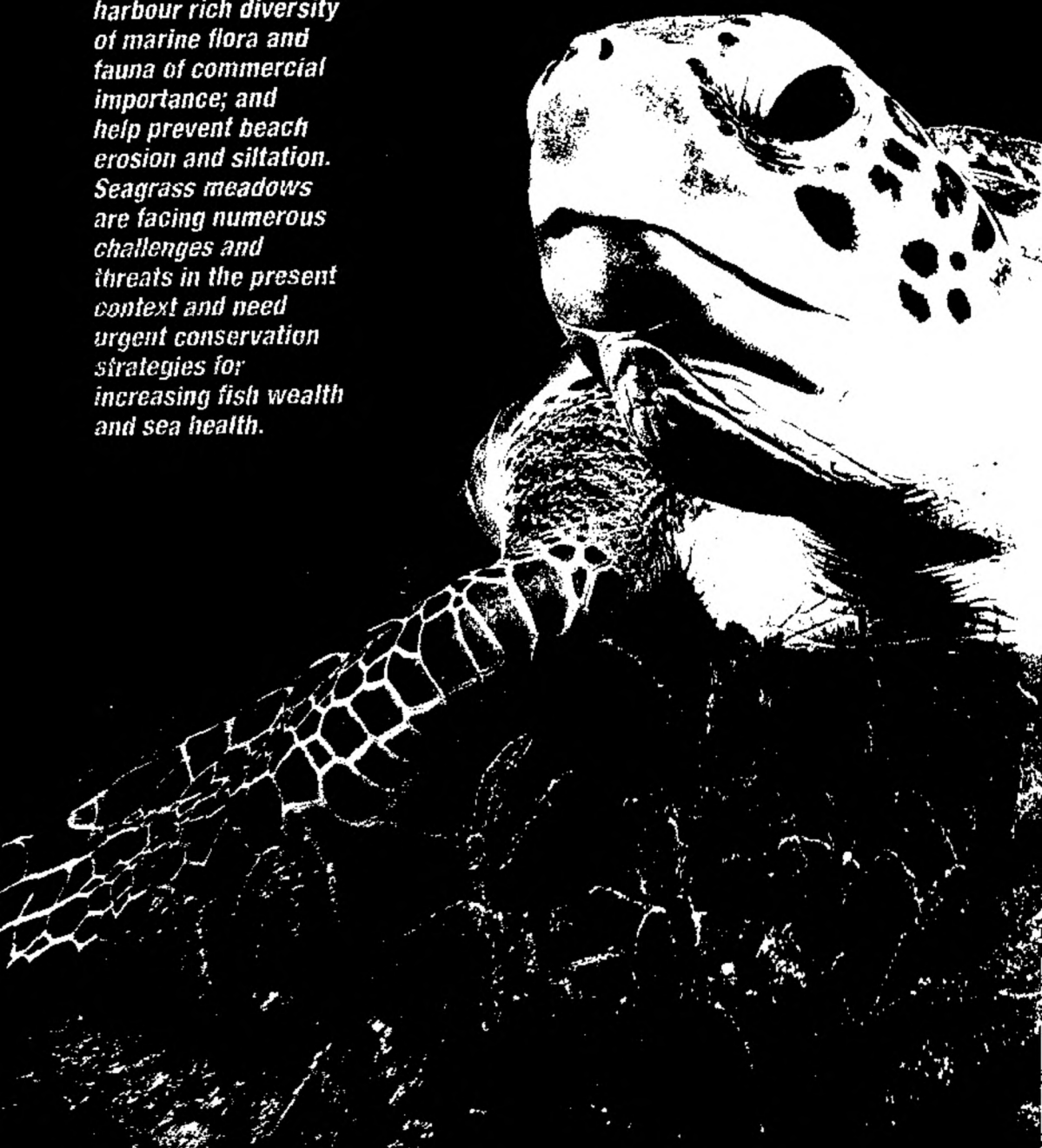


***Seagrasses are submerged monocotyledonous flowering plants adapted to complete their life cycle below the sea surface. They harbour rich diversity of marine flora and fauna of commercial importance; and help prevent beach erosion and siltation. Seagrass meadows are facing numerous challenges and threats in the present context and need urgent conservation strategies for increasing fish wealth and sea health.***



The Union Territory of Lakshadweep, located on the Laccadive - Chagos Archipelago is a unique, magnificent, but very fragile coral ecosystem. These Islands are believed to be formed on the submerged portions of Aravali mountain cliffs rising from 1500- 4000 m deep ridges as a result of millions of years of reef building process of a wide variety of corals and due to the prolonged geological changes during the period. The lagoons and the reef flats of Lakshadweep are ideal habitat for seagrasses - submerged monocotyledonous flowering plants, adapted to complete their life cycle below the sea surface. In contrast to other submerged marine plants (e.g. seaweeds), seagrasses do flower, bear fruit and produce seeds. They also have true roots, stem and leaves and generally grow in shallow coastal water from the inter-tidal zone to depths up to 10 m. In less turbid areas, such as the Caribbean Sea and the Australian coast, seagrasses can be found at depths even beyond 50 m.

#### SEAGRASS DIVERSITY

Seagrasses exhibit low taxonomic diversity (about 54 species worldwide, compared to 250,000 terrestrial Angiosperms). The three independent lineages of seagrass - *Hydrocharitaceae*, *Potamogetonaceae*, and *Zosteraceae* have evolved from a single lineage of monocotyledonous flowering plants between 70 million and 100 million years ago. This is in stark contrast to other plant groups that have colonised the marine environment, such as salt marsh plants, mangroves, and marine algae, which have descended from multiple and diverse evolutionary lineages. Seagrasses have evolved into 12 genera spreading to the Pacific and Atlantic as continents drifted apart during the Eocene period.

In India, seagrass meadows can be found on the eastern and western coast, in Lakshadweep as well as in the Andaman and Nicobar Islands. They range from the strap-leafed *Enhalus acoroides* which grows to a length of 30-150 cm to the *Halophilla ovalis*, that is 2-3 cm long. Large seagrass beds are present along the Palk Bay and Gulf of Mannar, with the latter harbouring the highest concentration (11) of seagrass species in India and six of the world's 12 genera. Nearly 14 species are found around the Indian coast, of

which nine can be found in the Andaman and Nicobar Islands. During the 1950s locals transplanted the seagrass (*Thalassia hemprichii*) beds onto several northern islands of Lakshadweep to promote beach stability and to check the erosion. The seagrasses here are locally known as *kavarutti pullu* as it was introduced from the Kavaratti lagoon. A healthy seagrass ecosystem has resulted in a short time extending 40 - 60 m wide from the tidal line to the deeper zone.

In all seven species of seagrasses - *Cymodocea rotundata*, *C serrulata*, *Halodule uninervis*, *Halophila ovata*, *Syringodium isoetifolium* and *Thalassia hemprichii* and *Halophila decipiens* were reported from nine atolls of Lakshadweep. *C serrulata* was found to be dominant whereas *Halophila decipiens* was limited to Kalpeni Island. Higher seagrass diversity was found around Agatti. According to Z A Anzari et. al., 1991, in a study titled 'Seagrass habitat complexity and macroinvertebrate abundance in Lakshadweep coral reef lagoons, Arabian Sea' published in Coral Reefs, seagrass meadows of Lakshadweep coral lagoons are known to harbour a dense and rich invertebrate assemblage.

#### SEAGRASS ECOSYSTEM

Undersea meadows play a significant role in deciding the processes and resources of near-shore coastal ecosystems as they have physical, chemical and biological effects on habitats. Seagrass meadows are also involved in cycling of nutrients from water and sediments. The capacity of seagrasses to absorb dissolved CO<sub>2</sub> is quite high - one sq km of seagrass can absorb CO<sub>2</sub> equivalent to 50 sq km by tropical forests. In a paper by C Hartog, 1970, titled 'The Sea Grasses of the World', North-Holland Publication, it is highlighted that seagrass ecosystems are the one of the most productive ecosystems in the world and have a very high rates of growth, producing organic matter of about 300-600 g dry weight/sq m/yr. Seagrasses have also shown a decisive role in the productivity and oxygen budget of coral atolls as outlined by various scientific studies.

Thus, the disappearance of seagrass may lead to a more significant contribution to climate change than coral reef destruction, as seagrasses are widely distributed across the oceans. The



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
*The capacity of sea grasses to absorb dissolved carbon dioxide is very high - one sq km of seagrass can absorb carbon dioxide equivalent to 50 sq km by tropical forests.*

health of seagrass meadows is closely tied to that of mangrove and coral reef ecosystems, as many fish migrate between these habitats for food, shelter and breeding. The recent large scale coral mortalities reported from Lakshadweep could in effect be due to the seagrass destruction and resultant sedimentation. The excessive removal of seagrass shoots lead to stirring up of sands and sediments. Such sediment particles transported by the waves and current settle on live polyps, which instantaneously kill them. The dead corals, particularly the branching corals, broken in to small pieces (shingles) get deposited in the relatively deeper parts of the lagoons. This accretion and filling up of the lagoons reduces the depths, warming up the lagoon, and worsening the conditions for vulnerable communities, perpetuating the cycle of imbalance in the ecosystem. Till about two decades ago almost the entire fresh fish requirements of the islanders were met from the respective lagoons. Presently, many lagoons have turned barren. It is believed that seagrass destruction is responsible for the reduction in fish availability.

#### **THREAT TO SEAGRASS ECOSYSTEM**

Although corals and sea turtles receive more attention, it is the seagrass meadows that are amongst the most threatened ecosystems on earth. A recent study by a group of seagrass experts supported by the National Centre for Ecological Analysis and Synthesis, Chennai, found that seagrass meadows have been disappearing by about 7 per cent per year since 1990. Anzari's 1991 study reported a seagrass vegetation cover of

0.05 sq km in Agatti and 0.34 sq km in Kavaratti. Subsequently in 1998, T G Jagtap in his study titled 'Structure of major seagrass beds from three coral reef atolls of Lakshadweep' published in Aquatic Botany, reported a seagrass vegetation cover of 0.005 sq km in Agatti - a drastic decline. The case is almost similar in Kavaratti, Minicoy, Kiltan etc.

Herbivory (grazing), boat services and other construction activities pose a threat to seagrass meadows. Turtles, a protected species since the 1980s, has increased their population exponentially. Lack of predators and low fishing mortality has encouraged herbivory by the turtles - leading to large wipeouts of seagrass meadows. Opposed to this, octopus - one of the benthic predators and a sought after resource in Lakshadweep, is rampantly harvested. This has resulted in the infestation of crabs due to the reduction of their predators. Crabs feed on modiolus, threatening their population in many of the Lakshadweep atolls resulting in an imbalance in the reef ecosystem. Once seagrass beds have been lost through environmental degradation, they are notoriously difficult to restore. Seagrasses are important in stabilising bottom sediments as they slow water movement. They prevent erosion, trap and bind sediment and organic detritus, provide a stable habitat for epiphytes and associated flora and fauna. And due to its carbon sequestration benefits the preservation of these ecosystems may prove essential in the global fight against climate change. 

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