Literary & Archaeological Evidence of Early Seafaring & Navigation Technologies in India

S. Rama Krishna Pisipaty[1]

Abstract

India is situated at the central point of the ocean that washes on its coast on three sides, seemed destined very early for a maritime future in the region. Both literature and archaeological works of the region are providing ample evidence about the early sea routes and maritime trade activities of the region. Vedic literature, one of the early existed texts, has provided copious references about the early seafaring. There was a time in the past when Indians were the masters of the long distance seaborne trade. They built ships, navigated the sea, and held in their hands all the threads of international commerce, whether carried overland or via sea. The archaeological excavations of several Indo-Saraswathi, the first civilization in the region, sites and many others have also conclusively demonstrated advance maritime activities right from the third millennium Before Christ[2] (BCE). During the early historical period (second BCE to second CE) several coastal towns, both east and west coasts of peninsular India, had international trade and commerce. The subject matter for the present discussion are based on glimpses of the regional seafaring and navigation technologies mentioned in the available early indigenous literature of the Sanskrit language, as well as archaeological records.

Key words – Vedic literature, Sanskrit, *Rigveda*, *Matsya yantra*

India has all required geographical feature suitable for water transportation, which has been utilized by human since the ancient times to the present day. It is situated at the central point of the ocean (see Map).

Figure 1. Map of India's geographical location, the red arrow extends from its most western coast to its eastern border (by author).

[1] Prof & Geoarchaeologist, SCSVMV University, Enathur, Kanchipuram – 631561., India.
Email- sramakrishna.pisipaty@gmail.com

[2] A designation of the Gregorian Calendar, from the year -1 and continuing backwards from the year of the birth of Jesus Christ of Nazareth. Common Era - abbreviated as CE, is an alternative designation for the calendar era, traditionally identified with *Anno Domini* (abbreviated AD), both systems are numerically equivalent. BCE - Before the Common Era, an alternative to BC (Before Christ).

The rivers flow from the Greater Himalayas and other Ghats, further provide the intra-connection within the region to the coast. From the region many advanced traits were evolved for the first time in the history of mankind. Among them is a vast amount of literature developed by the Sindh region around 2000 BCE. This has been a major source in reconstructing the past on various aspects. It may be true that the Sanskrit literature is only existing early literature. Early Indian literature has appeared in two major groups depending on the language – one is in Sanskrit language and other group of literature is in the regional dialects of that period (Mujumdar 1996; Datta 2006). Literature in Sanskrit language is grouped in to two types of texts – one related to Veda origin; and the second category is classical literature (Keith 1993). In the former group of text, of Sanskrit language, according to scholars *Rigveda* is an early text and complied around 2000 BCE (Kochhar 2000). It may be noted that the vast Indian literature has oceanic depth. For the present study evidence related to the early India seafaring have been restricted to the *Rigveda* and a few other early text along with archaeological data unearthed from various Indo-Saraswathi sites. According to various scholars the Rigvedic compilation and the late phases of the Indo-Saraswathi civilization (around 2000 BCE) were happened almost in the same period (Kochhar 2000; Talageri 2000).

Allusions to Early Maritime Activity in Sanskrit Literature

In Sanskrit literature constant reference is made to merchants, traders and men engrossed in commercial pursuits. The oldest evidence on record is supplied by the *Rigveda* which contains several references to sea voyages undertaken for commercial purposes (Table I). The word "navy", or related word, has its origin from the Sanskrit word *Navgatih,* potentially the word "navy" derived from the word *nou* meaning boat.

From Sanskrit language *Samudra* is usually translated as "ocean and/or sea" and the word itself means "gathering of waters". The term *Samudra* occurs 133 times in the *Rigveda*, referring to oceans (real, mythical or figurative) or large bodies of water as well as to large Soma vessels (*RV* 6.69.6). However, the *Samudra* is never said to flow in the *Rigveda*, but it receives all rivers (*RV* 6.36.3; 8.44.25). The *Rigveda* also describes the Sarasvati River as a river that flows to the ocean (*RV* 2.41.16-18) and, "is pure in her course from the mountains to the sea" (*RV* 7.95.2). *Rigveda* (1.71.7) describes the seven great rivers seeking the *Samudra*. All rivers flow to the *Samudra* but are unable to fill it (*RV* 7.33.8). It also says that the *Samudra* is the eldest of the waters (*Samudra jyestha*) and that the goal of the rivers is to reach the *Samudra* (*RV* 7.49).

One passage (RV. I. 25,7) represents Varuna, the rain God who has full knowledge of all sea routes. In another context (RV. I.56,2) it speaks of merchants, under the influence of greed, going abroad on ships to foreign countries. Another verse (I. 56.2) mentions merchants whose activities know no bounds, who go everywhere in pursuit of gain, and frequent every part of the sea. The seventh mandala (book) (VII. 88. 3 & 4) alludes to a voyage undertaken by Vasishtha and Varuna in a ship skillfully fitted out, and their, "undulating happily in the prosperous swing". A verse in first mandala/book, which is the most interesting passage (RV. I.116. 3), mentions a naval expedition on which the Tugra, a King (mentioned in Rigveda) sent his son Bhujyu against some of his enemies in the distant islands. Bhujyu, however, is shipwrecked by a storm, with all his followers, on the ocean, "where there is no support, no rest for the foot or the hand", from which he is

rescued by his twin brethren, the Asvins (Rigvedic Gods), in their hundred-oared galley. The Panis in the Vedas and later classical literature were the merchant class who pioneered to unknown lands and succeeded in crossing oceans and rivers between many regions and diverse nations. The Phoenicians were no other than the Panis of the Rigveda (*RV* X.108). They were called Phoeni in Latin which is very similar to the Sanskrit Pani.

From the above verses show that the people credit Varuna (rain God in Rigveda) with knowledge of the ocean routes and the versus describe naval expeditions having occurred by the time of the Rigveda compilation (around 2000 BCE). It may also appear that the Vedic culture was a maritime culture, the Vedic people lived by the sea for some time before the hymns of the Rigveda were composed.

Rigveda articulation of sea voyages include (I. 97.8), "Do thou convey us in a ship across the sea for our welfare". “As a ship crosses the river (or sea), Agni takes us across to safety” (RV I. 97.8). Besides these examples there are numerous allusions in the Rigveda to sea voyages and to ships with a hundred oars. According to the text, “all the universe rests within your nature, in the ocean, in the heart, in all life” (RV IV. 58. 11).

Manu Smriti is the oldest law book in the world. It is written in Sanskrit and lays down laws to govern commercial disputes. Its references, of concern for this paper, are to sea borne traffic as well as inland and overland commerce (*MS* I-XVIII).

The *Ramayana* refers to the *Yavan Dvipa* and *Suvarna Dvipa* (Java and Sumatra respectively) and to the *Lohta Sayara* or the Red Sea (Buck (ed) 1976 (rp)). In the *Kishkindha Kandam (4,40)* in *Ramayana* Sugriva, the Lord of the Monkeys, gives directions to monkey leaders for the quest of Sita (wife of Lord Rama and the main female character in Ramayana), and entails all the possible places including islands where Ravana could have concealed her (*RY* 4.40.34,37,38 &45). In *Ayodhya Kandam* there is a passage which hints at preparation for a naval fight, thus indirectly indicating thorough knowledge and universal use of waterways (*RY* 2.52). Construction of overpass on sea to reach island Srilanka, is another example of early navigation and sea exploration from India to the other regions (RY).

The well known story of the "churning of the ocean" (*Samudra manthan or Ksheera Sagara Mathanam* in Sanskrit language) in the Mahabharata, *Vishnu purana* and *Bhagavata purana* is not without significance (Wilson 2006; Mani 1975). According to the story, all kinds of herbs were cast into the ocean and fourteen *Ratnas* (gems or treasures or most important) were produced from the ocean during churning and were divided between *asuras* and gods. The list of *Ratnas* in the scriptures are ranges from 9 to 14. This is further indicating the exploitation and extraction of natural resources from the sea by the people of the region.

Moreover, the most interesting passage in the Mahabharata is that which refers to “a large ship with machinery and all kinds of weapons of war that is able to defy storms and waves” (Buck 2004 (rp)). Ancient texts such as *Vishnu Puran* (around fifth century CE) and the *Periplus of the Eruthreanean Sea* (a mid-1st century date is now the most commonly accepted) vividly describe the tidal range and its uses in navigation practice. The fabulous literature of India is also replete with stories of sea voyages by Sindh regions.

The *Jatakas (JS)*, Buddhist scriptures in Pāli language (other than Sanskrit language) are also providing information about the merchantization and navigation through the sea. Some very definite and convincing allusions to sea voyages and

sea-borne trade are also contained in the vast body of Buddhist literature, which are generally taken to relate themselves to a period of one thousand years beginning from 500 BCE (Viggo Fausbll (ed). 2010). The *Baveru Jataka* without doubt, points to the existence of commercial intercourse between India and Babylon in pre-Ashokan days (before second century BCE) (BJ 313; Moorkerji 1999). There is another to consider, a Prakrit text on ship-building named *Angavijja* written in the Kushana period (around second century BCE) and edited in the Gupta period (around fifth century Common Era (CE)). This text enlists about a dozen names of different types of ships, such as Nava, Pota, Kotimba, Salika, Sarghad, Plava, Tappaka, Pindika, Kanda, Katha, Velu, Tumba, Kumba and Dati. Some of these varieties of ships such as Tappaka (Trappaga), Kotimba and Sarghad have also been mentioned in the *Periplus of the Erythrean Sea*. They are considered to be very large ships capable of sailing along the coast as well as in deep sea (Vincent 1998).

Tamil literature of a few centuries before and after the present era, which was composed in the southern part of India, especially *Silappadikaram* and *Manimekhalai* also testify to this great overseas trade.

Technologies

Yuktikalpataru of Bhoja gives a detailed classification of ships. There were two kinds: ordinary (*Samanya*) ships comprising those used in inland waters; and special (*visesa*) meant for sea journeys. The largest of these called 'Manthara*'* measured 120 cubits (1 cubit = 45.72 centimeters) in length, 60 in breadth and 60 cubits in height. During the days of the composition of *Yuktikalpataru* (around ninth century CE), it appears that ship-building was highly advanced. It explains how to build ships (*YK* 81-82), ship types (*YK* 89), sizes (*YK* 90-95) and materials (*YK* 83-87), including suitability of different types of wood. Bhoja has advised the builders of the sea-faring ships not to join the plants with iron as, in this case, the magnetic iron in sea water could expose the ship to danger (*YK* 88). To avoid this risk, he suggests that planks of the hull's bottom should be held together with the help of substances other than iron (YK 88). According to the literature ships could carry crews numbering between 100 to 600. Out of regard for passenger convenience and comfort the ships were well furnished and decorated. Gold, silver, copper and compounds of all these substances were generally used for ornamentation and decoration.

The magnetic compass was first used in India around 1800 BCE, for navigational purposes at sea, and was known as '*Matsya yantra*' (which roughly translates to *fish machine*), because of the placement of a metallic piece shaped into a fish in a cup of oil (Prakash 2008).

Yantra Sarvaswa (All about machines) composed by Maharishi Bharadwaj and other sages is another resource book in the Sanskrit language commemorates early Indian technologies. *Vaimanika Shastra (YS),* the extant text is claimed to be only a small (one-fortieth) part of a larger work, four planes called Shakuna, Sundara, Rukma, and Tripura are described in greater detail. The *Tripura Vimana in Vaimanika Shastra* (see plate 1) described a hi-tech vessel which could have been use in three natural environments - air, water and land (Josyer 1973).

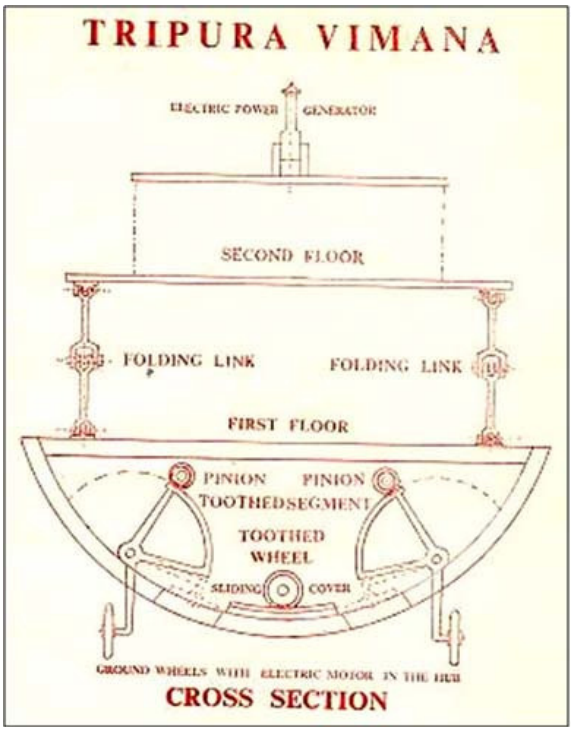

Plate 1. Hi-tech vessel which could have been use in three natural environments - air, water and land (Josyer 1973).

Archaeological evidence

From the archaeological horizon, the representation of ships on a seal and coin indicate maritime activities, there is enough evidence to show that the people of the Sindhu region carried on trade, not only with other parts of India, but also with Sumer and the centers of culture in Western Asia, Egypt and Crete (Behera 1999).

At Lothal a tidal dock, believed to have been built during Indus Valley Civilization (2300 BCE), near the present day Mangrol harbour on the Gujarat (west) coast is an example of early Indian seafaring. According to Rao (1979, 1985; 1987; 1991) the dock has been used in two stages: at the first stage it was designed to allow ships 18-20 meters long and 4-6 meters wide, at least two ships could simultaneously pass and enter easily; in the second stage the inlet channel was narrowed to accommodate large ships but only single ships with flat bottoms could enter. The terracotta models of a boat from Lothal and engravings on Indus seals give some idea of ships going to the sea (Rao 1979, 1985).

Further, the Indus Valley ports were set up to trade overseas with ancient Mesopotamia (the land between the Tigris and Euphrates rivers corresponding to the regions of modern Iraq, northeastern Syria and southeastern Turkey) and Arabia along the Gulf of Cambay. These ports trans-shipped much sought after Indian products from upriver cities along ancient Indus Valley rivers to the world market (Moorkerji 1999). The distance from the mouth of the Sindhu river to Mesopotamia was approximately 2000 kilometers (km), and probably covered by Sindhu merchants from sites such as Dholavira and Mohenjo-daro by sailing along the coast to various ports of the Arabian Gulf and Mesopotamia.

From the above information one can note concrete evidence about the seafaring and technology involved in the construction of vessels in ancient India.

Further, there was a time in the past when Indians were the masters of the seaborne trade of Europe, Asia and Africa (Chanda 1977). They built ships, navigated the sea, and held in their hands all the threads of international commerce, whether carried overland or by sea. Indian traders sailed their ships not only on the Indian Ocean and the Persian Gulf, they also ventured into the Red Sea and even into the Mediterranean and Aegean Sea (Vincent 1998). From the very beginning Indian traders had a very fair knowledge of all the ancient oceans and seas of the populated world (Radha 1912). The Egyptians called India 'God's land' because India was, in those days, very culturally developed (Prasad 1990). The priest of ancient Egypt required vast quantities of aromatic plants for burning incense; and frankincense, myrrh and lavender were also used for embalmment. Herodotus (around 425 BCE) has left us a sickening description of the great number of spices and scented ointments of which India was the center (Marincola 2003). Beauty products from India also attracted the women of Egypt and the cosmetic trade was entirely dependent on imports chiefly from India (Prasad 1977). The Pharaohs of the fifth and sixth dynasties made great efforts to develop trade relations with the land of Punt (Prasad 1977). Knemphotep made voyages to Punt eleven times under the captainship of Koui (Mitra 2007), these expeditions were organized and financed by the celebrated Queen Halshepsut.

The vast extent of Indian cultural influences, from Central Asia to the north to tropical Indonesia including Philippines in the south and from the borderlands of Persia in the west to China and Japan in the east, has shown that ancient India was a radiating central civilization. Its advanced cultural thoughts, art and literature were destined to leave deep marks on the races wholly diverse and scattered over the greater part of Asia (as defined by the 'United Nations geoscheme for Asia').

The most valuable of the exports of India was silk, which under the Persian Empire is said to have been exchanged by its weight in gold. It is evident that there was a very large consumption of Indian manufactures in Rome (Warminton 1974). Roman coins in large quantities are found in places in India (Gupta 1965; Singh 1988), whence beryl, pepper, pearls and minerals were exported to Rome (Begley & De Puma 1992).

The chief articles of export from India were spices, perfumes, medicinal herbs, pigments, pearls, precious stones (like diamonds, sapphires, turquoise and lapis lazuli), animal skins, cotton cloth, silk yarn, muslin, indigo, ivory, porcelain and tortoise shell (De Silva 1970). The chief imports were cloth, linen, perfume, medicinal herbs, glass vessels, silver, gold, copper, tin, lead, pigment, precious stones and coral (Chanda 1977).

Some important verses from *Rigveda*, quoted in the above text
(first in Verses in Romanized Sanskrit Font (transliterate) and original text in Sanskrit)

vedā yo vīnāṃ padamantarikṣeṇa patatām |
veda nāvaḥ samudriyaḥ ||

वेदा यो वीनां पदमन्तरिक्षेण पतताम |
वेद नावः समुद्रियः ||

(RV I. 25. 7)

Tam gurtayo nemannishah parinash
Samudram na sancharane sanishyavah

Patim dakshasya vidathasya nu saho
Grim n a vena adhiroha tejasa

तं गूर्तयो नेमन्निषः परीणसः समुद्रं न संचरणे सनिष्यवः |
पतिं दक्षस्य विदथस्य नू सहो गिरिं न वेना अधि रोह तेजसा ||

(RV I.56.2)

tughro ha bhujyumaśvinodameghe rayiṃ na kaścin mamṛvānavāhāḥ |
tamūhathurnaubhirātmanvatībhirantarikṣaprudbhirapodakābhiḥ ||

तुग्रो ह भुज्युमश्विनोदमेघे रयिं न कश्चिन मम्वानवाहाः |
तमूहथुर्नौभिरात्मन्वतीभिरन्तरिक्षप्रुद्भिरपोदकाभिः ||

(*RV* I. 116.3)

ā yad ruhāva varuṇaśca nāvaṃ pra yat *Samudra*mīrayāvamadhyam |
adhi yadapāṃ snubhiścarāva pra preṅkha īṅkhayāvahai śubhe kam ||
vasiṣṭhaṃ ha varuṇo nāvyādhād ṛṣiṃ cakāra svapā mahobhiḥ |
stotāraṃ vipraḥ sudinatve ahnāṃ yān nu dyāvastatanan yāduṣāsaḥ ||

आ यद रुहाव वरुणश्च नावं पर यत समुद्रमीरयावमध्यम |
अधि यदपां सनुभिश्चराव पर परेऽख ईऽखयावहै शुभे कम ||
वसिष्ठं ह वरुणो नाव्याधाद रषिं चकार सवपा महोभिः |
सतोतारं विप्रः सुदिनत्वे अह्नां यान नु दयावस्ततनन यादुषासः ||

(*RV* VII 88. 3 & 4)

vedāyovīnāṃpadamantarikṣeṇapatatām|
veda nāvaḥ samudriyaḥ ||

वेदायोवीनांपदमन्तरिक्षेणपतताम|
वेद नावः समुद्रियः ||

(*RV* I. 25.7)

dviṣonoviśvatomukhātināvevapāraya|
apa...||
sanaḥsindhumivanāvayātiparṣāsvastaye|
apa ... ||

दविषोनोविश्वतोमुखातिनावेवपारय|
अप...||
सनःसिन्धुमिवनाववयातिपर्षसवस्तये |
अप ... ||

(*RV* I. 97. 7 & 8)

Strengthened with sacred offerings, Indra-Visnu, first eaters, seRVed with worship and oblation,
Fed with the holy oil, vouchsafe us riches; ye are the lake [*Samudra*]*, the vat that holds the Soma.*

(*RV* 6.69.6)

sūryasyeva vakṣatho jyotireṣāṃ samudrasyeva mahimā ghabhīraḥ | vātasyeva prajavo nānyena stomo vasiṣṭhā anvetave vaḥ ||

(*RV* 7.33.8)

ekācetat sarasvatī nadīnāṃ śuciryatī ghiribhya ā samudrāt | rāyaścetantī bhuvanasya bhūrerghṛtaṃ payo duduhe nāhuṣāya ||

(*RV* 7.95.2)

aghniṃ viśvā abhi pṛkṣaḥ sacante samudraṃ na sravataḥ sapta yahvīḥ | na jāmibhi*RV*i cikite vayo no vidā deveṣu pramatiṃ cikitvān ||

(*RV* I.71.7)

taṃ sadhrīcīrūtayo vṛṣṇyāni pauṃsyāni niyutaḥ saścurindram | samudraṃ na sindhava ukthaśuṣmā uruvyacasaṃ ghiraā viśanti ||

(*RV* 6.36.3)

indrāviṣṇū haviṣā vāvṛdhānāghrādvānā namasā rātahavyā | ghṛtāsutī draviṇaṃ dhattamasme samudrah sthaḥ kalaśaḥ somadhānaḥ ||

(*RV* 6.69.6)

Table 1. Some important words related to Sea & Seafaring from Early Sanskrit Literature

Sanskrit words	**Transliterate in English** (Romanized Sanskrit Font)	**Translation into English**	**Suitable term**
ÌÌ¥Ì:	N¡VAÅ	Ship	-
ÌÌÍ¥ÌFÒ	N¡VIKA	Belonging to a Sailor, pilot	-
ÌÌ¥™Ì˜Ì Æ	N¡VYAM	Navigable, accessible by a boat or ship	navigation
²Ì˜ÌÙ‡Ù:	SAMUDRAÅ	sea	-
²Ì˜ÌÙ‡ÙO Ì˜ÌÌ˜ÌÆ	SAMUDRAGAMANAM	Voyaging by sea	-
²ÌÌ ²Ì˜ÌÙ‡ÙÌ:	SAPTA SAMUDR¡Å	7 oceans *Lavana, ikshu, sura, ghrita, dadhi, dugdha, jala*	-
ÌÌ¥Ì–	NAVABANDHANA K¢LAÅ	A nail to tie up a ship	Anchor

ÌŒÌÌFÒÕ¡Ô:			
¥ÌÌTÌ¥Ìµì˜ÌÆ	V¡TAVASTRAM	Wind cloth	Sail
²YÎÜ¡Ô—ÌÌOÌ:	STH£LABH¡GAå	Expanded area	Hull
FÂÒÍÌÌHÕ: FÒSÌÊ:	K®NIPA¶Aå KAR¸Aå	Curved blade	Rudder
ÌÌ¥ÌTÌ¡Ô˜ÌÆ	N¡VATALAM	Bottom of a Ship	Keel
¥ÌÌUÌ–ÌWÓ—ÌÌOÌ:	V¤TTAÀA´GABH¡GAå	Navigation	sextant

Abbreviations

Jataka Stories(JS)	*Jataka Stories in Theravada Buddhism*. (Ed) Appleton, N. 2010. Ashgate Publishing Ltd. England.
Manusmrith (MS)	http://sanskritdocuments.org/all_pdf/manusmriti.pdf
Ramayana(RY)	Buck, W. (ed),1976 (rp) University of California press. England. http://www.valmikiramayan.net/
Rigveda(RV)	*Rigveda* http://www.sacred-texts.com/hin/*Rigveda*/
Yukti Kalpataru(YK)	*Yukti Kalpataru*. 1917. Calcutta oriental series no 1.
Vimanika Sastra(VS)	*The Vimanika Shastra*: Ancient Manuscript on the Constructionand Use of UFOs. Forgotten Books

Bibliography

Begley, V., and R.D. De Puma (eds)., 1992.	*Rome and India, the Ancient Sea Trade*. New Delhi.

Behera, K.S. (ed.)., 1999	*Maritime Heritage of India*. Delhi: Aryan Books International.
Buck, W. (ed), 1976 (rp)	*Ramayana*. University of California press. England.
Buck, W. (ed), 2004 (rp)	*Mahabharata*. The Regents of the University of California, First Indian Edition in 2000, New Delhi.
Chanda, M., 1977	*Trade and Trade Routes in Ancient India.* New Delhi.
Datta, A., 2006	*The Encyclopaedia Of Indian Literature*. 2 volumes. Sahitya Akademi, New Delhi.
De Silva., 1970	"The Spice and Silk Roads*", in Indian Contribution to World thoughts and Culture: Vivekananda Commemoration Volume.* Madras :229-231.
Gill, J. S., 1993	"Our heritage of traditional boat building", in *Journal of Marine Archaeology* 4, pp. 74.
Gupta, P.L., 1965	*A catalogue of Roman Coins in the Andhra Pradesh*. Government Museum. Museum series. Government of Andhra Pradesh. Hyderabad.
Humphrey, J. W., 2006	Ancient technology. *Greenwood guides to historic events of the ancient world*, Greenwood Press, Westport.
Josyer, G.R. , 1973	*Vymaanika Sastra*, The University of Michigan.
Keith, A.B., 1993	*A History of Sanskrit Literature.* Motilal Banarasidas Publishers. Delhi.
Kochhar, R., 2000	*The Vedic People, their History and Geography.* Orient Longman Limited. New Delhi.
Leshnik, S.L., 1979	"The Harappan "Ports" at Lothal: another view", (ed.), Gregory L Possehl, *Ancient Cities of the Indus* , Vikas Publishing House Pvt. Ltd., New Delhi.
Mani, V., 1975	*Puranic Encyclopedia*, Motilal Banarsidass, New Delhi.
Marincola, J.M. (ed) 2003 (rp)	*The Histories,* Herodotus (Author), John M. arincola (Editor, Introduction), Aubery de Selincourt (Translator),Penguin Classics.
Mitra, S., 2007	*The Vision of India,* Crest Publishing House, New Delhi.
Moorkerji R.K., 1999	*Indian Shipping. Munshiram Manoharlal Publishers. New Delhi.*
Mujumdar, R.C. (ed), 1996	*The History and Culture of the Indian People*, XI volumes, Frist published in 1951, Bharatiya Vidya Bhavan, Mumbai.
Prakash, A.A., 2008	"A Vision of Maritime India 2020", in (ed.) Prakash Nanda, *Rising India: Friends and Foes*, *Essays in Honour of Prof. M.L.Sondhi*, Lancer Publishers, New Delhi.
Prasad, P.C., 1977	*Foreign Trade and Commerce in Ancient India.* Abhinav Publications, New Delhi.
Radha, K. M., 1912	*Indian Shipping - A History of the Sea-Borne Trade and Marine Activity of The Indians From The Earliest Times,* Bombay.

Rama, S., and Tripathi, S., 1993	"Boat building technology of Bengal: an overview of literary evidence", in *Journal of Marine Archaeology, Goa,* 4, pp. 84.
Raman, K.V., 1997	"Roads and river transportation", (ed.) A.K. Bag, *History of Technology in India,* Indian National Science Academy, New Delhi, pp.592-93.
Rao, S.R., 1979, 1985	*Lothal – A Harappan Port Town*, 2 vols, Archaeological Survey of India. New Delhi
Rao, S.R., 1987	*Progress and Prospects of Marine Archaeology*, National Institute of Oceanography, Goa,
Rao, S.R. (Ed.)., 1991	*Recent Advances in Marine Archaeology*, National Institute of Oceanography, Goa.
Singh, A.K., 1988	*Indo-Roman Trade. New Delhi.*
Talageri, S. G., 2000	*The Rigveda: A Historical Analysis, Aditya Prakashan, New Delhi.*
Viggo Fausbll (ed). 2010 (reprint)	*Ten Jatakas: The Original Pali Text, with a Translation and Notes. BiblioBazaar.*
Vincent, W., 1998	*Commerce and Navigation of the Ancients in the Indian Ocean*, 2 vols**,** Asian Educational Services, New Delhi.
Warminton,E.H., 1974 (second edition)	*The Commerce between the Roman Empire and India*. London.
Wilson, H. H., 2006	*The Vishnu Purana*: *A System of Hindu Mythology and Tradition.* Read Country Books.Cambridge.