

CHAPTER 2

STUDY AREA

2.1 IMPORTANCE OF THE STUDY AREA

The marine ecosystem of Gulf of Mannar is endowed with four specialized ecosystems namely island ecosystem, mangrove ecosystem, seagrass ecosystem and coral reef ecosystem. The 21 islands in the Gulf of Mannar on the southerneast coast of India extending from Rameswaram island on the north and Tuticorin on the south, along with the marine environment, have been declared as India's first Marine Biosphere Reserve. Most of the islands have luxuriant growth of mangroves on their shorelines. The swampy and the sandy shores of the islands offer an excellent ground for turtle nesting. The sea bottom of the inshore area around the islands are carpeted with the seagrass beds which not only serve as feeding ground for sea cow, but also harbour host of animal communities, providing feed and shelter. Highly productive fringing reef and patchy coral reef that surround the island are the most complex and delicate ecosystem which are often referred as "Underwater tropical rain forest" and treasure house for marine ornamental fishes. This unique marine ecosystem of Gulf of Mannar is one of the richest for biodiversity resources in Indian subcontinent. The index map of the study area is shown in Fig. 2.1.

2.1.1 Geographical locations

The Gulf of Mannar Marine Reserve is predominantly coral reef ecosystem. The so called Mannar Barrier in this Gulf (Fig. 2.1) is composed of

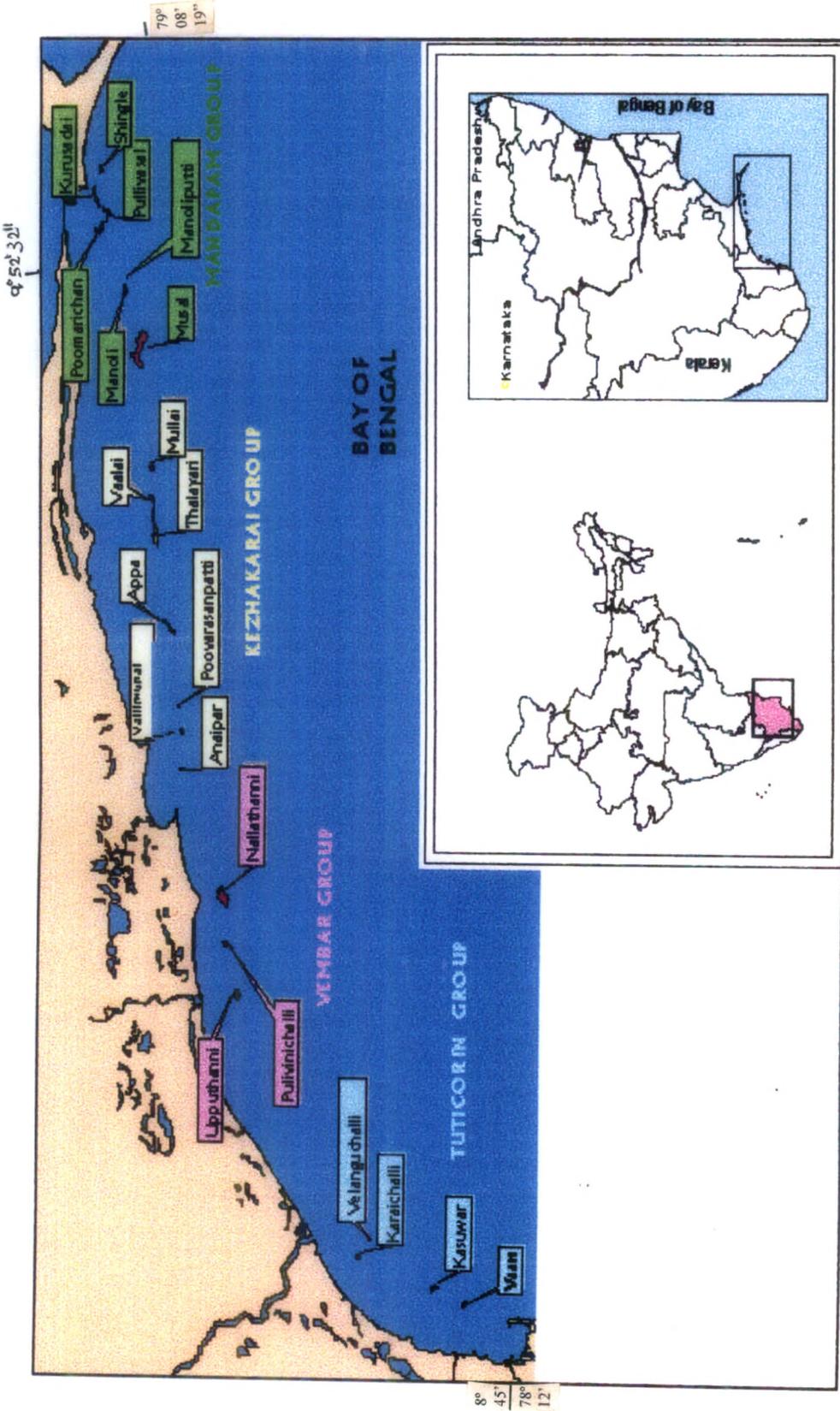


Fig 2.1 Index map of study area

21 small islands (each of 0.95 ha to 130 ha located between 8° 46' - 09° 14' N Lat and 78° 09' – 79° 14'E Long), which extends to a distance of 140 km from Tuticorin to Mandapam. The Gulf of Mannar lies between India and Srilanka covering an area of about 10,500 sq.km. It runs along the mainland coast for about 170 nautical miles and includes about 21 islands in the Indian part of the Gulf. The total island area is approximately 623.12 ha. The details of the island are as follows.

2.2 MANDAPAM GROUP OF ISLANDS

2.2.1 Shingle island

Shingle island is located at Lat 09° 15'N and Long 79° 14'E and 5 km from Pamban. The island had a total area of 12 ha. The maximum elevation of the island is 5 m. This island is covered with trees and bushes. Mangroves are found along the eastern side of the swamps. Small new coral colonies rise very close to the island. During low tide period a vast area of dead coral beds gets exposed. Algae and sponges settle over these dead corals. Sandy shores were observed along the northeast shore of the island. Coral reefs were found northern, eastern and western side of the island. Coral mining is used to be one of the activities of the fisherman in this island (Kumaraguru, 1999).

2.2.2 Krusadai island

Krusadai island is said to be one among the best known island for its rich faunistic diversity in the Gulf of Mannar. It is found 6 km from Mandapam at Lat 09° 15'N and Long 79° 12'E. The island is 2,000 m long and 700 m wide. The southerneast part of the island is sandy and the northern part is muddy with marshy vegetation. Mangrove vegetation is found along the

western side of the island. Among the islands in the Gulf of Mannar, Krusadai island alone is under the administrative control of the Department of Fisheries, Government of Tamilnadu. This island is characterized by dense cover of trees and bushes with good diversity of animals, hence it is called as “Paradise of Biologists”. Coral reef is found in the southern side of the island (Kumaraguru, 1999).

2.2.3 Pullivasal island

Pullivasal island is located in the Gulf of Mannar on the southerneast coast of Mandapam at Lat 09° 14'N and Long 79° 11'E. This island is located 6 km east of Mandapam. The total area is around 29 ha and maximum elevation of the island is 5 m. This island is adjacent to the Krusadai island on the one hand and on the other side it could be approached from Poomarichan island by crossing a shallow stretch of water. Northern part of the island is muddy and marshy with abundant mangrove vegetation. Thickly wooded trees have added an attractive green cover to the island. Sandy shore is observed around the southern and eastern shores of the island. A continuous fringing coral reef stretch is observed closer to the shore at a distance of 250 m, which provide an ideal niche for a variety of fauna. Coral reefs were also noticed on the muddy areas at the northern side of the island. Potable water is available in the island (Kumaraguru, 1999).

2.2.4 Poomarichan island

Poomarichan island is located at Lat 09° 14'N and Long 79° 11'E and 5 km east of Mandapam. This island has an area of about 27 ha, and it is U-shaped. Marshy soil with good vegetation cover is found on the island. The

swampy areas are treacherous in nature. Luxurious growth of mangroves are found around the island. The coral reef is observed in a short stretch along the western and eastern side of the island (Kumaraguru, 1999).

2.2.5 Manoliputti island

Manoliputti island is a small island located in the Gulf of Mannar on the southerneast coast of India at Lat 09° 13'N and Long 79° 07'E. It is separated from the nearby Manoli island by an extensive sand flat which is exposed during low tide. It is located approximately 6 km southeast of Mandapam camp. The maximum length, breadth and circumference of the island is measured as 335 m, 215 m and 905 m respectively. The total area of the island is 52,500 sq.km. The maximum elevation of the island from the sea level is 2 m. Erosion occurs on the sides of the island. This island is formed of sandy clay and dead coral pieces and has a complex topography. There is a tidal creek in the island. The mouth of the creek is very narrow and meandering west to southerneast forming a few tidal pools. The water logged area fluctuated from 35 to 50 cm in depth between two tides. Water flew steadily into the pools through the creek and during low tide most of the water from the pools flew back to the sea, leaving only a little quantity of water in the tidal pools as well as in the shallow basins. There is lush growth of mangrove vegetation with different species. Fairly dense growth of wild vegetation is found bordering the high tide watermark. A thick matrix of algae is found in the bottom of the pools and at certain places of the creek. The water logged areas are rich in marine organisms. Some insects, such as grasshoppers, garden lizard and moth are also seen in the island. In addition to this, some sea birds and wading birds are also found. This island provide nesting site for turtles. Mangroves such as *Avicennia* species, *Rhizophora* species, *Brugeira* species,

Pempis species and *Pandus* species and other associated species such as *Scaevola* are found skirting the periphery of the island. This richness together with other flora and fauna made the location an ideal nursery ground for milkfish and mullets (Kumaraguru, 1999).

2.2.6 Manoli island

Manoli island is located in the Gulf of Mannar at Lat 09° 13'N and Long 79° 07'E. It is separated from the nearby Manoliputti island by an extensive sand flat which got exposed during low tide. It is located approximately 8 km south of Mandapam. The maximum length and breadth of the island are 1,550 m and 3,530 m respectively. The total area of the island is about 1,92,500 sq.km. This island is formed of sandy cay, dead coral pieces and has complex topography. Pools and open mud flats are seen in this island. The maximum elevation of the island is about 6 m and erosion is noticed in the shoreward side of the island. The northern and southern beach ridges are found separated by an area of *Thespesia sp.* Human interference is noticed in the island (Kumaraguru, 1999).

2.2.7 Musal island

Musal island is the largest among the islands in the Mandapam group in Gulf of Mannar. This island is 7 km away from Mandapam in the southernwest direction at Lat 09° 12'N and Long 79° 15'E. The total area is about 130 ha. The length of the island is about 4 km and the width is 250 to 1,800 m at different places. The elevation of the island is 3.5 to 4 m. It is relatively a large island, characterized by thick cover of vegetation consisting of *Acacia* trees, *Palmyra* and Coconut plantation. Patches of boulder reefs are

found on the southern and northern side of the island. Fringing coral reefs were also seen along the southern side at a distance of 1 to 5 km and the reefs spread towards the northern side and southern side (Kumaraguru, 1999).

2.3 KEELAKARAI GROUP OF ISLANDS

2.3.1 Vallai island

Vallai island is found to be a narrow island located in the Gulf of Mannar at Lat 09° 11'N and Long 79° 56'E. This island is 5 km away from Periyarpattinam, a village in the mainland. This island is separated from the adjacent Thalayari island, by a channel which got exposed during low tide. The total surface area of the island is 13 ha. The maximum elevation of the island is 3 m. Boulder reefs are observed throughout the northern and northwestern sides of the island (Kumaraguru, 1999).

2.3.2 Thalayari island

Thalayari island is located at Lat 09° 11'N and Long 78° 54'E as an extensive and narrow stretch of island lying parallel to the main land. The total area is about 100 ha and the maximum elevation of the island is 3 m. This island has a thick cover of trees. Boulder reefs are observed near the north and northwest part of the island. Dead coral rubbles are noticed on the southern side of the island. There is a narrow channel which separates Thalayari island from Vallai island (Kumaraguru, 1999).

2.3.3 Appa island

Appa island is located approximately 8 km south of Keelakarai at Lat 09° 09'N and Long 78° 49'E. The maximum length, breadth and

circumference of the island measured were 1,750 m, 400 m and 4,410 m respectively. The surface of the island is 3,70,000 sq.km. The southern region of the island is highly elevated (6 to 6.5 m) and has fossilized coral stones of large dimensions. The northern region of the island has an elevation of 2 to 2.5 m. Severe erosion is observed on the southern side of the eastern half of the island. There are no creeks in the island except a channel and during high tide, water flew across this island through this channel and the sand flats got exposed during low tide. A narrow channel bifurcates the island into two unequal east and west halves. No potable water is available in the island. Lush green growth of mangrove vegetation of different species were observed. Due to the presence of the vegetation in this island, some phytophagus insects, such as grasshoppers, butterflies are seen in the island. Besides these insects, some sea birds and wading birds are also found. Coral reefs are found on the entire southern side of the island. A huge mass of dead coral stones and boulders are found in the northwest corner of the island which extends up to a distance of 1.5 km and the southern part of the island is found good for snorkling (Kumaraguru, 1999).

2.3.4 Poovarasampatti island

Poovarasampatti island is located in the Gulf of Mannar at Lat 09° 09' N and Long 78° 49'E. It is a fully submerged island that rarely get exposed during low tide. This island is between Appa island and Palliyarmunai island. It is located at about 7 km from Erwadi village near Keelakarai. Boulder reefs are observed on the eastern side of the island. Dead coral rubbles are noticed at a depth of 2 m (Kumaraguru, 1999).

2.3.5 Anaipar island

Anaipar island is found located at Lat 09° 09'N and Long 78° 42'E about 6 km from Erwadi village, near Keelakarai on the mainland. The total surface area is 11 ha and the maximum elevation of the island is 3 m. The island is fully covered with *Acacia* trees and shrubs. Boulder reefs and dead coral reefs are observed around the northeastern and western part of the island at a distance of 100 m from the shore (Kumaraguru, 1999).

2.3.6 Valimunai island

Valimunai island is located at Lat 09° 09'N and Long 78° 44'E. It is about 5 km from Erwadi village near Keelakarai. The total area is 17 ha and the maximum elevation is 2 m. This island is characterized by sandy shores and thick cover of *Acacia* trees and tall bushes. Boulder reefs are noticed beyond a distance of 150 m near the southwestern edge. Dead coral rubbles and blocks are found throughout the island (Kumaraguru, 1999).

2.4 VEMBAR GROUP OF ISLANDS

2.4.1 Nallathanni island

Nallathanni island is located at Lat 09° 06'N and Long 78° 35'E . It is located 2 km away from Munthal, a coastal village near Sayalkudi town in the Ramanathapuram district. The total area of the island is 110 ha and the maximum elevation of the island is 5 m. Large number of Coconut trees, *Palmyra* plantation and other woody trees are seen in the entire stretch of the island. The island has derived the name because of the availability of potable water in the island. The island provides nesting sites for turtles. Fishing

operations, algal and live shell collection are found to be the main occupation of fisher folk of nearby coastal villages. Boulder reefs are observed all around the northern and southern sides of the island from a distance of 300 m from the above (Kumaraguru, 1999).

2.4.2 Pulivinichalli island

Pulivinichalli island is located at Lat 09° 06'N and Long 78° 35'E and it is about 6 km away from Mookaiyur, in Ramanathapuram district. The total area of the island is about 12 ha and the maximum elevation of the island is 3 m. The island is characterized by sandy beach throughout its circumference with thick vegetation. The eastern side of the island is having sparse distribution of *Thespesia* trees. The boulder reefs are observed all around the island except in the eastern side (Kumaraguru, 1999).

2.4.3 Upputhanni island

Upputhanni island is located at Lat 09° 11'N and Long 78° 30'E. This island is 5 km away on the southeast of Mookaiyur village. The maximum length, breadth and circumference of the island measured were 925 m, 775 m, 2,320 m respectively. The total area of the island is 337,500 sq.km. Pools and open mudflats are found in the island. There is a large tidal creek on the southern side of the island. The mouth of the creek is very wide running southeast to northwest ending in an extensive water logged area of about 1.5 ha. The depth of the water logged area fluctuated from 45 cm to 75 cm between low and high tide. Most part of the creek and tidal pool were exposed during low tide. During high tide water flows steadily in to the pools through the creek and during low tide most of the water from the pools recede back in to sea,

leaving only a little quantity of water in the tidal pool as well as in the shallow basin. Sweet water is not available in the island. The maximum elevation of the island is about 7m. Coral reef girdling the island from the mideastern part rounding south upto the mid western part at a distance of 150 to 350 m from the island shore. A good number of trees are also present along with numerous tall bushes and the entire island is covered with grass. The island is fairly big and sandy with plenty of coral rubbles all over the island. Areas on the northeast side, eastern corner and southern shore are found to be threatened by erosion. Several fisherman from Naripaiyur, Mookaiyur and other nearby villages, used to stay here for fishing and for commercial exploitation of the seaweed *Gleidella* species and *Gracillaria* species growing in the shallow water (Kumaraguru, 1999).

2.5 TUTICORIN GROUP OF ISLANDS

2.5.1 Vilanguchalli island

Vilanguchalli island is located at Lat 08° 56'N and Long 78° 14'E about 3 km away from Mupalodai near Tuticorin town. This island is found fully submerged under water and rarely exposed during low tide. Coral rubbles are found on the island (Kumaraguru, 1999).

2.5.2 Karaichalli island

Karaichalli island is located at Lat 08° 57'N and Long 78° 15'E about 3 km away from the Veppalodai, a coastal village near Tuticorin town. The total surface area of the island is about 16 ha and the maximum elevation of the island is 3m. This island has a poor vegetation cover with sparse distribution of bushes, grasses and small plants. Fisherman from the near by coastal village Tharuvaikulam, frequently visit this island for illegal coral

mining. This island is found to be sandy in nature. Boulder reefs are observed in the island at a distance of 300 m from the island (Kumaraguru, 1999).

2.5.3 Kasuwari island

Kasuwari island is the largest island in Tuticorin group. Kasuwari island is located approximately 7 km south of Tuticorin at Lat $09^{\circ} 09'N$ and Long $78^{\circ} 49'E$. The maximum length, breadth and circumference of the island is 1,750 m, 400 m and 2,230 m respectively. The total area of the island is 3,70,000 sq.km. This island is sandy with numerous small and sand mounds here and there. No trees are found. There are no creeks in the island. The maximum elevation of the island is 2 m. The southeast region of the island has an elevation of 5 m. No potable water is found in the island. A swamp is seen on the southwest side of the island and a small saline water pond is seen near the western shore. The island is mainly sandy with no mangrove vegetation. Boulder reefs are also found around the northeast and southeast portion at a distance of 150 m to 250 m. The coral head is sparsely distributed on the northern and eastern regions 1 km away from the island a shore. On the southern regions, a few live boulder reef patches are seen. Fishermen from Tharuvaikulam and Tuticorin are going to the island mainly for coral rubble exploitation. The fisherman uses olai valai and shore seine for fishing purpose. Thus, human interference is noticed in the island (Kumaraguru, 1999).

2.5.4 Van island

Van island is located approximately 6 km east of Tuticorin at Lat $09^{\circ} 50'N$ and Long $78^{\circ} 13'E$. The maximum length, breadth and circumference of the island is measured as 1,025 m, 450 m and 2,510 m respectively. The total area of the island is about 1,37,500 sq.km. The

maximum elevation of the island is about 2 m from the sea level. Erosion is found to be extensive on the northern tip of the western shore of the island. There is no creek in the island. A swamp of approximately 0.5 ha area occur on the southern half of the island. Boulder reefs are found on the southeast and southwest portion at a distance of 400 to 600 m from the island ashore. Illegal mining of coral reef is carried out in large scale by the local people. The mined corals are used as a source of calcium carbonate and also for building blocks. This is one of the main reason for the depletion of the coral reef in this area (Kumaraguru, 1999).

2.6 TOPOGRAPHY

There are no hills on any of these islands which are plains.

2.7 CLIMATE

This area is under the spell of both southwest and northeast monsoons. Southwest monsoon contributes little towards the total annual rainfall of this area. Rain is moderate to heavy during October to December (northeast monsoon). The range of annual rainfall varies from 792 to 1270 mm. There is no major freshwater flow into the area. The average monthly atmospheric temperature ranges from 28° to 31°C with the maximum and minimum during May and January respectively.

2.8 SOIL

The soil is typical coastal sand, strewn with shingles in some places. There are swampy regions in Van, Kasuwari, Poomarichan, Pullivasal,

Krusadai, and Shingle islands. Quick sand is also observed in place like Krusadai island.

2.9 CURRENT

The current in this area are swift. The sea is rough between April and August and calm during September. While during June to August it is very stormy. October to December months have northeast monsoon with occasional rains.

2.10 TIDES

There is a large diurnal tidal inequality which advances or delays the timing of the high and low tides. The tidal range increases or decreases by about half meter. At Pamban, the tides are irregular owing to the wind forces.

2.11 WATER RESOURCES

Fresh water is available only in Nallathanni island as the name of the island itself specifies. Tolerably good water is available only during rainy season in Talayari, Musal and Pullivasal islands.

2.12 SOCIO-ECONOMIC STATUS

The coastal district coming under the Gulf of Mannar area is part of Ramanathapuram, Kanyakumari and the entire Tuticorin and Thirunelveli districts. There are about 23,000 fisher folk household with a population of 1.15 lakhs in 90 fishing villages. The average number of fisher folk families

per village in this region works out to 256 with a population of about 1278. There are about 35,000 active fisher folk, at the rate of 389 people per village. A critical level of the occupational patterns reveals that about 70% of the working population is involved in direct fishing, 21% in fishing related activities and 9% in various other activities (Kumaguru, 1999).

2.13 GULF OF MANNAR AS A CRITICAL HABITAT

Gulf of Mannar is now facing severe threats due to destruction of critical habitats like corals, seaweeds and seagrass through indiscriminate and intensive trawling, coral mining, dynamite fishing, commercialized fishing of specific fauna such as sea fans, chanks, sea cucumber and sea horses, poaching of threatened and endangered species like dugongs and turtles and discharge of effluents from various industrial activities. Under such grave circumstance the Gulf of Mannar was aptly chosen as a critical habitat on the basis of the serious threats on one hand and its richness of biological wealth on the other.