CHAPTER 4

SHIPS IN LITERATURE
Archaeological evidences of the ancient Indian shipping in the form of paintings, engravings or models are substantiated with literary references. There are numerous references to sea voyages and river navigation in the ancient Brahmanical, Buddhist and Jain texts. Besides, several other secular texts and accounts of foreign travelers are also mine of information about the ancient shipping and shipbuilding technology. Ancient literature also gives important information about navigational instruments, processing of wood, methods of construction, ship's fastenings, mast, sail and even the painting and decorating the ships.

Ancient Indian literature, religious as well as secular, is replete with references to the ships and maritime activities, which prove that the ancient Indians freely used the ocean as the highway of international trade and commerce. Ancient literature can broadly be divided in two groups based on their nature - religious and secular. Religious Indian literature is Brahmanical, Buddhist and Jain while secular...
The ancient literature shows that the ancient Indians were familiar and had close association with the sea. They built coastal towns and realized their importance for commercial activities. There are mentions of the western sea (Arabian Sea) and the eastern sea (Bay of Bengal). There are also references of *Nala-mala Samudda* (Arabian Sea), *Nila-mala Samudda* (Bay of Bengal), *Agni-mala Samudda* (Sea around Andaman and Nicobar islands), *Kura-mala Samudda* (Persian Gulf or Red Sea?).

*Rgveda* mentions about sea, ships and boats and also about sea voyages, which continued for several days and nights. The other Vedic and later Vedic texts also contain similar references. The vast Buddhist and the Jain literatures composed in Pali and Prakrit languages also contain valuable information about overseas trade and maritime activities. The Buddhist *Jatakas* tells several stories of sea voyages. Many other works in regional languages also mention about ancient boat and ships and maritime activities.

These literary references in ancient literature throw light on ancient
Indian ship building techniques, traditions, local practices and maritime trade. Even some mythological stories also seldom provide valuable information about the ships and the maritime activities. The literature composed in any part of the country had some information to give. Not only the poets and scholars from the areas close to the sea but also from the far away places were fascinated by these giant moving machines and created literature mentioning about seafaring.

Kshemendra, the Kashmiri poet, has also written about the Indian mercantile activities, which informs about the foreign intercourse and naval activity in India.

Besides these literary works ancient inscriptions also give useful information about the sea voyages and naval battles. Epigraphic data also provide valuable information about seafaring and shipping and tells about the maritime contacts and commerce between India and Southeast Asia.

Scholars like R.K. Mookerji (1912), R.C. Majumdar (1960), Moti Chandra (1977) Lallanji Gopal (1962, 1970, 1999), and others have attempted to reconstruct the maritime history with the help of information given in ancient literary works such as Vedas, Purana, Epics, Jatakas, Buddhist texts and Jain chronicles.
While going through some of the earlier works on this subject one may notice that several descriptions have been simply quoted by a host of scholars without analyzing them. Quoting a verse from ancient literature without properly interpreting and analyzing it does not serve the real purpose. It may just tell that the author of the text was aware about the ships or ships existed while the text was written but that is not sufficient to reconstruct the systematic maritime history.

Study of ships in literature has several difficulties. Though these references in ancient literature furnish a vast amount of details about contemporary ships and other associated information but it is not very easy to have a clear picture of these ships. The purpose of the author of those texts was not to describe a ship but to narrate an episode. Terms used for various kinds of vessels and their parts in literature always remain the point of debate. These literary works were not aimed to impart technical knowledge to their readers but to entertain them. Writer’s knowledge of shipbuilding and seamanship is also very important in this regard (Tripathi, 1997).

Importance and reliability of any literary evidence largely depends upon the maritime knowledge and observations of the writer. If he
did not have understanding of nautical matters his works might be misleading. While studying ancient literature one has to read very carefully not only every line and every word but also sometimes between the lines. Comparison with other contemporary works dealing with other subjects is always useful.

Historicity of the places, the persons and the events mentioned in ancient literature has been a keenly discussed problem among historians, archaeologists and scholars since very beginning. Scholars have tried to verify these literary descriptions by studying and comparing them with various other literary, linguistic, geographic, ethnological, social, archaeological and allied studies. These attempts addressed to various problems have fruitfully resulted in understanding several aspects of early Indian shipping and shipbuilding technology also (Tripathi, 2003).

The early literature is also difficult to date accurately. A researcher has again to take help of other sources to arrive on any acceptable conclusion. The purpose of author of those texts was not to document an event with accuracy but to narrate the events of social significance.
The vast Vedic, the Buddhist and the Jain literatures composed in Sanskrit, Pali and Prakrit languages contains sketchy but valuable information. Many other works in regional languages also mention about ancient boat and ships and maritime activities. The study carried out by Rajamanickam and Arulraj under a project entitled Maritime History of South India, provided fresh data on the subject. The information generated includes various names of boats and ships, their parts and other related aspects.

Many other literary works are also full of passages that tell about the flourishing Indian shipping and shipbuilding technology.

VEDIC LITERATURE

The vast Vedic literature contains many references to ships, boats, sea voyages, foreign trade and commerce. Studies in Vedic literature indicate that shipping was well developed during Vedic times. There are numerous references of boats for river traffic and also huge sea-going vessels, which called at distant ports. There were different types of ships for different uses like merchant vessels, cargo ships, passenger ships, rescue ships, life boats, warships, etc. Construction of such variety of ships suggests advanced methods of
construction and skilled shipwrights.

Rgveda

The earliest literary work, the *Rgveda* also mentions about ships and maritime activities of Aryans. It contains several nautical terms and references to the sea voyages undertaken by the Aryans. MacDonnell & Keith (1912) noted a few technical terms appearing in the Rgveda and later Vedic literature. Later, Bisht (1988: 12-13) studied in detail the various mercantile and maritime terms in *Rgveda*, which give a good idea of seafaring activities during the Vedic period.

Hymns of *Rgveda* delineate the complete scenario of the contemporary society. Studies in *Rgveda* throw fresh light on some of the important aspects of trade and commerce of the contemporary society. *Rgveda* also mentions the Aryans navigating in the rivers as well as the high seas. The Rgvedic Aryans were advanced mariners whose motto was “May our Ship embark to all quarters of the earth”

*nava na ksodah pradisah prthivyah*
Two Pathya Svasti verses purport that the wealth that come from roads across deserts, over the waters be auspicious

Svasti nah pathyasu dhanvasu svastyay psu vrjane svarvati svasti nah putrabrthesu yonisu svasti raye maruto dadhatana svastriddhi prapathe srestha reknasvatyabhi ya vamameti sa no ama so arane

Besides several direct references of ships and sea voyages there are also several indirect evidences indicating maritime trade and related activities. Several terms used in Rgveda suggest brisk trade and mercantile activities. Many of these terms continued to be used for business transactions during the historical times also. Some of these terms are given below:

* artha (RV, VII.63.4, X.29.5) for wealth,
* avyaya (RV, VIII 86 2) for capital investment;
* bhaga (RV, VIII.86.2; VIII, 79.6, X 11.8; VIII 36.6) for share;
* gratha (RV, VII 6 3) for capital invested in business;
* nna (RV, VIII.47.17) for loan;
* sulka (RV, VII.82 6, VIII 1.5) for custom or octroi tax;
* bali (RV, VIII.89.9) for tribute to a superior authority, king or god;
* suvita (RV, V.80 3) for wealth or money,
These terms suggest frequent trade and commercial activities contrary to prevailing notion that the Aryans were rural people who were engaged in farming and cattle raising and followed a system of barter.

In a verse the price of an image of Indra is proposed at ten cows. There are also references to ten kosas and to ten hiranyapindas (RV, VI 47.23) Basic unit was further divided in parts (samnayamasi) amounting to one-sixteenth (kala), one-eighth (sapha) and one-fourth (pada). From the Satapatha Brahmana (3 3 2 6.1-6) it appears that the basic value should be hiranya (or suvarna) It was the value of a piece of gold of a specific weight which was evaluated at par with the price of a cow. Half the value of such a unit is called artha or gavardha. The accumulated wealth is counted in numbers of a hundred, a thousand, or ten thousand (RV, VIII 1 5) The gold currency was reckoned in binary system in respect of its lower denominations such as 1:2:4:8:16 equal to one unit and in the decimal one in that of the higher, e.g. 100, 1000,
10000. Such system of trade and transactions is possible in a well-developed society only. There may not be any doubt that these traders were also carrying out overseas trade.

Trade and commerce necessitate a viable network and better modes of transport. *Rgveda* speaks of roads going to far away lands across the rivers, plains, deserts, mountains and high seas. In fact, the wealth coming from far away lands (*RV*, VIII 89.6; VIII.34.18; VII.30.2) as well as seas (*RV*, V 52.11, VII 6.7, V.75.3) is solicited earnestly and repeatedly. Rgvedic seafarers offered prayers to make their going abroad pleasant and homeward journey comfortable *madhumanme parayavam madhumat punarayanam* (*RV*, X.24.6).

Distance was measured (*RV*, III.38.3) in *yojana* (*RV*, IX.7.1, IX.102.3). The traders of Vedic period were also engaged in long distance trade across the sea. The trade was conducted through the land-routes and the waterways. The navigators wished to have their path full of wealth (*RV*, VII 42.2). During journey, they halt and then move on for increase of wealth (VIII.72.6). There are copious references to *pathins*, which are solicited to bring fortune (*RV*, III 54.21; VI.4.8, VIII.86.13).
The Rgvedic Aryans had brisk maritime trade. A number of references of their going across the sea for wealth, their settling down across the sea and their prayers to make their voyages pleasant clearly indicate these activities. The references to horses, mules, mares, asses (RV, I.30.18), and bringing wealth from the distant sea (RV, VIII 5.30, V.76.5, V.68.8) indicate horse trade. They went to the west for the acquisition of wealth (RV, I.124.7). Some of the traders had perhaps settled across the far sea (RV, IX.65.22). Sea voyages are mentioned as pratara (RV, VI.47.7) and pratarana (RV, VII.54.2) (Bisht, 1988 12-13).

Water vessels are generally called nau in the Rgveda. They are also referred as tan (RV, X.69.7), tarani (RV, III.29.13, VII.26.4; VII.32.9, VII.67.8, 20, VIII.49.8), pratarani (RV, V.46.1), plava (RV, I.182.5) and drun (RV, VIII.85.11). These terms refer to a watercraft of different types and dimensions. Drun seems to be a raft made of logs or a small dugout canoe. The term tan does not occur frequently like plava. Tarani fitted with sails appears to be a river-vessel (RV, VII.67.8) used for carrying provisions (RV, VII.32.9). Pratarani is described as a guards carrier (RV, V.46.1).

In the hymns dedicated to Asvins, nau is mentioned as a large sea-
going ship  Ship was fitted and furnished with oars (antra) (RV, I 116 5, X.63 10, X 101 2) Oars are sometimes compared to feet (RV, I 116 4) The number of oars in some of the boats are as many as hundred. The one hundred as a stock number in the Rgveda usually stand for many (Bisht, 1988 12-13).

Besides oars the ships also used sails These ships had masts which are called vandhura, skambha or stambha. The masts were usually three in number (RV, I 34.2; I 34 9, VII 69.2; VIII 5 28; VIII 22 5, VIII 74 8, IX 62 17)

Sails were used on seagoing vessels The composers do not call them by one definite term but usages various adjectives. They have been described figuratively some times as swans having golden wings, (RV, IV 45 4) or as birds (RV, VII 69 71, VI 62 6, I 116 4, I 118.4). A sailing vessel floating with great speed in favourable wind is described as a bird flying in the sky.

\textit{yuvor-hi yantrani himyeva vasaso} (RV, I.34 1)

There is also mention of ropes (RV, VII.69 7) which were used for hoisting and lowering sails or with anchors (RV, X.41.1).
Interpretation of Vedic hymns and understanding them in right sense is very important for extracting the useful information from these ancient texts. A large ship with enough accommodation onboard is called as Asvins house fashioned in the sea.

\[ \text{samudre adhyakrte grhe} \ (RV, \text{VIII 10 1}) \]

In another verse a ship is compared to an auspicious mansion. These descriptions perhaps indicate spectacular dimensions and luxurious construction of ships.

Verbs like \textit{vah, tr, pratr} etc. are used in the context of sailing of ship. Besides some special and unusual verbs like \textit{uh, inkh, prenkh}, are also used.

Rgvedic hymns also contain some of the highly technical terms clearly suggesting the maritime activities of the Vedic people. Some such terms are listed below -

- \textit{Niyana}: passing over with carriage or anchoring
- \textit{Nyayana}: docking
Parayana - sailing abroad
Sannana - commissioning
Avartana - homeward journey
Nivartana - returning or reaching

These terms indicate that the authors or the composer of these hymns were well aware of seafaring and the maritime activities of the Aryans (Bisht, 1988 12-13)

The above-mentioned details leave no doubt that the Vedic people built large ships of high carrying capacity. These ships used many oar (sataritra) to cross the sea. The 100 oared galley of Ashwini’s mentioned in the I mandala (I 116.3-5, I 117 14-15; I 118 6, I 119 4, 8, I 182 5-7) is referred most frequently. It narrates how Bhujyu, son of King Tugra along with his followers was picked up by the Asvins in their boat having 100 oars when he was attacked in the mid-sea by the enemy. Such large ships were different in construction from ordinary riverboats. Big ships, fit for maritime traffic were used to carry merchandise

Another passage of the Rgveda states that the ship was so
constructed that they could withstand battering of storms (RV, I 24, 35-36)

**Atharva Veda Samhita**

A hymn in the *Atharva Veda Samhita* mentions a boat that rode the waves. It was broad in beam, spacious, comfortable, resplendent, with strong rudder, faultless in construction.

**Vajasaneha Samhita**

The *Samhitas* contain passages bearing on shipping and maritime commerce. The *Vajasaneha Samhita* mentions a ship equipped with hundred oars, and designation of the crew like *aritri*, *navaja* and parts of boat such as anchor (*naumanda*) and propelling pole (*sambina*) (Bisht, 1988 12-13).

The vast mass of *Sutra* literature also contains evidences pointing to the commercial connection of India with foreign countries by the sea-routes.
The *Smrities* also contain explicit references to sea-borne trade.

Shipping was a well-developed industry in Vedic times. There were boats for river traffic and also huge sea-going vessels, which called on at distant ports. Various words related to maritime activities suggest that they were efficient maritime people and using sea-going vessels. They were taking voyages of near as well as distant oceans for wealth and seeking glory in the oceans. Their vessels were sea worthy, large and well equipped. There were different types of ships for different uses - merchant vessels, cargo ships, passenger ships, rescue ships, lifeboats etc. There were advanced methods of construction which Indian shipwrights were skilled in (Tripathi, 1997)

*Vriksha-ayurveda*

The ancient shipbuilders had a good knowledge of the materials as well as the varieties and properties of wood, which was used for shipbuilding *Vriksha-Ayurveda*, a Sanskrit work datable to 1st century AD, classifies the wood in four distinguished classes according to their characteristics. A variety of woods were used for the construction of water vessels. These woods varied according to
the size, shape and purpose of the vessel. Different kind of wood was used for constructing different parts of a vessel. The selection of wood also depended on the region or the area where the craft was built and used. For the convenience of the shipwrights these woods were classified in four broad groups, based on their characteristics.

The *Brahman* class comprises wood that is light and soft and can be easily joined to any other kind of wood.

The *Kshatrya* class of wood is light and hard and cannot be joined to other classes.

The *Vaishya* class of wood is soft and heavy.

The *Sudra* class of wood is both heavy and hard.

There are also some woods which cannot be grouped in any of these classes as they possess properties of two different classes. Such woods with mixed properties were put in a separate class known as mixed (*Dvijati*).
In *Ramayana* and *Mahabharata*, the great Indian epics, there are several passages, which indicate Indian shipbuilding activities.

**Mahabharata**

*Mahabharata* mention about ships and seafaring activities. These deluge legends have interesting geographical accounts of seas, continents, and islands. *Digvijaya* accounts show familiarity with many ports of India as well as far-off seas and lands and people though these details are not very accurate geographically.

Bhima sets out from Tamaralipti and conquers many ports which can be identified with the ancient sites located on the east as well as west coast of India. Sahadeva also in his *digvijaya* reaches to coastal sites and ports on the west coast.

Elsewhere, Arjuna stormed a prosperous town, located on the farther shore of a great sea replete with thousands of ships carrying enormous wealth.
There are great differences in opinion on the date (Sankalia, 1985-41-46) and extent of various incidents narrated in Ramayana but it is undisputable that the text reveals a great deal of information about the contemporary social, political, economic and religious life of the people. Among these mentions are also made of boats on various occasions in Ramayana. The systematic study of the various descriptions of boats in Ramayana provides very useful information to study and reconstruct the history of ancient Indian shipping (Tripathi, 2003).

Several types of boats and ships are mentioned in Ramayana. Vessels mentioned in Ramayana were, interestingly, river crafts. Ram also used boats to cross the rivers when in exile. Based on their description these crafts can be divided in various classes.

There are several references of boats in Bal kand and Ayodhya kand of the Ramayana. While going with Vishwamitra and during his exile Ram crossed river Ganga (Rama I.24 1-11½, II 52 6-93), Shonabhadra (Rama I 35 1-5), Vedashruti (Rama II.49 10), Gomati (Rama II 49 11), Syandika (Rama II 49 12), and Yamuna (Rama...
Bharat also crossed river Ganga with his army at Sringaverpura \((Rama. \text{II.89.1-21})\). They used different types of boats to cross these rivers. Among these, five references are important for the study of ancient watercrafts.

Sarga 24 of Balakand \((Rama. \text{I.24.1-11\frac{1}{2}})\) mentions that the Rishis residing on the bank of river Ganga arranged a good boat for Ram and Laxmana at their arrival with sage Vishwamitra \((Rama. \text{I.24.2})\). All three crossed the river Ganga, near the confluence of Saryu and Gand to reach the southern bank \((Rama. \text{I.24.3-11})\).

In this short incident no description or detail of the boat is given, except its good characters \((shubham navm)\). From the reference it can be inferred that it could be a small canoe. These sages residing in the ashramas located on the banks of river Ganga might be using such small boats to cross the river.

Sarga 52 of Ayodhya kand \((Rama. \text{II.52.3-11, 74-93})\) informs that while Ram was going to forest in exile, with Laxman and Sila, at Sringaverpur, Nishad king Guh asked his minister to bring a boat with good qualities \((uttam)\) for them \((Rama. \text{II.52.6})\).
The boat and its navigators are better described here. Ram, Laxman and Sita crossed the river in a fast-speed boat, which was driven, by rowers (mallah) and steersman (karmgrah). This boat of good characters (shubham) was strong built (dridham) and easy to row and steer (suprataram). It was propelled by oars (vahana) which were pulled by boatmen (navikan) (Rama. II.52.6).

In sarga 55 of Ayodhya Kand (Rama. II.55.4-5, 12-13) the use of raft is mentioned. Ram and Laxman had to build a raft (Rama. II.55.14) to cross the river Yamuna. They used dried wood in the forest for preparing the raft. Not much detail of its construction is given but probably dried wooden logs would have been tied together with the help of creepers etc. The raft was covered with bamboo and kusha grass. It also had seats made of cane and Jamun tree wood. Ram, Laxman and Sita crossed the river on this raft (Rama. II.55.22). It, probably, would have been propelled with the help of a long bamboo and the river might have not been very deep.

The incident in sarga 84 of Ayodhya kand is particularly important from naval point of view being one of the earliest references of use of boats for military purpose. When Nishad king Guh heard about arrival of Bharat with his army, he ordered Kevats to board on 500
boats to keep vigil and protect river Ganga, at Sringaverpur (Rama. II.84.1-9). Each of the 500 boats are said to be carrying 100 soldiers.

Exaggeration of number of boats and soldiers (500 boats with 100 soldiers each = 50,000 soldiers) is clear here but it suggests to the large size and carrying capacity of boats. It also indicates to the large number of boatmen (kevats) at Sringaverpur and also tells about various uses of the boats, including for military purpose.

The most detailed description of boats is found in sarga 89 of Ayodhya kand (Rama. II.89.1-21). This long description throw important light on the types of boats, their size, carrying capacity and also their navigation. At Sringaverpur, Guh the chief of Nishad's, ordered his men to collect 500 boats to enable Bharat to cross river Ganga, along with his army, (Rama. II.89.10).

Here it is clear that all these boats were not of same shape or sizes but of different types and dimensions. Bharata's army boarded these boats and rafts with cavalry, carts, animals etc. and crossed the river (Rama. II.89.17). Guh himself called a boat called Swastika for the royal family members (Rama. II.89.11-12).
This description of boats gives important information about contemporary boat building and navigational activities. Careful analyses of these descriptions reveal useful technical information and facts about boat building during that period. Various names of boats like Nava (I.24.2-3; II.52.6-7, 74-75, 78, 80, 93; II.84.8; II.89.9-10, 12, 16, 20), Nau (II.52.8-9; II.89.7), Plava (II.55.5, 14, 16-17, 22-23; II.89.20), Nauka (II.52.81) and Swastika (II.89.11-12) are used (Tripathi, 2003).

Based on the information given in Ramayana the boats can be classified in two broad groups - Plava (Raft) and Nauka (Boat). Nauka can further be divided in two groups on the basis of their construction and use - Samanya (Ordinary) and Vishesha (Special). Ordinary boats may further be sub-divided according to their size and carrying capacity.

Word Plava is used in Ramayana for the rafts (Rama. II.55.5, 14, 16-17, 22-23; II.89.20). Ram, Laxman and Sita used Plava to cross the river Yamuna. Bharat's army also used Plava to cross the river Ganga at Sringaverpura. Plava is also referred in the Rgveda.
Construction of the rafts was simple and tying dried wooden logs and bamboos together made them. Ram and Laxman also made a raft in the forest by themselves. This square or rectangular platform was covered with bamboo and kusha grass. It also had provision to sit. The rafts might have been propelled and steered with the help of a long bamboo or pole.

The term Nauka is probably used for both, dugouts and plank built boats. They are also called Nava or Nau at some places. All these terms are used in same sense. In sarga 52 of Ayodhya kand, Nava (Rama. II.52.6, 7, 74-75, 78, 80, 93), Nau (Rama. II.52.8-9) and Nauka (Rama. II.52.81) are used for boats in various verses.

These terms were used for ordinary boats of different sizes. Some of the boats were quite small but on the other hand some of them were of considerably large size. The boat used by Ram while crossing river Ganga with Laxman and Vishwamitra would have been a small canoe or dugout used by the sages living in the jungle. These sages living on the banks of river Ganga would have used it to cross the river. Its small size is also suggested by the description where there is no mention of any boatman to propel it. It suggests that the users themselves rowed these small canoes.
The boat used by Ram to cross the river Ganga at Sringaverpur can be kept in Madhyam shreni. It was a strong built (dridham) passenger boat of good characters with boatman (mallah) to propel and helmsman (karnadhar) to steer the boat.

The boats used by Nishad’s to protect the river Ganga and later by Bharat’s army to cross the river can be kept in Dirgha shreni. These boats are said to be strong enough to carry 100 soldiers. Poetic exaggeration cannot be ruled out here but at the same time it indicates towards the large size of the boats.

It is noteworthy that these boats were also used for military purpose. Use of the boats for protection in the river indicates their stability, maneuverability and strong construction. It also tells about the navigational skills of the Nishads.

Besides these samanya boats of different sizes, there were also some more boats, which were known by their specific names. These names were given because of their special construction and decorations. Such boats were very few and not much detail of these boats are available. Brief descriptions identify them simply as Royal
boats or luxury boats.

One such boat bearing the Swastika was called Swastika (Rama. II.89.11). It was fitted with bells and flags. The floor of the boat was covered with white carpets. They were rowed by trained boatmen (mallah) and steered by helmsman (kamgrah). Chiefs and royal personage used these boats for their journeys through river (Tripathi, 2003).

It is interesting to note that the boats are mentioned at several places in Ramayana but Tulsi Das mentions use of boat only at one place in the Ramacharit Manasa (Tulsi, II.100.2).

Besides literature, boats in Ramayana were also popular theme for the artists who represented them in various kinds of arts in various medium. The scene of Ram crossing river Ganga with Laxman and Sita is the most popular and has been found depicted at several places (Tripathi, 1997).

These descriptions of boats, in various episodes and their specific
characteristics also shed some light on the ancient boat building technology. Boats were carefully built and were strong (dridham) having good carrying capacity. They were well designed and therefore were able to cut the water efficiently and move fast (ashuga). Some of them were decorated with flags (patakinya yukto), which must have flown on the sternpost.

The users themselves rowed small canoes and dugouts but the bigger boats were rowed by the rowers (dash, kaivarta, navika, vahah). There were also helmsmen (karnagrah) to steer these boats. Since rudder was not used in ancient Indian boats they might have been steered by the way of long steering oars. The shape, number and size of such steering oars are not mentioned in any description. The boats were made in such a fashion that they could have also been used for military purpose. It is difficult to believe that each boat would have carried 100 soldiers (yunam) but it indicates towards the large number of boatmen.

All the boats referred in Ramayana are river-going crafts. It is very important that there is no mention of sea going vessels in the Ramayana. Not only that all the crafts mentioned in Ramayana were rowed by oars (vahan, sphya) and none of them had mast or sails.
Here it is interesting that no mention of boat is found when Ram reaches to seashore where he had to built a bridge to cross the sea.

Puranas

Besides the Vedic literature and epics boats and ships are also mentioned in many other Brahmanical texts. The Puranas contain a vast volume of historic information. Markandeya Purana refers to an ill-fated ship sailing in the ocean. The Puranas also furnish reference to merchants engaged in sea-borne trade.

The Dharmasastra of Manu also refers to the boat and ship while denoting the anadhyayana.

BUDDHIST LITERATURE

The Buddhist literature comprises of Jatakas, the stories of the Buddha, the chronicle of Sri Lanka, or the ancient historical works. In Pali literature, there are abundant reference to ship and sea Voyages. From these one can form an idea of the size and shapes of the ships.
Jataka stories speak of the navigational efficiency of people of ancient India. Stories in Jataka and Pali texts also mention ships and sea voyages. Jataka stories depicted on the walls of Ajanta caves depict some of the best examples of ships in Indian art. A number of stories mention numerous incidences where traders set voyages to distant lands to earn wealth. Some of the ancient manuscripts also depict scenes of sea voyages. The Rajavaliya legends, of Vijaya and monk Purna, contain good information about the sailing ships, their voyages and other related aspects.

The Maha Ummagga Jataka mentions of procuring choice timbers from the upper Ganges for building ships. The Jatakas specifically mention the ships to have been made out of planks of timber. Due importance was attached to selecting wood best suited for the construction of ships. Indians classified woods into several kinds according to their characteristic properties. These boats were of two types - Potavanika and Samyati Nava.

Potavanika was used for commercial fleet. The descriptions given in the texts suggest that these ships were large and spacious. The
Samatrika is defined as a Potavanika in the Amarkosa.

Another variety of ships, Samyati Nava was an ocean going vessel. It was a trading vessel used to carry merchandise but during navel battles they were also employed to carry military supplies.

The Sanka Jataka mentions the ships capable of undertaking overseas voyages. It describes a ship, which was 800 cubits long, 600 cubits wide and 20 fathoms deep, with three masts.

The Samudra Vanijja Jataka gives an interesting story mentioning a voyage in a big ship. According to the story a settlement of wood workers, who failed to carry out the orders for which payment had been made, constructed a huge ship secretly and emigrated with their families. This ship is said to be so large that it could accommodate the entire village, around 1000 people and sailed down the Ganges. The Jataka tells about the role of carpenters in construction of vessels. They were professional people and were paid in advance for their job. The ship described with 1000 people onboard shows that shipbuilding was at an advance stage of development during this period.
The tools used in shipbuilding like adzes, saw, axes, drills, chisels and gravers are often found in archaeological excavations at a number of archaeological sites. Finding of the tools used in woodwork from archaeological excavation alone does not evident that the ships were being built there but they definitively show that the required technology, materials and skills were available. If there are some other evidence to suggest shipbuilding activity they further support them.

The Baveru Jataka and Supparaka Jataka refers to boats and overseas voyages undertaken by the Indian merchants to distant lands.

The Mahajanaka Jataka mentions the ships capable of undertaking overseas voyages. It mentions one Potavanika as having on board seven caravans with their beasts.

Jatakamala

The Jatakamala of Arya-Sura, datable to about the 1st century A.D. informs about pilots and navigation. The text is considered to be the
contemporary of Periplus of the Erythrean Sea.

Other Buddhist texts also give a lot of information about the seafaring, ancient shipping and maritime trade.

Rajvansa

The Rajvansa mentions a large ship. It states that the ship in which Prince Vijaya sailed, with his followers, from Bengal to Sri Lanka was a big seagoing vessel that could accommodate 700 passengers.

Dipavamsa

The Dipavamsa also refer to ships and different voyages undertaken during early period.

Divyavadana

Divyavadana, a text datable to 2nd - 3rd century A.D., gives a good
account of trade mechanism. According to it a special class of sea-
traders used to collect trade goods from various merchants. The 
collection of goods for export was carried out through a group leader 
(sarthavaha) by making public announcement in a port town before 

The term Yanapatra has been commonly used in Divyavadana in the 
sense of a ship (Vaidya, 1962:21-ff). However in Supriyavadana (in 
Divya) the term pota has also been used.

**Avadana Sataka**

Ancient literature also furnishes important information about the 
navigation and management of the ships. The *Avadana sataka* 
classify pilots in five grades. They are called as - ahara, navika, 
kaivarta and karnadhara. These grades of pilots clearly suggest not 
only the variety of the ships but also the specialization in the field. 
These pilots probably worked under the guidance of a jalaniryamaka 
or a jetthaka.
In the *Mahavagga* are enumerated three types of riverboats - *Nava*, *Ulumpa* and *Kulla*. 

*Nava* was used for big boats. *Ulumpa* (*lumper*) and *Kulla* were small boats. Among these *Kulla* (Fig. 101) were used in the harbours. The *ulumpa* of the *Mahavagga* may be compared with the *ulumpa* of the *Astadhyayi*. According to V.S. Agrawala, *ulumpa* was a crescent shaped small boat (*dongi*).

**Mahavastu**

The *Mahavastu* also refer to ships and different voyages undertaken during early historical period.

**Milinda Panha**

*Milinda Panha* refers to the sailing ships. It tells about the function of the mast and also refers to sails. The height of the mast is said to be in proportion to the dimensions of the ship.
The anchor is called *lankaro*. It also mentions the functions of an anchor. As an anchor sinks down it holds the ship and keeps it still so that it does not go to one direction or another with waves and current of the sea.

**Samyuttaniyaka**

The *Samyuttaniyaka* refer to *nava* and overseas voyages.

**Sutta Pitaka**

The *Sutta Pitaka* refer to ships engaged in overseas voyages.

**Vinaya Pitaka**

The *Vinaya Pitaka* gives vivid description of the story of the monk *Purna*. The Rajavalliya legends contain good information about the sailing ships, their voyages and other related aspects.
The Jain literature also furnishes very valuable information on ancient seafaring. A number of Jain canons also mention numerous stories where traders set voyages to distant lands to earn wealth. Some of the ancient Jain manuscripts also depict ships and scenes of sea voyages. These texts mention *nava*, *aga-thiya*, *antarandakagoliya* (canoes), *Koncaviraga* (boat shaped like the elephants trunk) and inflated leather bags (*dailya*) and goatskins used as floats. The ancient Jain works also refer to the crew of ships like *nijjamaya* (pilot), *Kuchhidharaya* (boatmen), *Kansadhara* (helmsman), and *jabbhijja* (crew).

**Angavijja**

The *Angavijja*, a 3rd century A.D. text, provides interesting details about the watercrafts in ancient India. It mentions four classes of ship according to their sizes and also gives Prakrit names of some of the boats viz. *Kottimba*, *Tappaka* and *Sanghada*. These boats were also referred by Periplus as *Cotyamba*, *Trappaga*, and *Sangar* (Chandra, 1966: 9). The above-mentioned boats represented middle variety. The larger types (*Mahavakasa*) were called as *pota* or ships. Smaller boats were known as *Kattha* and *Velu* and still smaller ones
at Tumbu, Datii and Kumbhu. Possibly the term *pota* for a ship and other related terms mentioned above also seems to have been coined about the same time or slightly later (Joshi, 1988). According to their sizes the author has classified ships and boats in four categories in which are included 13 types of *Nijjivajalacarani*.

*Mahavakasanava:* These were the big size ships in which class the *nava* and the *pota* belonged.

*Majjhimakaya:* These are medium sized boats or ships. They included *Kottimba, Salika* (ship with cabin), *Samghad* (made of a single log) *Plava* and *Tappaka*.

The third type of vessel, which is smaller than the above, mentioned *Majjhimakaya* a vessels included boats known as *Kattha* or *kanda* (made of rushes) and *velu* (made of bamboos).

The smallest types of boats were *kumbha* (a float made of pitchers), *tumba* (a float made from dried gourds) and *dati* (a float of bloated skins) It can be compared with the *bhastra* of the *Astadhyayi*. This category may also include *pindika* (a round boat made of cane).
The Angavijja describes them as *pancavarakay* a class of *Nijjivajalacaram*. The most noteworthy point in this reference is the use of the name *samghad* for *sangar*. Previously, there was much confusion about the common source of *sangar* of the Periplus, *jangar* of the Malabar Coast, *janghala* of the *Yuktikalpataru*, the Tamil-Malayali work *sangadam* or *Channatam* and the Chinese name junk. The term *samghada* in this Jain work suggests that these different terms are to be traced originally to the Sanskrit form *samghada*.

*Tilakmanjari,*

The Jain work, *Tilakmanjari*, interestingly mentions stone anchors. According to the text when a ship halted, its heavy anchors made of rocks were lowered down. Recent marine archaeological studies in Indian waters have resulted in discovery of a large number of stone anchors of different shapes, sizes and of different periods.

*Amarakosa*

The *Namalinganusasanam* is also known as *Amarakosa* of *Amarsimha* (Sharma and Sardesai, 1914:62-63). This Sanskrit
lexicon, datable to the 5th-6th century A.D., also refers to various types of boats and ships and provides useful information on navigation. *Pota, nau, tarani, tari, droni* and *udupa* are the names of the vessels mentioned in it. The last chapter (*Vari-varga*) of first book (*Kanda*) of *Amarkosa* refers to terms pertaining to navigation. These navigational terms help to form some idea of types of Indian boats and ships used during that period.

Some of the verses preserving references to shipping and associated elements are interesting. The text mentions rafts (*Udupa*) ordinary boats called *nau, tarani* or *tari* and *droni* (Hindi *dongi*) or a small oval boat with depth. Besides various names of boats it also makes a reference to freight to be paid for the use of a boat and ship.

It mentions voyager (*Samyatrika*), voyaging merchants (*pota-vanika*), crew consisting of navigators (*navika*), sail operator (*kamadhara*) and pilots (*niyamaka*). It uses the term *pota* for ship, *guna-vrishaka* (*gun-rakha* in Hindi) for mast, *naukadanda* for oar, *aritra* for rudder and *Keripataka, kupaka* for some form of hollow area below the deck. Bhatta Kshirasvamin a commentator of *Amarakosa* of about the 10th century AD calls it as *adharagarta*. The
text also refers to *Kashta-kuddala* or wooden pickaxe and *sechana* or *sekapatra* i.e. bucket kept in the ship in the context of navigation.

Joshi (1990:19) identify term *ardhanava* as one of the two boats joined together to form a ship. *Ardhanava* seems to be an outrigger which is also boat shaped and looks like one of the two boats however smaller in size.

It mentions mast but there is no mention of sails. The term *pota* has been explained by Kshirasvamin in his commentary on *Amarakosa* as ‘*Pavate-vatena-potovahanam*’ i.e. ‘a carrier which is driven by the force of wind’ which clearly shows that the term *pota* stood for a ship with sails.

The reference to a wooden pickaxe as equipment associated with ancient Indian ships is significant. From the other sources like *Yuktikalpataru*, the famous work of Bhoja, we know that the use of Iron was tabooed (Mookerjee, 1912:14).

It also mentions the *Karnadhara* and the *niyamka*. The *Karnadhara*
steers the vessel by steering oar at the stern. *Niyamaka* perhaps
guides the vessel including seeing the directions and instructing oars
men. The *Samatrika* is defined as a *Potavanika* in the *Amarkosa*.

**Astadhyayi**

The *Astadhyayi* (IV.3.10; VI.3.58) makes a clear distinction between
coastal island cargoes (*Dvaipya*) and mid-ocean island cargoes
(*Dvaipa* or *Dvaipaka*). Panini (5th century BC) also mentioned four
types of timbers used for making ships and various types of water
transport (Agrawal, 1953:150-151).

The types of water transport mentioned in the *Astadhyayi* are:

- **Navatitha** a ferry boat
- **Utsang** a small dugout canoe or log boat
- **Utpata** probably a long fishing boat
- **Pitaka** a basket-like coracle made of weeds and rushes
covered with leather
- **Bhastra** raft made of inflated skins
- **Cumbha** terracotta boat
- **Chang** a kind of log boat
Panini refers a kind of boat that was called *Kumbha*. As the very name suggests it may be some kind of big earthenware, which might have been used to cross the shallow rivers. It may also be identified with terracotta boat. The discovery of terracotta boats at Ambari in Assam has provided very important evidence of terracotta boat. Scholars have suggested that such terracotta boat might have been used in the rivers and shallow waters.

Panini does not refer to sails or the methods of propulsion of these boats. He also mentioned the various trees such as Simsapa, blackwood (*Delbergia sisoo*), Amra, (Mango), Khadira (Khair), Salmali and silk cotton tree (*Bombax malabaricum*).

*Brihatsamhita*

The *Brihatsamhita* contains indirect references to shipping and maritime commerce. It mentions that the health of sailors get influenced by moon. The passage refers to the existence of shippers and sailors as a class (Mookerji, 1912:64).
During the Mauryan Empire, 3rd - 2nd centuries B.C., India had prosperous society. During this period India was in contact with foreign states, and there was a constant stream of visitors, travelers, envoys visiting India and carrying out brisk commercial activities. The *Arthasastra* of Kautilya gives an elaborate account of the maritime trade during the rule of Emperor Chandragupta Maurya. Under Ashoka, India became the center of commercial and spiritual activities, possible because of the efficient shipping and system of communication.

Kautilya’s *Arthashastra*, gives very useful information about shipping and seafaring. It not only mentions about boats and ships but also about the different terms and conditions of maritime activity, routes, port duties, names of ships and boats, superintendent of ships and his duties, goods of import and exports, inland river transport, the taxes levied and safety precautions imposed and so on. It has been widely studied and quoted by the scholars.

The ships were under a *Navadhyaksa* (captain of ship), who was concerned not only with the navigation of ocean, but also with inland...
The Arthasastra refers to different trade routes leading to the inland (riverine transport), coastal (routes along the coasts), and overseas or across the sea (Kangle, 1963:70, 145). The Arthasastra at one place compares the relative importance of the land and the sea routes. Kautilya observes that according to earlier authorities, the sea and river routes were more profitable than the land route. Further, he compares the overseas route with coastal routes and river routes and prefers the coastal and river routes because of their comforts (Kangle, 1963:415). He rejected the overseas routes in the light of hazards of the open sea voyages. Thus it is certain that river, coastal, and overseas routes were in vogue for the purpose of navigation.

Kautilya’s scheme of taxation on water-transport indicates the types of boats used in his times. In general, there were ships useful for maritime trade (samudrasanyanapatra), boats useful for general use (nauka), large boats (mahanava) for large rivers which could not be forded even during the summer and winter seasons, and lastly, small boats (Kaudraka) for small rivers which flooded only in the rainy season. It refers various names of the boats.
The boats and ships mentioned in the Kautiya's *Arthashastra* can be divided into two groups according to their size, *mahanava* and *kshudrika*.

**Mahanava** – As appears from their very name these were big vessels. Such big vessels were used for overseas as well as inland trade and transport. Big boats might have been used in perennial rivers all the year round.

**Kshudrika** – The very name suggests that they were small boats. Such small boats were either owned by people for their personal use or were used in small rivers and shallow waters. Such small boats could also be used in seasonal rivers.

According to their use, they were divided into four groups:

- **Potavanika** Merchant ships
- **Svanava** Private ships
- **Rajnau** Royal ships
- **Himsrika** Warships

Merchant ships (*Potavanika*) were of two types, *Samyati-nava* and *Pravahana*.

*Samyati Nava* was the class of ships, which were used for overseas
trade. This ocean going vessel transported various merchandise for trade. Such ships were well designed and provided with facilities to undertake long sea voyages. *Jataka* stories suggest that merchant ships were quite large and spacious. The *Sankha Jataka* mentions one ship that was 800 cubits long and 600 cubits wide. It is also said to be 200 fathoms in depth and having 3 masts. It is difficult to say how accurate these measurements could be as they do not suggest the proportion of a good ship however they indicate the large size of the ship. The *Mahajanaka Jataka* does not mentions the size of the ship but it tells that about a *Potavanika* as having on board seven caravans with their beasts, suggesting the high carrying capacity of the merchant ships of that time. The *Samatrika* in *Amarkosa* is defined as a *Potavanika*.

*Pravahana* were the passenger carriers. These sea-going vessels are also said to be of large capacity of carrying passengers. The commentary on the *Uttaradhy anasutratika* mentions about ship carrying merchants. For accommodating the passengers onboard such ships had cabins. According to the position of the cabins on the ship they were classified in three groups.

*Sarvamandira* type vessels had the largest cabins extending from
stem to stern. The entire deck was covered to provide accommodation to the souls on board.

*Madhyamandira* type vessels had a cabin in the middle of the vessel. Such vessels could accommodate only a few persons in that. Most of the royal or pleasure boats are shown with a cabin at the middle. Such cabin is always shown open from all the sides, which provide shelter as well as good view to the travelers.

*Agramandira* type vessels were having a cabin towards the stem. Such boats might be having limited accommodation, perhaps minimum among all the three types mentioned here.

Stories in various ancient texts suggest that the *Pravahana* ships were the large ships and could accommodate 500 to 800 passengers. There are numerous references of carrying 700 passengers on board in ancient literature. The story in *Samudra Vanijja Jataka* mentions one ship that accommodated about 1000 souls, a whole village of absconding carpenters.
The second group of boats is called *Sva-nava* or *Svayanava* meaning private boat. Such boats might have been smaller in size and owned by those living close to sea or on riverbanks for their daily use. These privately owned boats were used for ferry and could cross the rivers at all time and places. Such boats are also known as *Svataranani*.

The third group of boats is called *Rajnau* meaning Royal Boats. As apparent from their very name they were used by the king or members of his family. These boats were of two types, *Swastika* and *Samkhamuktagrahina*.

A swastika type vessel was tagged on to another boat. Another boat was evidently for the safety of the king as well as it would have provided accommodation to the attendants and others those accompanying the king.

*Samkhamuktagrahina* is said to be a royal boat used for pearl fishing in the ocean.
The fourth class of boats is called Himsrika. Himsrika were the naval ships used for naval battles. Ships of the pirates which attacked and destroyed other ships were also called Himsrikas.

The ships need to have trained crew. It also mentions about the crew and describe five members of a crew-

- **Sasaka** The Captain,
- **Niyamaka** Pilot or steersman,
- **Datragrahaka** Holder of sickle or carpenter,
- **Rasmigrahaka** Holder of ropes or sailors, and
- **Utsecaka** Servant to pour out water

Kautilya does not refer to sails. The earliest representation of boat with masts in the historical period is found in Satvahana coins of 2nd century A.D. (Mukherjee, 1912: 51). The mention of rasmigrahaka, the holder of ropes, indicates to the sailing ships. It is the rope work on a sailing ship which needed sailors to hold them and the rowing boat does not require rasmigrahaka.

It is obvious that these ships classified in different classes according to their uses were designed and constructed differently according to...
their need. The trading vessels undertaking long voyages need to have enough space and facilities to sustain their crew during the long passages and also to face adverse sea conditions. The passenger ships require accommodation and provisions for the souls on board during their journeys. Such huge ships can not be very effective in battle as a Battle ship need to fast and easily maneuvered to have effective movements for attack as well as for the safety.

Besides these above mentioned four classes of ships and boats there were also several other varieties of water crafts. Some of these water crafts are mentioned are -

*Kasthasamghata* seems to a raft made by tying wooden logs together. It is very common form of water craft which could be made easily. Rafts are commonly used in different parts of the country.

*Venusamghata* is another type of raft made by tying the bamboo.

*Alayu* is a small vessel made of the dried bottle gourd. Several bottle
gourd tied together make a float that could be used in shallow water.

*Carmak-aranda* is a type of skin boat. A basket with its lower side covered with skin is used for transport in the rivers and lakes. This could be identified with the *Pitaka* mentioned in *Astadhyayi*.

*Chatti* seems to be made of leather bags. These leather bags could be inflated and used as a float.

*Plava* is a small canoe. Such canoes could be used by those living on the banks of rivers or near lakes and ponds.

*Gandika* is said to be a floating device made of rhinoceros leather.

*Venika* is a type of reed boat. It was made of woven reeds.

The seafaring has developed so much that it was organized for proper operation and the benefit of the state. The seafaring and shipping activities were controlled and regulated through an organization of a Board of Admiralty. Elaborate accounts of Megasthenes and Strabo also provide more and information
regarding the organized shipping, functioning of the board and Naval Department and substantiate the information given in the Kautilya’s *Arthashastra*.

**Patanjali**

*Mahabhashya* of Patanjali (2nd century B.C.) mentions *Devadaru*, identified as cedar. The Timber of cedar was used for shipbuilding. He also calls small boats as *Udupa*. Besides boats, the floats were made from a variety of locally available materials such as beams and planks, bamboos and reeds. These inflatable materials were bound together and used as float in the rivers.

**Paulisasiddhanta**

For effective navigation a sailor has to know the accurate location of his ship in sea. Finding the accurate location and fixing the position of the ship are the must for overseas voyages. *Paulisasiddhanta* (Thibaut & Dwivedi, 1968: III) does not mention about the ships or boats but tells about the calculation of latitude which was necessary for the navigation.
The knowledge of two co-ordinate systems (latitude and longitude), the application of navigational instruments had been in use since antiquity. The Hindu astronomers consistently adhered to the (prime) meridian extending from North Pole (Meru) to Lanka on the equator as the reference line. The line passes through Ujjaini, Kurukshetra and the river Yamuna. Sri Lanka was the central point and the equator served as the reference line for longitude.

According to Paulisasiddhanta (Thibaut & Dwivedi, 1968: III, 31-33) the latitude of a place is equal to altitude of the pole star. During daytime, the latitude of the place was calculated by adding (or subtracting) the zenith distance of the sun to its declination when the sun was on the meridian nearer to Aries to Libra (Pancasiddhantika, IV, 20-21). The circumference of the earth according to Pancasiddhantika, (III,14) was assumed as 3200 yojanas (Bag, 1988:10)

In ancient times the longitude difference between two places was determined in two ways from the latitude differences of and the linear distance between the two places, or from the time difference of an eclipse observed from the two places concerned.
Bag opines that the rule given in the *Pancasiddhantika* (III, 14) is defective, since the calculation is done with linear right-angled triangle in place of spherical triangle. The calculation of longitude differences by eclipse method was undoubtedly a correct method, but it was not possibly followed by the mariners (Bag, 1981).

**Yuktikalpataru**

*Yuktikalpataru* of Bhoja (11th century A.D.) is a unique text on ancient shipbuilding. This Sanskrit work is a complete treatise on the art of shipbuilding in ancient India, which served as a text-book to later Indian shipbuilders.

It contains many interesting details on shipping and shipbuilding, which became a manual for the Indian shipwrights, in later times. It gives important information about the various kinds of ships, their building materials, instruments, processing, methods of fastening, mast, sail, painting and decoration, etc. and sums up in a condensed form all the available information and knowledge about this ancient industry of India.
Bhoja divided all the ships in two broad categories - *Samanya* and *Vishesa*. Choudhury believes that *samanya* types of boats were river-going and *vishesa* type boats were sea-going crafts. Many scholars do not agree with his interpretation.

*Samanya* meaning ordinary type of vessels. The text also mentions that all *samanya* type vessels except *manthara* are sea going (*ambudhagati*) (Yukti, ver. 95). Since they were the ordinary cargo ships they were called *samanya*. Those ships, which were specially decorated, were called *vishesa* types vessels. These vessels were decorated with foils of copper, gold and stone etc.

*Samanya* vessels were of ten varieties. This classification was based on their construction, size, shape and their performance in the water. The names and sizes of these ships are given in table 4.1

*Vishesa* vessels were sub divided in two sub-groups *Dirgha* and *Unnata*.
Table – 4.1 Samanya type vessels

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Names of vessels</th>
<th>Meaning</th>
<th>Length (Cubits)</th>
<th>Breadth (Cubits)</th>
<th>Height (Cubits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kshudra</td>
<td>Small</td>
<td>16</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Madhyama</td>
<td>Moderate</td>
<td>24</td>
<td>12</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>Bhima</td>
<td>Formidable</td>
<td>40</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>4</td>
<td>Chapala</td>
<td>Move to and fro</td>
<td>48</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>5</td>
<td>Patala</td>
<td>With covering</td>
<td>64</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>Abhaya</td>
<td>Fearless</td>
<td>72</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>7</td>
<td>Deergha</td>
<td>Long</td>
<td>88</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>8</td>
<td>Patraputa</td>
<td>Like folded or doubled leaf in the form of a cup</td>
<td>96</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>9</td>
<td>Garbhara</td>
<td>With inner compartments</td>
<td>112</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>10</td>
<td>Manthara</td>
<td>Slow</td>
<td>120</td>
<td>60</td>
<td>60</td>
</tr>
</tbody>
</table>

Among these the Bhima, Abhaya, and Garbhara are said to bring ill-luck.
Dirgha sub-class of Vishesa type vessels were of ten varieties. This classification was based on their construction and their performance in the water. The length of the vessel is the main feature of this sub-class. The names and sizes of these ships are given in table 4.2

Table – 4.2 Vishesa type (Dirgha) vessels

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Names of vessels</th>
<th>English</th>
<th>Length (Cubits)</th>
<th>Breadth (Cubits)</th>
<th>Height (Cubits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dirghika</td>
<td>Long</td>
<td>32</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Tarani</td>
<td>Moving hither and thither</td>
<td>48</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Lola</td>
<td>Moving hither and thither</td>
<td>64</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>4</td>
<td>Gatvara</td>
<td>Perishable</td>
<td>80</td>
<td>10</td>
<td>8</td>
</tr>
<tr>
<td>5</td>
<td>Gamini</td>
<td>Going and moving on</td>
<td>96</td>
<td>12</td>
<td>9</td>
</tr>
<tr>
<td>6</td>
<td>Tari</td>
<td>Running swiftly</td>
<td>112</td>
<td>14</td>
<td>11</td>
</tr>
<tr>
<td>7</td>
<td>Janghala</td>
<td>Running swiftly</td>
<td>128</td>
<td>16</td>
<td>12</td>
</tr>
<tr>
<td>8</td>
<td>Plavini</td>
<td>Flowing over</td>
<td>144</td>
<td>18</td>
<td>14</td>
</tr>
<tr>
<td>9</td>
<td>Dharini</td>
<td>Power of possessing</td>
<td>160</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td>10</td>
<td>Vegini</td>
<td>Move with speed</td>
<td>176</td>
<td>22</td>
<td>17</td>
</tr>
</tbody>
</table>
Among these the varieties of *Lola, Gamini* and *Plavini* are said to bring ill luck. Besides, also all ships that falls between these three Classes and their next respective classes.

*Unnata* sub-class of *Vishesa* type vessels were of five varieties. This classification was based on their construction and their performance in the water. The height of the vessel is the main feature of this sub-class. The names and sizes of these ships are given in table 4.3

Table – 4.3 *Vishesa* type (*Unnata*) vessels

<table>
<thead>
<tr>
<th>Si. No.</th>
<th>Names of Vessels</th>
<th>English</th>
<th>Length (Cubits)</th>
<th>Breadth (Cubits)</th>
<th>Height (Cubits)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Urdhava</td>
<td>Elevated</td>
<td>32</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>2</td>
<td>Annuradha</td>
<td>Non-elevated</td>
<td>48</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td>3</td>
<td>Svarnamukhi</td>
<td>Golden faced</td>
<td>64</td>
<td>32</td>
<td>32</td>
</tr>
<tr>
<td>4</td>
<td>Garvini</td>
<td>of being filled with proud</td>
<td>80</td>
<td>40</td>
<td>40</td>
</tr>
<tr>
<td>5</td>
<td>Manthara</td>
<td>Curved</td>
<td>96</td>
<td>48</td>
<td>48</td>
</tr>
</tbody>
</table>
Among these five varieties, three are not recommended. *Anurdhava, Garvini* and *Manthara* are said to bring misfortune. Bhoja praise the *Urdhava* variety which brings much gain or profit to kings.

It is mentioned that the ships whose height is more than 35 cubits bring prosperity and those more than 50 cubits bring joy or two-third of that (50 cubits) cause misfortune (*Yuk*.ver.188). The *Unnata* type of vessels seems to be the sailing ships as suggested by their height. The hull of the ship cannot be so high. Being the sailing ships the *unnata* types were more suited for sea-going purpose. Higher the mast better rigging and faster the speed therefore such ships are said to bring joy. Ships with small mast and few sails are said to cause misfortune.

Ships having cabins were classified in three groups according to the location of the cabin on the deck. The ships with cabins were of three types –

**Sarvamandira** – A ship having cabins which extended from stem to stern was termed *sarvamandira* type vessel. These ships with covered deck were used for the transport of royal treasure, horses and women.
Madhayamandira - Ship having a cabin amidships was known as madhyamandira type vessel. These vessels were used as pleasure boats by kings. The open cabin at the centre and open space around it provides enough space for various pleasure activities. They were also suited for trips during the rainy season.

Agramandira – The ship having a cabin at fore was known as agramandira type vessel. They were suited for long voyages. Such ships with open decks might have also been used in naval warfare.

The river-going vessels were operated in shallow waters and brought to shore for loading and unloading they might have been flat or oval bottomed.

According to Yuktikalpataru the heights of the sea-going vessels should be more than 35 cubits. They were larger in size and shaped to cut across the sea waves. The shapes and sizes were achieved possibly from their many years of experience in the sea.
Stability is very important for ships and boats. Any vessel remains in equilibrium position as long as its centre of gravity coincides with the centre of buoyancy. When the floating body is tilted, the centre of buoyancy gets displaced. The buoyant force acts upward and the weight of the ship acts downward. These two opposite forces try to bring the vessel back to its original position. While designing the Ships the centre of gravity is kept as low as possible. The centre of buoyancy acts vertically below the centre of gravity, which provides good stability to the ship. If the centre of buoyancy is above than the centre of gravity it will make the ship unstable. The large heights of ships given in *Yuktikalpataru* suggest that most of them were quite stable and suitable for sea voyages.

A variety of woods were used for the construction of water vessels. These woods varied according to the size, shape and purpose of the vessel. Besides different wood were used for constructing different parts of a vessel. The selection of wood also depended on the region or the area where the craft was built and used. For the convenience of the shipwrights these woods were classified in four broad groups, based on their characteristics. It also mentions about the *Vriksha-Ayurveda* (1st century AD), which classified woods in four categories.
The wood of *kshatriya* class is recommended for shipbuilding. Due to the lightweight and hardness the ships made of such wood were capable to pass through troubled water. Therefore the ship built with such wood are said to bring wealth and happiness.

The use of timbers of different classes possessing contrary properties was not recommended. For the repairs etc. usually woods of the same varieties were used. The ships made of two different types of wood are said to bring neither good nor comfort. Due to unmatched qualities of the wood they do not last for long. Such ships made of mixed wood get rot, split at the slightest shock and sink in water.

It is clear that Bhoja recommends use of same type of wood for construction or repairs of the ship. Wooden pegs made from the same type of woods were used for joining the planks. Planks were
The gaps between the planks were filled with hemp and string. Cane foils soaked in resins extracted from trees were applied over the joins to make them watertight. Damage in the hull or leakage of water was also treated in the same manner.

Bhoja also mentions about the decorating the ships. The sail was made of *avajnasika* cloth. Ships were tastefully decorated and painted. The use of figurehead is an age-old tradition. *Yuktikalpataru* mentions the faces of lion, buffalo, serpent, elephant, tiger, bird, frog and man for figurehead. Different colours were recommended for different type of ships.

Ships with four, three, two and one mast are recommended to paint with white, red, yellow and blue colours respectively (Yuk,109-118). The hull of the ship was also decorated with paintings. *Yuktikalpataru* tells picture of sun, pitcher, mirror, moon, god Indra, swan, peacock, parrot, lion, elephant, serpent, tiger and two bees were painted on the hull.

Metal nails were not used in the construction of the ship. Bhoja also cautions that the nails will be influenced by the magnetic rocks in the
sea and the ship will sink in the water. Only treenails or wooden pegs were used in the hull of the ship.

FOREIGN SOURCES

The foreign sources also refer to different type of boats used in India. A number of foreign scholars and travelers who visited India time to time have left their accounts in the form of travelogues. The eyewitness accounts and writings of foreign travelers and historians also contain observations on Indian subjects. These accounts furnish some valuable information about the contemporary society. Some of these scholars also mentioned about the ancient Indian shipping and shipbuilding. Among all these the *Periplus of the Erythrean Sea* gives a detailed account of the seafaring in India. Important information is also embedded in classical literature in Greek, Arabic, Persian and Chinese. Some of these foreign account and travelogues contain valuable information about Indian boats.

**Greek**

The earliest reference to India is made, by Herodotus (484-431 B.C.). He refers to a type of Indian boat. This boat was made of reed
and its construction was very simple. He mentions that only one joint of the reed was sufficient to make the boat.

At a later period, the Greeks and the Romans wrote about Indian Ocean and also took part in sailing. Quintus Curtius, Arrian, Plutarch and others mention about Alexander's campaign in northwestern India. While describing his military expeditions to India they referred to river routes of Sindhu. While returning, Alexander constructed a fleet with the help of Indian artisans. The ships of this fleet were made of Pine and Cedar. The itinerary of Alexander the Great, written by an unknown scholar refers to a boat made of weaver work.

Pseudo-Kallisthenes, who accompanied Alexander on his Asiatic expedition, has mentioned about boat building in India. The Indians build their boats which were fastened by wooden pegs.

Megasthenes was the Seleucid ambassador at the Mauryan court. His famous work Indica is an important source of information about contemporary society. Megasthenes also refers to the boats which were used to transport elephants from Sri Lanka.
Ptolemy's Geography mention about Indian shipping and maritime activity. Ptolemy also mentions Alexander's campaign to India and his fleet. He refers to 2000 vessels in his fleet. The entire fleet was built by Indian shipbuilders using Indian wood. The ships had capacity to accommodate 8000 troops, several thousands of horses and vast quantities of supplies.

Pliny the elder (1st century A.D.) mentions about Indian boats. He also wrote about the material used for construction of boats and ships and their characteristics. Small boats were made of reed or bamboo. The ships were built with prows at each end which were suitable for turning about in narrow channels. Tonnage of these ancient ships was estimated to 3000 amphorae. Each amphora weight about one-fortieth of a ton.

Strabo (60 B.C. - 19 A.D.) mentions Alexander's campaign to India and construction of a large fleet by Indian shipbuilders. He gives the details of the area from where the wood was brought and also the type of wood used for construction of the ships. He recorded that a great quantity of pine, fir, cedar and various other tree wood was brought for shipbuilding. The wood was cut from the country of Poros, between the Hydaspes and Akesines from the neighbouring
forest of the Emodoi mountains.

He also refers to the voyages between Sri Lanka and India. The ships used in these voyages transported elephants. He also comments on the quality of these ships and according to him, the sails and the structure of the boats were not good.

Arrian (200 A.D.) wrote about Alexander's expedition to India. According to him Alexander's army used a flotilla to bridge the big rivers of India during the invasion (Majumdar, R.C., 1960:19). He also refers to timbers and boat building along the river Indus. He mentions the construction of dockyards, galleys of 30 oars and transport vessels. According to him Nearchus, Alexander's general, assembled a fleet of 800 vessels. The Alexander's army of over 100,000 soldiers to sail down across the river Indus used this huge fleet.

Curtius and Diodorns mention Alexander's campaign to India and construction of a large fleet by Indian shipbuilders. They mention 1000 vessels in Alexander's fleet.
Ktesias refers to a kind of bamboo, which grows in the Sindhu region. According to him the circumference of the bamboo was nearly 12 feet that could not be embraced by two men. This variety of bamboo was used to make small boat that could accommodate two-three persons.

From the above-mentioned references in Greek literature, it is clear that shipbuilding industry was highly developed in India in the 4th century B.C.

*Periplus of the Erythrean Sea*

*The Periplus of the Erythrean Sea* is a work of unknown Greek mariner of 1st century A.D. It furnishes a vast amount of geographical data, useful information on trade, the types of ships in use and also throws light on Indian shipping and maritime activities. It also contains information on the navigation in the Indian Ocean during that period.

Periplus mentions some classes of Indian boats. He writes 'in the Gulf of Barygaza (Bharukaccha) there are pilot boats known as
trappaga and cotymba. He appreciates the navigational skills of these native fishermen who were in the king's service. These boats were large in size and operated by a trained crew. According to him they go up the coast as far as Syrastrene from which they pilot vessels to Barygaza.

Lassen derives trappaga from trapaka, a type of large fishing boat. Angavijja a 3rd century A.D. text mentions its Prakrit name Tappaka (Chandra, 1966: 9). Tarappaga might have been used in the port area for pilot and other purposes.

The cotymba may be the traditional boat kotia still built and used on Kachcha coast. Angavijja a 3rd century A.D. text mentions its Prakrit name Kottimba (Chandra, 1966: 9). Kotumba might have been used in the port area for pilot and other purposes.

There were also some ship coasting along the shore to whom he calls 'ships of the country'. The ships of the country were perhaps boats made of hollowed logs with plank sides and attached with outriggers. Such outriggers are carved on the famous monument of Borobudur and still used in South India and Sri Lanka.
Other large vessels made of single logs was called Sangara. *Angavijja* mentions its Prakrit name Sanghada (Chandra, 1966: 9). The *Sangara* was most probably made by joining of two or more canoes together by deck platform and was used for coastal traffic. *Periplus* calls these ships monoxyla. The name *Jangar* was used on the Malabar Coast for the double canoes. Caldwell relates it form *Chandagam* in Malayalam, *jangala* in Telugu, and *Samghadam* in Sanskrit, meaning a raft. Vincent opine ‘the monoxyla are still in use, not canoes as they are improperly rendered, but with their foundation formed of a single timber, hollowed, and then raised with tiers of planking till they will contain 100 or 150 men’.

The *Periplus* also mentions sewen boats known as *Madarata*. This is probably the Arabic *Muddarra* fastened with palm fiber.

The ships belonging to the Ganges are called *Colandia*. They were very large in size. There have been long discussions about the identification of these ships. The name *Colandia* is suggested to be of Malaya origin. The *Periplus* mentions these ships as *Colandiophonta*. There is a Sanskrit word *Kolantarapota* for the ships going to foreign shores. Vincent feels that the *Colandiophonta*, built for the trade to Malacca, perhaps to China, were very large and
stout. He also compared it with those described by Marco Polo and Nicolo di Conti. Verthema mentions this type of vessels at Tarnasari (Masulipatam). They were designed for the trade to Malacca with 1000 tons burthen.

It also mentions timbers of teakwood and logs of Blackwood and ebony among the items of exported from Borygaza (Broach) to the ports on the Persian Gulf coast. Tamralipta, the great harbour on the Bengal coast is mentioned as a great commercial city near the mouth of the Ganges. It also tells us that the ships frequenting the ports on the Malabar Coast are of large size on account of the amount and bulkiness of their cargo. The Periplus also noticed large Hindu ships off East African, Arabian and Persian ports.

**Chinese Literature**

Chinese literature also contains some information about Indian shipping. Travel accounts of three most distinguished pilgrims, Fa-Hien (5<sup>th</sup> century A.D.), Yuan Chwang and I-t sing (7<sup>th</sup> century A.D.), who visited India provides useful information on seafaring in India. Fa-Hien (401-410 AD) describes the boats and ships involved in the voyage he had undertaken (Sastri, 1939). I-t sing mentions about
Indian shipping in the eastern waters and intercourse with China.

**Inscriptions**

Tamil inscription of 10\(^{th}\) – 13\(^{th}\) centuries contain useful information about the ships, sea routes and naval battles and tells about considerable maritime activity under the Chola Kings. Identification of these places where naval battles took place and ships were sunk is of great importance to study the ancient sea routes and maritime history as well as development in shipbuilding technology.

The Cholas are known as great maritime power who set several expeditions overseas and conquered distant lands. These naval achievements of the Cholas are known through their *Prasasti*. However, the composers of these *prasasti* exaggerated the achievements of their Kings but they contain valuable information and are useful source for writing maritime history. The information gathered from these *prasastis* is some times supported by the other contemporary literature or epigraphic sources.

The Hindu settlements in Malaya and Indo-China are evidence of
the steady increase of seafaring and the naval activities under the Pallavas. The Cholas continued this ancient tradition and developed their naval power for attaining supremacy over the sea. The conquest of Sri Lanka and Maldives by the Cholas indicate their naval power. During Chola period we find several references of use of ships for battles in the sea and conquering the islands. However these inscriptions do not describe these ships in detail.

Kulottunga I describe his navy, which mounted many naval expeditions and conquered the enemies.

The Chola king Parantaka I is credited to have conquered Sri Lanka (Ilam). His epithet Maduraiyum Ilamum Konda also indicate towards his naval power and destruction of the enemy's ships in the naval battles. He was the first to boast of an overseas conquest. The Udayaendram plates of the Western, Ganga king Prithvipati II, who was a vessel under Parantaka I, contains a graphic account on the defeat and destruction of Sri Lankan fleet by the Chola king.

Sri Lankan chronicle Mahavamsa, also mentions the naval defeat of the ruler of Sri Lanka. A Tamil Work Rajarajasolanula also testify the
naval expedition of Parantaka and destruction of the Sri Lankan fleet. It also tells that Sri Lanka was at a distance of 700 kadam (a nautical unit) from the Chola kingdom.

The prasasti of Rajaraja I tell about the naval battle at Kandalur. The phrase 'Kandalur Salai Kalam aruthu aruli' means 'he who was pleased to destroy the ships at Kandalur Salai'. Nilakanta Shastri has interpreted this phrase as "he who had destroyed the fleets in the roadstead at Kandalur. T.N. Subrahmaniyam, Burton Stein and others have interpreted this phrase as an ideological victory in which Rajaraja managed to secure or the Chola court, the services of a prestigious Salai i.e. a Sanskrit school at Kandalur. The inscription mention that many ships of his enemies were destroyed (Kandalur salai kalam arutu aruli). The inscriptions also contain many references about his overseas conquest.

The Tiruvalangadu plates give the account about his naval expedition to Sri Lanka. It mentions that 'The great Rama built with the aid of monkeys a cause way across the sea and then crossed the ocean. But Rama was excelled by Rajaraja whose powerful army crossed the ocean by ships and boats and reached Lanka'. The phrase "Munnir Palantivu Pannirayramum tindiral venri tandar
"kond" has been interpreted by the scholars as Rajaraja conquered 12000 islands of the sea. This is identified as Maldives (Venkatesan, 1988:26-27).

The Chola Kings became masters of the sea. The most ambitious and innovative of the imperial Chola Kings, Rajaraja I and his son Rajendra I began to look beyond the Indian coast. First to Sri Lanka during the reign of Rajaraja I and then at least as far as Malaya peninsula under Rajendra I. The Chola incursions into Sri Lanka acted as a conditioning experience in which they accustomed the Tamil warriors to follow the routes of maritime commerce. The early Tamil commercial and cultural contacts with Sri Lanka and South East Asia are considered as the background to the naval expeditions of Rajaraja and Rajendra Chola.

Rajendra I also had a strong navy. His epithet "Purvadesamum Gangaiyum Kadaramum Konda" reveals about his naval power. Contemporary inscriptions tell about his victories of Dadaram. The first naval expedition of Rajendra I had been directed against Ceylon for retrieving Pandyan royal insignia. The Tiruvalangadu and Anaimalai plates refer to his naval expedition to Sri Lanka. They acclaim the kings naval power while referring to the defeat.
encountered by the Sri Lankan navy at Tandar salai.

The Prasasti engraved on the east wall of the central shrine in the Rajarajesvara temple at Thanjavur, gives the account of his naval expedition towards the maritime state of Sriivijaya. It mentions 'alai kadal naduvul pala kalam selutti sanigirama visaiyothunga varuna nagiya kidarttarasisanai vagai ap-poru kadal' meaning that 'the king having despatched many ships in the midst of the rolling sea, emerged victorious in the naval battle'. The place where this naval battle took place is identified with present Kata situated to the west of Malaya (Venkatesan, 1988:27). Rajendra is also credited to have conquered several islands.

The Prasasti of Rajendra II mentions 'ten desai vayir porpadai nadattikar kadal llangaiyill idarpadai kalingarman Virasalameganai Kadalgalil torupada' meaning that 'the king sent a naval expedition from the gate way of the South to Sri Lanka and made the enemy's ship to sink deep into the black coloured sea'. The Prasasti also mentions that the King despatched innumerable ships which covered the entire area of the sea without leaving any empty space and defeated the Simhala fleet in the sea at place called Valaiyaranam.
Kulottunga claims to have sunk the ships of his enemy Bhupala in the parkadal Dvipa. *Parkadal tivan Karpattu Pupalam tiraividu kalam sorinda etc.*

The Tamil epigraphs are replete with such glorifying claims, suffice it to surmise from the foregoing that the Cholas had a strong navy with the help of which they undertook several naval expeditions and destroyed the enemy's ships.

**European Travelers**

Many European scholars and travelers who visited India described Indian boats and ships being very different in construction from those in their own countries. There are many notices of Indian intercourse overseas in foreign work. Accounts of Marco Polo, Friar Odoric, Varthema and many others give evidences of India's flourishing trade and commerce.

In the 13th century Venetian Marco Polo (*circa* 1293 A.D.) furnishes valuable information regarding Indian shipping. He describes the methods of construction and repair of Indian ships. He also
discusses in detail about their size, form, fittings and the mode of repairing. He mentioned that Indians were not using iron in their ships. These ships were built by fastening the planks with coir thread (Latham, 1978). He mentions the ships that carried ten small boats hung on the side. These boats could be lowered into the water and hauled over the sides. Large ships were manned by crews of 150 to 200 men. One of the ships mentioned by him was so large that it had a crew of 300 men. These large sailing ships were provided with four masts. Ships were also propelled by oars. The oars were long and each oar was operated by four men. These merchant vessels usually had a single deck and could carry 5,000 - 6,000 baskets or mat bags of pepper. The accommodation for passengers was provided below deck. The space was divided into small cabins. Number of these cabins was as many as 60 in large ships. Some ships had up to 13 bulkheads in the hold.

John of Montecorvino (1292-93 A.D) also describes Indian ships. The information given by him is identical to the information given by Marco Polo (Sastri, 1939).

During the Medieval period there are several records of considerable maritime activities on the coasts of India. Since the information
available from medieval period is good enough to understand the
development of shipping and shipbuilding this period is not covered
under this thesis.

*Arab*

The early Musalman travelers throw light on Indian seafaring in the
11th - 13th centuries. Before the arrival of Muslim Arabs the science
of navigation had reached perfection. The compilation of
navigational literature had also begun. There are many notices of
Indian commercial intercourse overseas and information regarding
Indian maritime enterprise in the work of Al-Biruni, Al-Idrisi, Al-
Biladuri, Al- Masudi and many others.

Al-Biruni, (Sachau, 1910:I, 316) informs that the Indian scholar
Prthudaka had not placed Kuruksetra on the same meridian of
Ujjaini, rather placed it 120 yojanas east of it on the basis of the
method given in *Pancasiddhantika*. Bag (1988:10-11) opines that the
Indian mariners had rough knowledge about the position at sea. The
Indian mariners were possibly experts in coastal movements, but
were not very adept in deep sea navigation.
REGIONAL LANGUAGES

Many other Indian literary works composed in regional languages contain information about Indian shipping and shipbuilding. These literary works have been studied by scholars to reconstruct the maritime history of India.

Sangama literature

The classical Tamil literature of the Sangam age contains innumerable references to the naval activities of the Tamils in high sea and the danger involved in it. The later Sangam work *Manimekalai* contains a picturesque description about a shipwreck because of foul weather. It compares the condition of Udayakumaran at the time of his search of *Manimekalai* with a ship. The condition of the young hero is mentioned similar to that of a wooden ship caught into a great storm in the high sea. The Captain of the ship was trembling because the tall mast in the centre of the ship had broken in its base, the strong knots were loosened and the ropes were cut by the strong wind; the ship dashed about in all directions by the surging waves and sank into the deep ocean (Venkatesan, 1988:26). This literary piece clearly describes the experience of a seafarer. Evidence from the Tamil classics of the 1st
century A.D. testify to active intercourse with Rome.

**Tamil Literature**

Tamil language has a very rich literature. Many of these Tamil works are datable to early historical period (IEIL.II, 1987). The knowledge of ships and shipbuilding is noticed in these ancient and medieval Tamil literatures. The works like - *Sangam Pulavarkal - Purananuru, Paripadal, Ahananuru, Ainkumuru, Kalittogai; Madurai-Kokanchi* by Mangudi marudanar; *Perum Panatrruppadai* by Uritiram Kannar(c. 200 B.C. to 200 A.D.), *Silappadikaram* by llankovadikal (5th century A.D), *Manimekalai* by Sattanar (c. 5th-6th century A.D.), *Perunkadai* by Konguvel (7th century A.D.), *Naaladiyar* by Samana Munivarkal (7th-8th century A.D.), *Nalayiradivya Pirapantam* by Alvarkal (c. 8th century A.D.) are a few to name.

In Tamil literature many terms are used for ships and boats. They also mention details and parts of the ship and also the instruments used in the navigation. Rafts are called *puranai* or *pinai, timil, teppam* and *mitavai* in Tamil. *Kaipparicu* is a skin boat. *Toni* (Fig. 102) is a log boat and remaining boats namely *ampi, Kamal, kappal, matalai, navay, pataku* or *patavu* and *vankam* are plank built boats.
The following terms are found in Tamil literature denoting the ships and boats.

Ampi          Conku
Kaiparicu     Kalam
Kappal        Matalai
Mitavai       Mutuku
Navay         Otam
Pahri        Palacam
Panu          Paru
Pataku        Punai
Teppam        Timil
Toni          Vanka

Apart from these, there are more than hundred words in Tamil Lexicons and dictionaries for boats and ships (Rajamanickam and Arulraj, 1994). Based on their construction these boats can be classified under four broad categories viz. Rafts, Skin boats, Longboats and Plank build boats.

Kannada

The literary works composed in Kannada language during 13th to
17th century A.D. (IEIL, Vol.IV, 1987) have several references to boats and ships. The descriptions are scarce and are often found in the form of the metaphors and similes. A variety of names are found in these literary works. Some of the names referred in Kannada literature are given below (Swami, 1997)

<table>
<thead>
<tr>
<th>Ambi</th>
<th>Ballon</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beda/vada</td>
<td>Bhaitram</td>
</tr>
<tr>
<td>Doni</td>
<td>Hadagu</td>
</tr>
<tr>
<td>Harigolu</td>
<td>Jang</td>
</tr>
<tr>
<td>Jangal</td>
<td>Kalagam</td>
</tr>
<tr>
<td>Kaphile</td>
<td>Kol</td>
</tr>
<tr>
<td>Machuva</td>
<td>Mancive</td>
</tr>
<tr>
<td>Mangini</td>
<td>Manji</td>
</tr>
<tr>
<td>Nave</td>
<td>Oda</td>
</tr>
<tr>
<td>Pandi</td>
<td>Paros</td>
</tr>
<tr>
<td>Paru</td>
<td>Pattemari</td>
</tr>
<tr>
<td>Pervadagu</td>
<td>Plava</td>
</tr>
<tr>
<td>Plavaka</td>
<td>Pota</td>
</tr>
<tr>
<td>Pravahana</td>
<td>Sambukhi</td>
</tr>
<tr>
<td>Sangada</td>
<td>Sanghatam</td>
</tr>
<tr>
<td>Siyampane</td>
<td>Subhaitra</td>
</tr>
<tr>
<td>Talpa</td>
<td>Tari</td>
</tr>
<tr>
<td>Teppa</td>
<td>Yanapatra</td>
</tr>
</tbody>
</table>

The names of the boats referred to in the Kannada literature are
both seaworthy crafts as well as those which were used in riverine transportation.

According to the classification suggested by Green Hill these crafts can be classified into four major groups - rafts, skin boats, log boats and plank built boats (Greenhill: 1976). The *teppa* (Fig. 103) and *harigolu* would come under rafts and skin boats category. The *doni* (Fig. 104) and its variant denote log boats whereas *nave*, *hadagu*, *padagu* and *bhaitra* would form plank built boat category.

**Malayalam Literature**

A variety of boats were constructed and used on the Kerala coast. The Malayalam literature also refers to many varieties of traditional boats. In ancient period, these boats were used for different purposes such as fishing, ferry, cargo transportation, war, and also for sports. The tradition of boat building is still preserved in coastal area through the ages.

The Malayalam works from 15th to 20th century A.D. (IEIL.VI, 1988) mentioned various names of boats and ships. These various names
of the watercrafts referred in the Malayalam literature are listed below.

Antarvahini  Aratti
Bottu       Brittaniya
Campa       Cannatam
Cinu        Civata
Emdan       Iruttukkutti
Kappal      Kattumaram
Marakkalam  Nau
Navayi      Olamari
Onnar       Orrattati
Oti         Ottulakkam
Paru        Pataku
Patram      Pattamari
Patti       Plavam
Ponnu       Potam
Tarani      Toni
Ulplava     Uru
Vahitrlam   Valar
Vallam      Vallam
Vanci       Varkkas
Vattel
**Telugu Literature**

In Telugu literature like *Baddana’s Sumati Satakamu* by Chenubhatal Venkata Krishna Sarma (14th Century A.D.), *Mallaramayanamu* by Atukur Molla (16th Century A.D.), *Vasucaritramu* by Ramaraja Bhushan (16th Century A.D.), *Katamaraju Kathalu* by Komanala yellaya (1170 A.D.), *Andhra Bharatamu* by Nannaya Bhatta (11th Century A.D.), *Sringara Naishadam* by Srinatha (1365-1441 A.D.) (IEIL.V, 1988) of medieval period there are many terms, which denote the boats and ships. These various names of the watercrafts referred in the Telugu literature are listed below.

<table>
<thead>
<tr>
<th>Telugu Term</th>
<th>English Term</th>
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<tr>
<td>Done</td>
<td>Doni</td>
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<td>Droni</td>
<td>Dunga</td>
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<tr>
<td>Jogu</td>
<td>Kappali</td>
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<tr>
<td>Nauka</td>
<td>Nava</td>
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<td>Oda</td>
<td>Padava</td>
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<tr>
<td>Putti</td>
<td>Tarani</td>
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<td>Teppa</td>
<td>Yanapatra</td>
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These literatures in various regional languages of India tell about the ancient ships and boat building.
Logboat

*Toni* is most frequently referred in the ancient Tamil literature. It is used in a broader sense and denotes boats of medium size as well as outrigger canoe. The term ton is derived from Tamil means to dig. Thus a boat made by scooping a log is called *toni* (Fig. 102). It is also used with many prefixes according to the purpose for which the boat is used.

- **Tavatittoni** A vessel used to destroy the enemies vessels
- **Turaittoni** A ferry boat
- **Karivalaittoni** A flat bottomed fishing boat
- **Kallatoni** A boat used by pirates (Fig. 105)

The log boats are also referred in the Sanskrit, Kannada, Tamil, Malayalam and Telugu literature. The terms such as *orrattati*, *otam* and *toni* denotes the log boat. The term *toni* is used with several prefixes according to the size and purpose of the boat. The terms *ceriya* and *valiya* means small and big respectively. In Malayalam literature *toni* and *orrattadi vallam* (Fig. 106) are used as synonyms. *Orrattadi vallam* denotes boat made out of a single log.
The word *doni* (Fig. 104) or *dhoni* (Fig. 107) in Kannada is very popular term for boats. It represents a class of boats. The term *doni* derived from the Sanskrit word *droni* or *drun* meaning scoop out. The word literary means a canoe made by scooping a log or in other words the craft made by the way of scooping is called *doni* (Fig. 104) or *toni*.

In Telugu language *Droni, Doni* (Fig. 104), and *Dunga* are used for the log boats.

**Plank Built Boats**

*Oda, nauka, nava, padava* (Fig. 16), *kappal, jogu* and *kappali* are the plank built boats. *Oda* is a small boat to carry one or two persons from one bank of the river to another. The word *oda* appears in the Andhra *Mahabharatamu* of Nannaya Bhatta and the *Aranyakanda* of Molla Ramayanam. *Nauka* means a boat or a ship. This word also appears in the *Mahabharatam*, the *Ramayana Kalpavrikshamu* (Vishwanatha Satyanarayana) and the *Bhaskara Ramayanamu* (Giriprakash).
The *padava* (Fig. 108) ship was used for loading and unloading cargo from the ships anchored in the sea. This boat referred in the *Ramayana Kalpavrikshmu* (Vishwanatha Satyanarayana) and other ancient Telugu texts.

*Yanapatra* is a big boat used to cross the river and transportation. These references in ancient literature tell that several types of crafts were being built and used in those days. Some of these traditional crafts are still built and are in use in various parts of the country. Traditional boat building and literary evidence studied together show the antiquity of these boats and also the continuity of the maritime heritage.

*Ampi, kalam, kappal, matalai, navay, pataku, patavu* and *vankan* are the plank built boats. *Ampi* means water in classical Tamil literature. It is a common term used for both boats and ships. The *Silappadikaram* mentions *ampis* whose prows were decorated with figures of lion, horse or elephant. The *Manimekalai* and the *Civaka Cintamani* mention *ampi* as a ship. It is also mentioned in *Silappadikaram* and the *Kamba Ramayanam*.
The term *kamal* also means a ship or a boat made of wooden planks which were used in overseas trade for transporting horses.

*Matalai* is a big boat used in overseas trade. During the reign of Kulottunga Chola these big boats were used to import elephants and other cargo from foreign countries.

*Navay* has derived from Sanskrit term *nau*. It has mast and sails and is used in overseas and coastal trade. *Vankam* is also a sea going vessel with masts and sails. The name derived from the word *vankam* meaning sea waves. It was used for overseas trade during the Pallalva period. It is mentioned in *Silapadiakaram* and *Manimekalai*.

Tamil literatures also mention other technical details. It also mentions that a particular wood *uruppa* tree is used in place of teak for boat building. These references indicate that the ancient Tamils were very good boat builders who built and used a variety of boat for various purposes. The ship building industry was flourishing and their ships were engaged in overseas trade. These traditional Indian ships were sailing to the ports of East African Cost, Sri Lanka, South
East Asia, Arabia, China and Persian Gulf.

There are many local or regional terms used for the plank built boats in Malayalam. The terms for this category of boats, in the Malayalam literature, are *pataku, patavu, potam, bodham, virkkass, vahitran, aratti, patti, ottulakkam, bottu, vallam* (Fig. 109), *vanchi, marakkalam, cinu, valar, vattel odi, iruttukutti vallam* (Fig. 110), *olamari, navayi, nau, patram, yanapatram, onnal, pattamar, tarani, civata, civati, uru, uruvu* and *kappal* (Arul Raj, 1987).

Among these *aratti* (*antra* - oar) *navayi, nau, potam* (*pota* - a ship), *bodhan, patra, yanapatram, tarani, Navayi, nau, tarani, patram* (*patra*), *yanapatram* (*yanapatra*) are either Sanskrit terms or derived from the Sanskrit terms.

In the above-mentioned terms *Vallam* (Fig. 109), *vanchi, ceruvanchi, cinu* and *odi* are small to medium sized boats used for fishing, transportation and sports. *Pataku, padavu, pattamari, uru, uruvu, kappal* and *kalam, marakkalam* are comparatively bigger boat or ships used for coastal and overseas trade.
Many terms in Kannada language like nave, hadagu, padagu, bhaitra, pervadagu and nava denote the plank built boats.

The term nave is a general term used to denote boat and ship in many literary works. The term nau in the Rgveda refers to a rescue boat which traveled three days and nights in the sea (Ritti, 1988). The numbers of oars are referred as pada, the feet of the boat. The Dharmamrutam of Nayasena mentions it as sea worthy craft.

The terms used for the parts of the crafts like mast, rudder, etc. also occur in the Kannada literature. The mast is called as kupastambha, kuvakambha, kupaka, kupa and gunavrikshaka.

Some of the names referred in the Kannada literature such as tappa (Fig. 103), doni, hadagu, harigolu, beda, vada (Fig. 111), machuva (Fig. 112), manchi, manji, pandi and pattemari are still in use among the coastal people of the Karnataka coast.
Raft

The Malayalam terms such as cannatam, sanghatam, cannata, odu, pilippu, udupam, plava, ulplava, ponnu, campa, ovu, kolam, kol, paru, varu, var, akattepparu, kattamaram and kattumaram (Fig. 113) denote the raft. They are made of bamboo or reed or wooden logs and are used for fishing in sea as well as for transportation in backwaters.

Many of these terms such as sanghatam, plava, udupam, odu, cannatam, cannata, ulplava have either derived from the Sanskrit or are the corrupt form of Sanskrit terms.

The word kattamaram probably derived from Tamil word kattumaram (Fig. 113) meaning a short wooden log. The word campa seems a corrupt form of Chinese word Sampan which means a boat made of three planks or logs (Swami, 1997).

In kannada the word teppa (Fig. 103) is equivalent to the term teppam in Tamil and the Telugu word teppa. The term teppa denotes raft and they are used in sea for fishing along the coasts of
Tamil Nadu and Andhra Pradesh. In Karnataka they are used in rivers, lakes, and ponds for fishing, ferry and transportation. They are also used in religious ceremonies in temple. The festival related to them is called float festival (*teppothsava*) in many Hindu temples of South India. These boats and rafts are also used to cross the rivers.

The raft is defined as flat floating structure of wood or fastened logs etc. used in water for transportation or as lifeboat. Several Tamil terms like *punai, pinai, timil, teppam, teppai* and *mitavai* are used for raft.

*Punai* or *pinai* is a type of raft. *Punaikkatai* is used in the sense of catamaran. The logs of wood or bamboos were tied together as raft or float, is termed as *kathamaram* in modern days - *kattu* means to tie and *maram* means wooden log.

*Nermpunai* in ancient Tamil literature means light raft. Rafts were also made of bamboo or reed. They were used in ancient time to cross the rivers. Catamaran is a common and most popular name for rafts. Based upon the number of logs used in a raft they are...
divided in four groups.

Two logged catamaran  

Three logged catamaran  

Four logged catamaran  

Five or more logged catamaran  

Inaikkattumaram  
mukkattumaran  
Irukkumaram  
Jantilimaram.

Word *timil* is used for a small boat, which was used for fishing and pearl fishing. Some people living in the coastal region in Tamil Nadu coast are called Timilar, probably the tribe that used *timil* in ancient times. The term *Timil* is also used with different prefixes, like *koduntimil, neduntimil* and *thintimil*.

Other terms like *mitavai* and *teppam* also denote catamaran. *Mitavai* is made of bamboo or Indian mast tree. *Teppam* is a Telugu word. It is called *tappal* or *tappai* in Tamil.

A raft is called *teppa* (Fig. 103) in Telugu as in Kannada and Tamil. This term also occur in the *Mahabharatam* (Giriprakash) and the *Ramayana Kalpavriksham*.  

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**Skin Boats**

*Harigol* or *harigolu* is a skin boat. Kittel describes the word *harigol* as a boat made of wickerwork covered with hides. It is used only in inland waters for crossing the rivers and fishing. This type of boats is very effective in navigating in the rivers with whirlpools. *Putti* in Telugu is a basket like wicker work which is used for transportation in rivers. Its rear portion is covered with a skin or hide.