

Seamanship and Navigation: Seafarers on Board Daily Skills in Chinese Junk

Xu Lu
Chinese Sailing Junk Expedition Society
xuluxm2013@yahoo.com

Yu Long Fa
Xiamen Old Fishing Port
13666084562@163.com

Abstract

Chinese sailing traditions changed a little through time; sailors inherited their onboard skills, expertise, and experience by orally imparting others with physical instruction. But these daily skills were rarely recorded or studied in the past. For seafarers, how to operate and maneuver a Chinese junk was their daily work; and apart from sparse historical documents such as Phing-Chou Kho Than (Yu, 1117), Shi Liu-Qiu Lu (Xiao and Xia, 1580) (Fig. 1), and preliminarily observations by G.R.G. Worcester, Joseph Needham, Thomas Hoppe, and others, seamanship and navigation were kept in the minds of surviving successions of living sailors. In 2004, the author had an opportunity to sail on a nearly 100 year old Jin Hua Xin as an apprentice sailor for her last voyage. Several months of onboard experiences provided a rare field investigation to approach the complex mechanism of crew, their organization and their daily work. This experience led the authors to raise a marine ethnographic field investigation project along Fujian coast. Experimental archaeology creates effective scenes for realistic performance of past systems. A small full-size replica LanTay II was built for a series of archaeological voyages; the data gathered from the traces of past sailing routes will verify and add some knowledge for understanding the real daily work of Chinese seafarers onboard. In this paper, the authors shall present combined researches on historical documents, past observations with lively oral materials achieved by marine ethnographic field investigation on traditional sailing ports along South Fujian coast; throughout this research, the authors approach the knowledge about seafarers onboard daily skills and try to present the research about the sailors methods to maneuver the junk and its navigation system by means of a combination of instinct, eyesight, memory, and skill.

Key words: Chinese junk, seafaring, ethnography

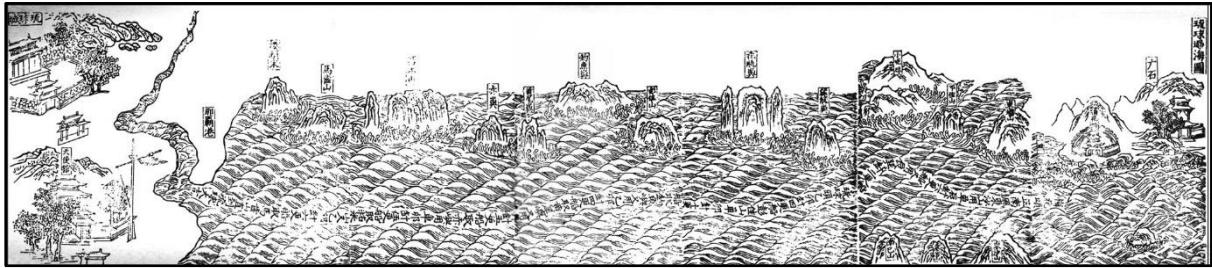


Fig. 1: One of the Earlier Documents to Record the Compass Bearing Direction for Sailing Routes between Fu-Chow to Ryukyu in 1580.

Introduction

In 2004, the author had opportunity to sail on the three-masted Jin Hua Xin as an apprentice sailor for her last voyage, this long voyage from Dong Shan Bay of southern Fujian to Zhu-Hai of Canton took 9 days and covered 330 nautical miles. Jin Hua Xin was the last working traditional sailing junk in China coast; nearly 100 years old (Xu, 2010). Several months of onboard investigation voyage provided a rare field experience to approach the complex mechanism of crew, their organization, and their daily work; and this experience led the author to raise a subject of seafarers with a marine ethnographic field investigation project along the Fujian coast in 2001. The details of seafarers daily work on Chinese junks are little known by outsiders previously; yet the last successors of sailors and fishermen recollected their past stories piece by piece. Experimental archaeology creates an effective scene for realistic performance of past systems by sailing a full-scale reconstruction boat. A small full-size replica LanTay II is planning an archaeological voyage to cross the Taiwan Strait, the data gathered from the traces of past sailing routes will verify and add some knowledge for understanding the real daily work of Chinese seafarers onboard.

Previous Researches

The studies on seamanship for operating and maneuvering Chinese junks have not yet been explored in detail. To improve productivity, safety and speed standards of the traditional water transport industry, a unique official field investigation and iconographies collected for Chinese cargo junks had been engaged in Fujian during 1958-1959. These works were restrictedly published in book in 1960, also a reference for sail design and use was attached in its appendices. This may be the only short description in Chinese for sailing practices. Sometime in the early 20th century, European scholars tried to understand the composition of Chinese junk. A brief description about the structure and working principle of yuloh has been included in G.R.G. Worcester's marine ethnographic field investigation (1947). Joseph Needham (1971) also had a brief introduction about the action of wind on a Chinese junk under sail, and the principles of tacking and wearing. There are also a few references about the performance of Chinese sails under different angles of apparent wind in Thomas Hoppe's English manuscript in 2004.

One of the earlier European scholars who observed Chinese traditional navigation is G. R. G. Worcester (1947). He noticed some important details and technical logic that others had not found before; his description is a following:

“In former days, lighted joss sticks suspended from the deck head were the only timepieces...the cheap alarm chock has greatly simplified navigation for the junk master. The junks carry no charts of any kind. The laodahs find their way by means of a skillful combination of sea instinct, keen eyesight, good memory, and an instinct for direction nearly as a homing pigeon...they stand in for the land, depending entirely upon their knowledge of its appearance and the depth and nature of the soundings to give them position, for to them the bottom of the sea has its hills and valleys like the land, and they acquire an intimate acquaintance with its contours and the type of bottom to be expected in each locality.”

Another European scholar, Joseph Needham, noted the joss sticks used by Chinese seafarers (1971):

“...(besides sand-glass,) Burning incense in stick-like form is a practice which goes far back into China’s Middle Ages, and it would have been very easy to measure time approximately enough with the ‘joss-sticks’.”

Needham (1971) also categorized the history of navigational methods into three periods: (a) primitive navigation (b) quantitative navigation (Measurement): +900 A.D. in East Asia (c) mathematical navigation: +1500 A.D.

In 2008, an original map of the China Seas region was rediscovered in the Bodleian Library Special Collections in Oxford by Robert K. Batchelor (2014) and Timothy Brook (2013). The Selden Map is a detailed map of Southern China dated the mid-16th century; it appears that the old Xiamen port is the beginning of all the sea routes on the map, it also labeled the trade routes departing from Xiamen.

A recent paper summarized the navigation and religion in traditional Chinese junk have listed several historical materials and demonstrated with two collections of sounding lead in Quan-Zhou (Lin, 2015).

Historical Contexts

A boat under sail is a very complex historical mechanism; the vessel consists and represents a naval architecture system, as the tools for different functions, as a space to reflect the weather, the waves and the currents, and as a society for the composition of crew and their daily life. In his encyclopaedic work, Heavenly Creations (chapter on boat, Tian-

Gong-Kai-Wu), Song Yingxing (1637) divided the Chinese vessels into sea-going, river and other craft; and then, he classified these for many types according to their different sailing environment. This classification may be applied even today because Chinese sailing traditions have changed little through time, and the last sailors and fishermen of wooden sailing junk still survive/alive. This paper focuses on Sha-Po-Wei, the main area of old Xiamen port until the first half of the 20th century, the ages when wooden sailing boats shuttle in the Taiwan Strait.

Sha-Po-Wei, along with adjacent coast lines, was an ideal port for seafarers due to its location on the sea route connecting East Asia, Southeast Asia, and Taiwan (Fig. 2). The demand of marine transportation and ocean fishery brought seafarers from coastal regions of Quan-Zhou and lower Zhang-Zhou River. Seafarers of Sha-Po-Wei divided into two types: crews and fishermen. The crews mainly migrated from Hui-An county of Quan-Zhou, while fishermen moved from Zhang-Zhou river basin belong to Hai-Chen county. Fishermen of Sha-Po-Wei called themselves 'sea beggars,' and it is subdivided into several groups according different fishing method, namely types and lengths of fishing vessel. Those groups (between fishermen and local resident, fishermen and crews, even between different groups of Sha-Po-Wei fishermen) were rarely communicating each other. Furthermore, both fishermen and crews lived in their own enclosed social space to avoid troubles with others; many of them have not even walked several miles out to countryside in whole their life.

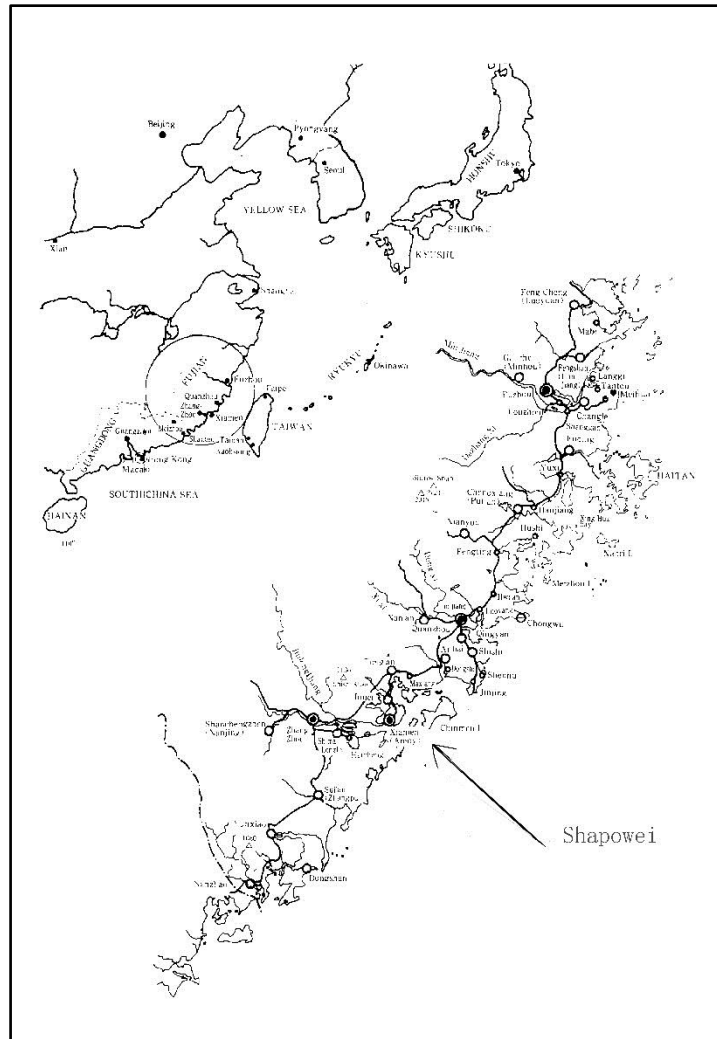


Fig. 2: A Map of South Fujian and Old Amoy Port Sha-Po-Wei.

Organization

To learn composition of crews is the first step to approach their daily life. In general, 15-20 tons deadweight trade vessel with two sails allocated 5-6 sailors, 30-35 tons also two sails would be 7-8 sailors, 55-65 tons with three sails has 12-13 sailors. Crews were temporary employed between by the ship owner; however, in addition to their lower wage, every sailor was allowed to carry a few private cargo up to 250 kilograms, and usually the 'laodahs' (equivalent to captain in Western) had doubled weight and doubled payment more than other crews. There are five chief positions in Chinese trade vessel; these were laodah, (and vice laodah, which is

equivalent to helmsman in the western world), mast head, sampan, foreboard, and supply chief (besides the 'chu-hai' who served as ship owner's representative also in charge of accounting and port to call for loading and unloading cargo). The crews were on duty during the day and in two shifts in the night; they changed shifts in midnight. Laodah and vice laodah keep working throughout the voyage until they cast the anchor. Chuhai did not participate in onboard works.

For a local long-line fishing vessels crew size was much bigger than a corresponding-sized merchant ship. Lodah and vice laodah had to work day and night during the deep-sea fishing voyage; there were no chief positions for other sailors, hence there were no arranged shifts. After vessel dropped the long liner fishing, sampans were lowered one by one along the fishing route; 3-4 sailors on each sampan were taking back the hooks. This hard work usually lasted all day long.

There is a small shrine at the aft area of the poop deck containing the effigy of the junk's patron saints, Goddess of Mercy, Matsu, Guandi, etc. The laodah or vice laodah of trade vessel burned incense in stick-like 'joss-stick' one by one throughout the voyage to keep alight in the shrine where the compass laid also. For fishing junks, it was same but joss-stick only burned one in morning and one in evening, as well as some important occasions and critical times. Many local long liners have one 'tong-ki', a trance-state man while intercommunicated oracles onboard; he would give advice in case of an emergency. The tong-ki was a fisherman in normal times, and they did not receive extra payment.

A living room/quarters was located at the aft area of the ship, or the lower area of the quarter-poop deck; laodah's bunk on the back on the left, opposite side was for chu-hai. In Chinese junk, portside also named yuloh side while starboard called sail side. Ice butt and stove located in the sail

side, toilet and water bin were in the yuloh side. Sailors carried water in a bin contained 30 'dan', or 1500 kilograms.

Seamanship

The bamboo strip sails had been adopted in Chinese junks since the Western Han Dynasty (206 BC-220 AD), and used up until the early 20th century. However, the last successors of seafarers along the Fujian coast, which the average age is 80 years old, mostly never saw the bamboo sails; some of them just heard them from their previous generation or two generations earlier in which these sails were being used. To operate a bamboo matting sail, it has to be rolled and unrolled; it is heavier than one used cloth sail. There is an idiom applied to both sail types, and that says 'trim one's rubber to the wind'. The cloth lugsail was fasten on odd number of bamboo from luff to leech where could see the balance from the mast; each end of the batten on the leech was connected by the bight and through some euphroes lead the control sheets terminated in one main sheet to the stern of the upper deck. The sail was often very heavy, and it required the whole crew at the winch to set the sail. On Jin Hua Xin, it required approximately 12 minutes with six sailors to turn the winch. The vice laodah held the tiller and order the trimmer to control the main sheet, while the laodah served as a navigator and rarely handled the rudder.

The leeward sailing, windward sailing, and wind abeam sailing were the main points of Chinese sailing junk under different angles of apparent wind. The latter was rarely recorded by previous researchers, both Song Yingxing (1637) and Needham (1971) seemed to be confused between the beam reach and windward sailing. The local seafarers call it 'tripod sheet' as the sheet system have fasted the main sail keep it at approximate 50 degree angle with the stern, which is the position in between the leeward sailing and windward sailing. The Old Xiamen

seafarers often used tripod sheet when they set sail to Tainan by the winter monsoon (northeast or north wind). The main sail of Fujian junk was hung on starboard side of the mast, thus the sailors on quarterdeck would see the bamboo battens while sailing with tripod sheet; they called it open sail (all the way on the road was port tack, the batten was force to left the mast). When the boat went back to Xiamen by using same monsoon, no matter sailing with close reach or beam reach ,it was starboard tack; this was call close sail (the batten was pushed to touch the mast) as the bamboo battens could not been seen at the position of laodah. Moreover, Chinese sailors often worked to windward tacking and jibing by turn the stern to wind; accident jibe was deemed to be dangerous especially under the strong wind.

Onboard tools include axes, nails, knives and cloth tec., were used for emergency repairs. The author learnt and experienced to block the bottom loopholes in the towed voyage of Lan Tay II at February 2004 (Fig. 3).



Fig. 3: To block the bottom loopholes of the LanTay II.

Navigation

Just like people live in mountains naturally know and understand their surrounding landform, Chinese seafarers understood that the seabed had hills and valleys similar to the land with different sediment types; sailors used these sediments and topography of the seabed to acquire positions of the vessel on voyages. The last successors of Fujian seafarers did not use the needle sailing route manuscripts, but they relied on their trained eyesight and memories. Yet, some of them also learnt the manuscripts given by their previous generation; therefore, they can read and understand it.

Phing-Chou Kho Than, written between 1111 and 1117 by Chu Yu, described navigation techniques as follow:

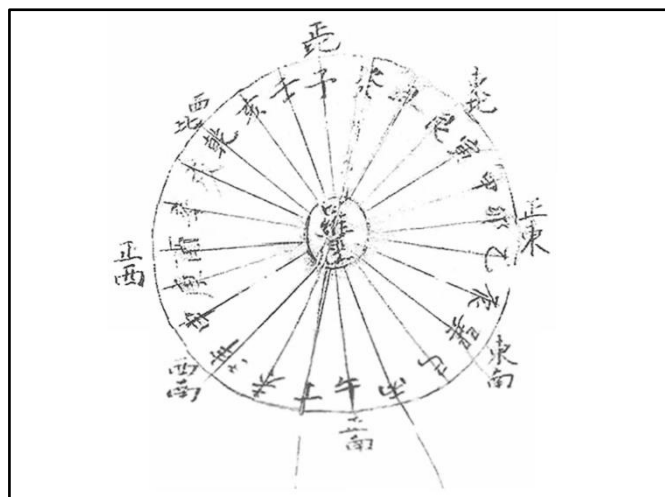
“The ship’s pilots are acquainted with the configuration of the coasts, at night they steer by the stars, and in the day-time by the sun. In dark weather they look at the south-point needle (compass). They also use a line a hundred feet long with a hook at the end, which they let down to take samples of mud from the sea-bottom, by its smell they can determine their whereabouts.”

The sounding lead was used to ascertain the depth of water, the head of lead has a hole filled with soap or grease to stick to a few seabed materials to identify if there was sand, mud, or stones. The weight of a sounding lead was between 3-5 kilograms. The word ‘fathom’ and ‘water’ was used by old Xiamen port seafarers to mean a two-arm span, which is approximately 1.6 meters. Usage of the sounding lead was also described by Xiao LiuQiu Man Zhi written in 1755. When thrown into the sounding lead from window of yuloh or shipboard, sailors should remain the boat stationary. Every five waters there was a red sign in the rope.

The laodah or vice laodah burned a joss-stick and kept it alight in the shrine after the ship set sail, and each incense ran about one hour; this also helped them to acquire the positions in the sailing route. Chinese seafarers almost never used the 'distance' to describe the sea route, but instead of 'how long' it took.

In the middle of the Selden Map, there is an illustration of a Chinese mariner's compass at the top, this may be the earliest sample can be seen today (Fig. 4). The compass was divided into 24 points represented by the twelve Chinese, earthly branches and the twelve heavenly stems. The most common compass was consisted of a round wood box, where an arrow shaped needle was balanced inside. The oldest style compass was dry-pivoted, later ones were filled with water; yet both were called 'dry-gen' by local seafarers. After the compass was improved with 12 Chinese characters, it came to 360 degrees; this compass was called 'luo-gen'. The seafarers were taught to use the compass and to calculate the tides and winds since they were young. Every seagoing junk had two dry-gens, at least, should one needle lose its magnetic field. The Vice laodah kept one on his side, while the loadah kept another one. In the night, it was illuminated by the laodah's opium pipe. Even sampans from long line fishing junks had their own small dry-gens.

Fig. 4 (right): The Chinese Mariner's Compass on Selden Map.



Besides compass and sounding lead, Sha-Po-Wei fishermen used primitive astronomical guidance for them to orient themselves. They could read directions by simply by 4 stars during the night. Venus for east, Needle End Star for south, West Star for west and North Star for north.

Sailing Routes

There are a least eleven historical documents about compasses and its bearing directions for sailing routes in Taiwan Strait: these are listed as follows:

1. Si yi Guang Ji (四夷广记), written between 1592 and 1598 by Shen Mao Shang.
2. Shun Feng Hsiang Sung (顺风相送 Fair Winds for Escort), written in about 1593.
3. Tung His Yang Khao (东西洋考 Studies on the Oceans East and West), written in 1617 by Chuang Hsich.
4. Chih Nan Cheng Fa (指南正法 General Compass Bearing Sailing Directions), written before 1669.
5. Hai Kuo Wen Chien Lu (海国闻见录), written in 1730 by Chen Lun Jiong
6. Peng hu Ji Lue (澎湖纪略), written during the reign of Emperor Qianlong in Qing Dynasty by Hu Jian Wei.
7. Xiao Liu Qiu Man Zhi (小琉球漫志), written in 1755 by Zhu Shi Jia.
8. Wai Hai Ji Yao (外海纪要), written in early 19th century by Li Zen Jie.
9. Xia-Men Zhi (厦门志, Xiamen Chronicle), written in 1839 by Zhou Kai.
10. Xia-Men-Gang ji shi (厦门港纪事), written in 1843 by Dou Zheng Biao.
11. Hai Jiang Yao Lue Bi Jiu (海疆要略必究), written in 1856 by Li Yan Yu.

When a ship set sail to Tainan from Xiamen, nearly all the above documents showed similar descriptions for navigation; departing from Nan Tai Wu of Xiamen at direction between 'chen' and 'Xun' (amount to 127.5°), it takes seven 'gen' to Peng-Hu hill, then sail at direction of 'xun' (about 135°), and it takes another five 'gen' to Luerhmen of Tainan.

Many sailors of old Xiamen port served on merchant junks between south Fujian and Taiwan; they sailed to Tai-Nan in north wind season, went to Wu-Qi of Taichung, Lu-Kang of Chang-Hua, Dong-Shi and Bu-Dai of Chia-Yi, kee-Lung during south wind season. Mostly, they set sail from the old Xiamen port; it took less than one tide to arrive Bay Liao-Luo of Quemoy. After waiting for good wind, they set sail again and used the tripod sheet sailing to Ma-Kung of Peng-Hu for approximately twenty hours. They then waited for suitable winds and tides to Luerhmen; it would take another 10 hours. They would try to sail closer to the east direction when sailed across Taiwan Strait. It would take much less time when ones sailed from Tainan to Xiamen.

Archaeological Experiment of LanTay II

On 21st May 2017 at 10 am, LanTay II set sail from port of Liao-Luo of Quemoy planning to trace the historical sailing route by heading 127.5° to Peng-Hu (Fig. 5). The weather forecast for the day were Wind Northeast Beaufort force 3, Swell 1.3 meters, but the author onboard found that the wind had veered to east and increasingly, while the swell is more angular than the wind after the ship entered Taiwan Strait. The course of the ship had to turn in direction of 170°-180° to steer quartering sea. The LanTay II was under control until 16 pm, when the skipper made the decision to abandon the boat at the position 24.1743°N, 118.5535°E, while the situation was Wind East Beaufort force 6-7, Swell 3 meters and 6-7 meters

instantaneous. The 6 years of preparatory archaeological voyage lasted 6 hours, all the crew numbers transferred to companion ship.



Fig. 5: The archaeological voyage of LanTay II.

As postmortem reports of the experiment, Sha-Po-Wei indigenous fishermen had compiled the warning signals as below:

- a. The day of 21st May was the 26th day of the fourth month in Chinese lunar calendar, one of the brightest days of the Great White Planet in the whole year; and it is the day for brewing disaster the whole year ahead in Taiwan Strait. It means that this is a day with storm surge and a taboo day for sailing.
- b. The included angle of wind and wave increasing with the height of the sun which reached the maximum after 12 am, and they stacked up into higher swell. The best set sailing time to cross Taiwan Strait was 4 am.

c. The position where the ship was abandoned is right between seabed valley and hills based on the past records; that was where the swell on the sea surface become rougher (Fig. 6).

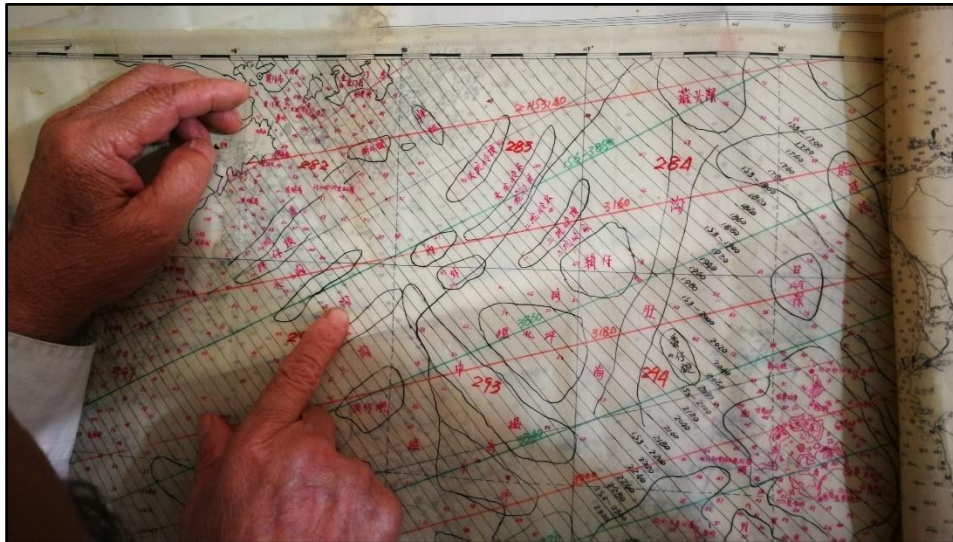


Fig. 6: The Sha-Po-Wei indigenous fisherman motioned the topography of the seabed of the Taiwan Strait they recorded half a century ago.

Discussion

The seamanship and navigation of the Chinese Junk requires a plethora of nautical knowledge and a variety of onboard skills. All knowledge regarding Junk ships (including sail and rudder, sounding lead, mariner's compass, joss-stick, compass bearing recorded for sailing route, wind and tide, etc.) formed a closely connected knot of complementary techniques. The information gathered during the marine ethnographic field investigations at old Xiamen port indicated that a series of traditional onboard skills displayed by the last successors of sailors and fishermen may be closely corresponding to skills and techniques described in the historical documents that range from Song Dynasty to Qing Dynasty.

Nonetheless, details of the geographic parameters of sailing routes are still obscure, such as accurate depths and seabed materials, and the sailing directions under the effect on winds and tides. An old local

seafarers proverb says, 'The stationary compass bearing recorded but flexible brains', and also says 'Live performances to speak clearly', thus experimental archaeological methodologies, or sailing a real ship, shall be used to study their historical context to reconstruct navigational practices and methodologies for sailing in China Seas. The better way forward with archaeological voyages is involving the older seamen and indigenous fishermen into the sailing investigations. The authors believe that expected discoveries of this research-investigation will bring new evidence that significantly extends our knowledge of earlier onboard lives of Chinese Junk ships.

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Biographies



Xu Lu (Chinese: 许路) is Founding Director and Chief Maritime Archaeologist of NVOCC Chinese Sailing Junk Expedition Society (CSJES). He is a commissioner of China Maritime History Studies Association and Fellow of The Explorers Club.

He also works as a co-research fellow for NSC-ANR project Maritime knowledge for China Seas hosted by École française d'Extrême-Orient (EFEO) and Institute of History and Philology, Academia Sinica (IHP) in 2014-2018 duration. His English publication include *The Naval Architecture of Ancient Fujian Style Sea Going Sailing Junks: An Overview* (Delta Book World, 2014).



Yu LongFa (Chinese: 余龙发) is a local fisherman at Xiamen old fishing port, born in 1952 at ShaPoWei. He works as a professional fisherman since the age of 12, being a skillful master of seamanship and navigation in east and South China Sea during past 50 years. He assisted Mr. Xu Lu

with the recording and decoding on board skills in Chinese Sailing Junk.