



The Story of Ships Across a Thousand Years on the Maritime Silk Road

Sailing by the Stars

An illustrated encyclopedia for children about maritime history and culture.

Copyright – Sailing by the Stars
Cataloguing-in-Publication (CIP) Data
Sailing Across the Ocean with Mou Xing / Chief Editor: China Maritime Museum,
Shanghai; compiled by Children’s Fun Publishing Co., Ltd. — Beijing: Posts & Telecom
Press, 2025.
(A Thousand Years of “Ship” Tales along the Maritime Silk Road: An Illustrated
Children’s Encyclopedia of Maritime History and Culture)
ISBN: 978-614-495-742-4

Chief Editor: China Maritime Museum, Shanghai
Responsible Editor: Ren Lixin
Executive Editor: Hu Hui
Printing Supervisor: Shao Chao
Cover Design: Han Muhua
Layout and Typesetting: Beijing Qizhi Hangyuan Culture Co., Ltd.

Compiled by: Children’s Fun Publishing Co., Ltd.
Publisher: Posts & Telecom Press

All rights reserved. Any infringement will be prosecuted. If you discover any quality issues, please contact the Reader Services Department directly at 010-81054177.

Editorial Board

Consultant: Gao Menghe
Chair: Zhao Feng
Vice Chairs: Cong Jianguo, Wang Yu, Lu Wei, Fu Xiao
Editorial Board Members: Zeng Lingsong, Qi Yuguo, Shen Qiang, Huang Qianwei

Authors

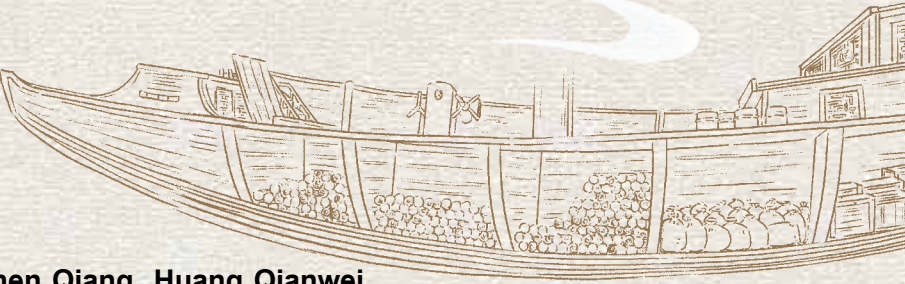
Yu Yanyan, Zhou Shu, Zhou Tian, Wang Lingling, Chen Xueping,
Song Kai, Pan Dongyan, Liu Dandan, Yang Yang, Xiao Jie,
Lu Jiayu, Zhang Duoduo, Jiang Boren, Zhou Yinying, Jiang Xiaohan,
Zhou Min, Dong Ni, Du Liye.

Publishing Committee

Chair: Li Wen
Vice Chairs: Ma Jia, Shi Yan, Liu Youyi
Members:
Zhou Xiu, Dai Dongmei, Qi Jie, Zhao Qian, Song Fei, Ren Lixin,
Guo Dandan, Zhao Xiaona, Shen Zhenyi, Zheng Mengyu, Wang He, Hu Hui,
Li Yao, Wang Ying, Zhang Fang, Shang Xuemin, Song Juan, Wu Min,
Shao Jiannan, Ye Mengjia, Zhao Yuhua, Wang Chuize, Wang Yuejing.

Acknowledgements

The Cultural Heritage Publishing Committee of the Chinese Cultural Relics Society.
China COSCO Shipping Corporation Limited.



Preface



Covering about 70 percent of the Earth's surface, the ocean is not only the cradle of life but also a vital channel through which civilizations have expanded and connected. China's relationship with the sea reaches far into antiquity. For thousands of years, its shipbuilding traditions have reflected remarkable ingenuity and legendary feats.

Let's travel back eight millennia to the rich wetlands of the lower Yangtze River—home to the unique Kuahuqiao culture. Among the fascinating relics left by this society, one discovery stands out: a perfectly preserved dugout canoe. This vessel represents one of the earliest examples of human maritime activity, silently witnessing our ancestors' curiosity and exploration of rivers, lakes, and seas.

From the Qin and Han dynasties onward, China's shipbuilding industry flourished. Advancements continued through the Sui, Tang, Song, and Yuan dynasties, reaching an apex during the Ming dynasty. By then, Chinese shipbuilding was globally unparalleled, supported by a rigorous and efficient administrative system. Techniques and craftsmanship achieved unprecedented sophistication. It was in this context that Zheng He set sail with his massive fleets, undertaking seven legendary voyages that left an enduring legacy in China's maritime history.

In honor of Zheng He's achievements and with approval from the State Council, the Ministry of Transport and the Shanghai Municipal Government established the China Maritime Museum—the country's first national museum dedicated to maritime heritage. Its mission is to celebrate China's maritime civilization, provide a platform for international exchange, support Shanghai's development as a global shipping hub, and inspire young people to engage with maritime culture. Here, visitors can trace the evolution of Chinese seafaring and navigational technology from ancient times to the present, witnessing the ongoing story of China's maritime development.

The year 2025 marks the 620th anniversary of Zheng He's voyage. To commemorate this milestone, A Children's Encyclopedia of the Thousand-Year History of the Maritime Silk Road was published. Consisting of four volumes, this book series explores shipbuilding, investiture missions, navigation technology, and cross-cultural encounters. Through engaging narratives, it recounts how China—building on the legacy of the overland Silk Road—extended a hand of friendship across the seas, demonstrating leading maritime technology and an indomitable spirit of exploration. Each volume opens a window onto nautical wonders, inviting young readers to set sail through history.

Special thanks are due to the authors and illustrators whose vibrant storytelling brings these ancient adventures to life. We invite young readers to embark on this journey with open eyes and curious hearts.

May every child who opens these books become a little navigator—discovering wonders and joy along the way, gathering courage for life's journey, and sailing boldly into the world's vast horizons!

China Maritime Museum



All Set—Just Waiting for the Wind!

In the 13th year of the reign of Emperor Jiajing (1534 AD), a sea breeze whispered through the harbor. The Ming court's Imperial Investiture Ships and the Ryukyu Kingdom's tribute ships, which had come to guide the way, were quietly at anchor, sails furled tight, awaiting the moment to depart. Chen Kan, the chief envoy appointed by the Ming court to travel to Ryukyu, stood tall and composed on the shore.

"What has caught your eye, sir?" asked Vice Envoy Gao Cheng as he approached, followed by Xiang Ying, the Chinese pilot (like a captain today).

"The wind," Chen Kan replied, glancing up at the sky. "It is midsummer now, yet the north wind has blown for days. But the south wind is coming soon—we can finally set sail!"

Do you know? Waiting for the Wind

Winds that change direction with the seasons are called monsoons. The ancient Chinese called them "winds of trust" (Xinfeng in Chinese) for they came regularly every year. In the east of China, summer usually brings south winds, while winter brings north winds. As early as the Qin and Han dynasties (over 2,000 years ago), sailors had already learned to make use of the monsoons. The route from Fuzhou, China to Naha Port, in the Ryukyu Islands, generally runs from southwest to northeast. Catching a good south wind made voyages much smoother and faster.



The Magic Tool of Sailing: The Compass

How can we find our way across the endless sea? What would you say?" Chen Kan asked. Xiang Ying smiled. "It's time to show you our mariner's compass—or simply, the compass". He invited Chen Kan and Gao Cheng aboard and led them to the compass chamber.

"Take a look, gentlemen!" he said. "This is the compass. The needle always points north and south. And the Chinese characters around it mark 24 directions. In general, the character Wu (午) marks south, and Zi (子) marks north. By using the compass together with our Needle-Route Map—a navigation chart—we can find the right direction".

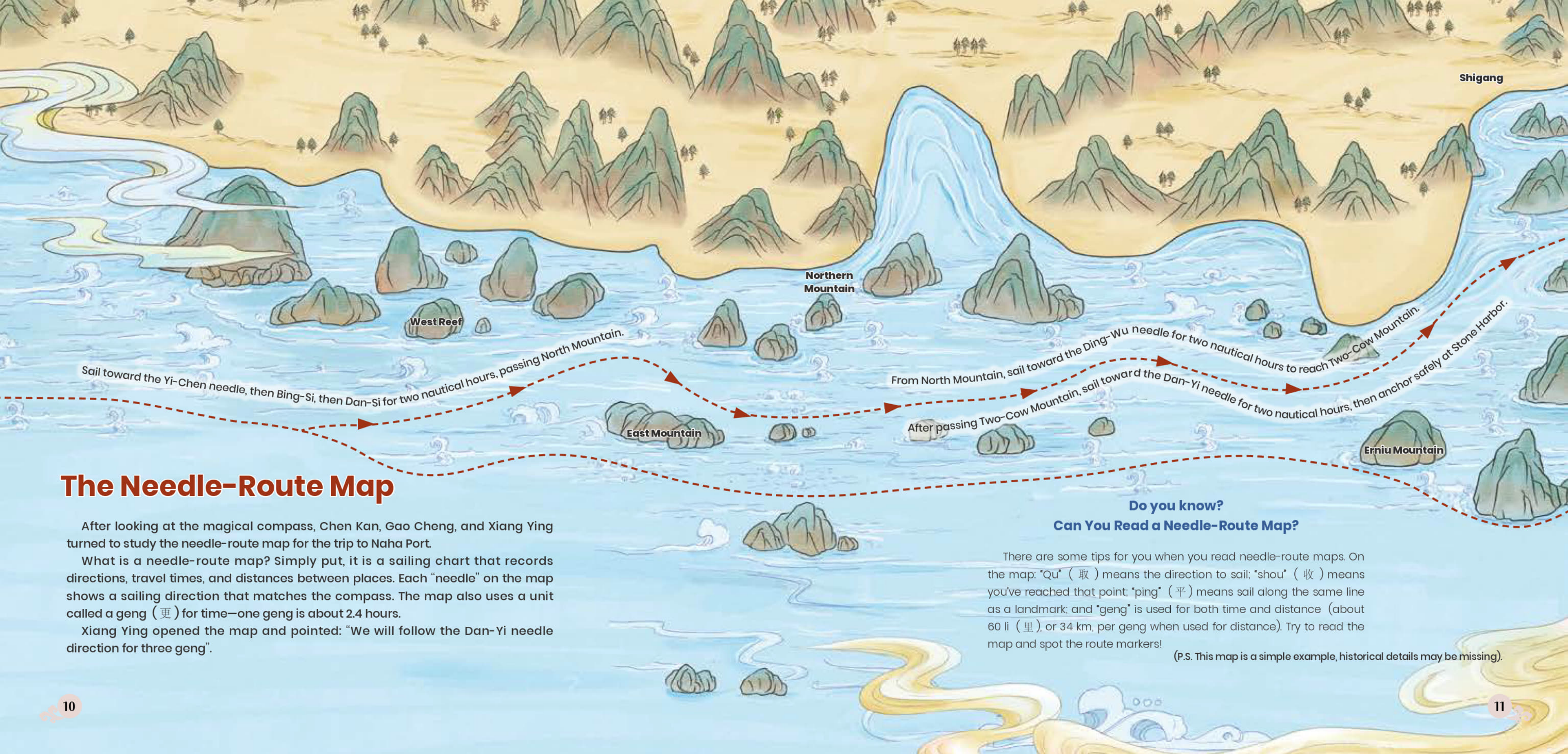
He then brought them up to the deck and continued his explanation.

"First, we use the needle to find north and south, making sure it lines up with the 'Zi-Wu line'—the north-south line on the compass. Next, we turn the compass so the character for the direction we need faces the ship's bow. Then we adjust the ship until the needle aligns again with the Zi-Wu line. Once that's done, we can sail straight ahead!"

When the needle comes to rest, it doesn't point to the true South Pole, but to the South Magnetic Pole. And the difference between the two is called magnetic declination.

Do you know? South-pointer or North-pointer?

During China's Warring States period (over 2,200 years ago), Chinese inventors made the "Si Nan", the very first compass. Nan (南) means "south", and Si (司) here means "point". You can imagine a little spoon, with its handle always pointing south. Later, people made many kinds of compasses—water compasses, dry compasses—but the old name stuck, because south was the honored direction in ancient China. That's why the compass was well known as the south-pointer. But nowadays, some compasses actually have a needle that points north, so they're sometimes called north-pointers. Which name do you prefer?



The Needle-Route Map

After looking at the magical compass, Chen Kan, Gao Cheng, and Xiang Ying turned to study the needle-route map for the trip to Naha Port.

What is a needle-route map? Simply put, it is a sailing chart that records directions, travel times, and distances between places. Each “needle” on the map shows a sailing direction that matches the compass. The map also uses a unit called a geng (更) for time—one geng is about 2.4 hours.

Xiang Ying opened the map and pointed: “We will follow the Dan-Yi needle direction for three geng”.

Do you know? Can You Read a Needle-Route Map?

There are some tips for you when you read needle-route maps. On the map: “Qu” (取) means the direction to sail; “shou” (收) means you’ve reached that point; “ping” (平) means sail along the same line as a landmark; and “geng” is used for both time and distance (about 60 li (里), or 34 km, per geng when used for distance). Try to read the map and spot the route markers!

(P.S. This map is a simple example, historical details may be missing).

Reading Clouds and Weather

The next day the south wind arrived and the fleet of the investiture ships finally set sail.

"The wind and sea are quite in our favor, Xiang!" Chen Kan called from the bow, cheerfully. While Xiang Ying frowned and pointed to a dark cloud bank far off. "Sir, clouds at sea change quickly. See those clouds—dark and heavy? It looks like rain".

Soon light rain began to fall. Luckily, it passed as quickly as it comes, and the sky soon brightened again.

"Watching the clouds is also a skill!"

Fire-cloud at sunset

If the sunset sky looks like fire, the next day will be very sunny.

Hook-shaped clouds

Hooks in the sky, showers nearby.

White-head rain

Black-headed clouds bring wind; white-headed clouds bring rain.

Fish-scale sky

When the sky appears like fish scales, there will be wind if not rain.

Do you know? How Sailors Predicted Weather

Before modern forecasts, experienced sailors predicted the weather by observing the clouds—their shapes, colors, and heights. As recorded in the Northern Song Dynasty's Dream Pool Essays, summer storms often strike in the afternoon. So if you plan to sail, you should get up in the early morning and look all around. If the stars and moon are bright and there's no cloud from horizon to sky, it's safe to go. If you stop by midday, you may avoid getting caught in a sudden storm.

Apart from sailing at sea, there were also many interesting proverbs about observing the weather in ancient China.

The Magical Tacking Technique

The rain had stopped, but now the wind had changed. What had been smooth sailing became a fight against the wind.

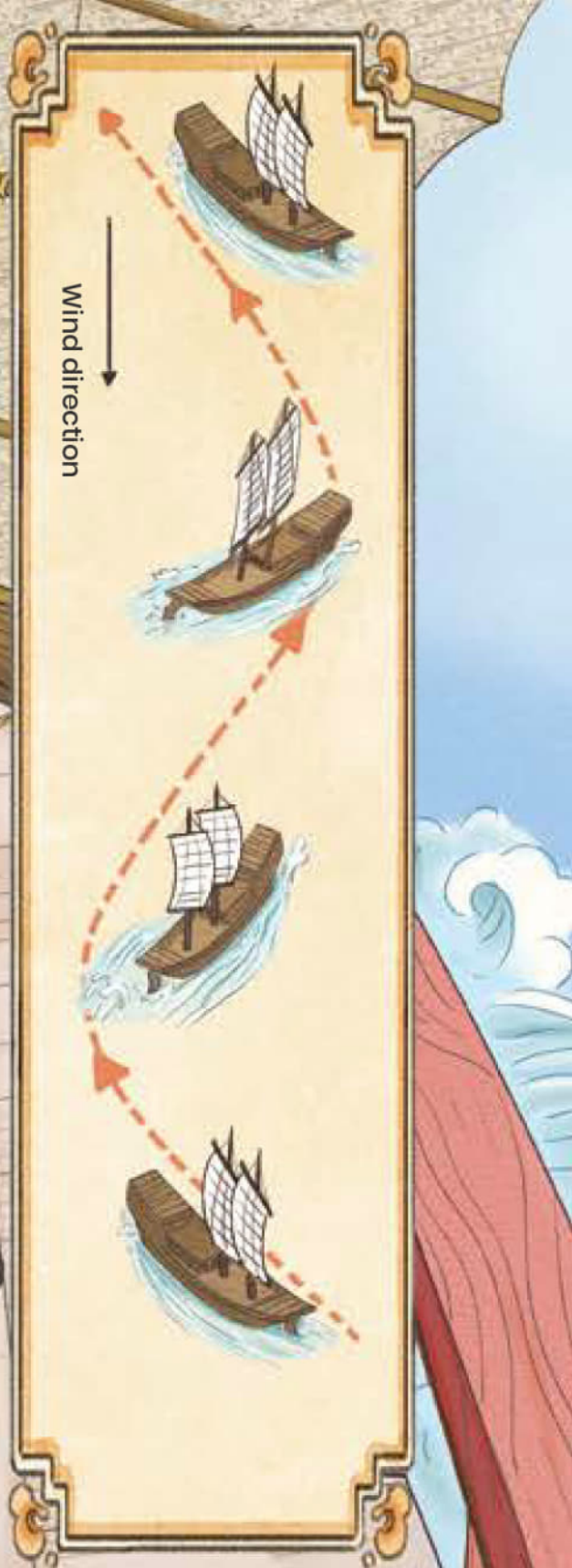
"What should we do now, Xiang?" Chen Kan asked.

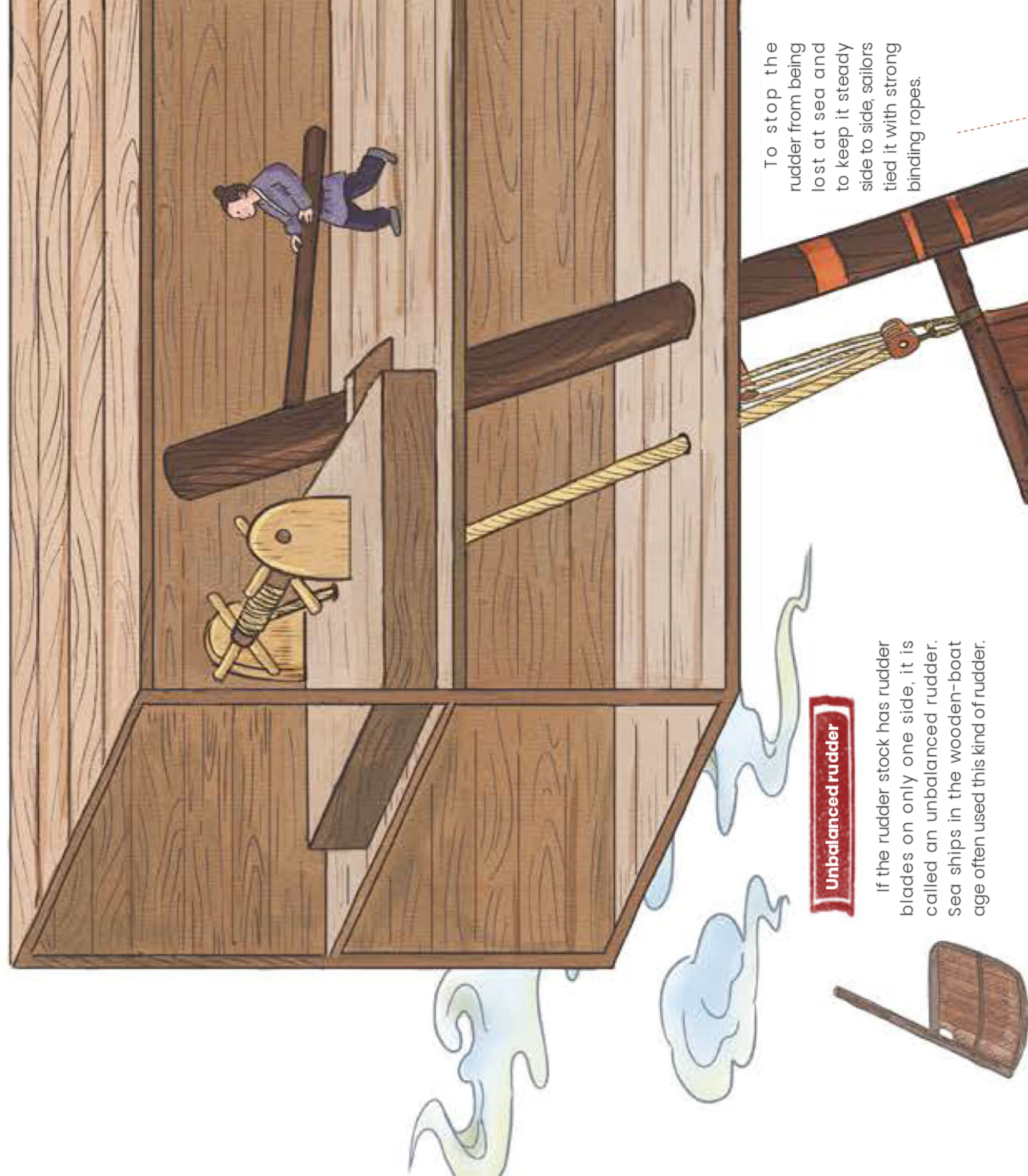
Xiang Ying was calm. "We can sail even with the headwind, sir. The sail works like an eagle's wing. If we keep the right angle to the wind, it will still give us some forward push".

Quickly, sailors sprang into action. They began pulling and adjusting the sail so that it turned, gradually forming an angle with the wind. The ship's wind-facing side shrank, making it easier for the fleet to move ahead.

Do you know? What Is Tacking?

One key reason Chinese sailing ships could "sail in any wind direction" is tacking. The magical technique, in a nutshell, means changing the sail angle, adjusting the course and steering in a zigzag path. By doing so, sailors turn the headwind into a side wind and make the forward motion much easier. This continual changing of the ship's heading is called tacking technique.





Unbalanced rudder

If the rudder stock has rudder blades on only one side, it is called an unbalanced rudder. Sea ships in the wooden-boat age often used this kind of rudder.

To stop the rudder from being lost at sea and to keep it steady side to side, sailors tied it with strong binding ropes.

Trim the sails

But changing the sail alone is not enough to keep a ship moving smoothly against the wind. You also need an important steering tool—the rudder.

After the sails were adjusted, the sailors moved the rudder at once. Step by step, they fixed the sail and then set the rudder, then sailed a little farther and adjusted them again. Bit by bit, the ship followed a zigzag, or “Z”-shaped path, and kept making headway against the wind.

Chen Kan watched this and could not help but exclaim, “We are truly trimming our sails!”

Do you know?

A rudder is like a car’s steering wheel, it helps control the ship’s direction. Never underestimate it—rulers of ship design and sailors both say the rudder changed the game for sailing.

Archaeologists have found rudders in China as far back as the Han dynasty. Over time people improved the rudder and invented different kinds to suit different waters: balanced rudder, unbalanced rudder, lifting rudder, holed rudder and so on.

Balanced rudder

If the rudder stock has rudder blades on both sides, it is called a balanced rudder. River ships in the wooden-boat age often used this kind of rudder.

Lifting rudder

The rudder can be raised or lowered based on the water. Lower it in deep water for better steering; raise it in shallow water so it won’t hit underwater rocks.

Holed rudder

This kind of rudder has many holes in the blade so that water can pass through. It makes turning the rudder easier for the helmsman.

Where Are We Now?

The fleet had been at sea for several more days. One day Chen Kan stared out at the endless water and asked, "My pilot, we've been sailing so long, where are we now?"

"Sir, look back at the sea we just passed, do you see the dark color of the water there? Sailors have a saying for the route to Ryukyu: "Out we go from blue to black; back we turn from black to blue". That tells us we're now sailing in waters near Ryukyu". Xiang Ying said happily. "Could I take a short leave, sir? I just saw a school of cuttlefish, fresh cuttlefish would make a lovely dish. I'll catch some and cook something special for us!"

Chen Kan laughed out loud. "Well! Very well!"

Do you know?

To find their position on the open sea, sailors relied more on experience than on instruments. They watched the shapes of islands, the color of the water, the kinds of fish and the direction they were swimming, how deep the sea was, and even the color and texture of the seabed. By noticing these small clues, sailors could judge where the ship was and correct its course in time.



Finding the North Star

The North Star was the key to knowing where “north” was. In the northern sky, sailors would look at the two stars at the front of the Big Dipper’s bowl (Dubhe and Merak). By drawing an imaginary line through them and stretching it about five times, they could find a single bright star—Polaris, the North Star!

Star-Gazing

That night, Chen Kan stood at the bow, gazing up at the stars. “Sir, what are you thinking about?” Gao Cheng asked from behind.

Chen Kan smiled, “I’m wondering how people found their way before the compass was widely used. How did they use the stars to navigate?”

Gao Cheng nodded, followed Chen Kan’s gaze and looked up at the starry sky. “I’ve heard back in the old days, sailors used mountains and rivers as guides when close to shore, but on the open sea they used the stars to find direction. That’s quite amazing”.

Do you know?

Secret of Ancient Sailors: Star-Gazing

Long ago, Chinese sailors discovered the secrets of the sky. They knew the bright stars like Altair, Vega, and the Big Dipper, and carefully noted when and where these stars could be seen in different seasons and places. Likewise, the waxing and waning of the moon can also help people tell the time. All these tricks are called Star-Gazing.

Celestial Navigation

"I've heard that in Zheng He's Navigation Map, there were four special star maps. People say they were used with something called the Celestial navigation—a way to tell where a ship is on the open sea". Chen Kan said.

Gao Cheng smiled and asked for twelve square wooden boards to be brought over. "These are the celestial observation boards we use," he explained. "Here's how we use them: stretch out your arm and hold up one of the boards. With your other hand, pull the string tight until the board hangs right in front of your eyes. Now line up the top edge of the board with the star you want, and the bottom edge with the horizon where the sea meets the sky. The size of the board in 'finger units' tells you how high the star is above the horizon".

"I see!" said Chen Kan, raising a board to try for himself. "So by comparing the star's height with the numbers formerly written on the star maps, we can check if our ship is on the right course!"

"Exactly," Gao Cheng nodded. "But it works best just before sunrise or just after sunset, when both the stars and the horizon can be seen clearly".

Measure Method

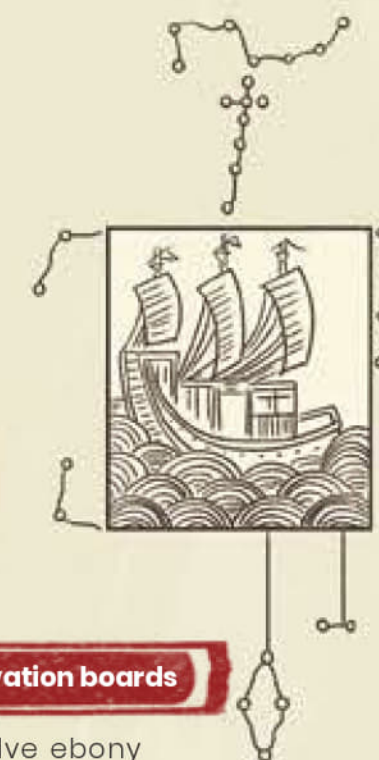
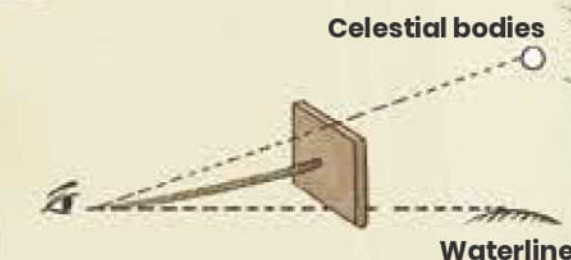
The sailor held the boards in the left hand and pulled the string tight with the right hand. The top of the board lined up with the star, and the bottom with the horizon. The number in "finger units" on the board showed the star's height.

Celestial navigation maps

A "celestial navigation map" was a rectangle with stars drawn around its edges, each marked with its name and height. By comparing the real star's height with the chart, sailors could figure out their ship's rough position.

Celestial observation boards

There were twelve ebony boards in a set. The largest was about 24 cm wide, the smallest about 2 cm. Each was marked with finger unit, from 12 down to 1, showing different star heights.



Hey! Can You “Hear” Me?

Early the next morning, Chen Kan was still writing down his thoughts about last night’s Star-Gazing when Gao Cheng stepped into the cabin. “Sir, look outside! The administrator’s ship has raised a flag asking us to stop. I just heard someone say it may be a Ryukyu ship coming near”.

“Well then, let’s go and see!” Chen Kan replied, walking quickly toward the deck. “Speaking of flags, what a clever way to solve the problem of two ships talking to each other at sea! With flags of different shapes or ways of waving them, we can send messages. We can even use smoke, lantern light, or the sound of drums and gongs. Isn’t that wonderful?”

With flag signals, it’s like the ships can “hear” each other!

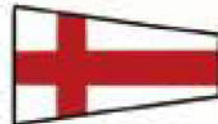
Fun with International Signal Flags

Alphabetical Flags



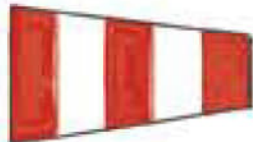
There are 26 alphabetical flags. Flags **A** and **B** are swallow-tailed, while the other 24 are rectangles.

Number Pennants



There are 10 number pennants, for digits 0-9. Each one is trapezoid-shaped.

Answering Pennant



There is 1 answering pennant, also a trapezoid. It can mean “answered” or “communication finished”. It is also used as a decimal point in numbers.

Answering Pennant



There are 3 repeater flags, all triangles. They are used to replace similar flags within the same group of flags, so you don’t need to carry multiple copies of the same letter or number flag.

The “Secret Weapon” Against Sickness!

When the two ships came close, Chen Kan learned that the Crown Prince of Ryukyu had sent men with supplies as a gift of care. He quickly ordered them to come aboard.

“Sir, our prince is busy with affairs of state and cannot come himself. So he sent me ahead to bring fine food and wine to you, our honored guests,” said the Ryukyu official.

Chen Kan and his companions were delighted. Before long, piles of supplies were set out on deck—all fresh fruits and vegetables, beef and mutton, and even good wine.

For sailors drifting far at sea, these gifts were priceless treasures. Fresh fruits and vegetables were full of vitamins, a true “secret weapon” against sickness.



Do you know?

In the history of sailing, sickness was one of the greatest threats for sailors. On Columbus’s voyage to the New World, many crew members died from scurvy—a disease caused by a lack of vitamin C. But during Zheng He’s famous voyages to the West, scurvy never broke out. Why? One reason was that his fleet carried not only fruits and vegetables that could be stored, but also soybeans and mung beans for sprouting fresh bean sprouts. On their journeys they also restocked supplies whenever they could. Thanks to these clever preparations, the sailors stayed healthy and strong.



A Giant “Cat”!

With fresh supplies on board, the fleet pressed on toward its destination. But the very next day, strong winds and waves rose up. The ship began to rock heavily in the surging sea.

“Don’t panic!” ordered Xiang Ying. “Hold steady! Drop the anchor! At once, the sailors rushed into action. The heavy iron anchor splashed into the water and sank straight to the bottom. With a deep rumbling sound, the ship’s rocking slowly eased, and everyone finally let out a breath of relief.



Do you know?

In early books, the word for “anchor (锚)” was miswritten as “cat (猫)” in Chinese, because anchor’s shape looked like a cat’s claws. Only later did the special character for “anchor” appear. No matter how it was written, the anchor was one of the most important tools for keeping a ship steady. At first, people used a heavy stone weight, called a Ding (碇), to keep ships in place. Later, this gradually developed into the anchor we know today, which is the very pillar of strength for ship safety. Even the modern Chinese phrase “pao mao (抛锚)” (to “throw anchor,” also used for a car breaking down) comes from this old sailing term.



How Deep Is the Water Here?

The ship no longer rocked so hard, but the wind and waves still would not stop. At Xiang Ying's suggestion, Chen Kan ordered the fleet to steer toward a nearby island and take shelter in its harbor.

Xiang Ying took out a rope tied to a lead weight called sounding lead. Every so often, as the ships moved forward, he slowly lowered the rope into the sea to measure the depth, writing down the numbers.

After several tries, Xiang Ying turned to Chen Kan gladly. "Sir, the water here is just the right depth, and the sand on the seabed is firm enough. We can drop anchor safely by the shore!"

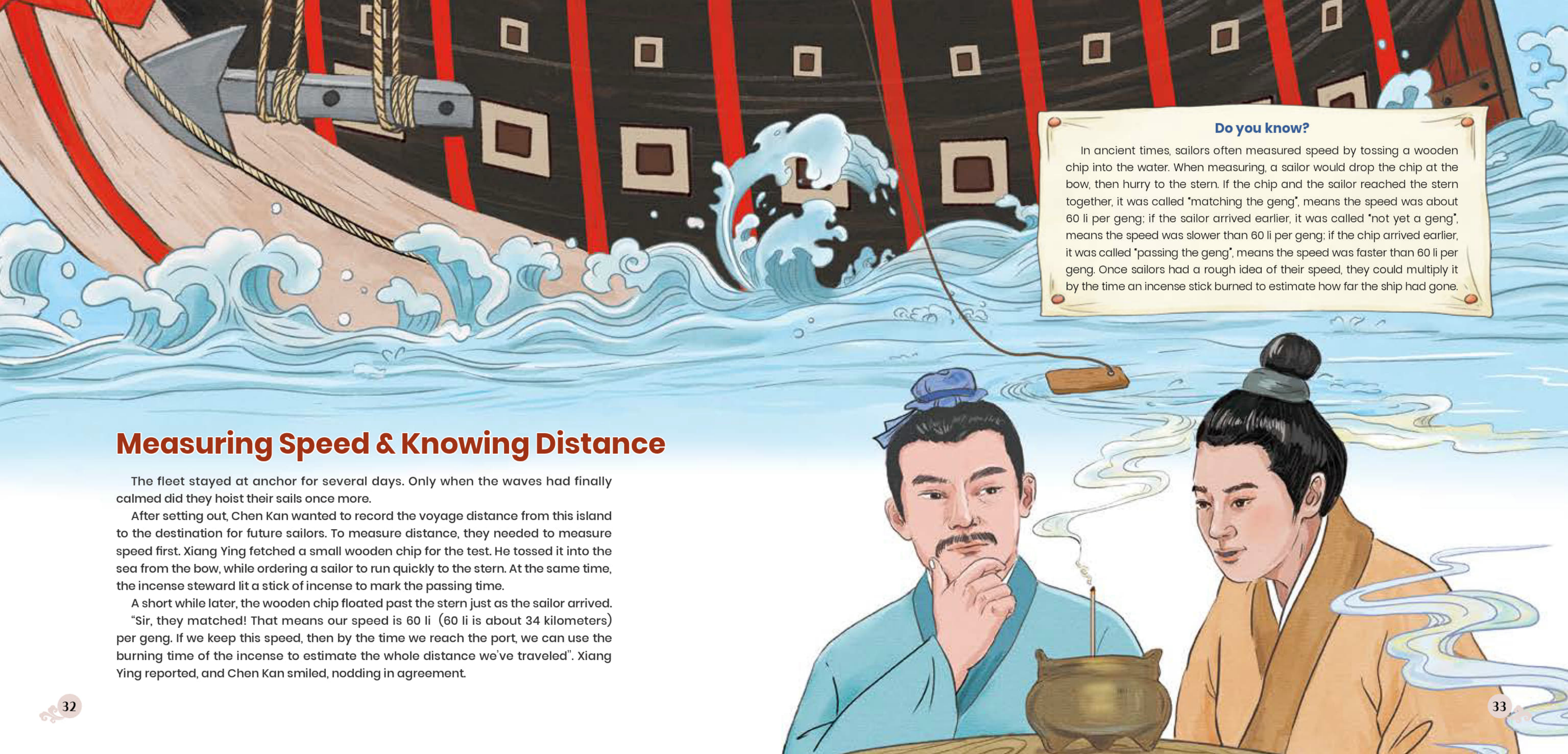
Do you know?

The Sounding Lead

To know how deep the sea was and to keep ships from running aground, sailors invented a special tool called the sounding lead. It was a heavy weight tied to a rope. By letting it sink to the bottom and measuring how much rope went down, sailors could tell the depth. In ancient China, the depth was measured in a unit called a tuo (托)—the length of a grown man's outstretched arms. Moreover, the sounding lead also gave sailors clues about what part of the sea they were in. Sailors often coated its tip with wax or grease, so that when it touched the bottom it picked up sand or mud. By studying the grains, they could guess the type of seabed and even check their position on the voyage.



The length of a grown man's outstretched arms is a tuo, about 1.6 meters.



Do you know?

In ancient times, sailors often measured speed by tossing a wooden chip into the water. When measuring, a sailor would drop the chip at the bow, then hurry to the stern. If the chip and the sailor reached the stern together, it was called "matching the geng", means the speed was about 60 li per geng; if the sailor arrived earlier, it was called "not yet a geng", means the speed was slower than 60 li per geng; if the chip arrived earlier, it was called "passing the geng", means the speed was faster than 60 li per geng. Once sailors had a rough idea of their speed, they could multiply it by the time an incense stick burned to estimate how far the ship had gone.

Measuring Speed & Knowing Distance

The fleet stayed at anchor for several days. Only when the waves had finally calmed did they hoist their sails once more.

After setting out, Chen Kan wanted to record the voyage distance from this island to the destination for future sailors. To measure distance, they needed to measure speed first. Xiang Ying fetched a small wooden chip for the test. He tossed it into the sea from the bow, while ordering a sailor to run quickly to the stern. At the same time, the incense steward lit a stick of incense to mark the passing time.

A short while later, the wooden chip floated past the stern just as the sailor arrived.

"Sir, they matched! That means our speed is 60 li (60 li is about 34 kilometers) per geng. If we keep this speed, then by the time we reach the port, we can use the burning time of the incense to estimate the whole distance we've traveled". Xiang Ying reported, and Chen Kan smiled, nodding in agreement.

Docking at Last! Time to Go Ashore!

"Mr. Chen, Mr. Gao, Mr. pilot! It's Naha Port ahead! We've finally reached our destination!" The lookout sailor shouted with excitement.

Chen Kan and Gao Cheng exchanged a smile, then turned to Xiang Ying. Xiang Ying gave a knowing nod, then shouted his order loud and clear: "Stand ready! Prepare to dock! Sound the depth and check the bottom first!"

When the depth soundings were done, Xiang Ying raised his voice like thunder across the deck: "Pao—mao—" (meaning "drop anchor" in Chinese)

After drifting for so many days on the vast sea, the envoy fleet had at last reached Naha Port, ready to begin a new journey.



From Land to Sea: A Thousand Years of Sails

The story of how the Chinese people moved from land to the sea is like a great epic. They broke through the barriers of geography and stepped into the unknown world. From the earliest tools used by Chinese ancient ancestors to cross rivers, to dugout canoes made thousands of years ago, and later to shipbuilding techniques and famous vessel types that deeply influenced the world's maritime industry, every step revealed the wisdom and courage of the Chinese nation.

Gourds

Long ago, people tied gourds to their waists to float across rivers. That's why gourds were called "waist boats".

Float Bags

Also called "skin bags," these were made by inflating animal hides to cross rivers.

Rafts

By tying floating things together, people made rafts. Bamboo tied into a bundle became a bamboo raft. Skins blown up like balloons became skin rafts—like the sheepskin rafts still seen today.

Dugout Canoes

Carving out the inside of a log made the earliest canoes—simple, but a true beginning.

Plank Boats

Later, people widened and raised the sides of canoes, turning them into flat-bottomed, pointed, or round-bottomed plank boats.

Towered warship

In Han Dynasty, these famous warships had tall, multi-level decks that looked grand and mighty. They often served as flagships for navy in ancient times.

Sand Ships

With square bows, square sterns, and shallow drafts, these flat-bottomed boats were perfect for sailing in shallow, sandy waterways.

Bird Ships

The pride of coastal Zhejiang, also among the four great types. They had small bows and wide bodies, with prows shaped like bird beaks—thus their name.

Guang Ships

Another of the four great types, from Guangdong. Their sails spread like folding fans, and their rudders had diamond-shaped holes.

Fu Ships

One of the four great ship types of ancient China, built in Fujian and Zhejiang. They had pointed bottoms, wide decks, and watertight-bulkheads technology, perfect for long sea voyages.

Eight-oared warships

First appearing in the Eastern Jin dynasty, they were the very first ships to use watertight-bulkhead technology. Their hulls were divided into eight compartments, so even if one compartment was flooded, the ship would not sink.

Fighting Ships

The huge tower warships were powerful but slow, so people in the Eastern Han dynasty built a new warship called "Fighting Ship".

Sailing by the Stars

Promoting maritime culture and
sharing Chinese civilization

