

The Archaeobotanical Analysis of Flora Samples from the Phanom Surin Shipwreck, Central Thailand

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ABSTRACT

The topic of this abstract fits best within this Session 7 Trade goods in shipwrecks – sources, routes and markets, including glass on the Maritime Silk Road because this paper is about the analysis of the archaeological evidences, especially the flora remains from the Phanom Surin shipwreck site, Lower Central of Thailand. The 2013-2015 and 2021 excavations at Phanom Surin Shipwreck at Phanthainorasing Sub-district in Samut Sakhon Province revealed a number of archaeological finds in the Arab-style ship dating back to 9th century CE. The organic matters were dominantly counted. This paper aims to give an interpretation on flora found in the ship by archaeobotanical classification and identification methods. Some specimens of flora artefacts, woods, ropes, and seeds were sent to a laboratory for doing scientific tests. The plant seeds were found in the stern. The analysis suggests that at most commons are betel nuts and lucky bean seeds which were trade items. Rare items include rice grains, coriander, calabash (bottle gourd) and jujube. Some seeds are not clear to be identified. The macrobotanical remains were likely consumed by ship's crews; i.e. nourishment, medicine, ship repairing and sailing. Some species have been known to the Arab manuscripts dating back to 9th century CE. The analyses provide further information of tools made of domestic plants that were applied for ship building, sailing, and using on board that facilitate seafarers' way of life during their journey across the ocean. The significant finds show the relationship between the locals and the overseas seafarers.

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Figure 1. Location of the shipwreck site in Samut Sakhon Province, Thailand.

INTRODUCTION

In 2013, the discovery of a shipwreck site in the muddy shrimp pond at Phanthai Norasing sub-district in Samut Sakhon Province, Lower Central Thailand revealed the buried ship and associated finds in situ. The 2013 - 2015 and 2021 excavations at Phanom Surin Shipwreck at Phanthainorasing Sub-district in Samut Sakhon Province revealed a lot of archaeological finds in the Arab-style ship dating back to 9th century CE. The organic matters were dominantly counted. This paper discusses the result of the study of botanical artefacts from excavation of the wetland shipwreck site, which includes scientific analysis of the following topics: (i) location and excavation projects of the shipwreck site, (ii) classification and identification of flora objects found from the site and (iii) interpretation of the origin and usability of flora samples.

Background

In September 2013, the 1st Regional Office of Fine Arts Department at Ratchaburi was informed about the discovery of an ancient shipwreck. Officials in charge were sent for site investigation. After the initial investigation, the shipwreck was found to be lying in the shrimp pond of Mr. Surin and Mrs. Phanom Sri Ngamdee where it had been discovered during rehabilitation of the pond. A huge square timber was discovered sitting in N-S orientation, having one end under the thick ground. Seams of fibre rope lashings on the fragments of recovered planks were still visible. There was also an assemblage of ceramic sherds that were recovered.

The definition of “Archaeobotany”

Archaeobotany is the study of ancient plant remains. By studying archaeobotanical remains we can find out how people used plants in the past: for food, fuel, medicine, symbolic or ritual purposes, or for building and crafts. We can also use plant remains to reconstruct past vegetation and the ways humans interacted with their environment.

Location and excavation projects

The location of the shipwreck site is in Phanthai Norasing sub-district in Samut Sakhon Province, Lower Central Thailand. The geographical feature of this area is the coastal plain, with the site located only 8 kilometres from the Gulf of Thailand to the south. The discovery of a shipwreck site in the muddy shrimp pond revealed the buried ship and associated finds in situ. Archaeologists of Fine Arts Department conducted excavation and conservation at the wetland site between 2013 - 2015 and 2021. The excavation was conducted in 2 periods: First period was between December 2013 - June 2014 and February – July 2015 to mark the scope of site and study of ship construction and associated artefacts. The second period was excavated in January – September 2021 that uncovered the entire ship structure and numerous archaeological finds.



Figure 1. Location of the shipwreck site in Samut Sakhon Province, Thailand.

The ship structures have an approximate length of 25 metres and width of 8 metres. Upon closer inspection, the south end is presumably the bow of the ship. The hull on the west side was still standing upright. Some planks have fallen down as the sewn fastenings were too decayed to support the structures.

On the port side, the ship hull obviously collapsed and flat down to the east. The planks are made from hardwood with holes drilled along the edges and assembled with black fibre ropes. 'Wadding' was lashed along the ship length to seal space between planks. This shipwreck appears to have double wadding.

The keelson is one of the main structures of the shipwreck. It was found in the middle of the ship, having features of a square timber measured length of 17.65 metres. On the larger end, the cross section is 70 cm wide and 60 cm thick. The other end of the shipwreck is not visible. The assumption can be that it was severely damaged causing the artefacts to spread far out from where the ship end should be found. There were two poles found at the site so far. One was found outside of the western side of the shipwreck. Its total length was 17.37 metres with a circumference of 53 cm on the small end and 101 cm on the other. On the small end, there is a groove. It is possible for a sheave fitting. The second spar was found perpendicular to the shipwreck on the eastern side. At the large end, it was cut off semicircular making one side flat with the other side still round. Rattan ropes were found associated with this spar as well. Considering the size, the second one is a bit bigger than the first spar and has a length of 17.40 metres. The end of the second spar was also found with a square tenon of 17 x 53 centimeters. It might be a joining part with another spar. From a comparative study, the ship assembled in such was commonly known among ancient Arab shipbuilding techniques.

According to Area 1, the work was extended from where the ship structure was first exposed. The excavation of the shipwreck unearths the skeleton of an ancient shipwreck that will slowly and subsequently reveal its characteristics and construction techniques of sewn-plank methods used for shipbuilding.

Area 2, this area was extended to the north of Area 1, separated by the earthen dike of approximately two metres width in the middle. The result of excavation shows fragments of ship structure such as frames, planks, and artefacts such as ceramic sherds, fibre ropes, rattan ropes, betel nuts, and plenty of cut wood and set forth, were spread out all over the area.

The excavation in 2021 was undertaken by using the non-intrusive archaeological excavation technique in both areas. Most importantly, this non-intrusive method was adopted to prevent stepping on the objects and a number of small artefacts were found using this technique. Moreover, the new technologies were also applied for more efficient and effective results such as Geo-Information System (GIS), 3D scanning, total station and photos by drone.

CLASSIFICATION AND IDENTIFICATION OF FLORA OBJECTS

There are diverse kinds of organic materials discovered at the Phnom-Surin Shipwreck that are classified based on their physical characteristics. These categorizations include coconut shells with holes, basketry, black ropes, rattan-braided ropes, and various sizes of brown ropes. Some specimens, such as woods, ropes, and seeds, were sent to a laboratory for further scientific tests. The scientific study was operated at Synchrotron Research Institute, Nakhon Ratchasima Province by Dr. Paul Joseph Grote and Dr. Wipanu Rakmai, researchers from Northeastern Research Institute of Petrified Wood and Mineral Resources. To avoid destroying some samples, the macro and micro organic remains were identified by Scanning Electron Microscope (SEM) and X-ray microtomography technique.

1. Timbers

Northeast of Area 2 was found with a distribution of timbers, crudely worked, with average length of 133-150 cm and diameter of 1-5 cm. It was found that some timbers were assembled together with ropes. During excavation, the timbers were intact but rapidly decayed after being exposed. Area 1 also has rounded timbers but all are damaged.

Moreover, many wood samples were found. Some wood utensils were modified from coconut shell, and bamboo. For example, the bamboo pole that is used for carrying heavy things on both sides. A ladle that was made from a half coconut shell was attached to a bamboo handle.

2. Basketry

There are many baskets found from the site, most of them seem to be made from bamboo strips.

3. Cordages

There are three kinds of rope found in this site as follows.

- The first is Black rope, it was being used for ship's structure assemblage, and for handling pottery. The diameter ranges from 0.1-0.2 cm. SEM technique demonstrated the result of the black rope that it was made from the *Arenga Pinnata* fiber (sugar palm tree). *Arenga pinnata* is an economically important feather palm native to tropical Asia, from eastern India east to Malaysia, Indonesia, and the Philippines in the east. Common names include sugar palm, black sugar palm, and kaong palm, among other names. The dark fibrous bark is manufactured into cordage, brushes, brooms, thatch roofing, or filters.
- Besides, brown ropes were also found, they have larger diameter. The construction of the rope indicated a Z twist, consisting of small strands. These brown ropes can be used

d for rigging as it was found coiled. The scientific analysis indicated that the Brown rope was made from palm or coconut fiber.

- Rattan braided ropes were set on board perhaps for navigational function. There are 20 – 26 rattan strands twined together to make a circular pattern that increases the durability. Rattan strands were made from Rattan or calamus rotang, also known as common rattan, is a plant species native to India, Sri Lanka, and Myanmar. The important feature of calamus is it being cohesive and waterproof.

4. Seeds

From the number of seeds or fruits. There are more than 20 types of seed found from the excavation and floatation technique – as to whether they were loaded as cargo or for other purposes.

The most common seed found in this shipwreck is Betel nuts, *Areca catechu*. Measuring from the complete pieces shows an average size of 2-3 cm diameter in circular or oval shape. They can be found all over the shipwreck. Interestingly, a number of them were found in one of the Chinese jars in its original place at the time the ship was wrecked. Betel nuts contain a large quantity of tannin and are used for dying fabric like fishing nets. Tannin extracted from betel nuts makes fabric softer and stronger, helping to extend the lifetime of the fibre and used as an adhesive in woodwork. The areca nut is also popular for chewing throughout some Asian countries. Areca palms are grown in Bangladesh, India, Indonesia, Malaysia, Taiwan and many other Asian countries for their seeds.

Another seed that is also found a lot is Lucky Bean seed or *Putranjiva roxburghii* Wall. The seeds are oval in shape pointed on both ends, their size is 1-1.5 cm diameter in common. The hard shell colours range from dark yellow to dark brown. Lucky Bean is commonly found in tropical regions. It is a most popular medicinal plant which is referred in Ayurvedic texts as an antirheumatic, this plant contains many active phytochemicals in seeds which shows its protectant capacity against various diseases.

The non-intrusive archaeological excavation technique in 2021 has revealed the large amounts of small grains that found from the floatation technique. Coriander fruits (*Coriandrum sativum*) is the dry seeds that used as a spice and herb. Most of them are in globular form, have a diameter of 3-5 mm. Coriander also called cilantro or Chinese parsley. Native to the Mediterranean and Middle East regions, the plant is widely cultivated in many places worldwide for its culinary uses. All parts of this plant are edible, the fresh leaves and the dried seeds are the parts most traditionally used in cooking.

Seeds of Wild jujube (*Ziziphus oenoplia* Rhamnaceae) were also found. Wild jujube is a flowering plant with a broad distribution through tropical and subtropical Asia and Australia. The plant produces ziziphines and has a long history of use as an herbal medicine. In India the root is used in Ayurvedic medicine.

A few seeds was considered to be the Bottle gourd (*Lagenaria siceraria*), also called white-flowered gourd or calabash gourd, running or climbing vine of the gourd family (Cucurbitaceae), native to tropical Africa but cultivated in warm climates around the world for its ornamental and useful hard-shelled fruits. It was one of the world's first cultivated plants grown not primarily for food, but for use as containers.

Rice grains were found resembling the stains on the interior walls of torpedo jars. The analysis from their appearance was assumed to be *Oryza sativa*. Rice is the main food of Asian people, the archaeological evidence shows that the early rice cultivation came from China dating to 5000 BCE. Rice is also the main food of the crew of Phanom-Surin shipwreck.

5. Bitumen

The interior of the torpedo jar is coated with a black substance. Presumably, this can be evidence of a coating technique for waterproof function or of the substance that was once contained in the jar. Besides a black stain, also found is a dark brown substance. The scientific analysis determined that black substance is bitumen from the Middle East (Iraq or Iran).

INTERPRETATION

Archaeological finds discovered in this shipwreck are varied. There are countless archaeobotanical remains found in the shipwreck. Some specimens of flora artefacts, woods, ropes, and seeds were sent to a laboratory for doing scientific tests. The plant seeds were mainly found in the stern. The analysis suggests that most common archaeobotanical remains are betel nuts and lucky bean seeds which were considered trade items. Rare items include rice grains, coriander, calabash (bottle gourd) and wild jujube are found as well. Some seeds are not clearly identified. The macrobotanical remains were likely consumed by ship's crews; for example, self-nourishment, medicine, ship repairing and sailing. Some species have been known to the Arab manuscripts dating back to 9th century CE. The analyses provide further information of tools made of domestic plants that were applied for ship building, sailing, and using on board that facilitate seafarers' way of life during their journey across the ocean. These finds signify the relationship between the locals and the overseas seafarers through their uses of cross-regional plants on the ship.

CONCLUSION

Dating of the Phanom-Surin sunken ship had been known by means of Relative and scientific dating methods. The carbon-14 dating (AMS) of the shipwreck site by using the three samples of organic matter, that is to say, betel nut, rattan, and rope, suggests that the site dates back to 1,200 – 1,300 years ago which is consistent with the Chinese Tang wares and torpedo jar found in the ship. Judging from objects in its cargo, especially the torpedo jar, container of bitumen, the ship sailed from the Persian Gulf to the Southeast Asia and embarked to some seaports in Southern Peninsula and/or Indian archipelagos (Kota kapur, Muang Thong, Laem Pho, for examples) for collecting local products such as betel nuts, rattan, ivory and antler as well as Chinese jars used as containers of some local products. Afterwards, the ship sailed to the Gulf of Thailand and used a waterway connecting to encounters with local communities seeking local products and/or selling goods. It is likely that goods from the ship that was sold to the local here were torpedo jars containing bitumen and Chinese jars containing betel nuts, for two products were rare to find in this area. Local goods that the dhow's merchants and sailors needed were rice grains, basketry, meats as food that contained in the local carinated-potteries. Most of them were used as cooking vessels which had smoke residue on their bottom. This ship and the objects whether loading on board for voyage's supplying or being commodities give a new insight into the sailing trade routes between the Middle-East and the Far East (China) via the Southeast Asia and the trading interaction between the Arabian merchants and/or the Persian merchants and the local communities of the Dvaravati culture in central Thailand.

To conclude, the paper first discussed the background information of the shipwreck. The paper then explained the types of archaeobotanical finds discovered in the shipwreck and how they were being analyzed. The results of the analysis were then systematically listed here and supplement our understanding of the lives and trading network of the crews. (Insert your synthesized discovery here – e.g. it is believed that this shipwreck is X because we have found many Y, etc)

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