

On-going archaeological researches on shipwrecked junks in the Philippines

Franck Goddio¹, David Fabre¹, Marie-Amande Coignard²

¹Far Eastern Foundation for Nautical Archaeology, Manila

²Archaeological Artefacts Conservator

FEFNA, 125, Suerte Street, Pasay City, 1300 Metro Manila, Philippines

Email: dfabre.ieasm@yahoo.fr, marieamande.coignard@gmail.com

Abstract

The Far Eastern Foundation for Nautical Archaeology (FEFNA) have been working with the National Museum of the Philippines for twenty-eight years. The researches aim at illustrating the maritime history of the Philippines through excavations and studies of shipwrecks lying in their territorial waters. This presentation on junks focuses on a case study, with few conservation points. Some of the junks have been discovered during a systematic research campaign alongside historical trade routes. Some excavations have also been performed at the request of the National Museum. Our knowledge of the “Nanhai trade” is enhanced by the cargoes study: a large panel of Asian production disclosing a dynamic network of cultural influences and commercial exchanges lasting from the 11th to the 16th centuries. Some historical maritime trading roads have been revealed. The Santa Cruz junk, late 15th century, is representative of a transitional time in Nanhai maritime trade. In a way, this ship is a landmark of the last inter-Asian trading phase in the Chinese “Mediterranean” area, before the 16th century “globalization”. In addition, the Santa Cruz hull’s condition enabled completion of the existing documentation and a larger scale reflexion on cargo stowage and shipbuilding process. Specific analyses on construction details and hypothesis on assembly methods result in original data on the evolution of nautical techniques and on reciprocal influence and co-existence of shipbuilding technologies. Hence, the construction study contributes to the renewal of Nanhai maritime transport understanding, as it shows some original characteristic and a perfect appropriateness to inter-Asian maritime trade organization.

Keywords: Chinese Trade, Junk, Naval Architecture, Nanhai Trade, Santa Cruz junk

Introduction

Far Eastern Foundation for Nautical Archaeology undertakes, with the National Museum of the Philippines, archaeological missions in the Philippines since 1985. This work is centred on the search for, and the study of, territorial waters’ shipwrecks. These junks were found either during systematic surveys¹, either while searching for Spanish galleons and East India Company vessels², or found by following up information given by fishermen³. To date these include the *Breaker* (11th century), *Investigator* (13th century), *Lena* (about 1490),

Española and *Santa Cruz* (both from the end of 15th century), *San Isidro* (about 1510), and *Royal Captain Shoal* (1573-1619)⁴.

Development of Chinese commerce

The cargoes of these merchant ships offer an overview of Asian products and trade routes with their development over more than six centuries, not only in Southeast Asia – the “Nanhai trade” –, but also in the Indian Ocean, and the Middle East. About Far East trade we knew, until recently, only the final and European phase, which began with the arrival of the Portuguese in Asia in the 16th century. The study of the shipwrecked junks in the Philippines contributes to the understanding of exchanges and the wider political and economical circumstances that led to the development of trade in the China seas and beyond, from the 11th century, when China established important and constant commercial links with the archipelago, up to the 15th century. Factors included improved navigational techniques, the apparition of a mercantile class, the reform of taxation, the unification of coinage, the development of new routes, the use of the monsoon system, the fight against piracy, the reforestation for shipbuilding, the expeditions of Zheng He, etc. Furthermore, the richness and variety of junk cargoes from the 15th century belies the restrictions on maritime trade implemented by the Ming Dynasty. Either the decrees prohibiting maritime trade caused an explosion in the price of South-East Asian products and thus created an incentive for smuggling, which is difficult to prove archaeologically, or there was considerable movement of goods to and from China within the category of official tribute⁵.

It is also at this time that exchanges between China and the Philippines experienced a considerable expansion, formalised through tributary relations and the sending of ambassadors. Successful trading operations between the two countries meant that many Chinese settled there, especially at the end of the fifteenth century and the sixteenth century. In the *Mingshi*⁶ the Philippines are the subject of the following comments: “*Luzon (...). Because of the fertility of the island, thousands of merchants from Zhanzhou went there. Many settled there... A large number of vessels visited Mindoro which became prosperous. The Chinese who traded with the island were treated with fairness and respect*”.

In the beginning of the sixteenth century, the arrival of Europeans would increase the volume of trade off the southern Chinese coast. The Spanish settled in the Philippines and massively imported, in 'Manila galleons', coins minted with silver mined in Mexico and Peru. To absorb this silver, the Chinese developed a very active trade with the Philippines, reaching as far as the Sultanate of Jolo.

Navigation to the Philippines

The Sulu Sea, south of the Philippine archipelago, between Mindanao, Borneo and the Moluccas, was an area of passage and exchange, certainly from the Tang period on (618-907). According to Chinese written sources, one of the main routes to reach Borneo, a junction of major shipping routes (Manguin, 2001: 8), utilised the interior sea of the archipelago and thus provided opportunities for interaction with the local populations. The *Shung Feng Hsiang Sung*⁷ states that starting from the southern ports, navigators could choose from two routes: the western coastal route, along the coast of China until the Malay Peninsula and then into the Indian Ocean, or the maritime route to the east, across the South China Sea to the islands of Luzon and Mindoro, then continuing along the east coast of Palawan to reach either Balambagan, Borneo and Java, or the Celebes or Maluku. Before the end of the seventeenth century written sources do not mention a route along

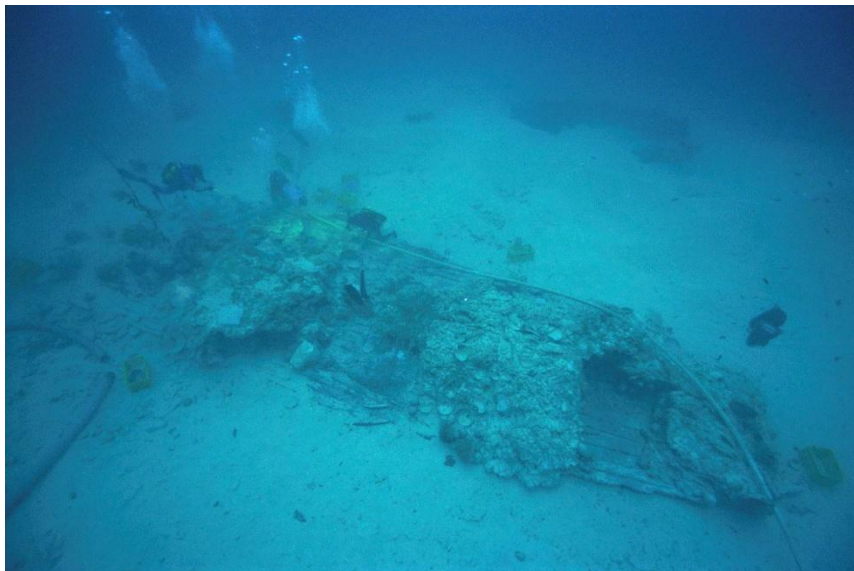


Fig. 1 View of the junk Lena during excavations. (© Christoph Gerigk and Franck Goddio/FEFNA).

the west coast of Palawan. But it is precisely in this "Palawan Passage" that the junks *Breaker*, *Investigator*, *Lena*, and *Royal Captain* shoal were found, providing evidence of a "Nanhai Trade" route along the west coast of the island (Goddio et al., 1987; Goddio et al., 2002).

Merchandise and cargoes

The *Chu-fan-chi*, written by Zhao Rugua, inspector of trade in Fujian Province in the early thirteenth century (Southern Song), describes the lands visited by Chinese merchants and also gives valuable information on the products traded⁸. Silks and ceramics were the main goods sold or bartered in exchange for spices, fragrant products and medicines. Luxury goods were very present: fine beads, precious stones, ivory, precious woods, etc. The Chinese reports from the fifteenth and sixteenth centuries, which describe tributes sent from the Philippines to the Ming court, list substantially identical products. The excavations of the junks offer unique insight of this international Asiatic trade, and most especially an overview of Chinese ceramic production for export (Goddio, et al., 1987: 22-73; Goddio et al., 2002; Dizon and Orillaneda 2002; Orillaneda, 2008).



Under the Song Dynasty (960-1276), the production of ceramics is clearly motivated by intellectual and aesthetic concerns (*Breaker*). The conquest of China by the Mongols in the thirteenth century, and then the “Tartar peace”, favoured the reopening of the great trade routes by land and sea. The ports of southern China, such as Guangzhou, Quanzhou or Whenzhou, exported Qinghai and shufu porcelain, as well as celadon and

stoneware (*Investigator*). In return, the Chinese probably imported, amongst other goods, a form of prepared cobalt from the region of Kashan in Persia, which, in the workshops in Jingdezhen, produced large quantities of “blue and white”, in many forms and styles, in the late fourteenth and fifteenth centuries (*Lena, Española, Santa Cruz*).

The cargo of the junk *Lena* (Figs. 1-2) is dominated by Chinese porcelain from the last decade of the fifteenth century (the reign of Emperor Hongzhi), mainly decorated in underglaze cobalt blue, some white monochrome pieces sometimes incised with floral motifs, a dish exceptionally richly decorated with enamel overglaze, and some fragments of *fahua* porcelain and stoneware with “celadon” glaze. Much of this material is similar to that in the collections of the Topkapi Saray in Istanbul and the sanctuary of Ardebil in Iran. Beyond the typological study of the ceramics, there is the question of the destination of the *Lena*. The large “blue and white” and celadon dishes, from the workshops of potters in Jingdezhen and Longqan are generally considered to be export ceramics for the Middle-eastern market. The jugs, bottles, large boxes, and the writing cases could confirm this hypothesis. However, the numerous Thai celadon, the large brown glazed jars, and some porcelain never noticed in the Near and Middle East, together with woks, basins and bronze bracelets suggest that an Asian destination is most probable. Moreover, since Islam, already installed in the Indonesian archipelago, had entered the Pacific Islands at the end of the 15th century, it is conceivable that the *Lena* was sailing towards one of the sultanates in the region⁹. In the beginning of the sixteenth century two types of porcelain predominate. The first keeps the classic designs but the composition tightens and often becomes overloaded, the blue has a grey tone, and the glaze is clouded (*San Isidro*). The second category, made for a Muslim clientele is decorated with Arabic and Persian characters. These are small pieces designed for the use of a scholar. In the last quarter of the sixteenth century, quality deteriorates – the clay is less fine, the drawing crude, the blue is less intense – like the china in the *Royal Captain shoal*, certainly intended for markets in South East Asia.

As evidenced from both texts and archaeology, beads formed a traditional part of the “Nanhai trade”. The *Lena* and the *Santa Cruz* transported many thousands of beads of different sizes, shapes and colours, fired in the Tao Maenam Noi kilns and packaged in small ovoid jars from Sawankhalok (Goddio et al., 2002). Several hundred have been

uncovered during excavations of the *Royal Captain shoal* (Goddio et al., 1987: 74-75). While the typology of these beads is not sufficient to identify their place of production, chemical analysis indicates a significant proportion of lead and barium, which could suggest a Chinese origin¹⁰. Ethnological studies conducted since the late nineteenth century, particularly in Borneo and the Philippines, have recorded that the beads, used for a long time and in large quantities, were often from China¹¹.



Fig. 3 Ceramics stacked in the hold compartments in the junk Santa Cruz. (© Christoph Gerigk and Franck Goddio/FEFNA)

The metal objects allow us to see the regularity of this trade over the centuries (Goddio et al., 1987: 76-81; Goddio et al., 2002: 235-248). All the junks, from the eleventh to the sixteenth centuries, carried cast iron ingots and pans. Wrought iron needles were

also found in a small porcelain “blue and white” vase carried

on the *Lena*. Needles were traditionally exported by China, as still recorded at the end of the sixteenth century by the governor of Manila, Antonio de Morga. In addition, more than 180 tin ingots were distributed within the junk. The production of this metal was located east of Sumatra, on the island of Banca, on the Malay Peninsula and adjacent islands. Textual sources indicate that the tin was imported at Calamian Islands, Busuanga and the Palawan region. Among the recurring finds are bronze gongs, were sold throughout South East Asia by the Chinese (Wang Ta-Yuan, *Tao-i Chih-Lioh*, 1350). Some thirty years after the sinking of the junks *Lena* and *Santa Cruz*, Pigafetta, who accompanied Magellan during his visit to the Sultan of the island of Cebu, Homahon, reported several Chinese bronze gongs of Chinese origin¹².

The quantity of ivory loaded on the *Lena* has been estimated at a minimum of eighty tusks of various sizes and weights (Goddio et al., 2002: 249). Written sources provide details about the trade in this product from the Malay Peninsula, Sumatra, Java and Coromandel.

During the Song Dynasty, its importation was heavily taxed, and it had to be made available to the official market and could only be purchased by licensed traders. The cargo of the *Lena* also contained combs and precious lacquer boxes.

Cargo stowage and organization

The remains of the junks evidences contribute to determine stowage techniques and cargo organization (Figs. 3-4). The *Lena* shows us that ceramics, selected by shape and not by decoration, were stacked in the hold compartments. No trace of protective cases has been found; only residual bark and rice straw used as packing materials. The *Santa Cruz* had sub-compartments formed by a small bamboo fence, held by poles, wooden hurdles and bamboo links (Goddio and Fabre, forthcoming). One characteristic of the cargo of the wreck of the *Lena* is the accumulation of small globular jars with the green glaze of Sawankhalok from the kilns of Satchanaloi. In one compartment of the ship, 297 of them remained stacked against each other. It is to be noted that the porcelain was not packed in jars (Goddio et al., 2002: 1-41). Jars of glazed clay, which the Chinese were the first to be able to make, were however the appropriate packaging for the transport of fragile goods. From the eighth to the sixteenth century, Chinese ceramics exported overseas were nested inside each other and then stacked in jars. In the estuary of the Pearl River fishermen have recovered Tang Dynasty (617-907) jars, used to package bowls and pots. Excavation of the junk *Breaker* correlates the data from Pingshou Ketan on



merchant ships loading during the Sung (960-1279). *Fig. 4 Stowage of the cargo in the junk Santa Cruz. (© Christoph Gerigk and Franck Goddio / FEFNA)*

Naval Architecture

Analysis of the junks discovered in the Philippines began to fill the gaps left by standard documentation. The junk *Lena* display a hull bottom 18 meters long and 5 meters wide – overall length being estimated at 24 m, that of a medium-sized vessel (Goddio et al., 2002: 1-41). Unfortunately, a thick layer of concretion, product of iron ingots shipment now welded to the remains,

complicated the study. The hull, 23 strakes of which are preserved, is double, confirming Marco Polo's observation that Chinese junks had “a hull with a double skin formed by two superposed planks throughout the length of the ship, carefully caulked with tow on both sides

and held together with good iron nails”. The ship has a hull with



Fig. 5 Prow of the junk *Santa Cruz*. (© Christoph Gerigk and Franck Goddio/FEFNA)

planks, made of *Shorea* sp., which are fully assembled from the freeboard, using small cylindrical tenons of *Palaquium* sp., spaced at eleven to twelve centimetres. The planks are fitted edge to edge and cut so that they fit into each other. To form the strake, the planks are joined with “Jupiter scarfs”. The absence of ribs is not surprising; texts and archaeological excavations show a subdivision of the hold with perpendicular bulkheads constituting the transverse frame of the boat.

Discovered off the west coast of Luzon, the merchant junk *Santa Cruz*, also from the Ming Dynasty, late fifteenth century, has a hull 80% preserved under the waterline (Fig. 5). This rare state of preservation is partly due to sand burial and partly to wood species used for the construction and known to be chemically and physically water resistant, as the long lasting *Vitex* sp., *Verbenaceae*, the shipworms-proof *Mimusops* sp., *Sapotaceae* or the rot-proof *Afzelia* sp., *Caesalpiniaceae*. Teakwood also contributed, since its oleoresin is abrasion-resistant and helped preventing corrosion of the nails. With three masts and a compartmented hold acting as frame, decked and supporting a castle, its length is about

25 m with a 5.8 m width. A detailed study of the construction techniques has been made (Fig. 6) (Goddio and Fabre, forthcoming).

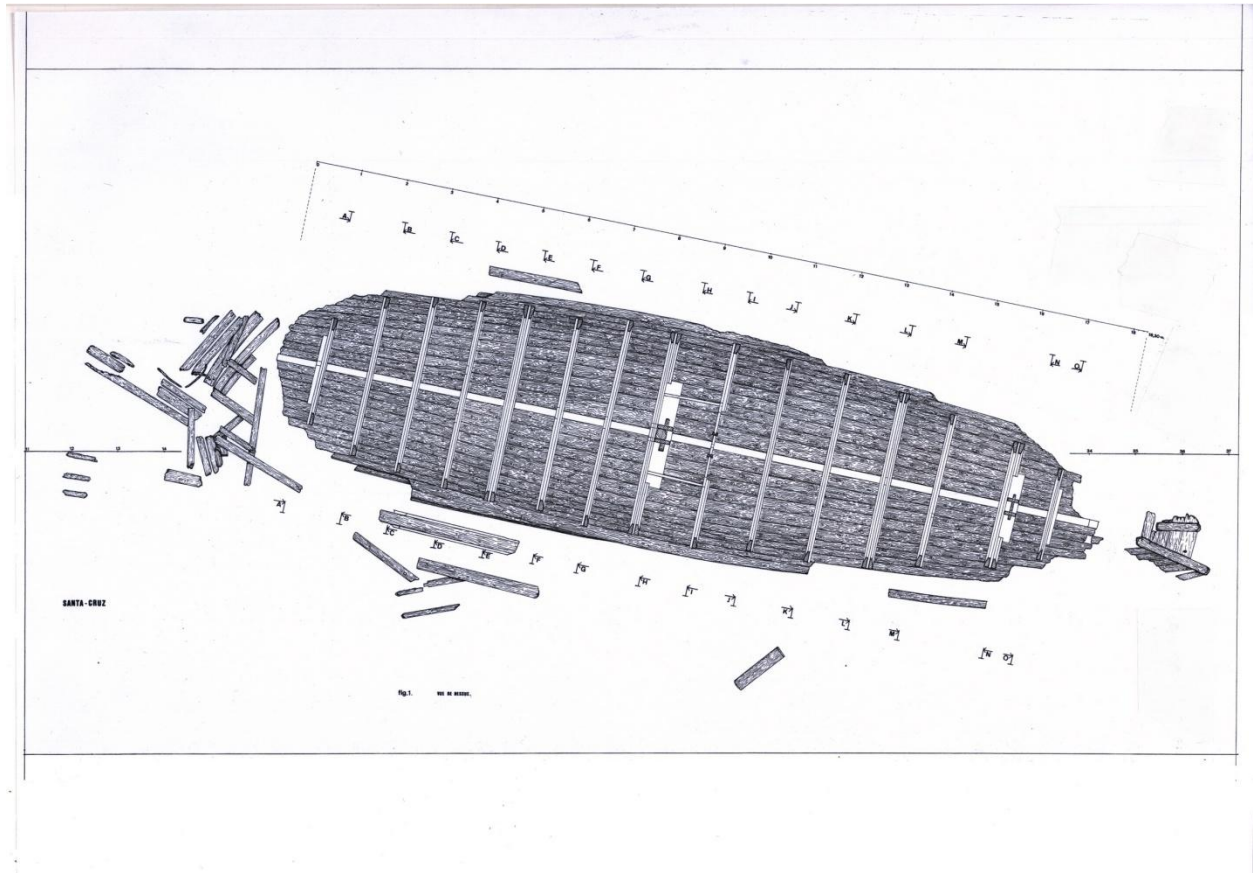


Fig. 6 Plan of the junk Santa Cruz. Transverse bulkheads with compartmented hold serving as frame. (© Patrice Sandrin and Franck Goddio/FEFNA)

Discussion

The case of the *Santa Cruz*

In considering the details of construction and their assumed assembly methods, points of analysis related to the evolution of naval technology appear, as the contamination of one technique by another, the coexistence of different processes of construction, etc. Thus, the Santa Cruz architectural study opens up the question of the nature of shipping in the China Sea before Portuguese and Spanish galleons arrival, showing the originality of certain techniques, and an efficiency and technology perfectly adapted to intra-Asian maritime trade organization.

Vessel architecture, date and nature of unearthed material as well as shipwreck location (west of the island of Luzon), make it highly to be a “Chinese” wreck – in the broadest sense of the term, namely travelling to or from China. Certainly built outside of China – most likely in the Philippines – it was loaded with an eclectic cargo of goods from all the major production centres of the Celestial Empire, collected in the harbour warehouses of southern China, but also Siam, Vietnam and elsewhere, before travelling to their final markets. The junk was as “Chinese” as the ships in the western Mediterranean from the imperial era were “Roman”.

The junk was also “Chinese” in its construction, with a hull shaped as a piece of split bamboo, transverse bulkheads with a compartmented hold serving as frame, hull planks joined with iron nails but also, following the traditional hybrid Southern China Sea style, with the keel playing an essential structural role, and using timber of tropical origin. All the wood species used in the construction of the *Santa Cruz* are found in the Philippine archipelago and most of the islands in the South China Sea, but not in China. The merchants who had chartered it therefore could not belong to the provinces of Fujian and Guangdong, sailing on ships built in China. The essentially “Chinese” architecture seems to rule out the possibility that it was chartered by the peoples of South East Asia, very active on the eastern route between Melaka and Manila Bay (Reid, 1996: 34-35), but who sailed on craft built with local traditional techniques (Manguin, 2001).

Ultimately, given the assumed departure port of the ship, wrecked off the coast of Luzon, and the fact that its ceramics all date from a period when the prohibition to build ships and trade abroad was strictly applied by the Ming, it is highly unlikely that the ship and its charterers were of continental origin. It is much more likely that they belonged to a Chinese community located in the commercial towns of the archipelago. Certainly made in collaboration with local shipbuilders, the junk benefited from their particular expertise. Its construction is consistent with a “tendency to crossing, identified in shipbuilding technology evolution, with a new type of ship in archaeological sites from between the fourteenth and sixteenth centuries, probably coinciding with the increasing role played by Chinese trade and ‘merchant adventurers’ in Southeast Asia” (Manguin, 2001: 15).

The *Santa Cruz* marks out the final phase of the intra-Asian trade in the late fifteenth century Chinese “Mediterranean”, before the sixteenth century “globalization”, when a new

global geography emerges from expanding traffic and desires for domination. While this future changes did not effect the Santa Cruz, it is poignant to note that it was wrecked a few miles northwest of Manila, the future Spanish colony that would be installed on the already well established maritime trade route. Is it possible that Manila (Luzon), on the eastern “Nanhai Trade” route played the same role as Maleka, on the western route? Before the Spanish conquest, Maleka took advantage of the Chinese emperor's closure of the seas. Located on a key point of Chinese Eastern trade route, the city was well placed to assert itself as an unavoidable stop for the tributary exchanges between Asia South-East and China, and as a regional depot for goods travelling to or from the Empire¹³. Like the Portuguese in Maleka in 1511, the Spaniards were not mistaking in settling down in Manila in 1571 in order to become the preferred trading partner of China. It was there, even before the lifting of the Ming ban in 1567, that Fujian merchants, deprived of their main source of income, foreign trade, rushed to build junks capable of transporting goods from both China and South East Asia.

Conservation

While hulls remain in situ, excavated artefacts are conserved in land. If some have been sent overseas for treatment, most of them have been treated in Manila, in partnership with the National Museum. Experts have been called sporadically for interventions, but all the long-term tasks, as desalinisation process, are in charged of local staff, with good maintenance and very good results. It is noticeable that standard European treatments for metals protection have to be reinforced to fit with the Philippines very high relative humidity, while ceramics will benefit of a low risk of salt crystallisation due to the same factor.

In-situ preservation is facilitated by usually calm deep water and sand burial but cyclones and pillars are a threat (i.e. pillars damaged the *Lena* site before excavation and stole the metal foils maintaining reburial sand on the *Santa Cruz* site). The *Lena* hull was reburied under 150 centimetres of sand, from the site itself, with no system to maintain the sand in position. Last checking on the *Santa Cruz* site shows that the sand was still in position despite the lack of holding devices.

Given the complexity, the cost and the constraints of waterlogged ship conservation, there are no current plans to unbury and treat the hulls. Even with recent developments

in waterlogged wood conservation, raising a ship should not become a standard operation unless it's under direct destruction threat. Iron-saturated wood of the *Lena* would still be a nightmare to conserve. Researches may eventually solve problems due to iron sulphates, consolidation products, and sensibility to relative humidity. Currently, we better stand with in-situ conservation and scientific data compilation.

Endnotes

¹Geophysical surveys notably led to the discovery of junk *San Isidro*. Goddio et al., 1997.

²As for the *Royal Captain shoal* (Goddio et al., 1987).

³As for the junks *Breaker*, *Lena* and *Santa Cruz* (Goddio et al. 1997; Goddio et al. 2002; Goddio and Fabre, forthcoming).

⁴Named after the site of their discovery.

⁵Official "tribute" trade did not prohibit trade market exchange. Lam, in Goddio et al, 2002: 50. In particular, in the early fifteenth century, the Muslim city-states that developed in Southeast Asia became prosperous thanks to embassies sent to China which wove strong economic ties with the continental power, i.e.: Brunei. Karim Osman, 2001: 21-22.

⁶The official history of the Ming dynasty. Quotes from Lam, in Goddio et al, 2002: 52.

⁷An anonymous compilation written in 1430, with additions in 1571, the *Shun Feng Hsiang Sung* is one of the most important sources for sea routes followed between South China and the Indonesian archipelago, the Malabar Coast, Yemen, the Red Sea, the Sunda Islands or the Sulu Sea. *Shun Feng Sung Hsiang*, Laud MS, Or 145, Bodleian Library, Oxford. Needham, 1971: 581; Mills, 1979.

⁸Hirth and Rockhill, 1911

⁹In the fifteenth century, relations between China and Brunei developed considerably. At the end of the fifteenth century and the beginning of the sixteenth century, Brunei experienced a golden age and became the hub of the region, collecting at its port most of the forest products of western Borneo, as well as those of the neighbouring Muslim communities of Sulu and Mindanao. Karim Osman, 2001: 20; Manguin, 2001: 9-10.

¹⁰Spectrographic analysis has also shown the role of metal oxides in the colouration of the beads. However one should be cautious as bacterial reduction following the shipwreck might have changed the colour of the beads by reducing the metal oxides in the paste.

¹¹We know the extremely important role that the beads played and continue to play in the lives of indigenous people of Borneo. The Philippines also imported glass beads, just as they did porcelain, gold, lead and iron needles (Rugua Zhao Chu-fan-chi, 40 trad. Hirth & Rockhill, 1911). The distribution of these beads has been identified in the archaeological sites along the western side of Luzon and the south-western fringe of the Philippines.

¹²Pigafetta, *Voyage autour du monde*, Ms. Fr. 24224 B.N. Paris. Musical or ritual instrument, and a sign of opulence, gongs were also used on boats to sound the hour and to announce the arrival of a trading junk to the local population. Among the metal objects discovered not directly related to trade were the guns found on the *Lena*, of great significance for the study of the armament carried by Asian ships and its technology, especially before the arrival of Europeans (Goddio et al., 2002: 237-241). Three staff guns were found during the excavations of the *Santa Cruz* (Goddio and Fabre, forthcoming).

¹³Not to mention Brunei and Banten on in the South China Sea which played an important role in international trade, being termini for navigation in the South China Sea.

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Biography

Franck Goddio is the founder and president of the Far Eastern Foundation for Nautical Archaeology (FEFNA), Manila, of the Institut Européen d'Archéologie Sous-Marine (IEASM), Paris, and co-founder of the Oxford Center for Maritime Archaeology. Under his direction the FEFNA excavated wrecks in the Philippines in collaboration with the National Museum of the Philippines : trading junks and native boats dating from the 11th to the 16th century, Spanish galleons – the San Diego (1600) and the San José (1794) –, vessels of the British East India Company – the Griffin (1761) and the Royal Captain (1773).

David Fabre is Doctor in Archaeology, he graduated from Montpellier University in 2003 and has participated to numerous archaeological excavations in France and elsewhere the world, specifically in Egypt which he concentrated on maritime trade shipwrecks. In 2004, he joined European Institute of Underwater Archaeology (IEASM), directed by Franck Goddio. He coordinate the publication of the junk Santa Cruz – discovered in the Philippines by The Far Eastern Foundation for Nautical Archaeology (FEFNA, Manila) in collaboration with the National Museum of the Philippines.

Marie-Amande Coignard is graduated from Sorbonne University Master degree in archaeological artefacts conservation. After holding internships in France, Greece and Western Australia, she worked mainly on underwater archaeological heritage, in France (Arles, Roman boat excavation and conservation; Marseille, museum artefacts and Roman boats conservation), in Egypt (Alexandria, underwater excavation artefacts), and in the Philippines (Manilla, mainly Santa Cruz junk artefacts). After a winter-over in Antarctica, working on historical frozen heritage, Marie-Amande is currently conserving another antique shipwreck at ARC-Nuclear conservation centre.