CHAPTER - 1

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With about 7500 km long coastline and hundreds of ports, India enjoyed the position of “mistress of eastern seas”, in antiquity. Indians built boats and ships from the very beginning. Different environmental, geographical, social and economic conditions in different parts of the country resulted in development of several types of watercrafts.

Ships are said to be the noblest artifacts of man’s multifarious skills representing the frontiers of technology, which any society could offer. A ship is also a machine as basically it is designed as a means of transport. Principal features of a ship, ability to float and efficient movements in controlled manner, are constrained by the requirements of its function. They were the biggest machines produced by pre-industrial society. They are also the good examples of art and craftsmanship.
A ship is described as a "vessel with bowsprit and three, four or five square rigged masts; any large sea going vessel; boat" in the dictionaries, but it is much more to archaeologist who study ancient ships and their remains. To merit classification as a ship or boat it is necessary for the vessel to support weight not merely because of the buoyancy of the material of which it is made but because of its displacement of water.

Ships were also the main instruments for trade and communications, which in turn helped in the development of many great trading centers of the past. A ship's fundamental purpose has been to function within a military or economic system. They play a far more important part in the life of a nation than is generally realized. It is the key element in a country's progress through its transport of man and goods to other countries. Places bordered by water have to depend a great deal on their maritime commerce for their economy.

Besides its main purpose a ship, for an archaeologist, is also a closed community. Items related to those on board shed light on their life-style. This shipboard society has its own peculiar customs, rituals, belief and way of working. These small societies are run
according to strict hierarchies. The great archaeological importance attached to ancient ships was not fully realized till very recent past.

The study of ancient ships is not the study of a motif, or of an ancient machine and its technology but also the ancient economy and society. The study of ancient maritime technology remained much-neglected subject and not much attention was paid to the study of ancient ship building technology. There has been a sudden rise in the publications on the ancient ships and shipping in India, in recent years, but often they lack, a clear and detailed database and analysis of the data.

Although, it is known since long, that the ancient Indian ships were of many varieties but the antiquity of Indian shipping could not be established satisfactorily being older than any written record pertaining to it. Almost all the previous works on Indian shipping started from the ships of Harappan period. These sailing ships were well capable of carrying passengers and appreciable quantity of cargo with reasonable degree of certainty, between one port to another. Study of development from primitive boats to Harappan ships was a challenging task due to lack of archaeological evidence.
prior to Harappan culture. There are very few and that too sketchy evidence during this period.

There were several factors for the development of shipping and shipbuilding technology in India. Ancient Indians were skilled shipbuilders and enterprising mariners who built strong ships and set voyages to distant lands across high seas. The shipbuilding technology, skilled ship writes and courageous mariners were the reasons for flourishing of shipping industry in the country since antiquity. Other factors, which encouraged this industry, are sea at three sides, many navigable rivers, availability of suitable materials for construction etc.

The long and broad rivers of India have always played a great part in the development of Indian society. Small units of human habitation sprang up along their fertile banks and soon developed into the great cities of the past. The Indian rivers formed an excellent system of inland navigation, connecting the cities with one another. These rivers have thus been one of the most important channels of inland trade and communication.
Ancient Indian ships were of many varieties depending geographically and chronologically in different parts of the country for different purposes. The antiquity of shipping is much older than any written history pertaining to it. Primitive crafts had developed to ships, well capable of carrying passengers and appreciable quantity of cargo with a reasonable degree of certainty, between one port to another, long before writing was known.

India is surrounded on her three shores by the sea. The Indian Ocean, from the beginning of history, has been a regular highway of commerce. India carried on a continuous and extensive commercial and colonial intercourse with east as well as with west. India is rich in culture and also has enriched the cultures of other countries with whom it had contacts. These exchanges were possible because of the existences of advanced shipping industry.

Archaeological researches have established that the ancient Indians had trade and contacts with Southeast Asian countries on one side and the western Asia, Africa and Europe on the other.
Although plenty of evidences, both archaeological as well as literary, are available to prove these contacts in the past but our understanding of ancient ships, which were involved in maritime trade was inadequate. Scholars of India and abroad have contributed some literature on ancient Indian shipping but they are hampered by an insufficient methodology and scientific study to examine the validity of various evidences to distinguish technical information from poetic imagination or artistic modifications.

On the interpretative side, this preoccupation with literary references restricted the amount of information, which could be gained from the archaeological study. In the present research ships construction, navigational instruments, steering methods, material and purpose have also been treated as a more basic criterion for establishing the development of shipping technology than the mere description.

In the absence of systematic studies it was very difficult to say - When the first ship was built in India? How they developed? How these early ships looked like? What material they were made of? How big they were? What purpose they were used for? How fast and far they could travel? Was their building technology indigenously
developed or borrowed from others? How adoptive they were for foreign technology? etc.

Yuktikalpataru of Bhoja gives details about ancient ships and shipbuilding. Prior to that no other literature describe shipbuilding in detail. The only sources to learn about ancient Indian ships are representations in ancient art and references in literature. Yuktikalpataru provides good deal of information about this ancient Indian industry. From 12th –13th century onwards, good representations in the art as well as detailed descriptions in literature are available. After some times even the paintings in manuscripts provide valuable information. These sources provide sufficient information to reconstruct the maritime history up to some extent

Archaeological evidence period prior to 10th century are limited. Various historians and archaeologists described the known ancient ships variously. These vivid descriptions made the danger of subjectivity very real leading to a multiplicity in nomenclature of ancient ships and their types. The students of archaeology thus have to struggle through a confusing descriptions that list a lot of data but from which it is difficult to derive much information.
Since no ship of early period has been excavated in the country our knowledge about ancient Indian ships is very sketchy. The available evidences were also not analyzed scientifically to reconstruct the evolution of shipping and shipbuilding technology. The reason this research was undertaken to collect all available data on the subject evidences as wide range as possible and to compare with other sources.

Archaeological evidences such as finding of Indian artefacts on the sites of Mesopotamian and Egyptian civilizations and the artefacts belonging to these civilizations in India established that the ancient Indians were enterprising mariners who set voyages to distant lands across high seas. But the real information about their ships, which they used for these interactions, was lacking. The maritime activities of the Harappans extended up to Mesopotamia through the Persian Gulf. The earliest reference of the intercourse between the Indus valley and Mesopotamia is probably found in the cuneiform inscriptions of the Hittite kings. The Harappans also had intimate intercourse with Sumer and Elam during 3rd millennium B.C. The findings of Indian teak in the ruins of Ur confirm that commerce by sea between India and Babylon must have been carried on as early as 3000 B.C. This conclusion is strengthened by the fact that a beam of Indian cedar was found in the palace of Nebuchadnezzar.
The maritime activity of India is proved by literature, art, sculpture, painting, numismatics etc. Foreign writers, while writing about the shipbuilding industry of the ancient civilizations, usually bypass India's contribution in this sphere, due to scattered evidences, which are yet to be studied systematically. There is very little mention of ancient Indian technological development in the works stressing upon advanced technology of the Egyptians, Phoenicians, Greeks and other ancient civilizations.

The origin of boats has been traced to the Upper Palaeolithic / Mesolithic period. The purpose of these early boats was fishing and transport. During the Harappan period it had developed to sailing ships. There are ample direct and indirect evidences to prove the maritime activities of the Harappans.

Ship representations exhibit variable shapes, construction and uses. In most of the cases these are stylized and not much attention is paid to technical details. But a careful study of associated representations reveals useful information about the shape, size, construction and navigation of the ship.
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.

Brahmanical literature like, *Rgveda*, *Athrava Veda Samhita*, *Vajasaneha Samhita*, The vast mass of *Sutra* and *Smrities* literature, *Vriksha-Ayurveda*, *Ramayana* and *Mahabharata*, *Puranas* like *Markandeya Purana* and others, *Dharmasastra* of Manu contain useful information about ancient shipping and seafaring. *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.

Jain texts also reveal important information about ancient Indian shipping. The texts like - Angavijja, Tilakmanjari, Namalinganusasanam, also known as Amarakosa of Amarsimha, etc. Are few to name.

Besides these religious texts, secular texts like – Astadhyayi, Brihatsamhita, Arthasastra of Kautilya, Mahabhashya of Patanjali, Paulisasiddhanta, Yuktikalpataru of Bhoja, etc. provide useful information about ancient Indian shipping and shipbuilding.

A number of Greek, Chinese, Arab and European scholars and travelers have also given the accounts about ancient Indian shipping and shipbuilding. These literary sources were examined which proved useful to reconstruct the evolution of Indian shipping and shipbuilding for about last two thousand years.

A number of inscriptions also contain information about sea voyages and naval battles. Prashashtis of Chola kings in this regard are noteworthy.
A vast amount of literature composed in the regional languages in different parts of the country are also important source to learn about ancient shipping and shipbuilding. However most of these texts have not received the attention of most of the scholars and remain largely unexplored.

Some European scholars made copies of traditional Indian ships and boats in the second half of 19th century and the first half of 20th century Hornell (1926, 1946). Some of the scholars documented information about the construction technology, materials used and their designs and usages. R.K. Mookerji (1912) produced a monumental work on Ancient Indian Shipping.

In the second half of the 20th century many other scholars like R.C. Majumdar (1960), Lallanji Gopal (1962, 1970, 1999), K.V. Hariharan (1966), N.G.Jog (1969, 1970), K.S.Ramachandran (1970), S.R. Rao (1970), A.C. Das (1975), M. Chaudhury (1976), Moti Chandra (1977), N. Gandevia (1978) and others have attempted to reconstruct the maritime history with the help of archaeological evidence and information given in ancient literary works. 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 that is not sufficient to reconstruct the systematic maritime history.


Indian archaeologists and historians also realized the importance of traditional shipbuilding and NISTAD undertook a national project to document boat building traditions and traditional navigation. The project resulted in the production of number of reports on the traditional boat building in different parts of the country.

Proceedings of the seminars and conferences on the subject also brought out some very valuable publications (Behera, 1999; Ray, 1996).
Last two decades of the last century marked the popularization of this subject. A number of publications were made, particularly in the last decade of the century. Most of these works were the collection of information from previous publications or new interpretation. They also lacked the fresh data from the field or the first hand information about the evidences.

Shipping was a well-developed industry even in Vedic times. There were boats for river traffic and also huge sea-going vessels, which called on at distant ports. 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.

The verse 'nava na kshodah pradishh prithivyah' in *Rgveda*, meaning let us by our boat set out to all quarters of earth, bears testimony to the fact that the Rgvedic people were good mariners. 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.

One of the greatest epic, *Mahabharata* also 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.

Boats and ships are also mentioned in *Ramayana*. Vessels mentioned in Ramayana were, interestingly, river crafts used by saints and sages to cross rivers. Ram also used boats to cross rivers when in exile. Based on their description these crafts can also be divided in various classes. During exile hero of the epic also made raft to use in mighty rivers. 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.

These stories in ancient texts however 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 Jain canons also mention numerous stories where traders set voyages to distant lands to earn wealth. Some of the ancient manuscripts also depict scenes of sea voyages.

*Arthashastra*, not only mention about boats and ships but also about the superintendent of ships and his duties, goods of import and exports, tax on them and so on. It has been widely studied and quoted by the scholars.

Besides these ancient texts descriptions by foreign travelers in their accounts also tell about ancient ships and seafaring. Account of unknown sailor in famous ‘*Periplus of the Erythrean Sea*’ mention valuable information about ancient ports and sea trade. We also have ample testimony of other foreign writers like Pliny and Ptolemy.

A number of ships are depicted in ancient Indian art in the form of sculpture, relief, painting, terracotta model, seals, engravings, coins etc. The value of ships in art is not fully estimated in the discussions of Indian seafaring. Study of these representations is far more
important and useful than what it is given. It is also more useful and reliable than descriptions in literature for many reasons.

These representations whether sculpture or painting or seal or a coin can be chronologically determined. Besides date these representations are often nearer to reality if not stereotyped. Visual art help in studying a ship in detail, its hull super structure, steering gear, type, building technique, capacity and so on. The artist has to depict many of these details whatever his purpose may be, unlike literature where only relevant part is described.

Quite a large number of ships have been noticed so far, by the archaeologists and maritime historians, in ancient Indian art. These depictions were studied and referred time to time but a need of a scientific and techno-analytical study to reconstruct long maritime history of India was always felt. For any systematic study data collection is a must. Author tried to study and document ancient ships and boats depicted in Indian art.

All the previous works on maritime history of India started with the maritime activities of the Harappans. Recent studies in the rock-art
have brought to light some very important archaeological evidence. The earliest representations of boats are found in stone age rock-shelters. The rock-art specialists on the basis of their style etc. have dated a number of boats painted in the rock shelters of Mirzapur region to Mesolithic period. These boats are simple and small. They were rowed with the help of oar or a long pole and used in small ponds and may be in small streams and rivers for fishing. The shape of the boats suggests that they were not primitive rafts but carefully made boats.

Not much is known about the seafaring between mid-second millennium BC to mid-first millennium BC. Two representations, dated to this period, come from Tamil Nadu. Rock-paintings at Karimaya Kavundanpatti and Kilivalai are dated to 1000 and 700 BC respectively. Like the other boats in rock-paintings they were also used in pond etc. for fishing. These representations are very sketchy and no detail about the construction of the boat can be made out.

Boat with somewhat details of construction appears in 2nd century BC. Boats in relief at Bharhut and Sanchi are although small boats but important because of their details. Here it can be said with certainty that the boats were made of wooden planks joined together
with the help of dowels. They were small rowing boats without any super-structure.

The boat on the western torana of Sanchi is of special type, *vishesha*, and not of regular use. Boats depicted at Kanheri are stereotyped and give no detail except that the boats were in use for trade during the period. Some good representations of ships with one or two masts comes from Andhra -Satavahana coins of 2nd century AD. These ships were undoubtedly sea-going trade vessels of large tonnage. Being depicted on small coins not much details can be made out. Corrosion of metal also reduced some of the finer details, which might have been drawn when the coins were minted.

Not only native crafts but also foreign ships visiting Indian ports tempted Indian artists who drawn them on whatever medium he could lay hand on. A ship, identified as Roman, engraved on the potsherd at Alagankulam is a good example of it.

A number of terracotta seals and coins found at Chandraketugarh also depict ships of different types. Some of these representations are very interesting not only for the study of ships but also to study
maritime trade as the variety of goods transported on ships are also depicted on the seals

Some of the best representations of ancient Indian ships are found in the world famous paintings in the caves of Ajanta. These paintings depicting various Jataka stories also show some ships and boats. Paintings are tastefully drawn and provide good information about the contemporary maritime activities. Though the episodes narrate stories of very early period but the representations must have been influenced by the existing crafts.

Paintings at Ajanta show various activities like transportations of army and a ship loaded with cargo, a shipwreck etc. The ships with three masts with full sails is one of the best and most detailed representation of a ship in Indian art. Details of construction and the degree of reality in these representations are higher than others. Besides artist's art it can also be attributed to the medium of art. It is supported by the stereotyped boats without any detail or superstructure carved in the rock at Ajanta.
A ship with unfurled sail depicted in Aurangabad caves is also one of the best and detailed representations in stone. Though it is a relief on rock surface but artist have tried to give greater depth by carving the prow away from the rock. Some more representations of this period are found at Ratnagiri, Aihole and Pachmarhi.

A boat depicted in the rock-shelter at Chamardi is probably the only rock-painting which show a ship with a rudder. Depiction of a ship that to of such late date in a rock-shelter is very interesting.

Thus the study of ships in ancient Indian art and literature provide useful information about ancient ships, their development, building technology and also their uses. This documentation of ships and boats provide a continuous history of shipping in India from Mesolithic period to historic period.

Study of ancient ships is also not free from difficulties. Traditional and stereotyped representations reduce the volume of information. Insufficient factual knowledge, composition according to availability of space, medium of art, purpose of depiction etc. are also some of the factors, which hindered realistic representation in visual art.
Traditional boats are deeply related to the societies who built and used them. This relation of man and boat is unique in Andaman and Nicobar, in Bay of Bengal and Lakshadweep, in the Arabian Sea. These isolated groups of Islands off the coasts of India were totally depended on ships and boats for their every activity. Boats and ships were the lifeline of these people and all the events of their history, culture or the daily life are related to the boats and ships, in one way or the other. This close association with ships made the Islanders very good boat builders and navigators. Till today a variety of boats, from simple wooden rafts and primitive dugout canoe to large sailing ships up to a carrying capacity of 400 tons are being built in these islands. The systematic study of these traditional vessels which are still built in very traditional way provides the missing links of Indian shipbuilding.

Evidences of ancient Indian ships in the art and literature were examined and compared with traditional ships. Study of traditional vessels proved useful to better understand the ancient Indian shipping, as most of the traditional ships are built and are being built in the same fashion as they were built several centuries back. As these traditions have remained unchanged since antiquity there
study takes a researcher back in distant past to visualize the ancient seafaring and shipbuilding technology.

The Indian shipbuilding industry got full scope due to various favourable factors. It was possible also because of easily available raw material for shipbuilding, courageous mariners, and high standard of Indian products, which were in great demand elsewhere.