Tamil Nadu Wetlands Mission Newsletter

Vol: (I) Issue: 2 Month of August - 2025

OVERVIEW OF THE GULF OF MANNAR MARINE BIOSPHERE RESERVE

AN ECOLOGICAL AND CONSERVATION PERSPECTIVE

INTRODUCTION

The Gulf of Mannar Marine Biosphere Reserve, the first Marine Biosphere Reserve in South and South East Asia, running southwards from Rameswaram to Kanyakumari in Tamil Nadu, India is situated between with a total area of 10,500 Km2. This marine Biosphere Reserve encompasses a chain of 21 islands and the adjoining coral reefs off the coasts of the Ramanathapuram and the Tuticorin districts forming the core zone: the Gulf of Mannar Marine National Park. The surrounding seascape of the Marine National Park and a 10 km strip of the coastal landscape covering a total area 10,500 km^2 in Ramanathapuram, Tuticorin, Tirunelveli and Kanyakumari Districts forms the Gulf of Mannar Biosphere Reserve. The Gulf of Mannar has drawn attention of conservationists even before the initiation of the Man and Biosphere (MAB) program by the UNESCO in 1971. With its rich biodiversity of 4,223 species of various flora and fauna, the Gulf of Mannar was declared as a Marine National Park in 1986 by the Government of Tamil Nadu and later as the first Marine Biosphere Reserve of India in 1989 by the Government of India. There are two zones in the Biosphere Reserve: The Core Zone (National Park) and the Buffer Zone (BR) that surrounds it.

Core zone
Gulf of Mannar Marine National Park

This zone is protecting breeding populations of fishes and other organisms for the natural replenishment of neighbouring fishing areas like the buffer zone, where resource utilization is allowed. All the 19 islands and 2 submerged islands, the sea portions surrounding them up to a depth of 6.405m on the bayside and 9.5m on the seaward side make up the National Park area; which is the Core Zone.

Buffer zone
Gulf of Mannar Biosphere Reserve

Buffer zone is proposed to be permitted for local people's use such as fishing and fisheries related activities, tourism and tourism related activities. The seascape surrounding the islands beyond the limits of the National Park will form the buffer zone; i.e., up to 20 m deep waters around the National Park and the coastal areas (10 km from the high tide mark, landwards) will form the buffer zone of the Biosphere Reserve. which extends from Dhanuskodi to Cape Comorin.

Topography

The Gulf of Mannar Biosphere Reserve is located of the southeastern coast of India extends between Thoothukudi & Ramanathapuram districts is characterized by a diverse topography including islands, coral reefs, seagrass beds and mangrove forests.

- **Islands:** 21 islands with some submerged are a defining feature, mostly small and arranged parallel to the coast.
- **Coral Reefs:** Highly productive fringing and patch coral reefs surround the islands, acting as underwater havens for marine biodiversity.
- **Seagrass Beds:** Extensive seagrass beds carpet the sea bottom around the islands, providing crucial feeding grounds for dugongs.
- **Mangrove Forests:** Luxuriant mangrove growth is found along the shorelines and in swampy areas of many islands.

Geology

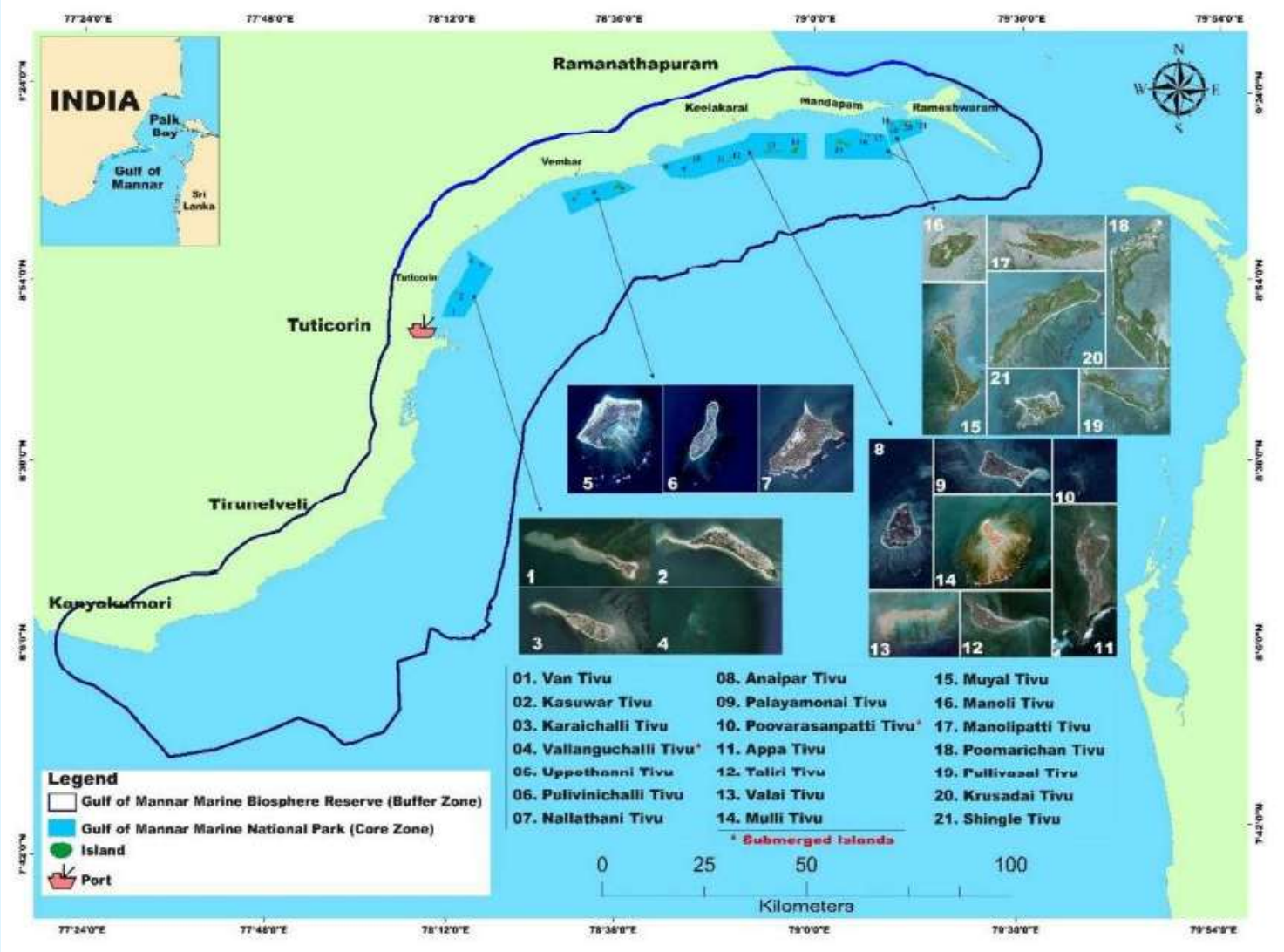
The Gulf of Mannar Biosphere Reserve is characterized by a geological setting deeply rooted in the breakup of Gondwana, resulting in the formation of the Mannar Basin with Precambrian metamorphic basement rocks overlain by thick sedimentary layers from the Late Jurassic onwards, which were further influenced by volcanic activity linked to plate tectonics. This rich geological history is reflected in the diverse landscape of the Reserve, which includes a chain of 21 islands primarily formed from ancient coral reef structures and sand along with fringing and patch coral reefs, extensive seagrass beds and coastal features shaped by riverine deposits and erosion/accretion processes. The combined forces of ancient tectonic events and ongoing marine and coastal processes have created a unique and valuable geological region with a dynamic and evolving topography.

Soil

The soil is typical coastal sand, strewn with shingles in places and there are swamps in places like Van Tivu, Kasuwar Island, Poomarichan Island, Pullivasal Island, Krusadai and Shingle islands. Quick sand is seen in places like Mulli and Krusadai Island.

Vegetation

The GOMBR exhibits a diverse vegetation, primarily characterized by three distinct coastal ecosystems: coral reefs (supporting algae and providing structure), extensive seagrass meadows thriving in shallow waters around the 21 islands and luxuriant mangrove forests lining the islands shores and in swampy regions. The seagrass beds, including species like Halodule uninervis, Cymodocea rotundata and Enhalus acoroides, serve as vital feeding grounds for the endangered Dugong and other marine life. Mangroves like Avicennia, Rhizophora, Bruguiera, Ceriops, Lumnitzera, and the endemic Pemphis acidula protect the coastline and offer essential habitats and breeding grounds. Additionally, the region supports a diverse seaweed community and various terrestrial plants on the islands and mainland coastal areas, forming a biodiverse hotspot of global significance.



GULF OF MANNAR BIOSPHERE RESERVE 21 ISLANDS

1. Mandapam Group (7 islands):

1. Shingle, 2. Krusadai, 3. Pullivasal, 4. Poomarichan,5. Manoliputti, 6. Manoli, 7. Hare.

2. Keezhakkarai group (7 islands):

1. Mulli, 2. Valai, 3. Thalaiyari, 4. Appa, 5. Poovarasanpatti (submerged),6. Valaimunai, 7. Anaipar.

3. Vembar Group (3 islands):

1. Nallathanni, 2. Pulivinichalli, 3. Upputhanni.

4. Tuticorin Group (4 islands):

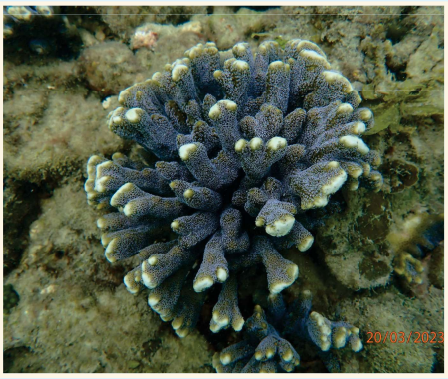
1. Kariyachalli, 2. Vilangu-challi (submerged),3. Koswari, 4. Vaan

ECOLOGICAL SIGNIFICANCE

The sanctuary is recognized as a Ramsar site (No. 2472) on 08.04.2022, a wetland of international importance designated under the Ramsar Convention. This highlights its critical role in maintaining global biodiversity and ecological processes. Gulf of Mannar Marine Biosphere Reserve qualifies as a Ramsar Site of international importance based on the 9 Ramsar criteria including its representation of unique wetland types, support for endangered species and critical ecological communities and contribution to maintaining regional biodiversity. The site provides crucial habitat during life cycle stages and adverse conditions, regularly supports large populations of waterbirds and significant fish species, and serves as an essential breeding, feeding and migratory ground for aquatic life. These characteristics underscore its ecological significance and contribution to sustaining global biological diversity.

BIODIVERSITY HOTSPOT

- It is one of the richest marine biodiversity regions globally and the first Marine Biosphere Reserve in South and Southeast Asia.



- It harbours a vast array of flora and fauna, boasting approximately 4,223 species of plants and animals, ranging from primitive to higher forms.

- The GOMBR ecosystems support a high diversity of marine organisms, including 117 species of coral, 181 species of seaweeds, 4 species of sea horses, 7 species of pipefish, 11 mangroves and numerous other invertebrates like crustaceans, mollusks, echinoderms and sponges.

- It is home to several globally important and endangered species such as the Dugong dugon and whale sharks (*Rhincodon typus*), four out of seven species of sea turtles found worldwide including the green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles and various species of dolphins and sea cucumbers.

- The GOMBR annually shelters a flock of approximately 5,000 flamingos between December and March, and serves as a vital foraging ground for migratory shorebirds including the Endangered Great Knot, the Vulnerable Black-bellied Plover, Broad-billed Sandpiper and Curlew Sandpiper

Corals and coral reefs in Gulf of Mannar form an essential ecosystem, which supports a variety of ecologically and economically important marine life. It occur mainly around the 21 uninhabited islands encompassing an area of about 683 ha. Fringing reef is the major reef type in Gulf of Mannar. Coral diversity in Gulf of Mannar comprises of 94 species belonging to 37 genera updated the list to 104 species and updated the list further to 117 species of corals belonging to 40 genera. The fast-growing corals such as *Acropora spp., Montipora spp. and Pocillopora spp* dominate shallow waters of depth ranging between 0.5 and 2 m. Boulders such as *Porites spp., Goniastrea spp., Favia spp., Favites spp.,* etc. are dominant in depths between 3 to 9 m around the islands.

CORAL REEFS

SEAGRASS BEDS

The Gulf of Mannar has dense seagrass meadows, mostly located between the mainland and islands with density decreasing seaward. Seagrasses are found up to 18 m depth and 15 species have been recorded, including *Cymodocea, Halodule, Halophila, Syringodium* and *Thalassia*. These meadows exist both inside and outside the Marine National Park. Surveys outside the park showed significant seagrass cover: 9.42 km² (51.69%) between Periyasamipuram – Vembar, 6.22 km² (51.78%) between Vaipar – Periyasamipuram, 5.25 km² (44.78%) between Valinokam–Ervadi, and 3.56 km² (45.11%) between Kasuwari–Kariachalli islands. These play a vital role as stabilizers and sediment accumulators, forming important habitats and feeding grounds for the endangered Dugong dugon, sea turtles and other marine life

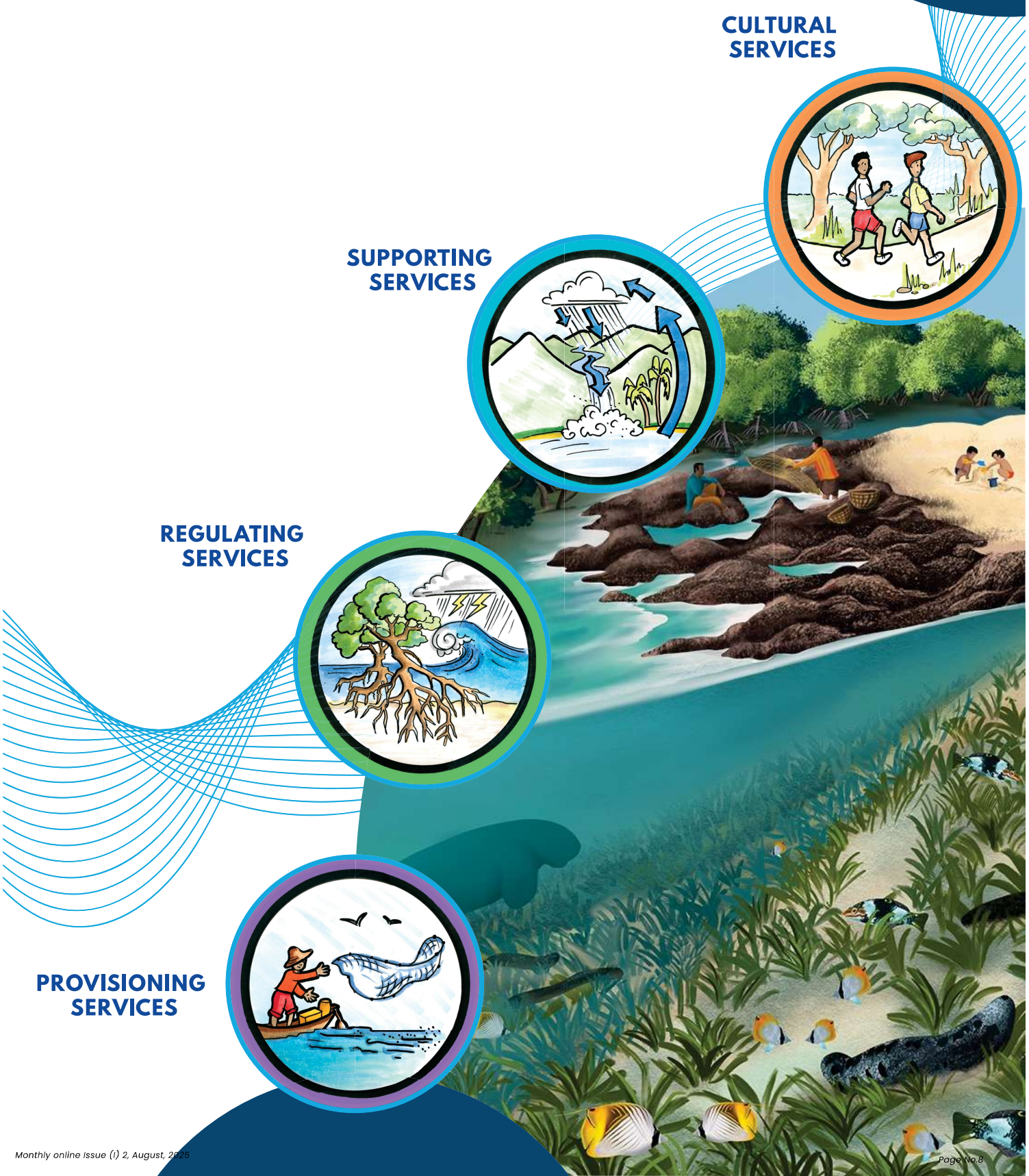
The Gulf of Mannar Biosphere Reserve's mangrove ecosystems are a vital component of its coastal environment, playing a crucial role in maintaining its ecological integrity and providing valuable services to both the marine environment and human communities. Among four coastal districts of Gulf of Mannar Biosphere Reserve, patches of mangroves were observed in Kanjirangudi, Vaipar, Buckil odai, Punnakayal-Pazhayakayal complex and in Manakudi estuaries. In all these sites, Avicennia marina is the dominant species and patch of Pemphis acidula in Punnakayal-Pazhayakayal complex of Tuticorin, *Rhizophora mucronata and Acrostichum aureum* were recorded in Manakudi of Kanyakumari district.

MANGROVE FORESTS

SEA TURTLES

The Gulf of Mannar is the only ecosystem in India where all 4 sea turtle species have been reported. Four of the seven species of sea turtles found worldwide are reported to occur in the Gulf of Mannar Biosphere Reserve. These are the olive ridley (*Lepidochelys olivacea*), green (*Chelonia mydas*), hawksbill (*Eretmochelys imbricata*) and leatherback (*Dermochelys coriacea*). All the four species of sea turtles that occur in these coastal waters are protected under Schedule-I of the Indian Wildlife Protection Act (1972), as well as listed in Appendix-I of Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) which prohibits trade in turtle products by signatory countries.

ECOSYSTEM SERVICES PROVIDED BY THE GOMBR



PROVISIONING SERVICES

Food: Corals, seagrasses and mangroves in the Gulf of Mannar serve as critical habitats, breeding and nursery grounds for diverse marine species, supporting local fisheries and sustaining over 1,10,000 families from 268 fishing villages.

Enrichment of Coastal Habitats: Coastal vegetation such as algae, seagrasses, seaweeds, corals and mangroves enriches the region's biodiversity by transporting nutrients and organic matter while providing nursery grounds for marine organisms and habitats for birds, mammals, and fishes.

Spawning Ground: The National Park and Biosphere Reserve support diverse commercially valuable species like fish, crabs and prawns, serving as a key economic resource for over 50 nearby fishing villages, where more than 90% of the population depends on it for their livelihood**.**

REGULATING SERVICES

Promoting accretion: Seagrasses, corals and mangroves function like a living barrier by accumulating sediment, stabilizing the ground, securing mud banks and preventing erosion.

Carbon Sequestration: Seagrasses, seaweeds, and mangroves act as vital carbon sinks, sequestering millions of tonnes of carbon annually worldwide. In the Gulf of Mannar, an acre of seagrass can capture about 3,350 kg of carbon per year (valued at ₹11 lakh), while a 20-year-old mangrove sequesters around 580 grams per square meter annually.

Protecting the shoreline: Corals and seagrasses in this region act as physical buffers between the elements and the shore and can absorb 70-90% of the tidal and wave energy, depending on their ecological condition.

SUPPORTING SERVICES

Primary Production: Seagrasses provide nesting and nursery grounds for important marine species, while mangroves play a major role in carbon storage worldwide and in India. Along with seaweeds and phytoplankton, these habitats produce essential resources that support many species and help sustain the livelihoods of over half a million people.

Eco-tourism and Support traditional fishing : This region has a high potential for eco-tourism, as the National Park is situated between Rameshwaram and Tuticorin with rich coral reefs and seagrass and Apart from mechanized fisheries, which is the major economic of the coastal communities, the traditional fisheries are also being sustained here because of seagrasses and coral reefs. Fishing is chief livelihood for more than a hundred thousand families.

CULTURAL SERVICES

GOVERNMENT INITIATIVES FOR CONSERVATION AND MANAGEMENT OF THE GULF OF MANNAR MARINE BIOSPHERE RESERVE

The Government have undertaken several conservation steps to protect the Gulf of Mannar Biosphere Reserve. These include the declaration of the Gulf of Mannar as a Marine National Park in 1986 by the Government of Tamil Nadu, followed by its recognition as the first Marine Biosphere Reserve in South and Southeast Asia in 1989 by the Government of India. The following steps taken by the Government collectively aim to conserve the ecological wealth of the Gulf of Mannar Biosphere Reserve while promoting the sustainable use of its resources,

Integrated Development of Wildlife Habitats (IDWH)

Anti-poaching measures; habitat improvement; strengthening of protection infrastructure; eco-restoration of critical marine habitats.

Tamil Nadu Biodiversity Conservation and Greening Project for Climate Change Response (TBGP-CCR)

Establishment of a sea turtle hatchery, climate-resilient ecosystem management, Coral restoration, biodiversity conservation, and Create Awareness about sea turtles and Dugong.

Green Tamil Nadu Mission (GTM)

New Mangrove Plantation and Restoration of Degraded Mangroves.

Tamil Nadu Sustainably Harnessing Ocean Resources and Blue Economy (TNSHORE)

Kariyachalli Island restoration, coral restoration, seagrass restoration, sustainable fisheries management, promotion of the blue economy, and skill development for fisherfolk welfare

CONCLUSION

- Coastal ecosystems are among the most important ecosystems and their significance in India is increasing as a large population depends on them for livelihood and resources. The Gulf of Mannar, a vital biosphere reserve is rich in diverse flora and fauna with high ecological and economic value.

- Encompassing coral reefs, seagrass meadows, mangroves, etc and 21 islands, it supports 4,223 species of flora and fauna, including the endangered dugong, sea turtles and numerous migratory birds.

- Beyond its biodiversity wealth, the reserve provides vital ecosystem services such as shoreline protection, carbon sequestration, nutrient cycling, fisheries support and climate regulation.

- However, these reserves are increasingly threatened by developmental activities along the coast, rising human population and natural disasters. To address these challenges, both the central and state governments have initiated special measures to plan and coordinate conservation efforts for sustainable resource management like Integrated Development of Wildlife Habitats (IDWH), Tamil Nadu Sustainably Harnessing Ocean Resources and Blue Economy (TNSHORE), Tamil Nadu Biodiversity Conservation and Greening Project for Climate Change Response (TBGP-CCR). These initiatives also emphasize creating awareness and educating the public about the importance of protecting coastal and marine ecosystems.

- This Newsletter highlights the Gulf of Mannar's ecological and ecosystem significance, serving as a foundation for integrated coastal and marine management strategies. A holistic conservation approach that combines biodiversity protection, sustainable livelihood promotion and ecosystem restoration will ensure the long-term resilience and global importance of the Gulf of Mannar Biosphere Reserve.

Reference:

1. Abdul Azis, P.K. and N.B. Nair, 1982. Ecology of the crustacean plankton of the retting zone with special reference to sulphide pollution in a backwater system of Kerala. Mahasagar. Bull. Nat. Inst. Oceanography, 15(3): 175-182.
2. Adrian D.G. 1995. Ed: Adrian Phillips. National System Planning for Protected Areas.Pub: IUCN.
3. Ajmal Khan, S. and P. Murugesan, 2005. Polychaete diversity in Indian estuaries. Indian Journal of Marine Sciences, 34(1): 114-119.
4. Balasubramanium T and Ajmal khan. (2001), coral reefs of India state of the art report, ENVIS publication series 4/2001. p109.
5. Balasubramanyam,T. and M.V.M.Wafar, 1975. primary productivity of some sea grasses beds in Gulf of Mannar. Mahasagar, 8(1-2): 87-91
6. Integrated Management Plan for the Gulf of Mannar Marine National Park and Biosphere Reserve (2018-2027)
7. Kannan , L., T.Thangaradjou and P. Anadharaman 1999. Status of seagrass of India. Seaweed Res. Utiln., 21 (1&2); 25-34: CAS in Marine Biology, Annamalai University , Parangipettai.
8. Kathiresan, K. 2001. Mangrove identification manual. Ministry of Environment and Forest, Government of India sponsored. Annamalai University, Parangipettai.
9. Kathiresan, K. and Rajendiran, N. 1997. Mangrove associated communities. In: Proceedings of the technical workshop on Biodiversity of Gulf of Mannar Marine Biosphere Reserve. p156-164. MSSRF, Chennai.
10. Patterson Edward, Jamila Patterson, G. Mathews and Dan Wilhelmsson (2005b).Awareness Raising and Feasibility of Reef Restoration through Coral Transplantation in Tuticorin , Gulf of Mannar, India . In coral reef degradation of the Indian Ocean Status, report 2005. 243-251p
11. Patterson, E.J.K., Jamila, P., Venkatesh, M., Mathews, G., Chellaram, C. and Wilhelmson, D. A Field Guide to Stony Corals (Scleractinia) of Tuticorin in Gulf of Mannar, South East Coast of India.
12. UNDP sustainable livelihood webpage: www.undp.org/sl UNEP Nairobi Convention: http://www.unep.ch/seas/main/eaf/eafconv/html
13. UNESCO Environment and Development in Coastal Regions and in small Islands: www.unesco.org/csi/pub/papers

Published by

Tamil Nadu Wetlands Mission
Panagal Maligai, Saidapet,
Chennai – 600015.

tnswa18@gmail.com

tnswa.tn.gov.in

tnwm_official

Photography