

# Marine Archaeological Investigations on Tamil Nadu Coast, India: An Overview

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## Abstract

Ancient ports such as Kaveripattinam, Nagapattinam, Korkai, Alagankulam, Periyapattinam, all on Tamil Nadu coast have played a dominant role in the transoceanic trade and commerce with many countries since the beginning of the Christian Era (CE, starting from year one on the Georgian Calendar). Many such port towns that existed on the coastal region vanished or were submerged in the sea probably due to coastal erosion, sea level changes and neo-tectonic activity and other causes.

Poompuhar, a flourishing port town, played a major role in maritime activities in the beginning of the Christian Era. The Sangam literature vividly describes its location, habitation and town planning. The marine archaeological explorations around Poompuhar brought to light the remains of terracotta ring wells, brick structures, and storage jars in the inter-tidal zone. The brick structures, stone structures, and pottery from offshore explorations support the existence of the ancient settlement.

Mahabalipuram is said to have been a seaport right from the beginning of the Christian Era. Geophysical survey and underwater exploration revealed structural remains including a fallen wall running about 10 metres (m) in length, scattered dressed stone blocks, a few steps leading to a platform and many other structural remains at various locations between 4 and 8 m water depth. The available data confirms that a large area comprising of a building complex have been submerged. These remains could be part of submerged structures and caused by severe coastal erosion in this area.

The data collected at the above sites support the literary evidence to prove their existence as ports. The major cause for the submergence of these port towns was due to shoreline changes caused by coastal erosion.

## INTRODUCTION

Ancient ports are the source of information to understand the strategic locations of ports, maritime trade, routes, material exchange and the socio-economic conditions of the contemporary period. Important ports such as Kaveripattinam, Mahabalipuram, Nagapattinam, Korkai, Alagankulam, Arikamedu and Periyapattinam all on the Tamil Nadu coast have played an important role in the transoceanic trade from the beginning of the Christian era. The *Periplus*<sup>2</sup> has mentioned the ports on Tamil Nadu coast such as **Camara, (Kaveripattinam)** and **Sopatma, (Mamallapuram)**, had maritime contacts with Roman countries during early centuries of Christian era (Ramaswami 1989:17). Many such port towns that existed on the coastal region vanished or were submerged in the sea, maybe due to coastal erosion, sea level changes and neo-tectonic activities. Ancient literary sources exist that provide possible explanations for the loss of these littoral settlements: like the **Sangam literature which refers to the submergence of Poompuhar**; or the popular beliefs regarding the submergence of the temples of Mahabalipuram; and the “Kumari Kandam” traditions of Tamil Nadu. It may well be impossible to search for their roots or find proof that such beliefs are based on facts. Nevertheless, many archaeological explorations have been taken up in an attempt to verify the historicity of these traditions.

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<sup>2</sup> Periplus of the Erythraean Sea, a sailor's manual written by a Greek of Alexandria dating to 1<sup>st</sup> Century AD and deals with the trade, commerce & ports from Red sea to Bay of Bengal.

Sangam<sup>3</sup> literature gives ample historical accounts on maritime trade and mentions the flourishing port town of Poompuhar, the capital of the early Cholas<sup>4</sup> culture (Pillai 1989:13). The *Manimekhalai*<sup>5</sup> mentions that Poompuhar was swallowed up by the sea due to the wrath of goddess Manimekhalai, for not celebrating the festival of Indra (Na Mu, *et al.* 2007:353,365-6). Though the reference is only to a supernatural incident, it may be taken as an echo of some actual sea erosion due to some high tidal wave surge(s) that engulfed the city.

Mahabalipuram was well known to earlier mariners as 'Seven Pagodas'. It is generally believed that out of seven temples originally constructed, all but "Shore temple" were submerged by the sea over a period of time. European travellers in the 18<sup>th</sup> and 19<sup>th</sup> century have recorded this folk tradition (Ramaswami 1989:48). Captain M.W. Carr (1984:11) refers to the account given by William Chambers (1869:11,1-29) after his second visit to Mahabalipuram in 1776 about the traditions on the submergence of pagodas.

Marine archaeological explorations have been carried out at Poompuhar and Mahabalipuram (Figure 1) by scholars at the National Institute of Oceanography, Goa, to find out the extent of the submerged evidence on the famous port towns. The underwater investigations have revealed information on submerged structures and also data on shoreline changes. The details of the findings are described below.

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<sup>3</sup> Sangam literature refers to a body of classical Tamil literature, is a collection of more than 2381 poems composed by Tamil poets during 3<sup>rd</sup> Century BC and 3<sup>rd</sup> Century AD, from various professions and classes of society about the marriages, dress, ornamentation, culinary fare, war and religious life of the early Tamils.

<sup>4</sup> Cholas were one of the most dominant political forces in the Tamil country. The early Cholas of the Sangam era ruled from their capital Urayur and Kaveripattinam. Medieval and later Cholas (848 AD-1279 AD) ruled from their capitals Thanjavur and Gangaikondacholapuram. Their empire consists of Tamil country, part of modern Karnataka and part of Sri Lanka.

<sup>5</sup> Manimekhalai is considered to be one of the great epics of Tamil literature, the sequel to the Shilapaddikaram, tells the story of the conversion to Buddhism of the daughter of Kovalan and Madhavi, which has been dated by various scholars between the 2-6<sup>th</sup> centuries AD. It is a poem in 30 cantos, describing about Puhar.

*Manimekhalai* which states as ;

*madavaral nallaai ninthan maanagar, kadal vayiru pukkadu kaaranam keelai (25:176-77) .....  
aninagar thannai alaikadal kolkena, itanal saabam pattathu ithuvaal (25:200-01)*

Meaning, the city Kaveripumpattinam was engulfed by the sea (200:176-77) since the festival for Indra was not performed the Goddess Manimeekala cursed "may the city is eaten by the sea" (25:200-201).

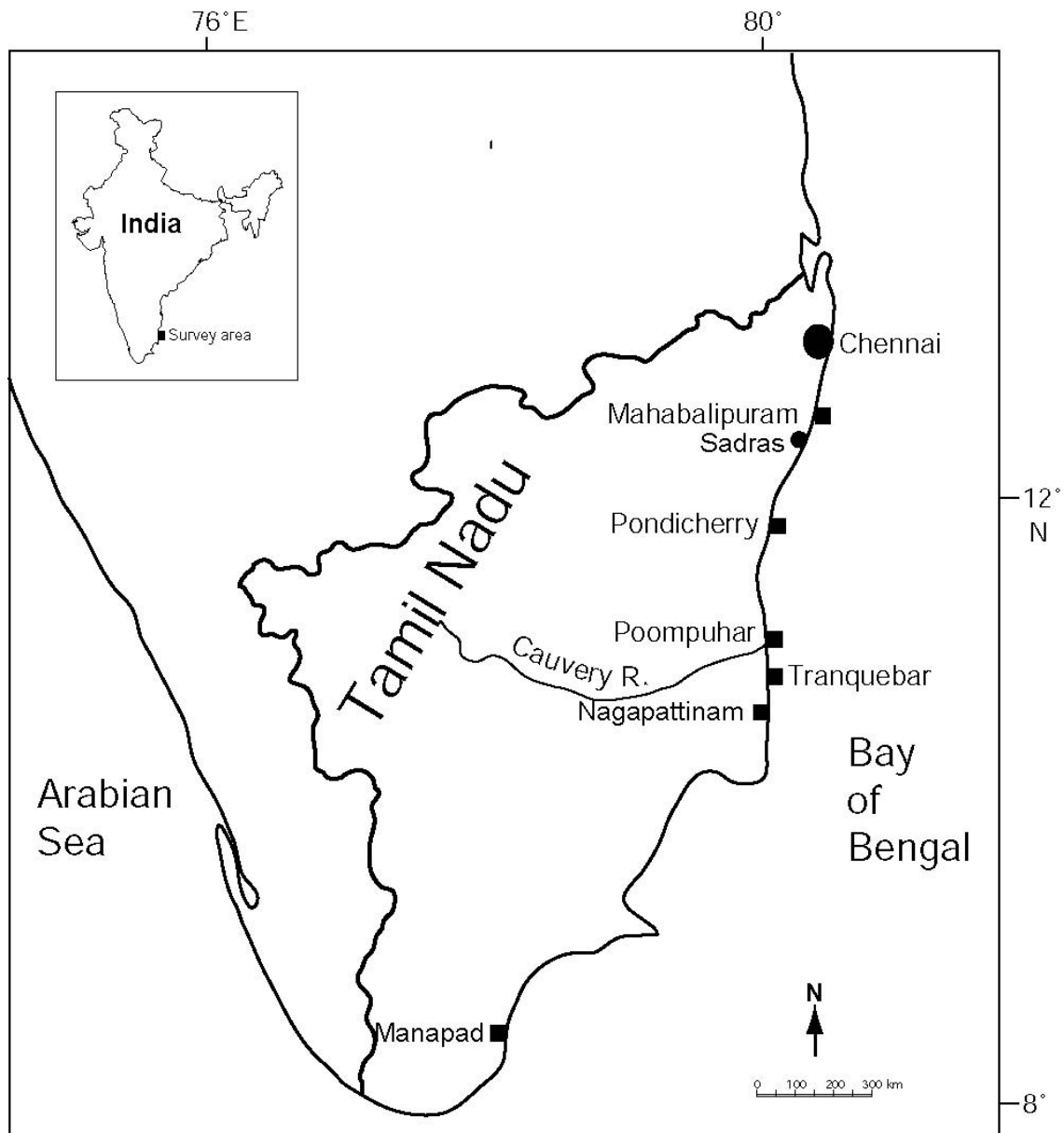


Figure 1. Location map of the sites explored on Tamil Nadu coast (Map: prepared by R. Uchil, NIO, Goa).

### **POOMPUHAR**

Poompuhar also known as Kaveripattinam, is situated on the northern bank of the river Kaveri on the Tamil Nadu coast. Sangam texts, specifically the *Silappatikaram* (Pillai 1989:13), *Pattinapalai*, *Manimekhalai* and *Ahananaru* vividly describe Poompuhar as the port capital of the early Cholas (Ramachandran 1974:8; Chandra 1977:107).

Land excavations at Kilaiyur brought to light two brick structures that have been described as wharves (Rajan 1994:25; Rao 1991a:6,5-20; Athiyaman 1999), possibly located on an ancient channel of the river Kaveri, an inlet channel to a reservoir at Vanagiri and Buddha Vihara at Pallavaneswaram (Rajan 1994:23,26-32).

## **Coastal archaeological explorations**

Coastal archaeological explorations have been carried out between Poombuhar and Tranquebar in the inter-tidal zone to find out the remains of archaeological evidences.

### **Poombuhar**

During the course of explorations in the inter-tidal zone at Poombuhar the following were exposed: a brick structure of eleven layers running parallel to the coast with dimensions 1.2 m width, 1.2 m height and 4 m length; and a terracotta ring well with dimensions 25 centimetres (cm) high, 4 cm thick at the rim, and a diameter of 75 cm with three courses (Figure 2). Further, four brick structures of 25 m length, 3.4 m width aligned in a straight line, were noticed at a water depth of 1 m, opposite to present Cauvery temple at Poombuhar. The size of the bricks is 22x13x6 cm.



Figure 2. Terracotta ring well exposed in the intertidal zone at Poombuhar (photo: Mr. SN Bandodker, NIO, Goa)

### **Vanagiri**

Vanagiri is located on the coast about 1 km south of Poombuhar. The 11<sup>th</sup> century Yellaiyamman temple was found. It had collapsed and the remains are scattered in the inter-tidal zone. Three terracotta ring wells (75 cm diameter, 15 cm high and 6 cm thick at the rim) were exposed about 300 m south of the Yellaiyamman temple. A neatly paved structure made of bricks (probably the floor of a house) was exposed in the inter-tidal excavation.

### **Chinnavanagiri**

Chinnavanagiri is located on the coast about 3 km south of Poombuhar. A terracotta ring well with rings of 25 cm height, 5 cm rim thickness and 115 cm diameter, was found surrounded with burnt bricks, associated with megalithic black and red ware and beads of terracotta and semi-precious stones. The other important finds are a potsherd with an inscribed Brahmi letter 'Ma', an early Chola square coin (completely eroded), and later Chola coins.

Findings of brick structures, terracotta ring wells, storage jars and brick-paved platforms prove the existence of a settlement in the inter-tidal zone. The pottery from Chinnavanagiri suggests that the ring well could be dated to the 2<sup>nd</sup> century Before Christ (BC) – *Anno Domini* (AD)<sup>6</sup>. The other ring wells found at Vanagiri and Poompuhar are of the same period. Similar kinds of ring wells found at Arikamedu and Vasavasamudram are dated to the 2<sup>nd</sup> century BC to the 3<sup>rd</sup> century AD (Rao, *et al.* 1995-96:15,7-22). The size of the bricks is 36x18x6 cm and closely corresponds to the bricks used in the Buddha Vihar at Kaveripattinam.

## Tranquebar

Tranquebar, a principal port during Danish rule (1620 AD-1845 AD), is situated about 15 km south of Poompuhar. The 13<sup>th</sup> century Masilamani temple is partly collapsed and the remains are found scattered in the inter-tidal zone (Figure 3). Two brick wells were found exposed in the inter-tidal zone. There is also evidence on the destruction of modern houses due to the encroachment of the sea (Sundaresh, *et al.* 1997:595, 593-98).



Figure 3. Partly collapsed Masilamani temple at Tranquebar (photo: SN Bandodker, NIO, Goa)

A careful study of the '*Historic map of Danish colony Tranquebar and Fort Dansborg, 1700 AD*', which is displayed at Dansborg museum at Tranquebar, suggests that Tranquebar was well protected by a fort wall with a distance of 50 m from the

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<sup>6</sup> BC and AD are designations of the Georgian Calendar. BC refers to the years before the birth of Jesus Christ of Nazareth from year -1 and continues backwards, whereas AD refers to the years after his birth from year 1 with years added as time progresses.



shoreline. The Masilamani temple was located sufficiently landward about 250 m from the fort wall. This observation unequivocally suggests that the shoreline has transgressed about 300 m in the last 300 years, therefore infringing at an average rate of one metre per year.

### **Offshore explorations**

Offshore survey was conducted between Tranquebar and Poompuhar with small grids of 250 m. The survey revealed several isolated objects such as rock boulders at a depth of 7-8 m and 11-13 m opposite to the Masilamani temple (Rao 1992:17, 17-22; Rao 1991b:22,21-31; Rao and Rao 1991:128,127-129). Off Poompuhar, three major sites of interest were observed at water depths of 5.5 to 10.5m and 23m. A few dressed stone blocks measuring 90x40x15 cm, a semi circular stone with an L-shape cut on its surface and many other irregular blocks of sandstone were noticed in 5 to 8 m water depth off the river Cauvery's mouth. The other findings observed during airlifting operations were rolled bricks and early historic pottery of black and red ware, Red ware, Buff ware and Grey ware, found 1 m below the seabed (NIO Technical Report 1993:30).

Explorations on the north of Poompuhar revealed a few dressed stone blocks in three general dimensions (30x20x5 cm, 65x40x10 cm and 60x35x10 cm), and brought to light potsherds of grey ware and storage jars. The echograms of the sub-bottom profiler revealed a submerged palaeo-channel of the river Cauvery on the north of Poompuhar at 10 to 15 m water depth, with a width of 300 m to 500 m, buried 20 m below the sea bottom (NIO technical report 1997:15).

Three structures identified with the help of side scan sonar surveys between 22 and 24 m water depth off Poompuhar were later confirmed by diving (Vora 1987:161,159-161). The first structure (in an oval shape) was located about 3.5 km offshore at 23 m water depth. The total periphery of the object is 140 m. About 40 m north of the abovementioned object, two smaller objects are found lying in east-west orientation within a distance of 10 m. The circumference of each object is not more than 15 m and their height is about 2 m (NIO Technical report 1995:22; NIO Technical report 1997:18).

The archaeological evidence recovered in the inter-tidal zone as well as offshore, are of the Sangam period (3<sup>rd</sup> century BC to 3<sup>rd</sup> century AD). Evidence in the inter-tidal zone, hydrographic charts, and the 17<sup>th</sup> century map at Tranquebar all confirm the shoreline recession is at an average rate of one meter per year. If the same rate continued for the last 2000 years, then ancient Poompuhar must have definitely been extended much further towards the sea from the present coastline.

### **MAHABALIPURAM**

Mahabalipuram is famous for its architectural marvels such as the Shore Temple, the Chariots, Arjuna's Penance, bas relief and several cave temples built by the Pallava<sup>7</sup> king Narasimha Varman during the 8th century. It is situated about 55 km south of Chennai and presently a World Heritage Monument.

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<sup>7</sup> The Pallava dynasty was a Tamil dynasty of South India which ruled the northern Tamil Nadu region and the southern Andhra Pradesh region with their capital at Kanchipuram, the largest capital of the sovereign nation Tondai Nadu of Tamilakkam. The early Pallavas had established themselves as a notable rising power in the region during beginning of 3<sup>rd</sup> – 4<sup>th</sup> Century AD. The later Pallavas came in to prominence during early 5<sup>th</sup> Century AD and continued to rule till late 9<sup>th</sup> Century AD.

Mahabalipuram is said to have been a seaport right from the beginning of the Christian era. The *Periplus* has mentioned the Roman trade from Damirica to Sopatma (Mahabalipuram) by very large vessels, made of single logs bound together, called Sangara (Ramaswami 1989:17). A few Roman coins of Theodosius (4th century AD) support this trade contact with the Roman world (Dayalan 1992:52). An 8<sup>th</sup> century Tamil text written by Tirumangai Alwar described this place as Kadal Mallai where ships rode at anchor (Ramaswami 1980:11). The epigraphical sources mention that the Pallava kings had an active contact with Sri Lanka, China and Southeast Asia. The Pallava king Sihmavarman lead two expeditions by embarking ships from Mamallapuram. The Pallava embassy and Vajradanthi, a Buddhist monk sailed, to China from the port of Mamallapuram (Ramaswami 1980:12). The huge buried remains of structures and ceramic varieties of the early historic and early medieval period found at Punjeri, about 1.5 km west of Mahabalipuram, on the western bank of the Bunkingham canal prove its flourishing existence in the past (Dayalan 1992:54).

### **Underwater Findings**

The underwater explorations were carried out by geophysical surveys followed by diving. The seabed off Mahabalipuram, in depths ranging from 6 to 15 m, is highly undulating with variations in height from 1 to 6 m. Granitic rocks with patches of coarse-grained sand, carpet the floor.

Several rectangular and square shaped structures appeared on most of the sonographs, particularly in the northern part, showing groups and clusters of blocks arranged in a systematic pattern. Strong reflections of the images suggest that they are massive hard bodies that are well shaped. It appears from the sonographs of the entire study area that some significant parallel discontinuous rocky structures exist on the seafloor at some places in addition to the dominant occurrence of natural rock outcrops. Based on the sonographs the following five major sites of interest were observed between the water depth of 5 and 13 m.

### **Site A**

A structure was found about 700 m on the eastern side of the Shore Temple at 6 m water depth which comprised of several small structures on a raised platform. The upper portion of the structure is above the sea surface during low tide. The structure covers an area of approximately 75x35 m. The structure is broader on the northern side where a heap of stone blocks are also observed, while on the southern side scattered small stone structures of various sizes were observed. The structure has several north-south oriented wall sections.



Figure 4. Stone block with a joinery projection found off Mahabalipuram (Photo: SN Bandodker, NIO, Goa)

Dressed granite blocks were used for the construction of this structure. A wall about 250x65 cm with two to four courses is noticed. Huge rectangular blocks measuring approximately 2x1x1.5 m were also noticed on the central upper portion of the structure. Another wall measuring about 5.4 m in length was seen on the northern side along with two parallel walls on the southern side of the main structure, with a stair-like structure leading upwards. Further on the northern side, the remains of a wall extend up to 15 m in length. The length of some of these six walls varies from 7 to 32.5 m; the other walls being shorter in length. A floor measuring 2x2.5 m was also noticed towards the north-western side of the structure. The entire structure has thick marine growth of sponges, shells, barnacles and mussels; a few blocks were cleaned and chisel marks were observed. One of the blocks shows that it has joinery projections for interconnecting the blocks (Figure 4; Sundaresh, *et al.* 2004:1233).

### **Site B**

Another interesting site was located about 200 m on the north-north-eastern side of Structure A at a depth between 5 - 8 m. The site has the remains of a wall, 2 m wide and 5 m in length running from east to west and many fallen dressed stone blocks found scattered around it. Another wall was found running more than 10 m with a width of 2.5 m. Some of the stone blocks appear to have figurines carved on them; however, identification was not possible due to thick marine growth.

Apart from the above there were many more structural remains such as fallen walls, L-shaped connecting walls (Sundaresh, *et al.* 2004:1234), dressed square and



rectangular stone blocks and a square platform reached by a flight of steps were found at different locations (NIO Technical Report 2003:22).

The plan of the structures indicates that this construction could be part of a big complex, as the huge stone blocks and several fallen walls were noticed *in situ*. It appears that construction had been carried out on a raised platform with several walls and a floor made of granite blocks. An opening from the southern side between two walls with steps has been noticed which may be the entrance to the complex. The natural rock boulders noticed on the southwest side are similar in shape and size to those found on land on the hill at Mahabalipuram. Similarly, the construction style observed underwater is identical to that observed on adjacent land. It was not possible, however, to verify the binding material of the underwater structure due to thick marine growth and their damaged condition. There were many wall sections observed at different locations including the "quarry area" on a huge rock. The dressed stone blocks required for the construction were probably extracted from the quarry found nearby. In fact, most of the religious or ceremonial constructions, including the present shore temple at Mahabalipuram, have been built with granite. The sand stone and granite was extensively used for the construction of temples during Pallava rule (Srinivasan 1983: 28-67).

### **Dating of Underwater Structures**

The archaeology of Mahabalipuram commenced from the early centuries of the Christian era. A few Roman, Chinese and Pallava coins have been reported from Mahabalipuram (Ramaswami 1980:4). One of the inscriptions of Narasimha I mentions that he (Narasimha I) is the first person to introduce the construction of cave temples made of granite. N.S. Ramaswami (1980:27) refers to several accounts of Europeans who recorded the submergence of the city and the tradition that, "a large city and six magnificent pagodas have been swallowed up at this place by the sea". William Chambers (1869:11,1-29), Graham Hancock (2002:121), P.M. Mohan and Victor Rajamanickam (2002:78,77-79) believe that out of seven temples carved out of granite during the 8<sup>th</sup> century AD only one has survived and the rest are submerged. Based on the facts that the rock art sculpture was encouraged by the Pallavas at this place and most of them were constructed during that period, it is inferred that these temples may not be less than 1200 years old.

### **Possible Causes of Submergence**

M.S. Krishnan (1968:523), S.P. Mahapatra and M. Hariprasad (2002:134,132-136) have pointed out that the major and important factor affecting the Mahabalipuram coast is erosion, as severe erosion at Kalpakkam (south of Mahabalipuram) was observed due to long-shore sediment drift (Krishnakumar, *et al.* 1994:45,41-45). A recent study suggests the rate of coastal erosion in and around Mahabalipuram is 55 cm/year (Ramaiyan, *et al.* 1997:1179,1177-1181). If the same rate has prevailed since the last 1200 years then the shoreline at that time might have been around 800 m eastward and all the structures noticed underwater would have been on the land.

The excavations at Saluvankuppam about 1.5 km north of Mahabalipuram, about 150 m from the sea coast, revealed three phases of construction belonging to 8-9<sup>th</sup> century AD, 6-8<sup>th</sup> century AD and 4<sup>th</sup> century AD at a depth of 3.2 m below the present ground level. Evident from the stratigraphy these structures were destroyed by the coastal flooding during 950 AD and between 320-560 AD (Rajendran, *et al.* 2006:1246,1242-1247). Therefore it may be mentioned here that the coastal erosion might have played a major role in the submergence of these structures.

The underwater structures, especially the long walls having 2 to 3 courses, the scattered dressed stone blocks of various sizes, and the stones with projections are considered to be man-made. They may well be the remains of huge complexes or the temples of the so-called "Seven pagodas". As the Pallavas encouraged temple architecture at Mahabalipuram during the 8th century, these structures may be assigned to the same period. Mahabalipuram served as a port during the Pallava period. Part of the earlier Mahabalipuram town may have been submerged in the sea.

## CONCLUSIONS

The marine archaeological explorations on Tamil Nadu coast have brought to light the submerged structural evidence at Poompuhar and Mahabalipuram. The traditions mentioning the submergence of these port towns have been partially confirmed with the evidence from underwater. These structures may have been submerged due to coastal erosion followed by shoreline changes. As evident from Mahabalipuram excavations, these sites might have been submerged due to large coastal flooding.

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