THE THIRTEENTH-CENTURY JAVA SEA WRECK: A CHINESE CARGO IN AN INDONESIAN SHIP

By Michael Flecker

As odd as it may seem, the Java Sea Wreck was first discovered by fishermen when they observed birds feeding on a school of fish that was hovering over the wreck. After months of great fishing an iron concretion was inadvertently hooked. A tiny green-glazed dish adhered to the concretion.

Local divers heard of the discovery and started to loot the wreck. They were caught by the Indonesian Navy and the wreck position became known to a salvage company which then obtained a salvage licence from the Indonesian government. That company recovered some 8,000 ceramic items before running into technical and financial difficulties. In 1996 Pacific Sea Resources obtained the salvage licence for the wreck and carried out what was essentially rescue archaeology, recovering approximately 12,000 ceramic items and a variety of artifacts. The author managed the excavation. The cargo was divided, with half being returned to the Indonesian government as per the licence terms and the other half being donated to the Field Museum of Natural History in Chicago, USA.

The wreck was located between Bangka Island and Jakarta, on the western edge of the Java Sea, in latitude 4°14′ S and longitude 106°40′ E (Fig. 1). A comprehensive archaeological report entitled *The Archaeological Recovery of the Java Sea Wreck* was published by Pacific Sea Resources. The findings are indeed worthy of wider dissemination and are therefore summarized in this paper, along with much additional information that has come to light since publishing.

**DATING THE WRECK**

Brown has dated the Java Sea Wreck to the mid to late thirteenth century based on the stylistic analysis of the ceramic cargo. To check this hypothesis a sample of aromatic resin was carbon dated. Aromatic resin was tapped and collected specifically for export and is unlikely to have been held in storage for long periods prior to shipping. The one sigma calibrated date range for the resin sample was AD 1265 to 1310, which is consistent with Brown's assessment.

**HISTORICAL CONTEXT**

Whether the ship sailed at the tail end of the Southern Song (1127 to 1279) or at the beginning of the Yuan dynasty (1280 to 1368) is not clear. The Song court established monopolies on luxury goods and occasionally introduced policies prohibiting private
overseas trade. Nonetheless, treaty ports were opened in southern China and missions were sent to the Nanhai (South Seas) to seek spices, aromatics, rhinoceros horn, pearls, camphor and other exotic goods, to good effect. The demand for Nanhai products, in fact, was so great that the Song administration accrued a serious trade deficit. The outflow of copper cash reached such proportions that internal availability was threatened. Ineffectual prohibitions on the export of coins led to an edict in 1216, officially encouraging the export of porcelain instead.4

The Yuan dynasty came into being in 1260 when the Mongols largely completed their conquest of China, although a fugitive Song court managed to survive for another 19 years. The Yuan government lacked the ancient Confucian prejudice
against trade. On the contrary, they set out to exploit all the opportunities for profit which the commercial policies of the Song court had set in motion. They liberalized commerce further and, despite restrictive taxes and contradictory and arbitrary policy changes, trade with the Nanhai flourished.

The Mongols launched into a shipbuilding campaign to vastly enlarge the inherited Song navy. Under the Song court the navy had the role of defending coastal settlements and eliminating the pirates that threatened maritime trade. In the hands of the Mongols the navy became an instrument of aggression. Large-scale expansionist campaigns were launched against Japan in 1281, Tongkin and Champa in 1283–8 and Java in 1292. A divided Java was reunited by the ruler of Singasari in 1222. By 1286, under Kertanagara, the Singasari empire had established Javanese hegemony over most of the Malacca Straits region. During the early part of the thirteenth century the Thais also turned expansionist, infringing on Burmese Pagan to the west, Cambodian Angkor to the east and the Malay peninsula to the south.

The Mongol ruler Khubilai Khan took exception to Singasari’s growing power base. In 1289 his envoys arrived in Java demanding submission. Instead they were sent home disfigured, thereby earning Khan’s wrath. He dispatched a large naval fleet to Java in 1292 to avenge this rather extreme sign of disrespect but the expedition became embroiled in a confused political situation, was ultimately betrayed by an erstwhile Javanese ally and sailed home the same year. The Javanese ally was Wijaya, who through the unwitting assistance of the Mongols established himself as the new ruler.

Thus began the Majapahit empire, the largest ever to exist in Southeast Asia. Within 50 years the kingdom, centred in the hinterland of east Java, controlled a seaborne fleet capable of subjugating the Malay maritime kingdoms of Sumatra, Temasik (Singapore) and the Malay Peninsula.

It is within this historic context that the Java Sea ship sailed, loaded to the gunnels with Chinese commodities for the Indonesian market.

SITE CONDITIONS AND THE WRECKING PROCESS

The Java Sea Wreck lies in the open sea. The nearest navigation hazard is the coast of Sumatra approximately 40nm to the west. It is therefore most likely that the ship was overwhelmed in a localized storm, perhaps exacerbated by overloading or rotting timbers. It lies directly in the modern shipping lane between Bangka Strait and Jakarta, which is 110 miles to the south. The presence of this wreck, and others known to lie in the area, indicate that this same route has been in use since the advent of commercial shipping. The cargo and location clearly indicate that the ship was bound for Java, as will become apparent in due course.

The water depth at the wreck site was 26m. The seabed was composed of a 0.3–1.0m thick layer of gently undulating silty-sand overlying stiff clay. Apart from a few isolated fragments of wood, nothing remained of the original hull. The ceramic component of the cargo had become widely distributed in a ring around the original ship location. The iron cargo, consisting of bundles of bars and stacks of cauldrons, had concreted together before the entire hull disintegrated, thereby preserving the hull configuration despite the complete disappearance of the timbers. The massive
concretions remained roughly in the original stowage position and protruded some 1.5m above the wreck mound.

These factors illustrate a remarkable wrecking process in which the ship has come to rest on a hard clay seabed with little or no sedimentary overburden. With nothing to protect the timbers from biological attack and erosion, the ship collapsed and was eventually totally consumed. The ceramic cargo, stowed above the iron, spilled out in an ever widening circle. Strangely, the seabed seems to have been subject to erosion at the time but the shipwreck materials protected the underlying clay, thereby creating an artifact covered mound.10 As the surrounding clay eroded, the ceramics spread further until they formed a ring around the central iron cargo. Later, with deforestation of the adjacent coast, a depository environment ensued, creating the present layer of sedimentary overburden. The resultant artifact field encompassed an oval shaped area some 70m long and 55m wide.

SHIP ORIGIN

The iron concretion blocks lie in a distinct pattern (Fig. 2). They are divided longitudinally into two rows by a long narrow gap. Transversely they are similarly separated at regular intervals, indicating that the ship was divided into at least 13 compartments. The initial conclusion was that 12 bulkheads formed an integral part of the ship’s structure. The longitudinal gap between the concretion blocks seemed to indicate that there was also a longitudinal bulkhead, a feature never before observed or even speculated upon, although a structurally continuous longitudinal bulkhead would add an enormous amount of longitudinal stiffening to a vessel. However, it seems that the longitudinal division was not continuous and perhaps only ran through

Fig. 2. Configuration of iron concretion blocks and conjectural hull division. (M. Flecker)
the midships compartments. This element could possibly have been a non-structural partition, although the width of the gap between concretions suggests otherwise. It should be noted that the iron concretions stand up to 1.5m high, so the iron cargo was stacked well above a keelson (if present) and this member therefore is no explanation for the longitudinal gap.

The total volume of the iron concretions has been conservatively calculated at approximately 43m³. The weight calculation is based on this volume, a specific gravity of 7.2 for cast iron and an allowance for packing interstices and concretion expansion of 40 per cent. The resultant iron cargo weight is in the order of 190 tonnes. The ceramic cargo weight is based on an estimated original quantity of 100,000 pieces with an average weight of 300g per piece, giving a total of 30 tonnes. The overall displacement of the ship would therefore have been in the order of 300 tonnes.

The widest iron concretion block, taking up approximately half the width of the original hull, measures 3.8m. Factoring in the central division, hull thickness and possible dunnage, the beam of the ship is therefore likely to have been 8–9m. The length overall can only be wildly guessed from the site evidence, so it is perhaps better surmised by comparing to the aspect ratio of vessels thought to be similar in size and function. The contemporary Quanzhou ship¹² had an aspect ratio of 1:3.5, which implies an overall length of 28–31m for the Java Sea ship. The Ko Si Chang III Wreck¹³ of the fifteenth or sixteenth century is also similar in configuration, although somewhat smaller at 20m overall.¹⁴ It has an aspect ratio of 1:3.3, which translates to an overall length of 26–30m for the Java Sea ship. So the overall length of the Java Sea ship is likely to have been in the region of 28m or more.

The rule of thumb for vessels with moderately fine entry is: displacement equals waterline length times waterline beam times draught times 0.5. For a vessel displacing 300 tonnes, with a waterline length of say 24m and a beam of 8m, the draught would be in the order of 3m, which seems reasonable for a cargo ship of this size.

Of prime importance in determining the origin of the wreck is wood identification. Two samples have been identified, although due to the degradation of the wood the conclusions are somewhat tentative. The timber that seems to have formed the hull or bulkheads, displaying evidence of dowel holes, has been identified as Parastemon urophyllum (mandalas) by Dr Ian Godfrey of the Department of Materials Conservation at the Western Australian Maritime Museum. This timber is found in west Irian Jaya, Papua New Guinea, the Soloman Islands, Myanmar, Indonesia and the Malay Peninsula. Burkhill,¹⁶ citing authorities, describes it as hard, heavy, dark brown, with a wavy fibre, good and useful. It is used in house building and in bridge construction in salt and brackish water. Of particular note, it is not attacked by the teredo worm, making it an excellent shipbuilding wood.

The other wood sample was taken from a small rectangular beam with a bevelled edge. It has been identified as Alstonia scholaris (cheesewood or milkwood). This timber covers an extensive area in the tropical belt from Africa to the Pacific, including all of the countries noted above. Burkhill¹⁷ notes that the timber is soft, light and perishable, being used in his time for writing slates and coffins. It also has medicinal uses, being regarded as the remedy for fevers, chronic diarrhoea and dysentery. This wood is therefore unlikely to have been used in the ship’s structure, although it would have been suitable for a partition. It is surprising that it has survived at all when the hull has virtually disappeared.
The only evidence of construction technique is provided by two small wood fragments with identifiable dowel or treenail holes, one 1.5cm in diameter and the other 2.7cm.

It is readily accepted that dowel edge-joining or treenail fastening were never used in traditional, purely Chinese shipbuilding. Mandarlas wood and milkwood are not native to China, and it is highly unlikely that these timbers were imported for ship construction and/or fitting out when there were eminently suitable local timbers available at the time. So while the cargo of the Java Sea Wreck is almost exclusively from China, the ship was definitely not built there.

The indication of bulkhead construction and dowel edge-joining immediately brings to mind the South China Sea tradition, a term coined by Manguin. Archaeological evidence indicates that these ships were built in Thailand and carried cargoes of Thai ceramics throughout Southeast Asia from the fourteenth to the sixteenth century. Their construction combined Chinese influenced bulkheads and iron fastenings with the Southeast Asian method of edge-joining planks with dowels and they tended to be made of teak (*Tectona grandis*). The Java Sea ship was not built of teak. In fact, the two identified woods do not occur in Thailand proper but may occur in the Isthmus of Kra area, so construction in that region cannot be ruled out by wood type alone. The other factor is that it seems unlikely, but by no means impossible, that a Thai built vessel would be transporting a Chinese cargo to Indonesia. The Chinese could have built or at least supervised the building of a vessel in Thailand but this is not thought to have occurred until the fourteenth or early fifteenth century when the South China Sea tradition makes its first clear appearance. This, of course, coincided with the ‘Ming ban’ on the export of ceramics and other goods from China and the consequent surge in the export of Thai ceramics.

The wood and the route, in fact, indicate that the Java Sea ship was built in Indonesia. But if the ship was compartmentalized by bulkheads, this raises some important questions. There is no evidence, either historical, iconographic, archaeological or ethnographic, to suggest that bulkheads were ever used in Indonesian ships. Sixteenth- and seventeenth-century Dutch and Portuguese travellers describe Indonesian vessels in some detail but nowhere is there mention of bulkheads; whereas early foreign writers describing Chinese vessels were enthralled by them. Furthermore, no traditional Indonesian vessel still constructed by the dowel edge-joined method incorporates bulkheads in its design. The Indonesian *janggolan*, which is still used for cargo carrying throughout the archipelago, has two non-structural bulkheads when fitted out for carrying salt but the timber carrying version is without.

Again, there is the possibility that Chinese immigrants built the ship or supervised its construction in Indonesia. A Javanese text mentions the King of Sunda sailing to Majapahit in a *jong* of Chinese build such as came into use after Wijaya’s war. As mentioned earlier, Wijaya founded the Majapahit empire towards the end of the thirteenth century with the help of a Sino-Mongol fleet. The Mongols retreated to China after the Javanese turned on them, so the vessel mentioned in the text is unlikely to have been a Chinese ship from the fleet, although it may have been a locally built version.

The Java Sea ship could have been a transitional vessel, representing the gradual change from the Southeast Asian lashed-lug tradition to the hybrid South China Sea
tradition. It may have had bulkheads and yet have been fully fastened by dowels and treenails and steered with quarter rudders.

There is another possibility. Perhaps the transverse gaps in the iron concretion blocks were not caused by bulkheads at all. Perhaps they were caused by tiers of lashed thwart beams. Perhaps the Java Sea ship was of traditional lashed-lug construction (Fig. 3).

Lashed-lug boats 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. They are carved rather than bent to shape and incorporate protruding cleats or lugs. Holes are carved out of the lugs so that they may be lashed to more or less flexible ribs and/or thwart beams, thereby holding the planks together. Additional strength and watertightness is achieved by stitching the planks together. Holes are drilled near the edges of the planks for stitches of vegetal fibre. They are usually drilled in pairs and occur within the seam, not being visible from outside the hull.

On first impression a lashed-lug boat seems to be exceedingly flimsy, suitable perhaps for small-scale fishing and river transport. But from archaeological evidence ships of up to 30m were constructed by this technique and Chinese historical sources indicate that some may have been as large as 50m.22 The secret of their success lies in their flexibility. The vegetal bindings, both the plank stitching and the lug and thwart ties, are to some degree elastic. As the vessel flexes with the seas, the bindings stretch but always maintain their tensile properties, thereby keeping the planks in compression and the boat watertight.23 Vessels constructed with nails and bolts, on the other hand, must be rigid and therefore utilize more and bigger timbers. Once such a vessel starts flexing, the fastenings tend to loosen as the holes are enlarged and the compressive forces holding the ship together decrease, resulting in a loss of watertight integrity.

Traditionally, the bark of paperbark trees (Melaleuca leucadendra) has been used as luting between the seams of hull and deck planks on vessels with dowel edge-

![Diagram](image.png)

Fig. 3. Cross-section of a lashed-lug hull. *(Adapted from Manguin [1996], 184)*
joining in Indonesia. It is quite likely that the same material was used on the ancient lashed-lug boats. Strips of bark are laid along the seams, pierced by the dowels, and are cut flush with the hull after the planks have been hammered together.

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 tripod masts and a bowsprit and probably used a canted square-rig or lug sails.

Apart from historical evidence for lashed-lug ships up to 50m in length, there is also archaeological evidence for large lashed-lug vessels. Manguin estimates that one of the lashed-lug vessels found at the Paya Pasir site in Sumatra was in the order of 30m long by comparing plank thickness with other wrecks of known size. One of the wood fragments from the Java Sea Wreck incorporating a dowel hole is from a plank some 7cm thick and the dowel hole is 2.7cm in diameter. The plank thickness for the Java Sea Wreck is only slightly less than that of the Paya Pasir Wreck (up to 7.5cm) so a length of 28m is certainly feasible.

Overall, the lashed-lug construction technique can be viewed as a magnificent piece of engineering. Great compressive forces were achieved in a light structure, utilizing cheap and readily available materials, by rolling with the waves rather than trying to fight them.

THE CARGO

While the main cargo of the wreck is Chinese in origin, there are sufficient non-Chinese items to conclude that the vessel was acting in much the same way as an early twentieth-century tramp steamer. Hundreds of fine-paste-ware kendis and bottles of probable southern Thai origin indicate that a port in peninsular Thailand may have been an intermediate stop on the voyage from China to Java. Ivory and aromatic resin, products of Sumatra, suggest a stop at a port along those shores. There is, of course, a chance that the fine-paste-ware was transshipped at the same port. The presence of bronze figurines and finials of pre-Majapahit style strengthen the argument. These items could also have belonged to Indonesian sailors or passengers on board.

Iron was the primary cargo item, approximately 190 tonnes of it. Rectangular bars were stacked in bundles of four or five, bound with strips of rattan and wrapped in coarsely woven fabric or strips of cane. Trapezoidal bars were bundled in a cone shape and were similarly packaged (Fig. 4). They were stacked end-to-end in the cargo compartments. Iron cauldrons were stacked inside each other, both thwartships and longitudinally. Southeast Asian blacksmiths lacked the technology to cast iron so the local population had to rely on Chinese imports for cast iron woks and cauldrons. The wrought-iron bars were used as stock by local blacksmiths to produce blades and tools. The Chinese product, containing undesirable sulphur, was more brittle than locally produced wrought iron. For such large quantities of low quality wrought iron to be imported there must have been insufficient local product, or the Chinese iron was substantially cheaper, a result achieved by mass production.

Other non-ceramic artifacts make up a very small proportion of the material recovered from the Java Sea Wreck. They include bronze figurines, mirrors and
trays, glass, aromatic resin, sharpening stones, ivory, copper and tin ingots, and scale weights and bars.

The scale weights are particularly interesting. Most are made of copper alloy, often with small inserts of a slightly different alloy in both sides. Others are of quartz or marble, or even composite materials. The 14 weights recovered from the Java Sea Wreck fall into ten Indonesian weight categories. These include 1 kati (760g), 1 tabil (38g) and several combined units such as those frequently mentioned as standard currency gifts in ancient Javanese inscriptions. The weights are definitely Indonesian, if not specifically Javanese.

Two conical bronze artifacts with concentric ring decoration were initially thought to have been small ingots. However, identical pieces were recovered from the tenth-century Intan Wreck, in addition to better-preserved pieces, one of which was found complete with a handle, confirming that the artifacts were in fact Indonesian mirrors.

Copper alloy trays suffered badly from corrosion, although many of the more robust rims survived. During the Majapahit era bronze trays with incised circular decorations were used for bearing offerings in religious ceremonies. Offering trays can also be seen in many of the bas-reliefs on the ninth-century Buddhist temple, Candi Borobudur, in central Java.

Bronze figurines include a cross-legged man forming one leg of a small platform or altar (Fig. 5) and a representation of a princess riding a dolphin-like sea creature, from the folklore of Sri Tanjung, which is described in an ancient Javanese text. There were also two finials that once adorned the wooden staffs of priests, one diamond-shaped and the other in the form of a masquerade mask.

Small hand-held sharpening stones...
and larger stones better suited to bench-top use were well worn, sometimes in several places, indicating that they were part of the ship’s equipment or perhaps belonged to soldiers or sailors assigned to protect the vessel, rather than items of trade.

Sixteen large pieces of elephant tusk still survived, some showing signs of working. Ivory was usually imported into China, being particularly significant in the tributary trade. Another important China import was aromatic resin, primarily for use in Buddhist ritual. This too formed part of the cargo, with blocks up to 41cm in length remaining in good condition. The distinctive fragrance could be rekindled simply by rubbing the surface.

It has been estimated that the ceramic cargo of the Java Sea Wreck comprised at least 100,000 individual pieces. During the 1996 excavation 12,000 intact or nearly intact pieces were recovered. Overall breakage has been estimated at over 80 per cent. The majority of pieces were utilitarian wares, green-glazed bowls and dishes from Fujian kilns, such as those at Anxi, Nanan and Putian. They vary markedly in glaze and quality. The lower quality bowls are mostly without decoration, although some have a cursive combed design on the interior. Many have an unglazed stacking ring carved into the interior centre but none of this variety has any decoration apart from an incised ring on the upper interior. The finer wares are higher fired and almost always decorated with combed and incised clouds or flowers on the interior, taking full advantage of their transparent glaze (Fig. 6).

Another type of ware, with a dark olive-green glaze, represents a southern attempt to replicate so-called northern celadons. They are thought to be from the Tongan kilns in Fujian Province. The shapes are limited to large heavily potted bowls and dishes, and a few smaller bowls which are decorated with carved lotus petals on the exterior and cursive combed clouds on the interior. Medium bowls have carved striations on the exterior and clouds on the interior, while large bowls and dishes have spiralling clouds on the interior and exterior.

Brown-glazed jars were not an item of trade in themselves but rather served as containers for ship’s provisions or organic trade commodities. No ceramic lids were

Fig. 6. Two high quality green-glazed bowls with incised cloud and floral designs. (Pacific Sea Resources)
found for these jars\(^{36}\) so they must have been covered with wooden plugs and sealed with wax or resin.\(^{37}\) The jars were made by the coil technique, probably at the kilns of Quanzhou where in all likelihood the ship set sail. They vary in height from 12 to 37 cm and most have four small lug handles (Fig. 7) but some of the smaller jars are without. Three or four character Chinese chops occur between the handles of several of the larger jars, either trade marks or cyclical dates. Unfortunately the dates have proven difficult to decipher.

While the brown-glazed ware is mostly utilitarian, not all need have been for storing commodities. A number of bottles with bulbous bodies and long straight necks are very similar in shape to later Yuan *qingbai* bottles.\(^{38}\) Several large basins were recovered, one with impressed floral motifs on the interior bottom. There were also a few small bowls, ewers, lids, and a large neck and rim from a jar, with a strap handle and a spout in the form of a ram or boar.

Several hundred covered boxes (Fig. 8) have been moulded, and coated with a *qingbai* glaze, although in many instances it would be better described as white with a slight bluish tinge. Kilns at Dehua and Anxi are known to have produced this
ware, the relatively non-plastic local clays in the region being well suited to the moulding technique. The diameter of the boxes varies from 5 to 11 cm. The smaller variety are invariably round with vertical ribs around the edge, while medium and large boxes can be octagonal or round. The moulded decoration on the lids is usually floral, with unique exceptions being fish, a geometric pattern and a swastika with Chinese characters between each arm. Several medium-sized boxes are shaped as melons. A single small round box base features a hand-moulded sculptural representation of a copulating couple attached to the interior. In many instances there are moulded Chinese characters on the base of the covered boxes. Most are names, while one reads 'seal of the Chen family'. Interestingly, approximately one-third of the boxes recovered had the cover firmly affixed to the base by drips of glaze, proof that they were fired, packed and shipped in this condition. With many of the boxes being octagonal and with slight distortions in the kiln being inevitable, there really was no alternative. It would be impossible to match covers to bases if they were fired separately.

Small vases, popularly referred to as 'Marco Polo vases', were produced at the same kilns as the covered boxes (Fig. 9). They were moulded in four pieces and then luted together, with a trumpet mouth, ribbed body and lotus decoration around the neck and foot.

Limited numbers of high quality wares with a deliberate qingbai glaze, as opposed to that acquired through fortuitous firing, are thought to have been produced at the kilns of Jingdezhen. The most beautiful pieces from the wreck must be the gourd-shaped ewers with lobed bodies, elegant slender spouts and moulded dragon-shaped handles (Fig. 10). There are two varieties, one with a decorative band around the shoulder and the other with moulded floral motifs covering the body. More stately, although equally fine, are panel-
led ewers with long curved spouts, a strap handle and incised floral decoration. Both varieties have a small loop at the uppermost point on the handle for connecting to a lid, although no lids were found. Other pieces from the Jingdezhen kilns include bottles with a dragon in sculptural relief set around the neck, a small gourd-shaped bottle decorated with moulded knobs on the lower body, a small ribbed jar, a moulded box cover, floral lids, a lid topped with a sculptural ram and a variety of very fine moulded dishes.

A small number of black-glazed ‘temmoku’ teabowls are standard in size and shape. The glaze is black with brownish patches, thin at the mouthrim but flowing thickly onto the lower exterior walls. They are thought to have been produced at the Ran kilns of Fujian Province, although perhaps not of the same quality as those usually attributed to this kiln site. Another possibility is the Jizhou kilns of Jiangxi Province.

The most interesting ceramics recovered from the *Java Sea Wreck*, while closely resembling Cizhou ware, are not from that kiln complex as the clay is whiter and harder. While numbers are few and most of those broken, the variety of shapes is impressive. Ewers, conical bowls, rounded bowls, large dishes, lids, vases, bottles, meiping, ambrosia bottles and covered boxes were all recovered. They are characterized by floral decorations painted in dark brown or black pigment but the manner of application is as varied as the range of shapes. Often there is an incised outline with pigment filling in the background. Where there is no incised outline floral sprays are painted directly on a white ground. Some of the ewers have a moulded decoration with pigment filling the recessed background. When recovered from the seabed, many of these pieces were a dull brown with no decoration evident. But after cleaning in dilute acid combined with light scrubbing, the degraded outer layer was removed to reveal the elaborate painted decoration beneath and traces of a lead–green overglaze (Fig. 11). Originally each piece would have been covered in bright green lead glaze, a low temperature glaze that would have been applied after the first stoneware firing, and fused during a second low temperature firing. This unusual ware may have been produced at the Chayang kilns in Nanping County, Fujian Province, or less likely from kilns in Yongchun County.

Finely potted fine-paste ware bears a general resemblance to wares associated with the southern Thai region of Patani. X-ray fluorescence component analysis shows distinct similarities to pottery from Kok Moh in Patani. The discovery of hundreds of these vessels on the wreck clearly demonstrates the importance of fine-paste ware as an intra-Southeast Asian trade commodity, a fact absent

![Fig. 11. A green overglazed bottle with black decoration and a sculptural dragon entwined around the neck, after cleaning.](Pacific Sea Resources)
from any historical records. Kendis make up the majority of this ware, with no two the same (Fig. 12). Many are elaborately flanged, including a distinctive flange near the end of the spout. Some are decorated with striations around the body. One unprecedented shape is that of a toroid kendi, previously known only from Ming dynasty China, where the blue-and-white porcelain version is more suggestive of a teapot. Another unusual variety is the kendi maling, or thieves’ kendi, which is completely enclosed on the top and is filled from a funnel in the base. Apart from kendis there are hookah bases, resembling Middle Eastern vessels used for smoking (water pipes), bulbous bottles, rice pots and tiered lids.

A COMPARABLE FIND: THE BREAKER SHOAL WRECK

In 1991 a shipwreck was excavated on Breaker Shoal, southwest of Palawan in the Philippines. No hull remains were found but many ceramics were recovered, together with a stone anchor stock, lead and iron ingots and traces of iron cauldrons. The similarities between the ceramics from the Breaker Shoal Wreck and those from the Java Sea Wreck are nothing short of remarkable. This is not only with respect to certain types. Almost every type of ware from the Java Sea Wreck was also recovered from the Breaker Shoal Wreck, including the rarer items such as the black-glazed teabowls, fine qingbai moulded dishes, Thai fine-paste-ware kendis and, most importantly, the unusual black decorated ware with a green overglaze.

If the Breaker Shoal ship was bound for the Philippines, this raises an interesting question. In the Philippines ceramics were used to a large extent in funerary practice, where they were buried with the dead. No doubt they also served a utilitarian purpose, but few non-burial sites have been excavated. In Indonesia, particularly Java, ceramics served principally a utilitarian role, augmented by ceremonial usage. If the end use of the ceramics was different, and certainly the cultural context of the two markets was, why were the cargoes nearly identical? Did the Chinese exporters, rather than the Southeast Asian importers, select the types of ceramics to be shipped to Southeast Asia?

But the Breaker Shoal Wreck’s location, to the southwest of Palawan, suggests that the ship was heading south, perhaps down the west coast of Borneo. If Borneo was the final destination, the question could still apply. Ceramics were utilized to a large extent for funerary practice in the various states along that coast. But if the final destination was Sumatra or Java the question is moot.

Unlike the Java Sea Wreck, which was probably Indonesian, the Breaker Shoal
Wreck may have been Chinese. The only evidence to go on is the stone anchor stock. This is described as being a 3m-long column, wide in the middle and tapering towards both ends. It is the same as anchor stocks found at Quangzhou Bay. Two stone anchor stocks were found on the Java Sea site, both being ovoid and relatively thin. A bas-relief on the Bayon of Angkor, Cambodia, clearly depicts an anchor being lowered from a large seagoing vessel of probable Southeast Asian origin. That anchor is probably of wood and has a stone slab stock near the crown. It is thought that the Java Sea anchor was of this type.

The China to Indonesia route is well documented by early Chinese travellers, such as Yi Jing, Fa Xian and Ma Huan. It is largely a coasting route down the coast of Vietnam and the east coast of Malaysia. There is no reference to a route between Palawan and the treacherous Spratly Archipelago. The presence of Thai kendi is the cargo further complicates matters. It is inconceivable that the ship deviated to Thailand to load a few kendi before recrossing the South China Sea. Were they picked up at an entrepot port in Luzon?

Continuing the discussion only raises new questions, all of which are beyond the scope of this paper. But they are all questions that deserve further attention.

CONCLUSIONS

The Java Sea ship was carrying a bulk cargo of iron and ceramics from China to Java. There was at least one port of call en route, probably on the southeast coast of Sumatra. In all likelihood parts of the cargo would have been transshipped at a port in Java, possibly Tuban, for distribution to the vast island network to the east of Java, the islands that supplied the all-important spices that led to Java’s ascendency.

While the cargo was predominantly Chinese, the ship was most likely an Indonesian lashed-lug craft. It was probably returning from a voyage to China, having off-loaded a cargo of spices and forest products. It is a clear indication of the importance of Southeast Asian shipping during the time when the China trade boomed, and yet Chinese oceanic shipping was in its infancy.

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References

2 In ibid, 109.
3 The two sigma probability date range is AD 1215 to 1405, so it can be said with a degree of certainty that the ceramic cargo does not predate the thirteenth century. This is significant as Dupoizat ('The Ceramic Cargo of a Song Dynasty Junk found in the Philippines and its Significance in the China–South East Asia Trade', Southeast Asia and China: Art, Interaction and Commerce (Percival David Foundation of Chinese Art, London, 1995), 205–24) implies that a nearly identical cargo from the Breaker Shoal Wreck dates to the eleventh or twelfth century.
5 Ibid, 23.
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6 Ibid, 23.
7 L. N. Shaffer, Maritime Southeast Asia to 1500, Sources and Studies in World History (New York, 1996), 87.

10 Cross-sections of the wreck mound clearly show that the sterile clay layer in the middle of the site is some 2m higher than the surrounding seabed level. There is no scour trench around the site.
13 Ibid, 47.

14 A length of 20m is estimated for the Ko Si Chang III ship but there is no mention of this being waterline length or length overall. From the plan, the surviving keel is only 14m long, so 20m is more than likely the length overall.
15 S. Juprie, personal communication. Southeast Asian vessels of this period are thought to have been 'double-ended', which makes the multiplying factor of 0.5 appropriate even if the section is full for cargo carrying. The tub-like European ships of the sixteenth century would have a multiplying factor in the order of 0.6 or more.
17 Ibid, 113.
22 Manguin, 'Southeast Asian Shipping in the Indian Ocean', 188.
23 This is a relative statement, 'watertight' meaning the crew were able to keep up with the ingress without the ship being in imminent danger of sinking. Some accounts of stitched Arab boats indicate that they had to be bailed constantly (G. F. Hourani, Arab Seafaring [Princeton University Press, 1995], 95).
24 Burningham and Mellfort, 'The Exceptional Janggolan', 40. Also observed by the author in Sulawesi.
26 By way of interest, the dowel diameter for the Java Sea Wreck (2.7cm) is considerably greater than the Paya Pasir Wreck (1.8cm) making the Java Sea ship that much more sturdy.
27 Chinese cast iron woks and cauldrons have been found on many shipwrecks in the region, including the thirteenth-century Breaker Shoal Wreck (Dupozat, 'The Ceramic Cargo of a Song Dynasty Junk', 207), the twelfth-century Pulau Buaya Wreck (A. Ridho, E. Edwards and E. McKinnon, 'The Pulau Buaya Wreck', The Ceramics Society of Indonesia Monogram Series No. 18 (Jakarta, 1997), 84), a fourteenth-century wreck off Belitung, Indonesia (surveyed by the author), a newly discovered Wanli period Chinese junk off Binh Thuan Province, Vietnam (excavated by the author) and the 1690 Vung Tau Wreck (M. Flecker, 'Excavation of an Oriental Vessel of c. 1690 off Con Dao, Vietnam', International Journal of Nautical Archaeology, vol. 21 no. 3, 221–244 [London, 1992], 234).
28 Forty-three scale weights recovered from the tenth-century Intan Wreck cover 23 Indonesian weight categories, encompassing most of
those of the Java Sea Wreck (Flecker, *Archaeological Excavation of the 10th Century Intan Shipwreck*, 67).

29 J. Wisseman Christie, personal communication.

30 The Chinese weight unit, the liang (37.3g), is very close to the Indonesia tabil, however while the three major Indonesian weight units are represented in the Java Sea and the Intan cargoes, the other primary Chinese units, the ch’ien (3.7g) and the chin (596.8g), are not.


34 While much of the breakage was no doubt due to the substantial migration of pieces away from the original hull, concentrations of highly fragmented material suggest that more recent dynamite fishing played a role. Damage from dynamite fishing is a common occurrence on shipwrecks in Indonesia.


36 Ceramic lids seem to have been used mostly on Thai storage jars of the fifteenth and sixteenth centuries, as evidenced by finds on many wreck sites throughout Southeast Asia.

37 Teak lids with traces of resin on their outer edge were recovered from the Manila galleon *Nuestra Senora de la Concepcion*, which wrecked in 1638 in Saipan (W. M. Mathers et al., *The Archaeological Excavation of the Nuestra Senora de la Concepcion* [Pacific Sea Resources, 1990], 123).

38 Many thousands of bottles and bowls have been recovered from a fourteenth-century shipwreck off Jepara in Java. Also recovered were Dehua kendis and covered boxes, greenware ewers and brownware storage jars. The ceramics were observed by the author in a warehouse in Jakarta but nothing of the site has been recorded.


40 Sealed covered boxes were also recovered from the tenth-century *Intan Wreck* (Flecker, *Archaeological Excavation of the 10th Century Intan Shipwreck*, 106) and from a late eighteenth-century European wreck found by the author off Sulawesi, Indonesia (M. Flecker, *Three 18th Century Shipwrecks off Ujung Pandang, southwest Sulawesi, Indonesia—a Coincidence?*, *International Journal of Nautical Archaeology*, vol. 28 no. 1, 45–59 [London, 1999]).

41 Several hundred black-glazed teabowls were recovered from the *Bai Jiao I Wreck* off Dinghai, Fujian Province (S. Kenderdine, *Bai Jiao I—the Excavation of a Song Dynasty Shipwreck in the Dinghai Area, Fujian Province, China, 1995*, *International Journal of Nautical Archaeology*, vol. 24 no. 4, 247–66 [London, 1995]).

42 Ibid., 262.


44 R. Brown in *ibid.*, 116.

45 Ho Chuimei, personal communication.


47 Examples can be seen in the University of Malaya kendis collection (J. E. Khoo, *Kendi—Pouring Vessels in the University of Malaya Collection* [Oxford University Press, Singapore, 1991], 43).


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