibid*.: 92). From the same period, the *Liang shu* records that Fan Shihman, ruler of Funan in the 3rd century CE, 'had great ships built, and crossing the immense sea, he attacked more than ten kingdoms' (*ibid*.: 93). During the Southern Dynasties (420–589), tribute missions arrived on *kunlun-bo* (Miksic 2015: 6).

From the 7th century, there is evidence of Middle Eastern and Indian shipping in the South China Sea, but this is unlikely to have diminished the role of the Southeast Asians. While Arab trading reached a zenith in the 9th century, in the *Yiqiejing yingyi* of 815, Hui-Lin notes that *kunlun-bo* were arriving regularly at the Gulf of Tonkin and along the south-eastern Chinese coast (Heng 2012: 28). And a source from 841 says: 'Guangzhou enjoyed the profits of the barbarian ships where all the valuable goods were gathered… Of all those who served at Guangzhou, not one returned without being fully laden' (Wang 1998: 83).

Ibn Battuta, who travelled in the region in 1345–46, mentions visiting Barahnakār, al-Jāwa (Samudera), and Mul-Jāwa (Java), the 'country of the infidels'. From there he sailed onward towards China on a ship provided by the ruler of Samudera, stopping only at the country of Tawālisi (probably Champa) (Wade 2013a: 94). He may have been voyaging on one of the last examples of a Southeast Asian lashed-lug ship, or perhaps one of the earliest examples of a *jong*.

From around the later part of the 14th century, a hybrid Southeast Asian/Chinese design emerged, termed the South China Sea Tradition. From archaeological evidence, this type of vessel seems to be of Siamese construction, although Chinese shipwrights may well have collaborated. Teak is the primary timber type and cargoes are overwhelmingly skewed towards Thai ceramics.

The marked predominance of South China Sea Tradition wrecks in the Gulf of Thailand and along the eastern coast of Peninsular Malaysia from the 14th century onwards graphically illustrates a surge in shipping that mirrored the surge in Thai ceramic production to meet the demand created by the Chinese ban on exports (Flecker 2007). Indeed, the life of the South China Sea Tradition ships mirrors the life of the Thai export kilns, from the late 14th century until the late 16th century.

Rather than tracing the various edicts banning overseas trade and/or shipping, Brown (2009: 69) has studied the proportion of Chinese ceramics on all known shipwrecks from the 14th to the 16th centuries. She concludes that the so-called Ming gap occurred in stages. From a complete monopoly, Chinese ceramic cargoes fell to 30–40% of the total between c. 1368 and c. 1430. From c. 1430 until 1487 the percentage plummeted further to 5% or less. However, during the Hongzhi reign (1488–1505) there was a flood of Chinese ware, including blue-and-white porcelain. There was another period of moderate shortage from about 1520 until the end of the Ming ban in 1567, the death knell for the Thai kilns.

13. THE ORIGIN AND DESTINATION OF THE *TEMASEK WRECK*

Before the discovery of the *Temasek Wreck*, Kwa Chong Guan (2012: 2) wrote:

> Maritime archaeology may now provide the evidence to frame this settlement [Temasek] in a wider spatial context and longer cycle of time to help us understand its rapid rise which enabled it, within some thirty years of its establishment, to import some of the newest underglazed blue wares being developed in the Yuan kilns of Jingdezhen.

While Kwa examined a wide range of wreck-sites throughout Southeast Asia, the *Temasek Wreck* could indeed be the missing crucial find that he was hoping for. But that depends on the answers to a number of questions. Where did the *Temasek Wreck* sail from? Where was she built, and who owned and crewed her? Where was she bound?

13.1 Where Did She Sail From?

The first question is the easiest to answer. The entire ceramics cargo originated from China: Longquan green-ware, Jingdezhen blue-and-white and *shufu*-ware, white-ware possibly from Dehua, and Guangdong or Cizao brown-ware. While the kilns were widespread, it was standard practice for Chinese riverine and coastal craft to transport a wide range of ceramics to key ports, such as Quanzhou and Guangzhou. There is also evidence of iron in the cargo, another product of Chinese manufacture. Almost certainly one more prized Chinese commodity, silk, would have been loaded above the weighty cargo.

So, there can be no doubt that the *Temasek Wreck* loaded her last cargo in China, and probably at Quanzhou or Guangzhou. To end up on the rocks of Pedra Branca, she followed the age-old western route down the South China Sea, southwest between Hainan and the Paracels, hugging the Vietnamese coast southwards as far as Con Dao, southwest to the coast of Malaysia, then south past Tioman Island before entering Singapore Strait.

None of the non-Chinese trade or shipboard ceramics often found on other shipwrecks of this era were recovered from the *Temasek Wreck*. There were no earthenware vessels or stoves usually associated with Southeast Asian culinary activities, no Thai stoneware storage jars, and no fine-paste-ware *kendi*s or vessels from production centres on the Isthmus of Kra. The *Temasek Wreck* had not stopped to trade en-route. She sailed directly from China to Singapore Strait taking full advantage of the northeast monsoon which blows consistently from November to March.

13.2 Where Was She Built?

The second question is impossible to answer. Without any remains of the ship itself, the origin of the *Temasek Wreck* cannot be conclusively determined. However, it is possible to make a very good guess, calling upon the archaeological and historical evidence for the period.

The maritime archaeological evidence that has been presented in this Report is summarised in the Table below. Of the eleven contemporary shipwrecks with identifiable hull remains, seven are Chinese junks (65%) and four are Southeast Asian vessels (35%). Given the small number of documented wrecks in relation to the likely number of wrecks in existence, many of which have been looted and many of which may never be discovered due to the fact that their entire cargoes were perishable, the statistical difference is not as substantial as it seems. However, as 'contemporary' in this case covers the period from the late 13th to the early 15th century, it is noteworthy that throughout the entire 14th century only Chinese junks are documented.

Of the four wrecks that are Southeast Asian, one is a lashed-lug ship, one may be a *jong*, and two are of the South China Sea tradition. They demonstrate a correlation between date and type. The lashed-lug design is thought to have been phased out towards the end of the 13th century. The all-dowel joined *jong* took over, although apart from very scanty evidence from the *Rang Kwien Wreck*, archaeological support for this transition is lacking thus far. From the late 14th century, the hybrid South China Sea Tradition developed independently and is thought to have co-existed with the *jong* until the former's demise in the mid to late 16th century.

Table 3: List of wrecks contemporary with the Temasek Wreck. ('~' implies within a year or two. 'c.' implies within a decade or two).

Wreck Name	Location	Vessel Type	Date
Quanzhou	China	Chinese junk	~1273
Jade Dragon	Sabah, East Malaysia	Southeast Asian Lashed-lug	c.1300
Sinan	South Korea	Chinese junk	~1323
Dalian Island	China	Chinese junk	14th C
Binh Chau	Vietnam	Chinese junk	Mid-14th C
Turiang	West Malaysia	Chinese junk	Late 14th C
Ko Si Chang II	Thailand	Chinese junk?	c.1400
Bakau	Indonesia	Chinese junk	Early 15th C
Rang Kwien	Thailand	Southeast Asian Jong?	Early 15th C
Longquan	West Malaysia	South China Sea tradition	Early 15th C
Nanyang	West Malaysia	South China Sea tradition	Early to mid-15th C

As noted earlier, Heng (2012: 64) believes that when the newly installed Yuan court lifted the Song restriction forcing junks to return within nine months of departure, Chinese shippers began to thrive and apparently displace Southeast Asians from their traditional role of transhipping products from the Indian Ocean littoral and Middle East to China. While this theory seems to be supported by the archaeological evidence, there is insufficient evidence to conclude that Southeast Asians pulled out of the transhipment business altogether. They surely continued to ship their own cargoes to and from China.

What of the Indians and Arabs who established such a strong presence in key Chinese ports at this time, a feat hard to achieve without fleets of their own? As discussed, the power of Tamil guilds was on the wane throughout the Yuan and had all but petered out by the Ming dynasty. Muslim traders, on the other hand, thrived during the Yuan dynasty. The Persians in particular established large communities in China, going as far as to take control of Quanzhou in 1357. If their ousting in 1366 did not precipitate an end to direct shipping, then the Hongwu ban on private trade that took effect a few years later certainly would have.

The archaeological record for Indian and Arab shipping during this period is blank, not just in Southeast Asia but anywhere. Nonetheless, historical texts suggest that Indians, Arabs, and Persians were voyaging to China in vessels of their own, stopping to trade at various Southeast Asian port cities on the way there and back. The numbers may have been small in comparison to Chinese and Southeast Asian ships, but the possibility of the *Temasek Wreck* being Indian or Middle Eastern, or indeed Southeast Asian, cannot be dismissed on the basis of the scant archaeological record.

There is another key factor to examine. While the majority of Chinese cargoes were carried by several foreign vessel types, there are always non-Chinese artefacts recovered from the wreck-sites, especially personal possessions or objects for shipboard use. The 13th-century *Java Sea Wreck* for example, carried mostly Chinese ceramics and iron, however bronze figurines and scale weights were of Southeast Asian origin. She was a Southeast Asian lashed-lug ship. Another, the c. 1300 *Jade Dragon Wreck*, contained a cargo of Longquan green-ware and iron. Of the few non-ceramic artefacts remaining on this looted site, a wooden kris handle and an anchor stone were Southeast Asian. Going way back, the 9th-century *Belitung Wreck* carried an exclusively Chinese cargo, and yet Southeast Asian coins, scale weights, mortars, pestles, and grindstones were found, along with a small number of Persian jars (Flecker 2000). She was an Arab ship.

The Chinese junks with exclusively Chinese cargoes such as the *Nanhai 1*, *Sinan* and *Dalian Island Wrecks*, on the other hand, did not carry non-Chinese objects. Very few non-ceramic artefacts remained on the *Temasek Wreck*: an ink stone, tiny glass beads, gold foil, lead disks, copper alloy vessel fragments and spoons, and a lead sinker. The ink stone is Chinese. At this stage the origin of the other artefacts has not been confirmed, but there is nothing to suggest that they did not come from China.

Taking all this evidence into account, while it can never be proven without hull remains, it is highly likely that the *Temasek Wreck* is a Chinese junk, owned and crewed by Chinese.

13.3 Where Was She Bound?

The answer to this question can only be speculative, but it is well founded. Unlike later European wrecks, there are no archival records for the *Temasek Wreck*, with details of inquests, survivor testimonials, manifests, crew lists, or captain's logs. Instead, we must look at her route, and the known destinations for the cargo she carried.

The most probable route taken by the *Temasek Wreck* is outlined above. From China to Tioman Island, the route is the same as that followed by ships heading for Java, a key destination during the 14th century. From Tioman they would head southeast to stay well east of Bintan, negotiate Gelasa or Karimata Strait, then cross the Java Sea to their final destination, often Tuban in eastern Java. It is conceivable that a Java-bound ship might

hug the Malaysian coast before veering southeast to clear Bintan. But the unnecessary risk of striking the rocks off Lima Channel, Pedra Branca, South Ledge or Berakit Reef off the northeast tip of Bintan make this route extremely dangerous and hence highly unlikely. Wrecking on Pedra Branca is far more likely to be the unfortunate outcome of having to traverse the Singapore Strait. The *Temasek Wreck* was westward bound.

Listing archaeological sites containing 14th-century Chinese ceramics, such as the ubiquitous Longquan green-ware, is a daunting task. In part this is due to the sheer number of sites, and in part it is due to the difficulty in accurately dating these wares. As with dating this wreck, it is easier to focus on the Yuan blue-and-white porcelain, with its well-defined date range and well documented distribution, both archaeological and historical.

In his account, the *Dao Yi Zhi Lue* (A Brief Description of Island Foreigners), published in 1349, Wang Dayuan lists the centres that preferred Chinese blue-and-white and *qingbai* porcelain: the Philippines, southwest Borneo, Tambralinga, Pattani, Terengganu, Kelantan, Java, northern Sumatra, all the kingdoms of India with which trade was recorded, and Saudi Arabia (Guy 1990: 26). The archaeological record in Southeast Asia does not seem to correspond well to this list.

Significant concentrations of Yuan blue-and-white porcelain only occur in Indonesia, the Philippines, and Thailand. In particular, abundant blue-and-white porcelain finds near Trowulan in eastern Java demonstrate the wealth of the Majapahit Kingdom, acquired largely through the control of the lucrative spice trade (Guy 1990: 27). Meitoku (2010: 18) has tabulated the number of restorable pieces archaeologically excavated at Trowulan, and compared them to major ancient collections around the world and to non-kiln sites in China. Large pieces such as plates, jars, and small mouth jars (*meiping*) from Trowulan are more plentiful than anywhere else, while bottles and bowls of various sizes are well represented. When also taking into account several private collections of Trowulan shards, such as the one donated to the National University of Singapore Museum, it would seem that the Majapahit capital dominated Chinese exports of Yuan blue-and-white porcelain, not just in Southeast Asia but worldwide.

In the Philippines, the finds tend to be more associated with burials. Indeed, small jars, cups, ewers, and figurines appear to have been produced for the Southeast Asian market to meet the funerary requirements of the people of the Philippines and Indonesia (Guy 1990: 27). Tan (2002: 32) notes that small blue-and-white vessels painted with simple floral designs are found in large quantities in the Philippines. She speculates that these may have been experimental products sent to less discerning markets, with the small pieces satisfying a strong demand for ritual. However, many larger and higher quality pieces were also exported to the Philippines as exemplified by an exhibition held in Manila in 1997 (Gotuaco, Tan and Diem 1997). Apart from magnificent large plates and jars, there are bowls, vases, ewers, and rare *kendi*s, mainly found in areas outside Luzon.

In Thailand, the Tak-Omkoi burial sites in Tak and Chiang Mai provinces, near the Myanmar border, have relinquished many high-quality Yuan blue-and-white ceramics (Pitiphat 1992). Apart from the more common bowls and jarlets, there are many large plates and jars of high quality. Jars in particular seem to have been treasured in Buddhist temples throughout central and western Thailand. More have been found in Ayutthaya, the ancient capital, with some in temples and some dredged from the adjacent Chao Phraya River (Chandavij 1994). Plates have also been found in or on the banks of the Mekong River in Ratchaburi province.

Obviously, the Philippines, on the eastern route from China, was not the destination of the *Temasek Wreck*. From the wreck's location and westward passage, Java is not a contender either. Thailand could have been supplied via a port on the Andaman Sea, but why would a trader take such a long and circuitous route when the thriving riverine port-city of Ayutthaya, founded in c.1350, and other established entrepôts within the Gulf of Siam were so much closer to China?

Guy (1990: 25) is of the opinion that in the 14th century blue-and-white porcelain was primarily intended for the Islamic market. He points out that it is no coincidence that the two greatest collections of early blue-and-white are to be found in the Middle East. There are some forty examples of Yuan blue-and-white in the Ṭopḳapu Sarāyı Museum in Istanbul. This collection was plundered or otherwise acquired from Persia and Egypt during Ottoman conquests (Yoh 2010: 555). Some of the most celebrated pieces of Yuan blue-and-white can be found in the Ardebil Shrine Collection, originally held on the western shore of the Caspian but now housed in Tehran. This collection was gifted to the shrine by Abbas I of the Safavid dynasty in 1611 (*ibid*.). As the Safavid dynasty was only established in 1501, the collection was clearly created by an earlier generation of aficionados. The large plates and bowls that dominate these collections were made to suit the communal dining habits of consumers in the Middle East and Maghreb.

Hundreds of pieces of Yuan blue-and-white have been found in Syria, and masses of shards have been unearthed in the middens of Fusat, or Old Cairo, in Egypt (Carswell 2000: 14). The travel diary of Moroccan scholar Ibn Battuta, written in 1355, confirms the presence of Chinese porcelain in Damascus in the early 14th century. Leaving Morocco in 1325 and finally arriving in Quanzhou in 1345, Battuta later visited Fuzhou, Hangzhou, and Guangzhou. He claimed that the porcelain bazaar at Guangzhou was the largest, and served as the launching point for exports to other parts of China, India, and Yemen 'from country to country till it reaches us in Morocco. It [Chinese blue-and-white porcelain] is certainly the finest of all pottery-ware' (Barnes 2010: 362).

India also imported significant quantities of 14th-century Chinese ceramics. At the ancient port of Kollam (Quilon), on the coast of Kerala, many 14th-century Chinese ceramic shards have been exposed by erosion of the seashore (Karashima 2009: 36). More Chinese ceramics, including Yuan blue-and-white, have been excavated at Periyapattinam on the Coromandel Coast. This is perhaps Dabadan, an important port described in the *Daoyi Zhilue*, a 14th-century Chinese text (*ibid*.: 21). A large cache of Chinese ceramics, including sixty-seven Yuan blue-and-white pieces, was excavated from the ruins of the palace of the Islamic Sultan Firuz Shah in Delhi (Yoh 2010: 554). He ruled from 1351 to 1388, and it is likely that his collection was acquired largely from imports through the port of Dabadan. One other collection containing Yuan blue-and-white was amassed by Shah Jahan, who ruled the Mughal Empire from 1628. It is assumed that prized ceramics imported by earlier generations were accumulated and brought to the capital to be housed in the Lal Qil'ah (the Red Fort in Delhi), which was completed in 1648 (*ibid*.: 554).

Zheng He's fleets famously journeyed from China to the Middle East and down the east coast of Africa during the early 15th century. But the jury is still out on whether Chinese junks traded directly with the Middle East or India prior to Zheng He's voyages. Cargoes were transhipped at entrepôts, but was this a pervasive practice? Several ancient texts mention China ships in the Indian Ocean, although this generally implies ships in the China trade rather than junks made in China. For example, a 12th-century Chinese text, the *Lingwai Daida*, details transhipment on the Malabar Coast of India (Karashima 2009: 29):

> When Chinese ship-merchants want to go to Arabia, they change the ship necessarily to a small one at Gu-lin [Kollam] and go … When Arabs come, they navigate towards the South by a small ship and reach Gu-lin country. [From there] they go towards the East to reach San-foiqi [Srivijaya].[13]

What does 'Chinese ship-merchants' mean? Ships carrying Chinese merchants or Chinese ships carrying merchants? In the 12th century, when junks were relatively new to sea-going trade, Southeast Asian or Indian ships were more likely to have been carrying Chinese merchants to Gu-lin. But by the 14th century junks were certainly capable of crossing the Bay of Bengal, and indeed the Arabian Sea. If only remnants of the *Red Sea Wreck*, with its small but precious cargo of Yuan blue-and-white, had been documented we would not be so reliant upon speculation. Unfortunately, there is no archaeological evidence for Chinese junks venturing into the Indian Ocean. Indeed, there is no maritime archaeological evidence for any ships entering the Indian Ocean from Southeast Asia! Thus, the lack of such evidence for junks does not disprove their existence.

There are only a few ancient ports where Yuan blue-and-white porcelain has been found on the Indian Ocean littoral: Kollam and Periyapattinam in India, Kilwa in eastern Africa, and Jiddah and Aydhab in the Red Sea (Carswell 2000: 17). A ship full of Chinese commodities, invariably comprising iron, silk, and a wide repertoire of ceramics, sailing directly from China, may not have been suitable in its entirety for Indian, Middle Eastern, or East African consumers. It is more likely that cargoes catering for specific demands were selectively redistributed at Southeast Asian entrepôts for onward shipment to targeted ports throughout the Indian Ocean. For example, the smaller Yuan blue-and-white bowls, stem-cups, dishes, and jarlets that prevail in Temasek, the Philippines, Thailand, and Java seem to be considerably less common along the Indian Ocean littoral. Hence the *Temasek Wreck*, with its full consignment of Chinese products, was probably bound for a Southeast Asian entrepôt. In the 14th century, Temasek was the only entrepôt that handled blue-and-white porcelain, west of Pedra Branca.

The scant textual evidence that has survived has been augmented by rigorous terrestrial archaeology to reveal the great significance of Temasek as an entrepôt from around 1300 until 1400, when Melaka assumed this role. Occupation and trade continued into and beyond the 15th century, but at a much-reduced level. Apart from trade, manufacture, and day to day life, literally tonnes of terrestrial artefacts provide glimpses of a sophisticated society and a diverse immigrant population.

From the discussion of finds that occurred on both the *Temasek Wreck* and in Temasek, it is evident that many of the ceramic types on the wreck-site were in demand in the entrepôt. Some were probably destined for transhipment. Large Longquan bowls and plates found on the *Temasek Wreck* are typical of finds in India and the Middle East, but they are also typical of finds in Temasek. From the context of the terrestrial sites, some of the ceramic types were for local utilitarian purposes, while the higher quality wares would have been for ritual use or a manifestation of wealth.

The absence of large blue-and-white plates on the *Temasek Wreck* suggests that at least the blue-and-white component of the cargo was not intended for transhipment

13 There is no explanation for transhipping to a smaller vessel for the onward voyage to the Middle East, a necessity according to this text. However, if the ship arriving at Gu-lin was a Chinese junk, it would have been considerably bigger than an Arab or Indian dhow.

to Middle Eastern or Indian markets. In fact, when compared with terrestrial sites and finds throughout Southeast Asia, the dearth of large blue-and-white plates in Temasek is an anomaly. The absence of this popular Yuan blue-and-white product from both the *Temasek Wreck* and the 14th-century port of Temasek may indeed provide more compelling evidence for Temasek as the final destination of the ship than the highlighted artefact parallels.

14. CONCLUSION

The *Temasek Wreck* was lost on Pedra Branca with a cargo of Longquan green-ware, blue-and-white porcelain and *shufu*-ware from Jingdezhen, and brown-ware from Guangdong or Cizao. The very few non-ceramic artefacts include glass beads, gold foil, wrought iron, lead ingots, and a few copper-alloy objects. All organic cargo rotted away long ago, as did the entire ship's structure. Without any hull remains it is impossible to conclusively identify the type of ship. However, from circumstantial evidence such as an exclusive Chinese cargo and an absence of non-Chinese artefacts, there is a high probability that the ship was a Chinese junk.

The *Temasek Wreck* contains more Yuan blue-and-white porcelain than any other documented shipwreck in the world, with well over 100 kg being documented to date. The *Binh Chau Wreck*, a Chinese junk lost in Vietnam, contained some bowls, cups, dishes, and lids. Only 103 blue-and-white shards were recovered from the *Shiyu 2 Wreck*, which was lost in the Paracels, although the site was looted before official excavation. There are only nineteen large shards from an undocumented wreck in the Red Sea, and just one jar from a possible wreck off Samar in the Philippines.

From an analysis of the exclusive blue-and-white porcelain recovered from the *Temasek Wreck*, it would seem that the wreck dates between 1340 and 1371. Many would opt for a tighter date range with a *terminus ante quem* of 1352. It is rare that a shipwreck with no historical documentation, and no specifically dated artefacts, can be dated as precisely as this. Once the *Temasek Wreck* ceramics have been cleaned and classified, and a detailed analysis of the many ceramic types and designs that formed the cargo (especially the diverse range of blue-and-white motifs) is undertaken, an equally rare event may occur: the *Temasek Wreck* finds, which mark one moment in history, may contribute to the accurate dating of Yuan blue-and-white porcelain.

From the location of the wreck, the many parallel finds, and importantly a common dearth of prized large blue-and-white plates, Temasek is the most likely intended destination of the *Temasek Wreck*. This being the case, the recovered ceramics and artefacts provide an incredible insight into the utilitarian, elite, and ceremonial wares that were either used by the inhabitants or re-exported. And because the wide variety of *Temasek Wreck* ceramics was lost at a specific moment in the 14th century, a moment that will hopefully become better defined as research progresses, they can be particularly helpful in interpreting the Temasek era stratigraphy as revealed in past and future terrestrial excavations in Singapore.

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BIBLIOGRAPHY

Anon. a

2014 *The Yuan Dynasty Shipwreck Site of Dalian Island*. Beijing: Institute of Archaeology, Chinese Academy of Social Sciences. (http://www.kaogu.cn/en/Publication/New_books/2014/1120/48296.html; last accessed February 2022)

Anon. b

2011 'Survey Report of the Shiyu Wreck Site in the Paracel Islands', *Journal of the National Museum of China*, pp. 26–46.

Barnes, L.E.

2010 'Yuan Dynasty Ceramics', in *Chinese Ceramics: From the Palaeolithic Period through the Qing Dynasty*, Z.Y. Li, V. Bower, and L. He (eds.), pp. 331–86. New Haven: Yale University Press.

Brown, R.M.

2004 'History of Shipwreck Excavation in Southeast Asia', *The Belitung Wreck: Sunken Treasures from Tang China,* pp. 40–55. Seabed Explorations New Zealand/ISEAS (https://www.iseas.edu.sg/wp-content/uploads/2016/05/02_brown_040to055.pdf; last accessed 21 September 2021).

2009 *The Ming Gap and Shipwreck Ceramics in Southeast Asia: Towards a Chronology of Thai Trade Ware*. Bangkok: Siam Society.

Brown, R.M. & S. Sjostrand

2002 *Maritime Archaeology and Shipwreck Ceramics in Malaysia*. Kuala Lumpur: Muzium Negara.

Carswell, J.

2000 *Blue and White: Chinese Porcelain Around the World*. London: British Museum Press.

Chandavij, N.

1994 *Chinese Ceramics from Archaeological Sites in Thailand*. Bangkok: Department of Fine Arts.

Cui Yong.

2020 *Guangdong Nanhai Number One Southern Song Shipwreck Underwater Archaeological Project Completion*. Wenbo Zhongguo App, 16 January (https://wemp.app/posts/82c681ba-2d4a-40cb-9877-d2075f12edad; last accessed December 2021).

Flecker, M.

1992 'Excavation of an Oriental Vessel of c. 1690 off Con Dao, Vietnam', *International Journal of Nautical Archaeology* 21/3: 221–44.

2000 'A 9th-Century Arab or Indian Shipwreck in Indonesian Waters', *International Journal of Nautical Archaeology* 29/2: 199–217.

2001 'The Bakau Wreck: An Early Example of Chinese Shipping in Southeast Asia', *International Journal of Nautical Archaeology* 30/2: 221–30.

2003 'The Thirteenth-Century Java Sea Wreck: A Chinese Cargo in an Indonesian Ship', *The Mariner's Mirror* 89/4: 388–404.

2004 *The Binh Thuan Wreck*: *Christie's Australia, Catalogue Containing the Complete Archaeological Report*. South Yarra, Vic: Christie's.

2007 'The South-China-Sea Tradition: The Hybrid Hulls of South-East Asia', *International Journal of Nautical Archaeology* 36/1: 75-90.

2008 'A 9th-Century Arab or Indian Shipwreck in Indonesian Waters: Addendum', *International Journal of Nautical Archaeology* 37/2: 384–86.

2012 'The Jade Dragon Wreck: Sabah, East Malaysia', *The Mariner's Mirror* 98/1: 9–29.

2015 'Early Voyaging in the South China Sea: Implications on Territorial Claims', *Nalanda-Sriwijaya Centre Working Paper Series* No. 19.

Flecker, M. & W. Blake

1994 'A Preliminary Survey of a Southeast Asian Wreck, Phu Quoc Island, Vietnam', *International Journal of Nautical Archaeology* 23/2: 73–91.

Gerritsen, A.

2020 *The City of Blue and White: Chinese Porcelain and the Early Modern World*. Cambridge: Cambridge University Press.

Gotauco, L., R.C. Tan & A.I. Diem

1997 *Chinese and Vietnamese Blue and White Wares Found in the Philippines*. Makati City: Bookmark.

Green, J.

2006 'Nautical Archaeology in Australia, the Indian Ocean, and Asia', in *Maritime Archaeology: Australian Approaches*, M. Staniforth & M. Nash (eds.), pp. 97-109. Boston, MA: Springer.

Guy, J.

1990 *Oriental Trade Ceramics in South-East Asia, Ninth to Sixteenth Centuries*. Singapore: Oxford University Press.

2011 'Tamil Merchants and the Hindu-Buddhist Diaspora', in *Early Interactions between South and Southeast Asia: Reflections on Cross-Cultural Exchange*, P.-Y. Manguin, A. Mani & G. Wade (eds.), pp. 243–62. Singapore: ISEAS.

2017 'The Phanom Surin Shipwreck, a Pahlavi Inscription, and their Significance for the History of Early Lower Central Thailand', *Journal of the Siam Society* 105: 179–96.

Heng, D.

2012 *Sino-Malay Trade and Diplomacy from the Tenth Through the Fourteenth Century*. Singapore: ISEAS.

Hourani, G.

1995 *Arab Seafaring in the Indian Ocean in Ancient and Early Medieval Times*. Princeton, NJ: Princeton University Press.

Huang, M.

2014 'New Discoveries of the Yuan Blue-and-White from the Jingdezhen Kiln Site', Presentation at the Asia Society, Hong Kong, 3 June (http://asiasociety.org/hong-kong/events/new-discoveries-early-yuan-blue-and-white-jingdezhen-kiln-site; last accessed February 2022).

Karashima, N.

2009 'Medieval Commercial Activities in the Indian Ocean as Revealed From Chinese Ceramic-Sherds and South Indian and Sri Lankan Inscriptions', in *Nagapattinam to Suvarnadwipa: Reflections on the Chola Naval Expeditions to Southeast Asia*, H. Kulke, K. Kesavapany & V. Sakhuja (eds.), pp. 20–60. Singapore: ISEAS.

Kessler, A.T.

2012 *Song Blue and White Porcelain on the Silk Road*. Leiden: Brill.

Kwa, C.G.

2012 'Locating Singapore on the Maritime Silk Road: Evidence from Maritime Archaeology, 9th to 19th Centuries', *Nalanda–Sriwijaya Centre Working Paper Series* No. 10.

2016 'The Maritime Silk Road: History of an Idea', *Nalanda-Sriwijaya Centre Working Paper Series* No. 23.

Li, G.Q.

1989 'Archaeological evidence for the use of chu-nam on the 13th century Quanzhou ship, Fujian Province, China', *International Journal of Nautical Archaeology* 18/4: 277–83.

Li, D., Z. Jiang & J. Guan

1980 'Chinese Porcelain Found in a Shipwreck on the Seabed off Sinan, Korea', *Southeast Asian Ceramic Society Chinese Translations* 2: 25–50.

Lim, C.S.

2017 'Preliminary Report on the Archaeological Investigations at the National Gallery Singapore', *Nalanda-Sriwijaya Centre Archaeology Unit, Archaeology Report Series* No. 5. <https://www.iseas.edu.sg/wp-content/uploads/pdfs/AU5NationalGallerySingapore_reduced.pdf>

Lim, C.S.

2019 'Preliminary Report on the Archaeological Investigations at the Victoria Concert Hall', *Nalanda-Sriwijaya Centre Archaeology Unit, Archaeology Report Series* No. 9. <https://www.iseas.edu.sg/wp-content/uploads/pdfs/AU9_Victoria_Concert_Hall%20-%207-1-19.pdf>

Liu, L.Y.

1992 *A Survey of Chinese Ceramics, Vol. 3: Liao, His-Hsia, Chin and Yuan Wares*. Taipei: Aries Gemini Publications.

Manguin, P.-Y.

1984 'Relationship and Cross-Influences Between Southeast Asian and Chinese Shipbuilding Traditions' in *SPAFA Final Report. Consultative Workshop on Research on Maritime Shipping and Trade Networks in Southeast Asia (I-W7), Cisarua, West Java, Indonesia, November 20–27, 1984*, SPAFA (ed.), pp. 197–212. Bangkok: SPAFA Co-ordinating Unit.

1993 'The Vanishing Jong: Insular Southeast Asian Fleets in Trade and War (15th to 17th Centuries)', in *Southeast Asia in the Early Modern Era*, A. Reid (ed.), pp. 197–213. Ithaca: Cornell University Press.

2020 'Ships and Shipwrecks in the Pre-Modern Indian Ocean', in *Oxford Research Encyclopedia of Asian History*, D. Ludden (ed.). New York: Oxford University Press. https://doi.org/10.1093/acrefore/9780190277727.013.326 (last accessed February 20200).

Mathers, W. & M. Flecker

1997 *The Archaeological Excavation of the Java Sea Wreck*. Annapolis: Pacific Sea Resources.

Meitoku, K.

2010 'Ceramics discovered at the Trowulan site' [Translated by Wilson, R.], in *Research on Ceramics Discovered at the Trowulan Site in Indonesia,* J.N. Miksic & K. Meitoku (eds.), pp. 17–9. Tokyo: Senshu University Asian Archaeological Team

Miksic, J.N.

1985 *Archaeological Research on the 'Forbidden Hill' of Singapore: Excavations at Fort Canning, 1984*. Singapore: National Museum.

2007 'Chinese Ceramics and the Economics of Early Southeast Asian Urbanisation, 14th to 16th Centuries', *Bulletin of the Indo-Pacific Prehistory Association* 26: 147–53.

2013 *Singapore and the Silk Road of the Sea: 1300–1800*. Singapore: NUS Press.

2015 'Introduction', in *Ancient Silk Trade Routes: Cross Cultural Exchanges and Their Legacies in Asia*, D.S Qin & J. Yuan (eds.), pp. 1–17. Singapore: World Scientific Publishing.

Needham, J.

1971 *Science and Civilisation in China*, *Vol. 4, Part III: Civil Engineering and Nautics*. Cambridge: Cambridge University Press.

NUS Museum

2020 *Archaeology Library Brochure*, Singapore. (https://nus.edu.sg/museum/pdf/2021/NUSM_ALNM_Brochure.pdf; last accessed February 2022).

Peng, M. & Q. Yin

2002 'Yuan and Ming Provincial Blue and White Ware from Jingdezhen', in *Yuan and Ming Blue and White Ware from Jiangxi*, H.W. Yau (ed.). Hong Kong: Jiangxi Provincial Museum and Art Museum, Chinese University of Hong Kong.

Pitiphat, S.

1992 *Ceramics from the Thai-Burma Border*. Bangkok: White Lotus.

Ptak, R.

1998 *China and the Asian Seas: Trade, Travel, and Visions of the Other (1400–1750).* Aldershot: Ashgate Variorum.

Prishanchit, S.

2000 'Maritime Trade from the Fourteenth to the Seventeenth Century: Evidence from the Underwater Archaeological Sites in the Gulf of Siam', in *The Silk Roads: Highways of Culture and Commerce*, V. Elisseeff (ed), pp. 185–98. New York and Oxford: Berghahn Books.

Sjostrand, S.

2002 'Turiang: A 14th Century Chinese Shipwreck, Upsetting Southeast Asian Ceramic History', in *Southeast Asia–China Interactions*, *Journal of the Malaysian Branch of the Royal Asiatic Society* 74/1 (280): 71–109.

Tan, R.

2002 'Chinese Blue and White Ware of the 14th to 15th Centuries: A Philippine Perspective', in *Yuan and Ming Blue and White Ware from Jiangxi*, H.W. Yau (ed.). Hong Kong: Jiangxi Provincial Museum and Art Museum, Chinese University of Hong Kong.

Temple, R.K.G.

1998 *The Genius of China: 3000 Years of Science, Discovery and Innovation*. London: Prion.

Wade, G.

2004 'Ming China and Southeast Asia in the 15th Century: A Reappraisal', *Asia Research Institute Working Paper Series* No. 28.

2013a 'Maritime Routes between Indochina and Nusantara to the 18th Century', *Archipel* 85: 83–104.

2013b 'An Asian Commercial Ecumene, 900–1300 CE', in *Offshore Asia: Maritime Interaction in Eastern Asia Before Steamships*, K. Fujita, M. Shiro & A. Reid (eds.), pp. 76–111. Singapore: ISEAS.

Wang, G.W.

1998 *The Nanhai Trade: The Early History of Chinese Trade in the South China Sea*. Singapore: Times Academic Press.

Wen, R. & A.M. Pollard

2014 'The Pigments Applied to Islamic Minai Wares and the Correlation with Chinese Blue-and-White Porcelain', *Archeometry* 58/1: 1–16.

Weng, Y. & B. Li

2021 *New Finds of Yuan Dynasty Blue-and-White Porcelain from the Luomaqiao Kiln Site, Jingdezhen: An Archaeological Approach*. London: Unicorn Publishing Group.

Worcester, G.R.G.

1947 *Junks and Sampans of the Yangtze*. Shanghai: Inspectorate General of Customs.

Yoh, K.

2010 'The Export and Trade of Chinese Ceramics: An Overview of the History and Scholarship to Date', in *Chinese Ceramics: From the Palaeolithic Period through the Qing Dynasty*, Zhiyan Li, V. Bower, & Li He (eds.), pp. 535–63. New Haven: Yale University Press.