

Interpreting the Underwater Data and Revealing the Historic Submerged Port –Poompuhar

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Abstract: Ancient Ports played an important role in overseas trade and also thereby spreading of Dravidian cultural to vast areas. Majority of the rivers of India and their distributaries are suitable for navigation and ports developed along the estuarine mouths. One such port is Poompuhar which is located in mouth of river Cauvery. This city is said to have been swallowed by sea. Many sangam literature has described about this important chola mandala port as a busy overseas trade centre. Since there is sudden extinction of this port, this paper deals with various inshore and offshore findings and thereby confirms that the Dravidian rich cultural heritage port has been partly submerged under the sea. Also through this it has been confirmed that the ancient seafarers had a knowledge of how to construct docks, wharfs, reservoirs and buildings at various port cities. Monsoon also plays an important role in the daily life of the people of South Asia. Use of the monsoon wind in the Indian Ocean for maritime trade was a boon to sailing ships to reach overseas countries. Archaeological and historical evidence indicates that Poompuhar is one of the oldest port and icon to Dravidian civilisation.

Keywords: Dravidian, cultural heritage, docks, wharfs, seafarers, civilisation.

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1. Introduction

In Sangam Literature, Silapathikaram portrays Poompuhar as covering an area of approximately 4 Kavatham, which is equivalent to about 30 square miles. Its boundaries stretch from Kadarakondan in the west, Thirukadaiyur in the south, Kalikamur in the north, to the sea in the east. This region encompasses 30 villages where numerous families lived happily. In the Pattinapalai, a detailed layout of the Poompuhar city is provided. Sangam Literature, including Chilapathikaram, Manimegalai, Pattinapalai, and Purananuru, serves as the primary source material for understanding the ancient port city of Poompuhar. Specifically, in the Pattinapalai, there is a comprehensive description of the town's layout, regions, streets designated for various activities, the port, merchandise, people, and more, offering a thorough account of Kaveripoompatinam. According to the descriptions in pattinapalai, Kaveripoompatinam was laid out on the north banks of the Cauvery River and was divided into two parts: Maruvurpakkam (inland town) towards the sea-shore and Patinappakkam (Coastal Town) to the west. In between the two towns ie from patinappakkam to maruvurpakkam ,we have bazaar. The day bazaar was called

"Nalangadi," and the night bazaar was called "Allangadi.". Pakkam refers to a location near the seashore. Greeks (Yavanars) and other foreign merchants lived on the outskirts of Maruvurpakkam and conducted business.

The fisherman lived at Maruvurpakkam. Foreign (Yavanar) merchant villages reside closer to the coast and dock-yard. There were also Chola Customs Officials in charge of collecting duties from them and apply the Customs Seal (Tiger Mark) to the imported products. Customs officials will not allow the imported items to be removed from the dockyard unless the proper Customs Duty is paid. Wandering pedlars sold coloured pastes, unguents, scented sandal, flowers, eaglewood, and fragrances in the streets near to the Yavanars' or foreign merchants' quarters. Weavers lived in nearby streets. In the spacious lane, silks, corals, sandal, gems, gold, and other costly things were sold. Grain markets near large Street sold several types of grains and cereals displayed in distinct collections.

The Thiruvallangadu copper plate provides insight into the history of the Chola dynasty, highlighting the king's commitment to justice, notably in a case involving a cow. Similarly, the Bharhut inscriptions

hold significant importance for early Indian Buddhism and its artistic expression.

It is believed that the Bharhut stupa was constructed by the Maurya king Ashoka in the 3rd century, with references to Kaveripoompatinam recorded in Prakrit inscriptions. The donation of a slab by the Buddhist nun Soma of Kakandi in the 2nd century BC indicates the prosperity of Kaveripoompatinam as a prominent Buddhist centre, enduring until at least the 8th century AD. Literary works and archaeological evidence attest to the challenges faced by Kaveripattinam, including tsunamis, sea incursions, erosion, and floods. The original city was submerged by the sea, leaving behind only a small remaining town.

2. Underwater excavation in Poempuhar

The interest sparked by Sangam Literature has led archaeologists to explore both the inshore and offshore areas of Poempuhar, uncovering a plethora of artifacts now housed in the Poempuhar Museum. Among these discoveries are numerous artifacts and idols dating back to the 8th century, demonstrating the advanced civilizations and prosperous lifestyles of our ancient ancestors. Previous archaeological endeavours, spearheaded by Mr. Gaur of the National Institute of Ocean Technology in Goa in 1992, utilized innovative technology such as the single-beam echo sounder system.

This technology enabled the detection of sediments and the identification of anomalies like u-shaped structures and ring wells. Additionally, several idols discovered near the seashore were subjected to carbon-14 dating, revealing their origins from the 6th to 8th centuries. As observed from our data and from the Tamil literature, it is confirmed that half of the ancient port has been submerged under the sea. The Early survey on the sea off the shore of Kaveripoompatinam began in the year 2019.

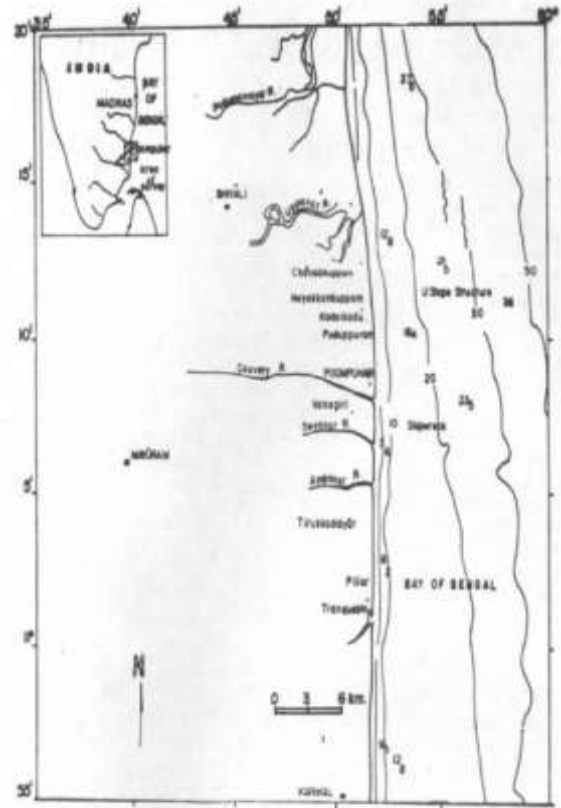


Fig 1: Map of Poempuhar Located near Kaveri River and Bay of Bengal

The Underwater excavation was carried out with the help of National Institute of Oceanography, Chennai. Previously the Exploration was carried out using single beam echo sounder and side scan sonar, but now using advance technology ie nothing but the Multi beam Echo sounder and Sub-bottom profiler is deployed.Using this we get tangible results in the form of graphs, offering valuable insights into the underwater sights and also its geological features within the sights. This advance technology is sued for the better understanding of the submerged environment and its significance

3. Discussion and Results

The Underwater archaeological explorations was carried out by National Institute of Ocean Technology, Chennai using advanced Technology. By this means we have unveiled numerous scattered remnants of Poempuhar. The First process of any technology is nothing but the data acquisition which is performed using Multi-beam Echo Sounder [10]. The vessels employed for data acquisition of the DST project are ORV Sagar Manjusha and CRV Sagar Anveshika. The Multibeam Echo sounder

[11, 12] is placed underneath the Vessel, which has both transmitter and receiver. In this Multiple Beams is transmitted underneath the sea and is received back through the receiver ,by measuring the roll and pitch value which is nothing but the velocity of the sound and the vessel movement, the exact depth of the ocean is measured. Thus using MBES, we can determine the water depth and also the nature of the seabed. After this analysis, the selected area is refined for a sub-bottom profiler survey.

This survey is then further narrowed down for optical and sonar imaging, enabling the identification of all features crucial for digitally reconstructing the submerged subsurface. Upon interpreting the data received from NIOT, Chennai, within Block E using ArcGIS and seismic software, a notable output was obtained.

This output likely reveals valuable insights into the geological or geomorphological characteristics of Block E. Such findings could include the identification of geological structures, subsurface features, or potential resource deposits. Further analysis and interpretation of this output could contribute significantly to understanding the geological landscape and potential activities within Block E. The data collected through running the vessels in E-W direction of the featured block area.

The raw data provided by NIOT undergoes conversion into SGEY format, which is compatible with ARCGIS software. Subsequently, it is processed within the software, utilizing mapping coordinates to visually represent the geological locations captured by NIOT. Each sound wave received is characterized by a triplet (x, y, z), where x and y denote the geographical or projected coordinates on the horizontal plane, and z represents the measured depth, as outlined in Table 1. These x, y, and z data points are then transformed into CSV format, enabling plotting within ArcGIS for further analysis and visualization.

Table 1: Sample data received in XYZ triplet form where x denotes latitude Y for longitude and z is for Depth

x	y	z
387855	1224975	31.19
387885	1224975	31.26
387915	1224975	31.3
387945	1224975	31.38
387975	1224975	31.46
388005	1224975	31.54
388035	1224975	31.57
388065	1224975	31.62

In the mapping of lost or submerged port cities, it is essential to map submarine geological and geomorphological features. This process involves analyzing contour patterns, shaded relief images, and color-coded Digital Elevation Models (DEM). The data obtained from Multibeam Echo Sounder (MBES) DEM data and contours, along with digitally processed outputs, are carefully interpreted in detail. This analysis aids in identifying significant underwater landforms, such as ridges, valleys, and other geomorphological features, which contribute to reconstructing the landscape of the lost or submerged port cities.

Using the choices provided by ArcGIS, different colour shades were allocated to different DEM altitudes for colour coding. When applying contours and hill shade region at the border of old coastal line, number of feature was found along it which is shown in the figure 2. In 1994 excavation of poompuhar the ingots and the shipwreck bearing were examined and Lead ingots with the inscription W: BLACKETT have been reported but these belong to the later period (CE. 1792).

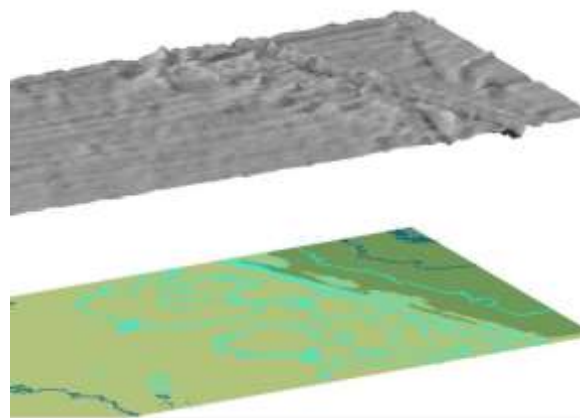


Fig 2: Dem Model displaying the dock structure and old coastal line

It was also found to be a Dutch Ship the wreck appears to be buried in coarse grained sediment. Now in 2019 through Results of the multiscan sonar

survey carried out at the shipwreck location indicate many dock in that place, shown in the figure 3 ,where many ships from other countries may have visited for load and unload there in that place. Through which it can be conclude that the sea has eradicated many places of Old Poompohar and it had shifted to new region. Through seismic software, with the time of reflected image a graph is drawn which shows many deviation shown in figure 4. This may be because the more clay sediment in the area. When applying more frequency gain in that particular area it can be highlighted that mere clay patches are actually the remains of ancient brick structures submerged in the sea subsequently buried under the sediments. There are many dock Structure found at many place in that region shown in the figure 3, if this structure is proved to be one of the structures of ancient city Poompohar, then the city could have extended up to this part. So there could be the possibility of having about half of the city submerged under sea. The reference to the submersion of Poompohar in literature has clear bearings and is proved beyond doubt by the material evidence. Further survey would reveal more facts about the once glorious city Poompohar.

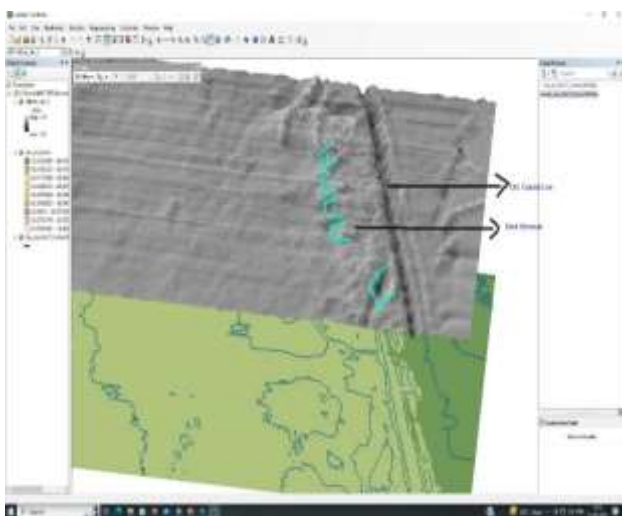


Fig 3: Dem Model from ArcGIS displaying the dock structure and old coastal line

Using seismic software, a graph was plotted based on the time of reflected images, revealing significant deviations, as illustrated in Figure 4. These deviations may be attributed to the presence of more clay sediment in the area. Increasing the frequency gain in this specific region highlighted the fact that the seemingly mere clay patches are, in

reality, remnants of ancient brick structures submerged in the sea and subsequently buried under sediments.

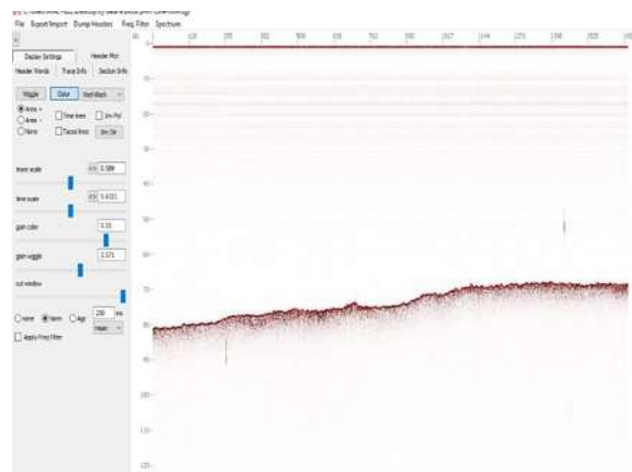


Fig 4.Graph showing the depth of sea

4. Conclusion

The primary goal of this survey was to determine the extent of the old town of Kaveripoompatinam's underwater extension and how much of it was destroyed by the sea. Poompohar was once a flourishing commercial centre and the second capital of the early (Sangam era) Chola dynasty. It is a significant historical cultural heritage that is immersed in the ocean. The main city of Poompohar is situated within the Bay of Bengal, approximately 30-40 kilometers from the current coastline. Over a span of 15,000 to 2,500 years, the city underwent six stages of relocation due to natural disasters and rising sea levels, ultimately resettling in Kaveripoompatinam. To enhance the study, the incorporation of remotely Operated Vehicle (ROV) survey data and sonar photography is proposed. This integration is expected to provide a clearer image of the scattered structures lying at the bottom of the submerged ancient port city of Poompohar. Further excavation at Poompohar, both on and off the coast, may uncover the presence of an ancient city and its significance in Tamilnadu's history.

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