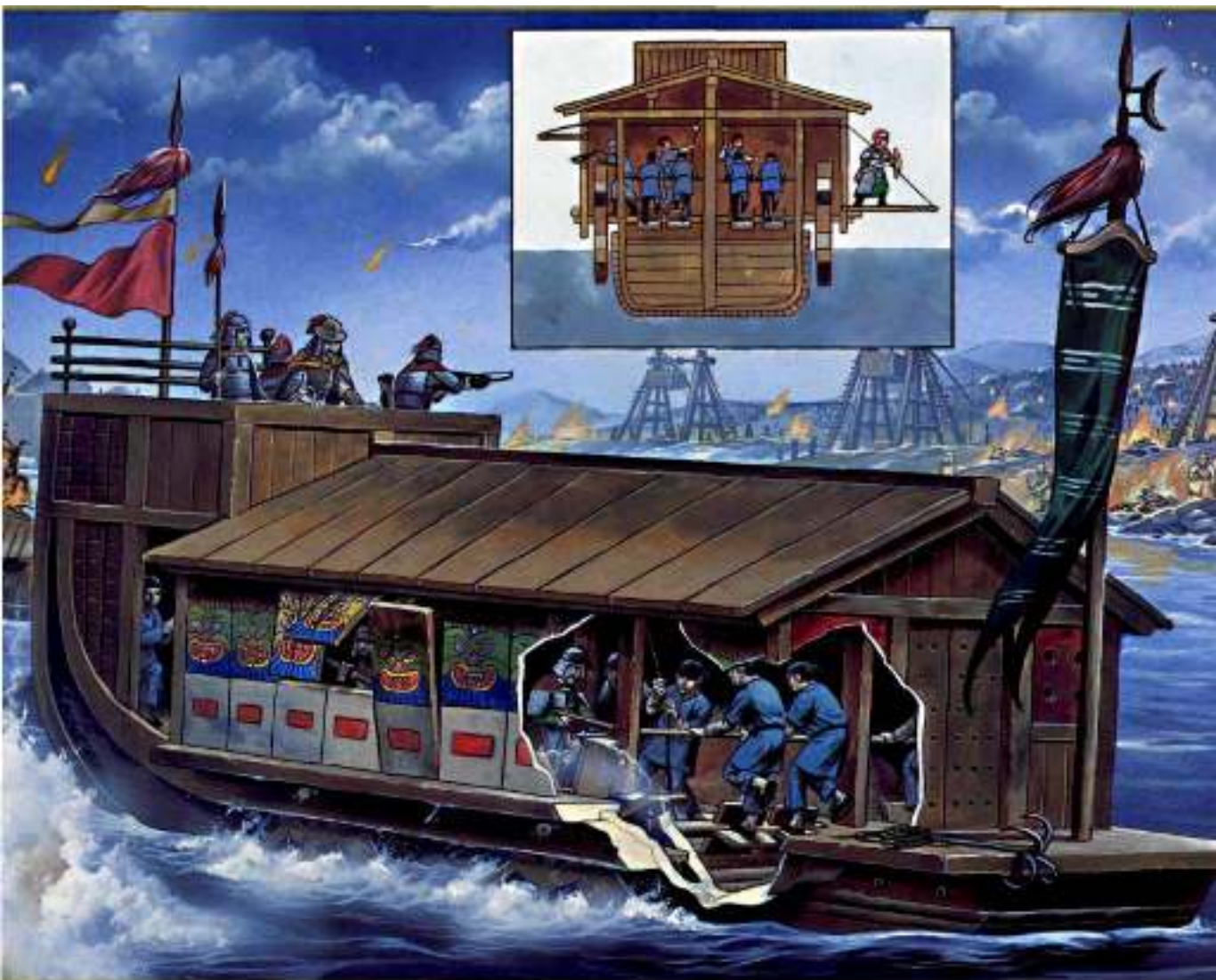


New Vanguard

OSPREY
PUBLISHING

Fighting Ships of the Far East (1)

China and Southeast Asia 202 BC-AD 1419



Stephen Turnbull • Illustrated by Wayne Reynolds

CONTENTS



STEPHEN TURNBULL is the world's leading English language authority on medieval Japan and the samurai. He has travelled extensively in the Far East, particularly in Japan and Korea and is the author of *The Samurai - A Military History* and *Men-at-Arms 86: Samurai Armies 1550-1615*.

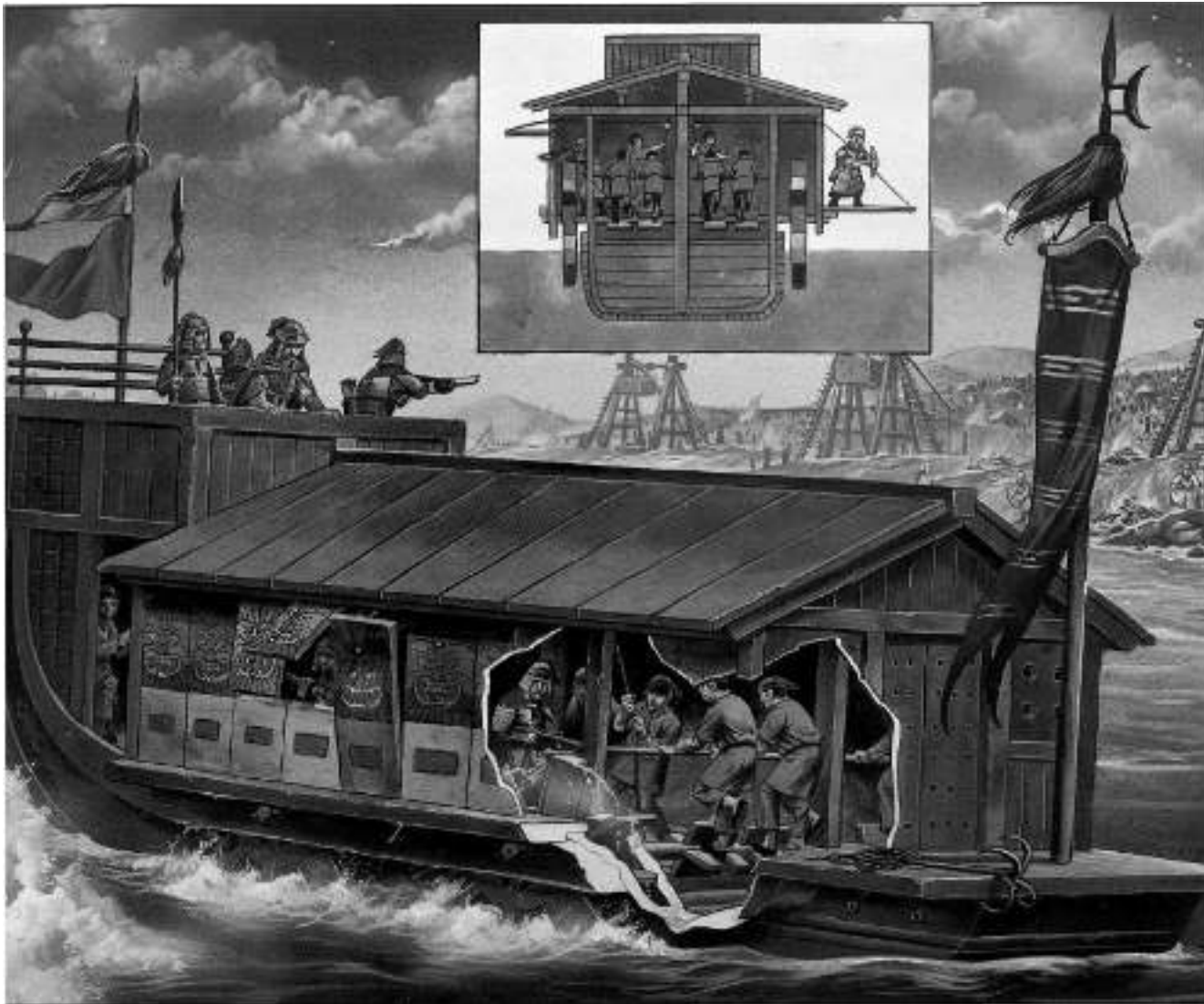


WAYNE REYNOLDS was born in Leeds, UK, and attended art college in Middlesbrough. He has had a life-long passion for illustration, and since 1991 has worked as a professional artist. Wayne has provided illustrations and source material for many gaming companies, creating figures, landscapes and interiors, as well as providing core characterisation. He is perhaps best known though for his work on titles such as *2000AD*, *Slaine*, and *Judge Dredd*. Wayne is also a keen modeller and historical re-enactor.

INTRODUCTION	3
FIGHTING SHIPS AND NAVAL WARFARE IN THE ANCIENT AND MEDIEVAL FAR EAST	4
• Fighting ships from Ancient China to the Tang	
• The fighting ships of the Song dynasty	
• Southeast Asia in the 12th Century AD	
• The rise of the Mongols	
• The founding of the Mongol navy	
• The Mongol naval campaigns in Southeast Asia	
• Naval power in the founding of the Ming dynasty	
TECHNIQUES AND TYPES OF CHINESE SHIPS AND SHIPBUILDING	10
• The first Chinese ships	
• The sampan	
• The eternal Chinese junk	
• The construction of a Chinese junk	
• Oar propulsion	
• Sails, rudders and anchors	
THE CHINESE FIGHTING SHIP	14
• Early specialist warships	
• The typology of Chinese warships	
• Lou chuan: The medieval Chinese battleship	
• Paddle-wheel fighting ships	
THE CHINESE FIGHTING SHIP IN ACTION	21
• Armour plating on Chinese warships	
• The use of striking arms	
• Boarding parties and close combat	
• Catapults and bombs	
• Naval incendiary weapons	
A CASE STUDY OF CHINESE FIGHTING SHIPS	37
• The battle of Lake Poyang, 1363	
SOUTHEAST ASIAN FIGHTING SHIPS	40
• The war barge	
• War barge fighting techniques	
SUGGESTIONS FOR FURTHER READING	43
COLOUR PLATE COMMENTARY	44
INDEX	48

Fighting Ships of the Far East (1)

China and Southeast Asia 202 BC-AD 1419



Stephen Turnbull • Illustrated by Wayne Reynolds

First published in Great Britain in 2002 by Osprey Publishing, Elms Court,
Chapel Way, Botley, Oxford OX2 9LP, United Kingdom.
Email: info@ospreypublishing.com

© 2002 Osprey Publishing Ltd.

All rights reserved. Apart from any fair dealing for the purpose of private study,
research, criticism or review, as permitted under the Copyright, Designs and
Patents Act, 1988, no part of this publication may be reproduced, stored in a
retrieval system, or transmitted in any form or by any means, electronic,
electrical, chemical, mechanical, optical, photocopying, recording or otherwise,
without the prior written permission of the copyright owner. Enquiries should be
addressed to the Publishers.

ISBN 1 84176 386 1

Editor: Simone Drinkwater
Design: Melissa Orrom Swan
Index by Alison Worthington
Originated by Magnet Harlequin, Uxbridge, UK
Printed in China through World Print Ltd.

02 03 04 05 06 10 9 8 7 6 5 4 3 2 1

For a catalogue of all books published by Osprey Military and Aviation please
contact:

Osprey Direct UK, P.O. Box 140, Wellingborough, Northants, NN8 2FA, UK
E-mail: info@ospreydirect.co.uk

Osprey Direct USA, c/o MBI Publishing, P.O. Box 1, 729 Prospect Ave, Osceola,
WI 54020, USA
E-mail: info@ospreydirectusa.com

www.ospreypublishing.com

Artist's Note

Readers may care to note that the original paintings from which the colour
plates in this book were prepared are available for private sale. All reproduction
copyright whatsoever is retained by the Publishers. All enquiries should be
addressed to:

Wayne Reynolds, 20 Woodside Place, Burley, Leeds, LS4 2QU, UK

Author's Note

To Stephen Randall

FIGHTING SHIPS OF THE FAR EAST (1) CHINA AND SOUTHEAST ASIA 202 BC-AD 1419

INTRODUCTION

These books complement my two previous volumes in the New Vanguard series that deal with the medieval siege weapons of the Far East. Here the subject is the fighting ships of China, Korea, Japan and Southeast Asia during roughly the same period, where we will see a similar ingenuity applied to military matters over an equally wide range of technology, and with equally impressive results.

The division between the two siege-weapon books was made according to weapon type. Here the division is by country and by time period, and it has seemed most sensible to deal with China and Southeast Asia together in Volume 1. For China the period covered is from the beginning of the Han dynasty to the first half-century of the Ming dynasty. The era covers over 1,600 years, during which there was much development in Chinese fighting ships, but also a remarkable consistency both in naval architecture and the techniques of naval warfare. The Chinese section ends with the classic case study of the epic naval battle of Lake Poyang in 1363, won by the man who five years later became the first Ming emperor.

The classic sea-going Chinese junk, shown here during the disastrous attempt by the Yuan dynasty to invade Japan in 1281.



The connections between the Chinese dynasties and Southeast Asia are also explored, firstly, because there are strong links between the two areas in terms of the transmission of military technology, and secondly because the major naval campaigns of the Yuan dynasty were directed against Vietnam and Java, whose war barges and river warfare complete the survey.

As space is limited I have no wish to repeat earlier material, so I shall confine technical descriptions of such weapons as trebuchets and incendiary bombs to the modifications made to them for use in naval warfare rather than in a siege situation. Instead the focus will be on the ships themselves and how they were used in war, from multi story Chinese battleships to Cambodian war barges.

Many organisations and individuals have been more than helpful in the preparation of this volume, but I would particularly like to thank the Royal Armouries Museum, Leeds; Cambridge University Library; and the Museum of Chinese History in Beijing.

FIGHTING SHIPS AND NAVAL WARFARE IN THE ANCIENT AND MEDIEVAL FAR EAST

Fighting ships from Ancient China to the Tang

The countries covered in this volume have a long history in the use of fighting ships in naval conflict, and just as in the case of siege weapons, the tradition begins in ancient China.

As early as 486 BC, during the Chun Qiu ('Spring and Autumn') Period, we read of warships possessing similar characteristics to those that would be met centuries later, particularly the use of 'marines' fighting from deck castles. In 219 BC a similarly equipped fleet was sent to war by the Qin emperor. Large battle fleets were found during the Han dynasty (202 BC - AD 220), including one sent against Korea in 108 BC, and there are lively tales of warships in the accounts of the Three Kingdoms Period (AD 221 - 265). This is the time that is thought of by the Chinese as the era of military romance *parexcellence*, where accounts tell us of double hulled battleships being attacked by small boats whose bows were tipped with iron rams. Huge battleships then helped bring about the downfall of the former Three Kingdoms state of Wu in 285. Three centuries later in 584 a naval genius called Yang Su was commissioned by the Sui emperor to destroy the Chen dynasty, and constructed a one hulled five story tower ship. By the time of the Tang

The use of sampan type boats for military purposes as depicted on the wall of a stone tomb in AD 147.





The 'sand boat', a word sometimes used for a Chinese warship, which is shown here crudely drawn and full of armed men. One source says, 'their bottoms are flat and broad; they can sail over shoals and moor near sandbanks, frequenting sandy creeks and havens without getting stuck'.

dynasty in the 8th century we have become used to references to ships of three storeys in height possessing 'bulwarks, arms, flags and catapults', and now read as well of Greek Fire being projected from ships.

The fighting ships of the Song dynasty

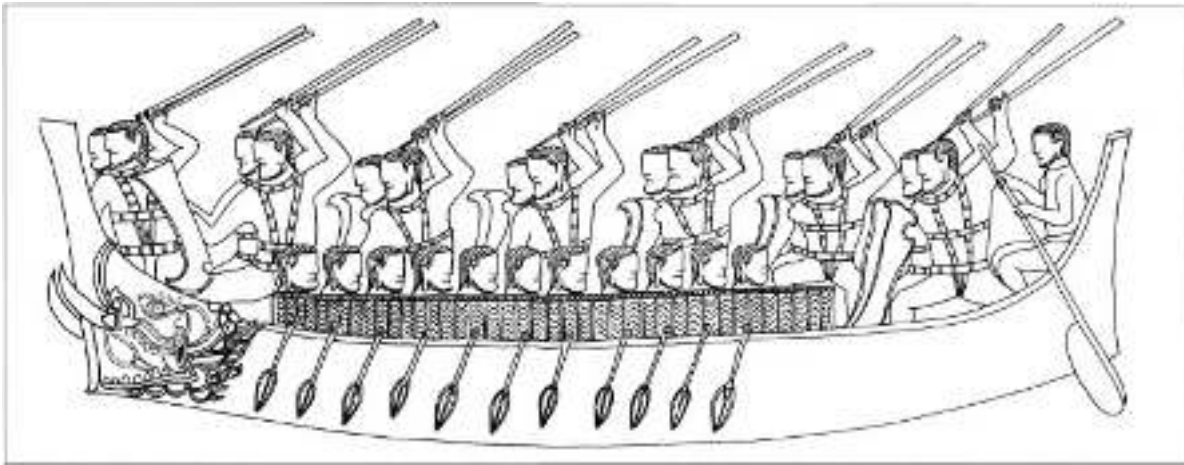
The Song dynasty, which replaced the Tang and reigned from AD 960 to 1279 in spite of interruptions and interregnums brought about by other dynasties, developed a considerable naval capacity, and shipyards were established in Hangzhou and elsewhere. The first Song emperor attached great importance to shipbuilding, and often made personal visits to the yards. Defence against pirate raids provided the initial stimulus for this enthusiasm, but the Song fleet soon proved vital in combating the Jin dynasty. During the 12th century the Jin fought a long war against the Song, and captured Kaifeng, the Song capital, in 1126. From this time on, Song hegemony was limited to southern China, so the dynasty became known as the Southern Song. It continued to fight back against the Jin, conducting operations from their new capital of Hangzhou from 1135 onwards, and much naval fighting took place.

Southeast Asia in the 12th century AD

The last quarter of the 12th century also saw the rivers and estuaries of Southeast Asia resound to naval warfare. While the Song were fighting the Jin, hundreds of miles to the south war barges and war canoes were going into action on behalf of the Khmer empire of Cambodia and the Chams of Champa (present day Vietnam). The war was indecisive for some time, but in 1177 King Jaya Indravarman decided on an invasion of Cambodia by sea. His fleet sailed up river to the Khmer capital of Angkor. The city was pillaged, and the Chams occupied Cambodia for the next four years. Other countries then took advantage of Cambodia's weakness. Ceylon sent a naval and military expedition against the Khmers in 1180, and this state of affairs continued until the future Cambodian king Jayavarman VII staged a revolt. He defeated the Chams in a great naval battle in 1181, an epic river fight commemorated forever in the bas-reliefs carved into the walls of Banteay Chmar and the Bayon in Cambodia. Further naval action followed 13 years later when King Jayavarman VII took his revenge on Champa. The defeated King Suryavarmadeva of Champa fled with his followers in more than 200 junks, and being warned that the local dignitary with whom he had taken refuge was planning to murder him, Suryavarmadeva set fire to his rival's junks while their guards slept, and then escaped in the confusion.

The rise of the Mongols

The early 13th century saw the rise of the Mongols, whose initial operations launched overland from the grassy steppes did not require



ABOVE A fine representation of a Khmer war barge going into action. The spearmen are at the ready. All have shields and apparently some form of simple armour.

BELOW A fanciful drawing of a fighting ship shaped like a dragon.

them to undertake any naval warfare. Even siege warfare was foreign to them at first, but when the neighbouring Xixia kingdom was conquered the Jin emperor considered it wise to put a barrier of water between himself and these wild horsemen. He accordingly moved from Zhongdu (modern Beijing) to the Jin's southern capital of Kaifeng, which was protected to the north by the natural moat of the Yellow River. The Mongols then overran Beijing and became the masters of northern China.

In spite of the new threat from the Mongols the Jin continued to fight the Southern Song, and we will note some further naval operations in this endeavour. The death of Genghis Khan in 1227 gave both kingdoms a brief respite from Mongol attentions, but in 1230 his successor Ogodei Khan began a large-scale operation against the Jin, culminating in 1232 in the celebrated capture of Kaifeng by the Mongols under their famous general Subadai. The Mongols pursued the Jin emperor to nearby Caizhou where he had taken refuge, and with his suicide in 1234 the Jin dynasty came to an end.

The founding of the Mongol navy

The conquest of the Southern Song was hindered temporarily by the death of Mongke Khan in 1259. The effort was resumed by Khubilai Khan, and became a colossal military undertaking that faced numerous obstacles. The Mongol armies were not used to the naval warfare that was now required in order to secure the rivers and ports of southern China, so the development of a Mongol navy became a top priority. In fact, transport by sea, and naval warfare in general, had not been needed at all until the invasion of Korea in 1231, but that campaign had taught the Mongols a very valuable lesson. The initial operation had been totally land-based. But when both sides suffered a

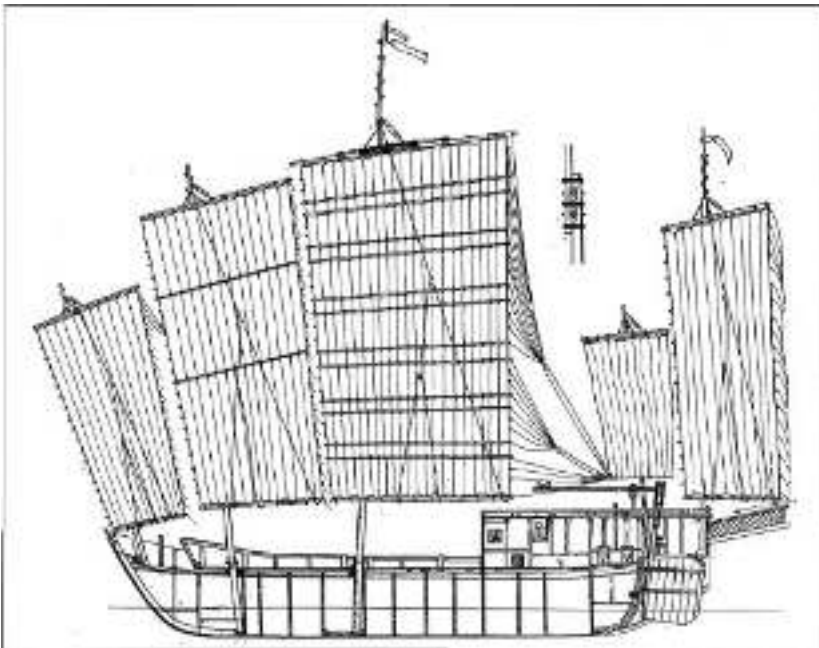


stalemate during the protracted siege of the town of Kuju in what is now North Korea, the Korean king took advantage of the opportunity to slip away with all his court from the capital at Kaesong to the island of Kanghai. There he formed a government in exile, and resisted all Mongol attempts to capture him, even though the distance from Kanghai to the mainland was only half a mile!

In addition to the lack of sea-going transport, the Mongol horsemen of the steppes were also faced with great rivers that would somehow have to be crossed and navigated in the unfamiliar climate and terrain of southern China. The first steps towards creating a Mongol navy occurred early in 1265 with a major battle at Diaoyu in Sichuan Province. The Mongols not only won the battle but captured 146 ships that then became the core of their fleet. The speed with which the Mongol navy then began to grow impressed a Chinese historian, who wrote, 'the alacrity with which the Mongols, a nation of horsemen unacquainted with the sea, took to naval warfare was amazing'.

Further defections from the Southern Song followed, and in 1273 an additional 500 ships entered Mongol service from a very unlikely source. Over the centuries, silt at the mouth of the Yangtze had produced a number of islands, and on the largest of these, Chongming, two pirates called Zhu Qing and Zhang Xuan had established themselves. They offered their services to the Mongol leaders, and soon found themselves in positions of responsibility. A further boost was given to the Mongol maritime capacity when the king of Korea saw his country ravaged around him and abandoned his offshore refuge. The resulting peace settlement handed the vast naval resources of Korea to Kubilai Khan, and the first use he made of them was in 1274 when the Mongols attempted to invade Japan. This well-known operation, which only lasted a couple of days and was essentially a reconnaissance in force, was nonetheless a considerable naval campaign.

The sha chuan or Jiangsu freighter, a sea-going junk that was probably the parent type for many kinds of Chinese ships, including ocean-going war junks. The largest types could reach nearly 200 feet in length, but this example is 85 feet long.



The advance against the Southern Song continued using the Mongols' newly acquired skills in both naval and siege warfare, and in fact it was a sea battle that brought about the final eclipse of the Southern Song. Bayan crossed the Yangtze in 1275, and from 1277 the war against the Song developed into a seaborne chase from one port to another. The pursuit reached its climax in 1279 in a sea battle off Guangdong. The Mongols blockaded the Song fleet, which attempted to break out. In the fight that followed the Song imperial ship was one of the

casualties, so an official took the child emperor in his arms and jumped into the sea, drowning them both.

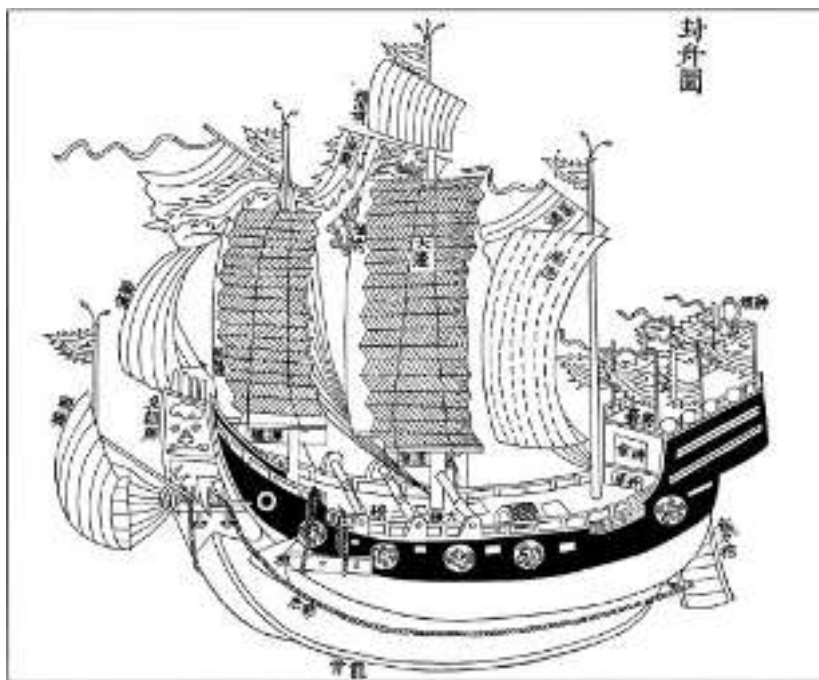
On completion of the conquest of the Southern Song the newly created Emperor Khubilai Khan of the Yuan dynasty of China turned his attentions once more towards Japan. He carried out a second invasion in 1281, but this attempt was no more successful than the first, and the fledgling Yuan fleet was smashed to matchwood by the *kami kaze*, the 'divine tempest' that saved Japan. Within a year the sailors of the Yuan dynasty had a new role, that of shipping and guarding grain convoys by sea from southern China to the Yuan capital at Beijing. This new enterprise was placed in the hands of the ex-pirates Zhu and Zhang, and was found to be a workable alternative to river transport. It also provided useful experience for the forthcoming series of naval expeditions to Southeast Asia.

The Mongol naval campaigns in Southeast Asia

The greatest test for the Yuan navy came with their campaigns in Southeast Asia that added dense jungles, long rivers, insects and diseases to the Mongol learning curve. Vietnam was the first objective. At the time Vietnam was divided into two kingdoms: Annam in the north, with its capital at Hanoi, and Champa, home of the Chams, in the south. In 1281 the king of Champa aroused Mongol wrath by refusing to pay homage. Khubilai responded by sending Sodu, one of his leading officials, on a punitive expedition by sea with 100 ships and 5,000 men. This was an amphibious exercise on the model of the Japanese invasion, but the king withdrew to the mountains, and fierce guerrilla warfare prevented the Mongols from making any headway.

A Mongol expedition against Annam reached Hanoi by 1287 and the Annamese king fled. Not satisfied with his victory, the Yuan general Toghon unwisely returned during the hot season of 1288. This time a fierce naval battle took place in the estuary of the Bach Dang River off Haiphong, where a celebrated Vietnamese general had defeated a Chinese army several centuries before. General Tran Hung Dao now repeated the victory, using the same tactics, against the Mongols. He waited until high tide, and lured the Mongol fleet into advancing over an area of shallow water where iron-tipped stakes had been planted. When the tide turned the Mongol ships were caught on the projections, and suffered great

An ocean-going junk depicted in a printed work of 1757, but showing many traditional features.





A replica Chinese junk in the style of the ships of the Yuan dynasty that tried to invade Japan is seen here moored in the harbour of Hirado in Japan.

loss. On land too, they were forced to retreat because of the heat and the environment, much to Khubilai's anger, and the efforts to conquer Vietnam were effectively over.

A large naval force carried out the Mongol expedition against Java in 1292. The fleet set sail from Quanzhou and took several months to reach Java because they chose an open sea route, calling at small islands, rather than following the coast through Malacca and Sumatra. We are told that 'the wind was strong and the sea very rough, so that the ships rolled heavily and the soldiers could not eat for many days'. The Mongols landed near present-day Rembang, on the north-eastern coast, early in 1293. The Mongol commander disembarked half his army and instructed them to march overland in a show of force, while the rest of the troops continued eastwards by sea. The Chinese account tells us how 'the fleet in the river and the cavalry and infantry on shore then advanced together, and Hi-ning-kuan [the Javanese commander], seeing this, left his boat and fled overnight, whereupon more than a hundred large ships, with devils' heads on the stem, were captured'.

After four months of fighting the Mongol army began to suffer from the equatorial heat; so taking with them what prisoners and treasure they had gained, the fleet set sail for China and home.

Naval power in the founding of the Ming dynasty

It was not long before the Yuan dynasty in turn 'lost the mandate of Heaven to rule'. A rebel army under Zhu Yuanzhang captured Nanjing in 1356 and, with this as their base, began a campaign to overthrow the Yuan, although they had other rivals who wished to steal the prize from them. It was a naval battle fought on an inland lake that decided which of several rebel groups would succeed the Yuan as the new dynasty. This was the battle of Lake Poyang in 1363, described later as a case study in Chinese naval warfare. Zhu Yuanzhang, the victor of Poyang, took Beijing in 1368, and that same year proclaimed himself the first emperor of the

Ming. The Ming navy became the glory of the empire and the means by which such heroes as the eunuch Zheng He carried out astonishing expeditions to Sumatra, Ceylon, India and even Africa, from where in 1419 he brought back a spectacular cargo of lions, leopards, camels and giraffes.

TECHNIQUES AND TYPES OF CHINESE SHIPS AND SHIPBUILDING

The first Chinese ships

In common with many countries, the fighting ships of ancient and medieval China do not represent a development entirely separate from that of other craft, but were adapted from boats and ships designed for peaceful purposes. For this reason we will begin the study by taking an overview of Chinese ship design.

The history of shipbuilding in China is lost in the mists of legend and antiquity. Some of the ancient Chinese classics attribute the inspiration for the earliest craft to Fu Xi, one of the Five Great Rulers of the legendary period, from about 2852 to 2205 . Fu Xi is said to have made important contributions to divination and philosophy, and also to have introduced rafts to the Chinese people. The use of the word 'raft' is interesting because although many adjacent countries developed their craft through the medium of the dugout, China does not appear to have done the same. It seems quite reasonable to conclude that China's development of built up craft came straight from the raft. In southern and central China rafts were generally made from bamboo, of which there was a local abundance, while in the Yellow River basin rafts based upon inflated hides were more common.

Until comparatively modern times similar rafts made from sheepskins or goatskins were still being used for passenger traffic or light cargo on the Yellow River. Single skins like waterwings were also used to support swimmers for short distances. In the case of larger rafts the skins were taken from yaks or bullocks. The prepared skins were stuffed with wool or tobacco leaves (to escape paying duty!) and inflated. The legs, pointing upwards, were lashed to the wooden framework of the raft, and the skins were tied together. A small 'one man' raft consisted of a wooden platform about seven feet square, supported by between nine and 12 skins. Large rafts would be about 30 40 feet long and used up to 200 skins.

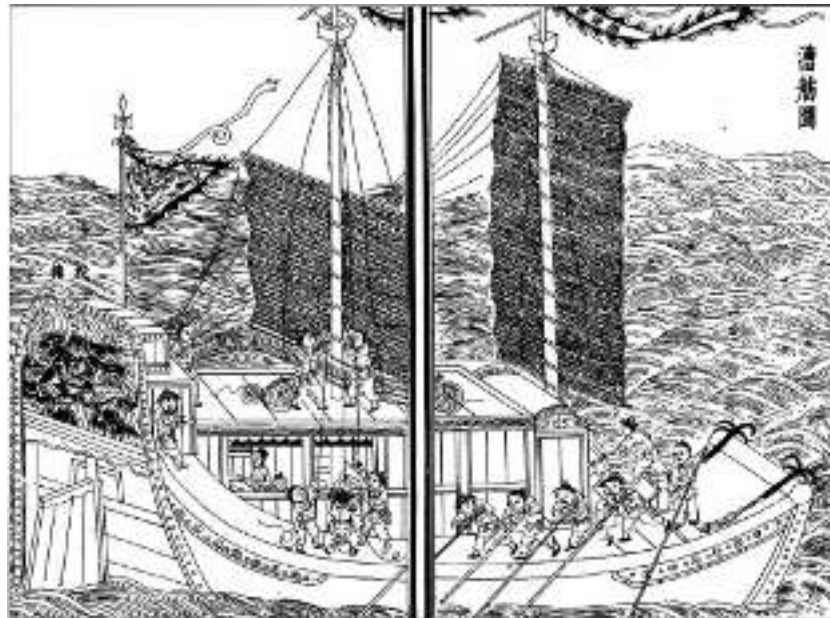
The sampan

When we turn to the first all wooden boats in China we encounter a word that was to become very well known. The word 'sampan' is derived from the Chinese 'san' meaning 'three' and 'pan' meaning 'planks', the whole being a symbolic representation of a small boat. As a class it represents

A simple drawing of a Chinese fighting ship suitable for ocean going work. Lots of lively military activity is going on.



A grain freighter on the Grand Canal at the beginning of the Ming dynasty. Some of the warships that fought during the battle of Lake Poyang would have looked like this.



a boat in its most rudimentary form, and doubtless the derivation of its popular name indicated its origin from a raft of three planks or logs. If its construction is studied, it becomes apparent how, through a process of evolution, it would occur to the ancient naval architects to build up the fore end of the raft to create a bow. Later improvements would have included the introduction of a transom in the stern. Ancient stone carvings give us our first pictures of Chinese sampans, and it is fascinating to note that one representation, dating from AD 147, shows sampans being used for naval warfare. The boats are of a characteristic shape, and we see combatants armed with swords and shields, while one has a bow and arrow. A single oarsman in the stern propels the sampans.

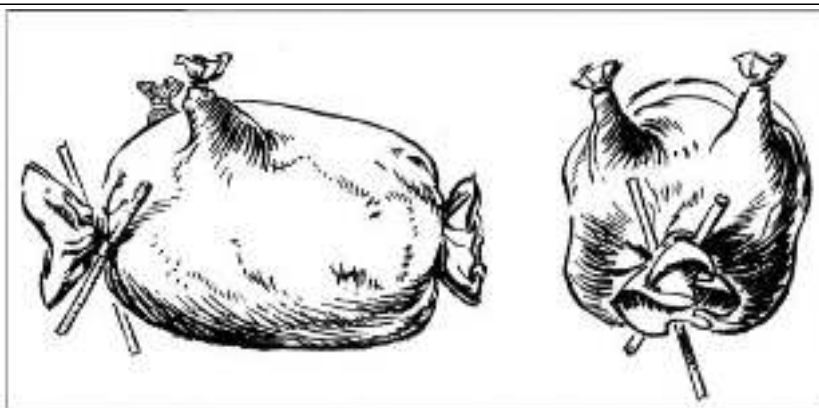
The eternal Chinese junk

The most commonly used word to describe any Chinese or even East Asian ship is 'junk'. This familiar expression was first used in a Western-language source in 1555, and is probably derived from a mishearing of *chuan*, the Chinese word for boat or ship. Unfortunately, the pejorative connotations of 'junk', in English at least, have tended to lead to a presumption that Asian ships were somehow inferior to Western ones, an impression that even a knowledge of the Ming voyages to Africa has done little to dispel. Yet in many respects Chinese ships were years ahead of their European counterparts, displaying such features as watertight bulkheads, balanced rudders and sails extended with battens long before these innovations were seen on Western ships. The expression 'junk' will occur frequently in the pages that follow, although a more useful nomenclature will enable us to identify warship types, including fighting junks, more precisely where this is possible.

The construction of a Chinese junk

When a man decided to build a junk, he was not confronted with any difficulties in choosing its design. That was decided for him centuries

before, for certain types were proper to certain districts. Some slight modifications were permitted to meet particular requirements, but they were in no way allowed to interfere with the essential design. The methods employed in building a junk varied according to the locality and the type and size of the craft, but the following process may be taken as typical and would form the basis even for the different types of specialist warships described below.

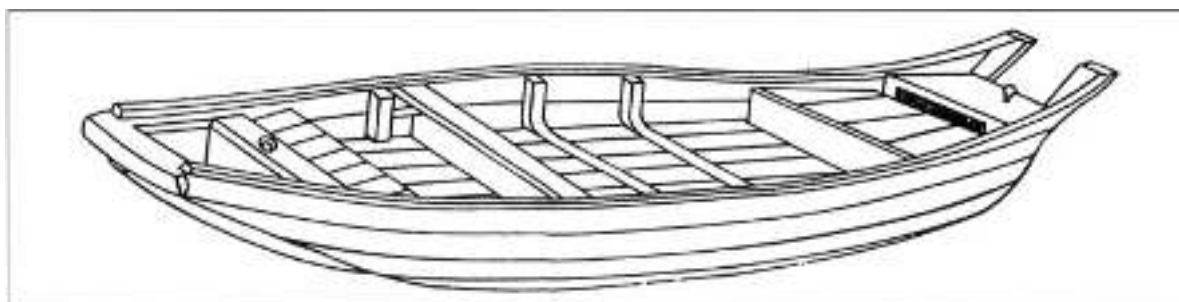


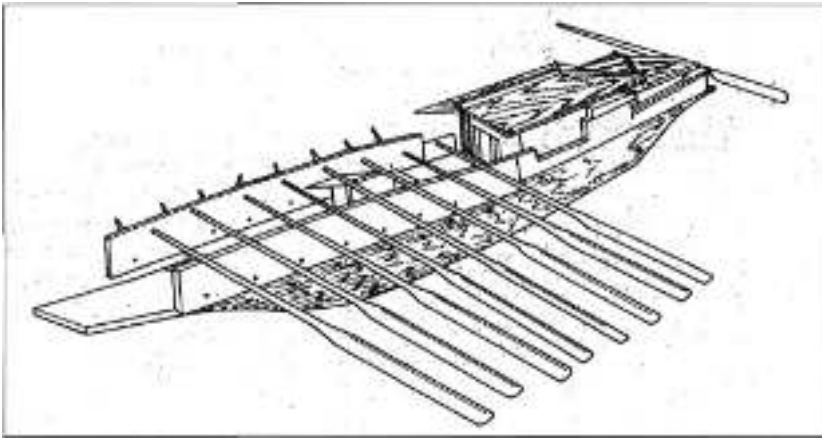
The simplest form of water transport, still used in China until comparatively recently, was the inflated bullock skin. It could be used by an individual person, or tied together under hurdles to make simple rafts. Several cultures are known to have made military use of this simple vessel.

The initial operation was essentially to lay the flat planks for the bottom boards side by side on the ground over a central keel (where one was fitted) and secure them together. This was done using wrought-iron double-ended nails, the planks being knocked together to form a solid whole. At suitable intervals, according to the length of the junk and the strength of the construction desired, transverse bulkheads or ribs were placed in position on the bottom planks, each being fastened in the same manner. The carpenters, who worked without a rule, using only the carpenter's string, cut the side planks of the hull and the wales to shape. The side planks were then placed in position, hove down with ropes and finally nailed to the bulkheads. Deck beams, usually of hardwood, rested on all the bulkheads, their ends being let into the topmost side planks. Frames, when fitted, were next built into the junks. These consisted of two, three or more members scarfed and joined by heavy nails. The bow and stern were built up in more or less the same way according to the traditional design usual in the district. When the hull was complete the deck planking was added. Caulking was vital, and was carried out using a compound of lime and wood oil. The caulk set hard and white within about 48 hours to produce a watertight join.

Sea-going commercial junks were important vessels in their own right, and there are good sources for them from the Song and Yuan dynasties. There is also an important pictorial source for a Chinese junk on one of the bas-reliefs at Angkor Thom in Cambodia, which may be dated to 1185. Similar vessels acted as warships during the Mongols'

The sampan. The word derives from a Chinese expression for 'three planks'.





A drawing of a Han dynasty boat model excavated from a tomb. It is a flat-bottomed barge operated by oarsmen, with a steersman in the stern and a simple wooden 'cabin'.

overseas naval campaigns, as attested to in the paintings of Mongol ships that appear on the Mongol Invasion Scroll that illustrates the expeditions to Japan of 1274 and 1281. Marco Polo, who was in China between 1275 and 1292, adds more detail about junks. Among many other features, he noted with some approval one deck with little cabins, a good rudder and four

masts, and he was fascinated to see that the design of the larger vessels meant that they possessed watertight compartments, something unknown in contemporary Europe: 'so that if by accident the ship is staved in one place, namely that whether it strikes a rock, or a whale-fish striking against it in search of food staves it in ... the water cannot pass from one hold to another'.

We may also note the 'sand ships', which were sea-going vessels: 'as their bottoms are flat and broad they can sail over shoals and moor near sandbanks, frequenting sandy creeks and havens without getting stuck'. These were simple junks without a keel.

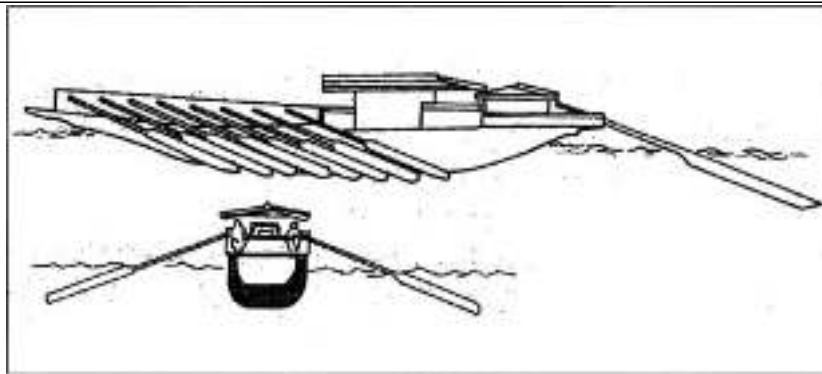
Oar propulsion

One important characteristic of many types of Chinese vessel, both military and civilian, was the use of an oar known as the *yuloh*. This type of oar was radically different from conventional Western oars, and may also be seen in Korean and Japanese craft. Instead of being dragged through the water the *yuloh* operated on the principle of a screw, and consisted of a broad blade of hardwood joined to a central section or 'staff', which in turn was fixed to a handle or 'loom'. A rope was fastened at one end to the loom, and at the other end to a ring bolt on the deck. The *yuloh* rested on a fulcrum at about its point of balance. The rope balanced the weight of the blade and kept it at the correct angle as it was moved. A pull on the rope also controlled the feathering of the blade. In contrast to Western practice, instead of multiplying the number of oars to increase the power, more men were added to the same number of *yuloh*.

Sails, rudders and anchors

Sea-going junks would make use of wind power. The characteristic sail of China is known as the 'balance lug', whereby between one-sixth and one-third of the sail area was before the mast. The actual design depended on the traditions and environment of the particular area, but the overall construction was the same everywhere. Battens of bamboo, each of which connected with, and indeed formed part of, the sheet, stiffened the sail. The sail was therefore kept very flat. The battens also had other advantages that would be appreciated in a war situation. The sail could be half-full of holes and still be drawing well, and a man

could use the battens to climb up the mast to throw bombs down on to an enemy deck from the crow's nest. In about 1100 an observer commented on a junk's employment of wind power as follows: 'Their masts are firmly stepped, and the sails are hoisted beside them. One side of the sail is close to the mast like a door on its hinges. The sails are made of matting ... At sea they can use not only wind from abaft, but winds from onshore or offshore ... When the wind is dead ahead they cast anchor and stop.'



The Han dynasty boat model reconstructed with side elevation.

Chinese junks were fitted with stern post rudders for steering. Some were very large, but all were superbly balanced. The anchors looked very crude, being usually made from a stone thrust through a piece of timber, but were very efficient.

THE CHINESE FIGHTING SHIP

Early specialist warships

The earliest known representation of a Chinese fighting ship may be found on a bronze vase of the 4th century preserved in Beijing. This is contemporaneous with the written records of deck castles on ships during the Warring States Period (463 221 BC). It is clearly a two storey vessel. The rowers occupy the lower storey, while above them flags are flying as warriors engage with dagger æ halberds and short swords. The other similar picture is from a later bronze of the Early Han Period (202 209 BC). Archers are more prominent here, and on the right hand vessel one man is beating a drum. The inclusion of soldiers in the water alongside the fishes is interesting. They may represent guardian spirits, but as they are attired the same as the crews, and two of them appear to be engaged in combat, it is most likely that the fight is continuing under water.

Clay models of boats from archaeological excavations may be added to this picture to build up a good idea of what Han warships looked like, and a wooden model of a river boat found in a prince's tomb has also provided vital clues as to the appearance of a simple war vessel of the Han dynasty. It is a flat bottomed barge operated by oarsmen, with a steersman in the stern and a simple wooden 'cabin'. The larger multi storey vessels are likely to have been built as rafts mounted over two similar flat bottomed hulls like an ungainly catamaran, with very simple multi storey deck castles decreasing in size like a wedding cake (see Plate A). The ships would be used exclusively on rivers or estuaries. Details of sea going craft of the later Han dynasty (AD 25 220) are also known, and these have typically bluff square ended bows and sterns and flat bottoms, a style of naval architecture that was to become the traditional 'Chinese junk'.

The typology of Chinese warships

More types of ship are found as we move into the Three Kingdoms Period (AD 221-265), but their study is bedevilled by a bewildering range of names for Chinese fighting ships in the literature. However, a very useful document is the *Wu Jing long Yao* of 1044, which is derived from an earlier work of 759, which describes six types of fighting ship. These types constantly recur in the source material for the next ten centuries, and they provide the overall framework for discussing Chinese fighting ships from the Tang dynasty onwards. The classifications are:

1. Lou chuan

The literal translation is 'tower ships'. These were three-storey battleships with fortified upper decks described in detail below. Unlike the Han multi-storey ships, they had flush sidewalls above a single hull, although there were many variations.

2. Zhan xian or Dou xian

Literally 'war junks' or 'combat junks', these craft resembled the tower ships in their design but were of a smaller-sized, one-storey construction and were less well protected. Just as with the tower ships, the oarsmen operated outside the central deckhouse, but there was a raised stern castle from where the captain directed operations.

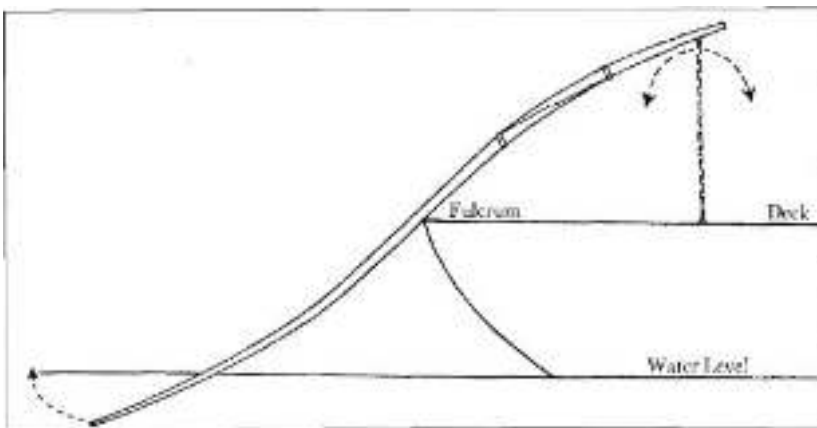
3. Meng chong

The two characters *meng* (cover) and *chong* (swoop) imply a vessel that was covered over but still able to swoop on to its prey. These fast and light warships were the 'destroyers' of medieval China. Unlike the above two types, the wall of the two-storey meng chong was continuous with its hull, so that the oarsmen who occupied the lower deck were fully protected, while missile troops went into action above their heads. Close-combat grappling was therefore not a primary function of these ships. The 'armour plating' was of wood or rhinoceros hide, and there was a fierce tiger's face painted on the bow.

4. Zouge

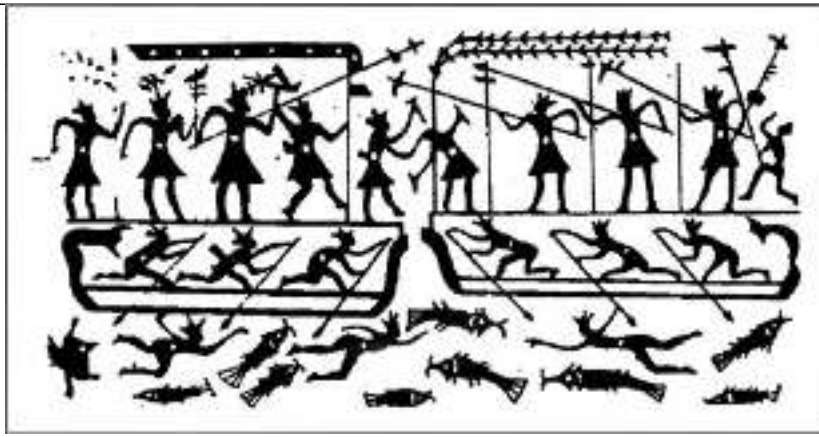
These smaller fast ships had one open deck with protective bulwarks, and carried 'the best and bravest soldiers', who were transported rapidly to and from the scene of action. The design meant that the soldiers were on deck alongside the rowers.

The yuloh-type oar, showing its component parts and mode of action by rotation.



5. You ting

These simple patrol boats were used for scouting and reconnaissance, and were not primarily fighting ships as such, although they would have a small detachment of marines on board for self-defence.



The earliest known representation of a Chinese fighting ship on a bronze vase of the 4th century preserved in Beijing. It is a two storey vessel. The rowers occupy the lower storey, while above them flags are flying as warriors engage with dagger, halberds and short swords.

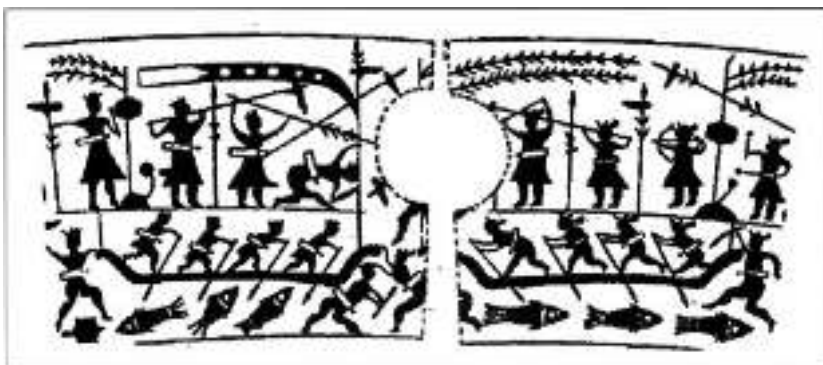
6. Hai hu

Literally 'sea hawks', these were converted merchant vessels to which protective features were added for use in war.

Lou chuan: The medieval Chinese battleship

There are so many accounts of the important lou chuan, the tower ships of the fleet from the Han dynasty to the Ming, that we can have a fairly good idea of what they looked like. They were multi storey in construction and had portholes and other openings for crossbows and lances. Trebuchets (both traction and counterweighted) were mounted on the uppermost deck beside portable forges for molten iron projectiles. In later varieties under the Ming dynasty, cannon and other firearms replaced the trebuchets. On its wide and curved bow was painted a fierce tiger's face in lieu of a carved figurehead. A door gave access to the bow areas and the sides from the castled area. The whole ensemble, says an early description, resembled a city wall.

Variations on the theme of the tower ship are encountered throughout history, as the following selection of examples will show, and their great size made them almost literally 'floating fortresses'. This was in fact the exact consideration entered upon in 285 in a war against the former Three Kingdoms state of Wu. Their enemies controlled no strong points on the borders of their territory, and decided to remedy this deficiency by building what amounted to a wooden castle and floating it downstream. The naval architect was one



Warship from a bronze of the Early Han Period (209-202). Archers are more prominent here, and on the right hand vessel one man is beating a drum. The inclusion of soldiers in the water indicates that the fight is continuing under water.



A smaller warship of Jiangsu style depicted in the *Wu Bei Zhi* of 1628. The vessel carries a small cannon in its bow.

Wang Chun, nicknamed the 'prancing dragon admiral', who produced a square-shaped tower ship with multiple hulls (perhaps four sets of four), 600 feet along each side and capable of holding 2,000 men. Horses could be ridden round its wooden ramparts. At the bows there were decorations of birds and animals 'to overawe the river spirits'. The ship was built in Sichuan Province, and warning was given to the Wu by pieces of scrap wood that floated downstream. The Wu prepared accordingly by erecting iron chain booms and planting iron stakes in the river. But the advance of the floating fortress down the Yangtze was preceded by piloted rafts that took the impact of and broke the underwater obstacles. The boats holding the chains were then set on fire and the river was cleared of all hindrances for the great ship's magnificent descent.

As no other descriptions of the huge ship exist we cannot be precise about whether it was the earlier Han dynasty type of 'wedding cake' warship, or the later *lou chuan*. But it is almost certainly the latter version that is being described in 584 when Yang Su was commissioned by the Sui emperor to destroy the Chen dynasty. He

constructed a one-hulled, five-storey tower ship of which one feature was a set of the strange 'striking arms' as described below. Multi-decked *lou chuan* battleships are also reported in 934, and in 1048 the Liao dynasty built warships that could carry horses below decks and men above, and these worked effectively as landing craft along the Yellow River. Finally, in 1170, a traveller on the Yangtze watched naval manoeuvres carried out by 700 ships, each about 100 feet long with castles, towers, flags flying and drums beating as they moved rapidly even against the current.

We will look in detail at the armaments of all six categories of ship in a later section, but it is worth noting that there are many variations of style within these categories. Some vessels were simply adaptations of sea-going transport junks, which enabled fighting to take place on the open seas rather than on rivers and coastal waters. The earlier list quoted above is also non-specific about the motive power of the vessels, so the paddle-wheel ship is not directly identified. This is such an important category of warship that the section that follows will be devoted solely to it.

Paddle-wheel fighting ships

In 1842, during the Opium Wars, a naval battle took place in the estuary of the Yangtze between Chinese ships and vessels of the Royal Navy. When the British commanding officer wrote an account of the incident he drew particular attention to the fact that while the British used steam-powered paddle-wheel ships of the very latest design, the Chinese ships were also powered by paddle-wheels, but in their case the motive force was

provided by manpower. He concluded rather patronisingly that this idea 'must have been suggested to them by the reports they received concerning the wonderful power of our steamers or wheeled vessels', all of which showed the rapid changes that the Chinese were making towards modernisation when they were confronted by superior Western technology. In fact the reality of the situation lay in exactly the opposite direction, because the Chinese paddle-wheel vessels were a 19th-century manifestation of a type of warship that had been used by them for hundreds of years. If anything, the British were the copyists, having simply applied steam power to the established principle of paddle-boat design in the mid-18th century.

Even before the Spring and Autumn Period there are references in the Chinese literature which imply the existence of paddle-wheel ships. Here are descriptions of vessels that could cover considerable distances 'without the help of wind', where 'the men propelling the boats were all inside the vessels'. Their enemies, noting the absence of oars and oarsmen, concluded that they were operated by spirits. A reference to a battle that took place in AD 418 notes the ships moving away from their moorings 'apparently by themselves', and a century and a half later we read of 'foot boats', which gives a further clue as to how the manpower was converted into motive power. This matter was further clarified in AD 782, when, 'Li Gao, always eager about ingenious machines, caused naval vessels to be constructed, each of which had two wheels attached to the side of the boat, and made to revolve by treadmills. The ships moved like the wind, raising waves as if sails were set.'

By 'treadmill' however, we must not conjure up images of prisoners walking inside some enormous wheel. The treadmills that operated the paddle-wheels were smaller devices, with pedals projecting radially from the axle, upon which a man, or a team of men, trod from an external position, a principle similar to that of the 'pedalo' found on holiday beaches. As all the Chinese texts remark on the speed attained, some form of gearing may also have been incorporated.

It was during the time of the Southern Song that paddle-wheel warships really came into their own as war vessels. When the Song dynasty was driven south by the Jin, the Yangtze River became its 'Great Wall', and paddle-wheel ships were regularly used for patrolling the river against Jin incursions. They were employed in battle in 1130 when the Jin were trying to withdraw across the Yangtze after one of their raids, and in 1132 a report noted that 'to defend the thousand-li vastness of the Great River it is necessary to have warships'. The writer then reported that he had designed a 'flying tiger warship' with four wheels at the sides. Each wheel had eight blades and was rotated by four men. The ship could travel 1,000 li a day.



A four-decker lou chuan battleship armed with counterweight trebuchets, which dates it to after 1272.



The lou chuan (battleship) in the 1520 edition of *Wu Jing Zong Yao* (AD 1044). It has the characteristic open construction whereby the oarsmen are protected only by the ship's gunwales. Its offensive armament is a counterweight trebuchet.

At about the same time another inventor called Gao Xuan produced an eight-wheeled version, which was tested in battle when it was deployed against a peasant revolt that had degenerated into numerous pirate raids on the settlements on the shores of Lake Dongting. The eight-wheeler 'proved speedy and easy to handle whether going forward or backward. It had planks on both sides to protect the wheels so that they themselves were not visible. Seeing the boat move by itself like a dragon, onlookers thought it was miraculous.' Larger ships

driven by 20 or even 23 wheels then followed from Gao Xuan's drawing board, and the sources tell us that his largest ships were 200-300 feet long and could carry 700-800 men. Unfortunately the technology fell into the wrong hands when a pirate fleet captured two eight-wheeled paddleships that had become stranded in a tidal river. On board one of them was Gao Xuan himself, who was taken captive. The pirates forced him to work for them, and within two months they had built paddle-wheel ships that were better than the imperial originals, which their rebel fleet then proceeded to ram and bombard with traction trebuchets. The account goes on to say that the imperial forces in their turn copied the rebels' large paddle-wheel ships and replied with the exploding bombs described in a later section.

The eventual government triumph in 1135 came about from a curious stratagem that took advantage of a design weakness in the paddle-wheel ship. General Yo Fei, one of China's greatest naval heroes, covered the surface of the water of one arm of the lake with masses of floating weeds and rotten logs, and lured the pirate fleet on so that their paddle-wheels became entangled and could not move. His boarding parties then swarmed on board and won a notable victory.

In 1161 there occurred the most celebrated naval battle between the Southern Song and the Jin, when the latter, who were that day under the personal command of their emperor, attempted to force a crossing of the Yangtze at Caishi. The Song paddle-wheel fighting ships went into action as they had against the pirates and moved rapidly round the island of Jinshan to bombard the Jin with traction trebuchets:

But our fleet was hidden behind Jinshan, with orders to come out when a flag signal was given. So a horseman was sent up to the top of the mountain with a hidden flag, and then our ships rushed forth from behind on both sides. The men inside them paddled

fast on the treadmills, and the ships glided forward as though they were flying, yet no one was visible on board.

The Jin had no vessels of their own that could compare to these rapid and manoeuvrable warships, and were so badly defeated that the Jin emperor was assassinated on board his flagship by his own followers.

Throughout the literature on the Southern Song paddle-wheel fighting ships we find references to large vessels having an odd number of paddle-wheels. This implies that one wheel was fitted at the stern, which is not surprising, because if we assume that a ship's manoeuvrability (which is regularly admired) arises from the wheels on the port and starboard sides being operated independently of each other, then the ship could be steered and reversed without the need of a rudder. This would leave ample space for a larger paddle-wheel at the stern. As for the numbers of the men providing the power, a four-wheeled ship of 1203 is recorded as needing 28 men, while a larger version, but still of only four wheels, has 42. The largest number of pedallers mentioned in any of the sources is 200, which may imply either relays of men or a system known to have been used during the 19th century (of which the technology was known to the Song) whereby several shafts were joined to the wheel by coupling rods and eccentrics, so that each paddle-wheel could be operated by three groups of pedallers at once.

The most famous use of paddle-wheel fighting ships in Chinese warfare took place during the epic siege of Xiangyang (modern Xiangfan in Hubei Province) between 1267 and 1272, the war which saw the most desperate rearguard action by the Southern Song against the advancing Mongols. The siege of Xiangyang is best known today because it was the occasion when counterweight trebuchets made their first appearance in China, but the use of paddle-wheel warships is equally striking. Two heroes of the Song called Zhang Shun and Zhang Gui took a relief convoy of 100 paddle-boats laden with clothing and other supplies to the help of the beleaguered twin cities of Xiangyang and Fancheng that lay opposite each other on the river. The Mongol commander, Achu, attacked them as they approached, and Zhang Shun was killed. The convoy waited until dark to make their return voyage, but Achu burned



A four-wheeled paddle-wheel warship, with tigers' faces painted on to the sides, which could be let down for boarding.



A charming drawing of a Chinese paddle-wheel warship of the Song dynasty which appeared in an 1842 edition of a work on coastal defence.

bales of straw on the riverbank to give illumination, and this time Zhang Gui was also killed.

Later in the same year we find paddle-wheel ships being used by the Mongols against Xiangyang, but in a very different way. These vessels had almost certainly been captured from the Southern Song defenders, and were used against a floating bridge which the Song had constructed between Xiangyang and Fanzheng. The ships were anchored in midstream next to the bridge, and the current was used to turn the paddle-wheels to operate mechanical saws that cut through the timbers of the bridge.

A Ming account of the 15th century gives vivid details about what happened when a paddle-wheel fighting ship closed with its enemy, a situation that can have been little different in Song times, because it was clearly written before the advent of cannon:

Above the hold the deckhouse gives through communication fore and aft, with a great beam supporting bulwark boards on each side, each plank being five feet long and two feet wide. Below this are fixed turning pulleys like those which raise hanging windows. When

approaching the enemy those inside can loose bombs, incendiary arrows and fire lances. With all this the enemy cannot even see us. The enemy being somewhat weakened, our sailors suddenly lift up and fully open the bulwark hatches, [the walls] acting like a shield, and stand ready within. In addition, raw ox hides are stretched out to protect the crew while from inside they throw incendiary bombs and toxic smoke bombs and shoot iron-pointed javelins [perhaps from large siege crossbows?] and use grappling hooks. Thus the enemy ships must be burnt and destroyed.

The Chinese paddle-wheel warships were formidable vessels indeed. Their use would of course be greatly restricted on the open sea, but on rivers and in estuaries they were to prove their worth for centuries to come, with only their armaments differing greatly from the originals on a craft that served successive dynasties so well and for so long.

THE CHINESE FIGHTING SHIP IN ACTION

Armour plating on Chinese warships

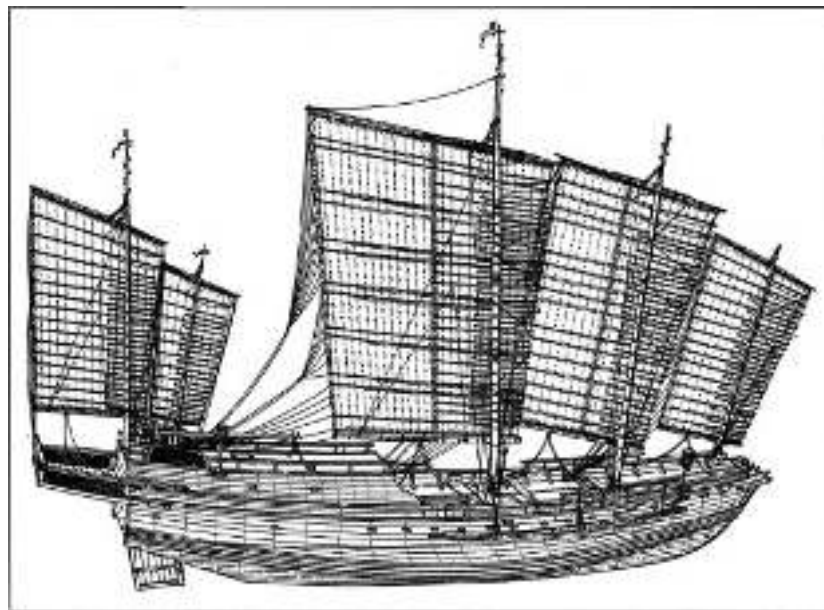
The use of paddle-wheels gave Chinese shipwrights the opportunity to provide their ships with close covering, or even armoured protection, in a way that projecting banks of yuloh oars or sails on masts would not allow. It is also interesting to see a reference to the principle of

protective bulwarks being adopted by the Jin, whose naval practices were inferior to the Song, at the battle of Huang Tian Dang in 1130. The Jin sailors built protective bulwarks (of what materials we are not told) with oar ports in them, and attacked the becalmed Song fleet with fire arrows. Yet such methods of defence were nothing new, because the wars of the Three Kingdoms Period had already involved the use of fast warships on which the bulwarks were covered with wetted hides as a protection against incendiaries. In the battle of the Red Cliff in 207 a fleet was destroyed by fireships, which were rendered more effective because the enemy ships were tied together as a precaution against seasickness, a strange remedy that turned out to have been suggested by a traitor!

The use of some limited form of metal armour plating (as distinct from 'ironclad battleships' of course) on Chinese warships is also well attested. Its origin is probably the very mundane one of applying sheets of thin metal to the undersides of ships for preservative reasons. As the predominant Chinese naval fighting technique was that of using missile weapons from a distance rather than close-combat grappling and boarding, to extend this protection to the upper reaches of the ship would have been perfectly natural, with thin plates of forged wrought iron replacing the rhinoceros hides noted earlier. How much iron was used on the ship and where it was placed depended on a number of factors, and an excellent example is provided by the Ming expedition of 1370 against Sichuanese rebels, who had seized the opportunity for independence when the Yuan dynasty collapsed. The following passage is so rich in other details of naval warfare that it is worth quoting at some length:

Where the cliffs are very precipitous and the water most dangerous, the Sichuanese had set up iron chains as booms and bridges to block the gorge horizontally so that no ships could get through. Liao Yung-zhong therefore sent several hundred men with supplies of food and water to make a portage with small boats, so that they appeared up river beyond these defences. Now the mountains of Sichuan are so well-wooded that he had ordered the soldiers to wear green garments and sleeveless raincoats made of leaves, and thus they descended through the forests and rocks. At the fifth night watch the general assault began both by water and land.

Drawing of a five-masted freighter, which gives a good idea of the probable build of the Ming dynasty treasure ships. These were the vessels that took Zheng He to Africa in the early 15th century.



- [**read Printing Ink Manual \(5th Edition\)**](#)
- [read Science 2 for the International Student pdf, azw \(kindle\), epub](#)
- [**Escaping the Price-Driven Sale: How World Class Sellers Create Extraordinary Profit book**](#)
- [**download online The 21-Day Belly Fix: The Doctor-Designed Diet Plan for a Clean Gut and a Slimmer Waist pdf**](#)

- <http://jaythebody.com/freebooks/Dirty-Love.pdf>
- <http://anvilpr.com/library/Aloha-from-Hell--Sandman-Slim--Book-3-.pdf>
- <http://cambridgebrass.com/?freebooks/Perspectives-on-European-Earthquake-Engineering-and-Seismology--Volume-1.pdf>
- <http://schrolf.de/books/The-21-Day-Belly-Fix--The-Doctor-Designed-Diet-Plan-for-a-Clean-Gut-and-a-Slimmer-Waist.pdf>