

Marine Biodiversity of Lakshadweep: An overview

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Introduction

The oceans and seas are the most dominant and significant features on this planet, covering over 71 % of its surface. This environmental component, with its vast expanse and sheer volume, is of immense importance to mankind, and serves as the economic lifeline for coastal communities, fish workers and those who sail in its water. Also, the seas and oceans play a pivotal role in shaping the world climate maintaining the water cycle and bio-geo-chemical cycling of elements. It contains a great variety of flora and fauna from its upper sunlit zone to the depths. But except for hotspots like coastal wetlands, mangroves and coral reefs, little is known about the biological diversity, abundance and distribution of marine organisms or the structure and function of the marine ecosystem in its totality (USNRC 1992). Marine species that face the greatest risks of extinction include corals, sponges, oysters, octopus, porpoises, whales, ornamental fishes, sea turtles and dugongs. The Lakshadweep Islands of India being oceanic in nature harbour important marine flora and fauna in the seas around it. An overview of some of the marine flora/fauna, their status, distribution, threats, sustainable uses and conservation need in Lakshadweep archipelago are discussed here.

Marine Geology and Geomorphology

The most accepted theory on the formation of the coral atolls is that put forward by Sir Charles Darwin. He proposed that the subsidence of volcanic islands resulted in the formation of fringing reefs which encircled the lagoon, following which the coral islands were formed by the accretion of corals in the lagoon. The Lakshadweep Islands are typical atolls, formed by constant deposition of corals.

The Lakshadweep group of islands forms the smallest Union Territory of India. It lies in the Arabian Sea between 8° and 12° 30' N latitude and 71° and 74° E longitude, scattered at a distance of 220-440 km from the mainland coast. Among the 36 islands, 10 are inhabited while others are *seasonally*

inhabited or uninhabited islands. The Lakshadweep archipelago also consists of 12 Atolls, 3 reefs and 5 submerged banks covering a land area of 32 km², 20,000 km² of lagoons and 4000 km² oceanic zones. All islands are coral atolls with live corals and reef surrounding it. The soil is formed by weathering the dead corals. It is estimated to have 95% calcium carbonate. Phosphorous and potash are also present in small quantities (Morgan, 1981).

Marine biological wealth of Lakshadweep

Seaweeds and sea grasses: Marine algal distribution is generally sparse and heterogeneous. Altogether, 62 genera and 114 species of seaweeds have been recorded from Lakshadweep (CSMCRI, 1979; Kaliaperumal *et al.*, 1989). Among them the most abundant species are the *Gracilaria edulis*, *Sargassum duplicatum* and *Turbinaria ornata* which grow luxuriantly on the lagoon beds of many islands. The shallow water lagoons of these atolls support rich beds of seagrass adjacent to the beach. The grasses help considerably in preventing erosion of beaches. A total of 6 species of sea grasses are identified from this area. The most common of these are the *Cymodocea rotundata* and *Thalassia hemprichii*, which the green turtles predominantly forage upon in the lagoon (Jagtap, 1987).

Mangroves: Two mangrove ecosystems are found in south and south east areas of Minicoy island. *Ceriops candolleana* is reported from the south and *Bruguiera cylindrica* from the southeast (Radhakrishnan *et al.*, 1998). Besides these two patches, no mangroves exist in any of the islands of Lakshadweep.

Corals: To date, there are no comprehensive accounts of coral fauna of Lakshadweep (though a study is currently being carried out by Rohan Arthur, James Cook University, Australia). The diversity studies of corals are limited only to Minicoy. Pillai (1983) recorded 70 species of hermatypic corals representing 26 genera from the shallow waters of Minicoy reef and lagoon. It is likely that many more

common Indo-Pacific genera may be occurring in the Lakshadweep. Few widespread but less common Indo-Pacific genera such as *Coscinarea*, *Siderastrea*, *Pachyseris*, *Oulophyllia*, *Trachyphyllia*, *Mycedium*, *Oxypora*, *Plerogyra* and *Seriatopora* still await detection from the reef of Lakshadweep. Future investigation on corals is bound to bring forth many more unrecorded species and genera from this archipelago. However the most common corals found in the lagoon and reef at present are the genus *Acropora* and *Montipora* while the massive species of corals are mainly those of genus *Porites* and *Heliopora* (Rodrigue 1995, Wafar 1986, Pillai & Jasmine, 1989). Besides, *Fungia* and *Favia* are also widespread in many island lagoons.

Marine fishes: The fishes that occur in the coralline niches of the lagoon exhibit the characteristic variety of colours and mainly consist of perches, gar-fishes, half-beaks, scarids, goat-fishes, carangids, grey mullets, antherinids, spyraenids, polynemids, balistids, blennids and globe-fishes (Balan, 1958; Kumaran *et. al.*, 1989). Jones and Kumaran (1980) recorded 603 species of fish from the Laccadive archipelago.

The offshore fishery is constituted by fishes *viz.* seer fish, sharks, sail fish, tunnies, flying fish, carangids and ribbon fish. Moreover, rays and skates are also common in the Lakshadweep water. Fishes such as *Crenimugil crenilabis*, *Polynemus sexfilis*, *Naso tuberosus*, *Naso unicornis*, *Gomphousus varius*, *Novaculichthys taeniurus* and *Anampses diadematus* are common in the offshore waters of Lakshadweep (James *et. al.*, 1989).

Others finfish fauna: Among the fishes of Lakshadweep, those of ornamental value (aquarium fishes) are abundant. Of the 603 species of marine fishes belonging to 126 families that are reported from the islands, at least 300 species belong to the ornamental fish category. There is however no information on the relative abundance or areas of occurrence of these fish in the lagoons and seas around the islands. The ornamental fish such as *Abudefdu*, *Amphiprion*, *Apogon*, *Coris*, *Balistes*, *Platax* are common in Lakshadweep lagoons (Murthy *et al.*, 1989).

Benthos: Prawns and crabs are not fished in Lakshadweep. In all, 41 species of crabs and two species of lobsters are recorded from this region (Meiyappan and Kathirvel, 1978; Shankarankutty,

1961, Rao *et al.*, 1989). The brachyuran crab *Grapsus albolineatus* and panulirid lobster *Panulirus homarus* are among the most common crustaceans in the lagoon and reef flats of this archipelago.

Mollusca: The giant clam *Tridacna (Tridacna maxima)* is found on the reef flat of many islands while octopus (*Octopus vulgaris*, *O. membranaceus* and *O. cyaneus*) are common in the lagoon bottom. In addition to this, 48 species of gastropods and 12 bivalves have also been documented from the Lakshadweep archipelago (George *et. al.*, 1986, Appukuttan *et. al.*, 1989). Among the gastropods, Cone shells (*Conus leopardus* and *C. litteratus*), and Cowries (*Cypraea caputserpentis* and *C. tigris*) are the commonly found molluscs in the island reef bottom.

Sponges: 41 species of sponges are identified from the Lakshadweep group. Only the class *Demospongean* is documented from this area. The common Indian sponge *Spongia officianalis* is for the first time recorded from Minicoy island of Lakshadweep (Thomas, 1989).

Economically and ecologically important fauna

Tuna: Oceanic species of tuna such as Skipjack (*Katsuwonus pelamis*) and Yellowfin tuna (*Thunnus albacares*) constitute the major tuna resources from Lakshadweep Islands (Alagaraja, 1987; Jones, 1986; Kumaran and Gopakumar, 1986; James *et. al.*, 1989). The main economy of the islanders is dependent on the tuna catch and fishing is done for nearly six months of the year from October to April.

Sharks: The most common species of sharks that occur in Lakshadweep are the Spade-nose shark/Yellow dog shark, *Scoliodon laticaudus* and the Milk shark, *Rhizoprionodon acutus* (Devdoss *et. al.*, 1985). The Blacktip Shark, *Carcharhinus limbatus* and Hammerhead shark, *Sphyrna mokarran* are also commonly found in the waters around Lakshadweep (Hanfee, 1997; Basudev Tripathy, *Pers. Obs.*).

Marine turtles: There are four species of marine turtles that occur and nest in the islands of Lakshadweep (Bhaskar, 1978). The green turtle (*Chelonia mydas*) is the common species that nests in inhabited islands whereas hawksbills (*Eretmochelys imbricata*) and leatherbacks nest more frequently in the uninhabited islands. The olive

ridley (*Lepidochelys olivacea*) nests from January to March where as the former two species nest in the monsoon (Tripathy *et. al.*, 2002 unpublished Report) (see Article, pp 3-7, this issue).

Dolphins and whales: In the seas around India, there are 24 species of cetaceans frequenting the coastal waters, mostly for feeding and breeding (James & Mohan 1987, De Silva 1987). However, no detailed scientific investigation has been carried out so far on the species diversity of dolphins in different coastal regions of India. Pillai (1981) reported the occurrence of Cuvier's beaked whale (*Ziphius cavirostris*) from Minicoy island of Lakshadweep. There is a skeleton of false killer whale (*Pseudorca crassidens*) kept for display in the museum at Kavaratti island. The common species of dolphin that are caught as bycatch are the Spinner dolphin (*Stenella longirostris*), Indo-pacific humpback dolphin (*Sousa chinensis*), Bottlenose dolphin (*Tursiops truncatus aduncus*) and Cape dolphin (*Delphinus delphis*) (Lal Mohan, 1989). Dolphins are frequently sighted close to the island coast between October and April (Basudev Tripathy, *Pers. Obs.*). To the fishermen, this animal serves as an indicator of tuna shoals in the offshore waters of Lakshadweep.

There are unconfirmed reports of the collection of ambergris by islanders, when washed ashore. This indicates that sperm whales may also occur in the offshore waters of Lakshadweep.

Dugongs: Dugongs, reported to be historically present in Lakshadweep, are probably extinct from this area now. However, there are some unconfirmed reports that islanders have sighted dugongs while fishing in offshore areas.

Birds: The Pitti island of Lakshadweep is inhabited by three species of terns namely the Noddy Tern (*Anous stolidus pileatus*) Sooty Tern (*Sterna fuscata nubilosa*) and the Brown winged Tern (*Sterna anaethetus*)(see Article, pp 19, this issue). Besides, there are Gray Plovers, Golden Plovers, Crab Plovers, Whimbrels, Curlews and common Sandpipers around the islands (Betts, 1938; Daniel, 1999; Mathew & Ambedkar, 1964).

Productivity: Coral reefs are the most productive marine ecosystems, with annual gross production rates in the range of 2000 to 5000 g cm² (Mann, 1982). These reefs are known to be more

biologically productive and with exceptionally diverse fauna and flora. Lakshadweep coral ecosystem is among the most productive marine ecosystem of India.

Important species

From one point of view, all species are equally important. But certain species loom large in people's perception due to their economic value, uniqueness or endemism. The colourful corals, turtles and marine mammals such as dolphins & porpoise and birds found in Lakshadweep are amongst these. The former are important flagship species for Lakshadweep not only because of their uniqueness in occurrence but as the structural framework on which the Lakshadweep atoll system depends. The species diversity is certainly noteworthy with the range of corals, fish, marine turtles, marine mammals and many more smaller but endemic flora and fauna that are found from the seas around Lakshadweep Island.

Threats to marine biodiversity in Lakshadweep

The exploitation of marine living resources is an age-old practice for human civilization. However, the extent of exploitation has crossed the limit of sustainable utilization of these resources due to anthropogenic pressures such as over fishing, developmental activities and pollution. Conservation and management of marine living resources is therefore necessary in many coastal areas. Though the present level of exploitation of marine living resources other than faunal elements like turtles, dolphins and corals have not reached alarming levels in the Lakshadweep archipelago, if the trend of over exploitation continues, the rest of the common flora/fauna of Lakshadweep will also soon be included in the Red Data Book of the IUCN.

Marine protected areas for Lakshadweep

The *in situ* conservation strategy for marine living resources remains restricted to 3 major protected areas notified by the Govt. of India, in accordance with the provisions of the Wildlife Protection Act, 1972 [See 35(1) and 35(6)], constitution of India [Art. 48 A and 51A (g)] and CRZ Notification, 1991 [CRZ I, 6(2) and CRZ IV]. The archipelago of Lakshadweep is a typical marine system where delineation of some areas, which are ecologically sensitive and fragile, is difficult due to people's

dependence on the resource. Therefore there is a need for further revision in the act for sensitive areas like coral islands where fishing is the major occupation. The adequate protection, propagation and development of fragile ecosystems are of urgent concern. However, the livelihood dependence on the resources also needs to be taken into consideration.

Important Areas

As is the case with important species, important areas also merit special attention due to various subjective and objective reasons. Although there have not been serious attempts to demarcate the marine hotspots, based on available information, the Lakshadweep archipelago is among the thirteen marine hotspot identified in India's oceanic space. Luxuriant coral beds are found around many islands of this archipelago. Marine turtles especially *Chelonia mydas* are abundant in lagoons and nest in large numbers on the island beaches. Dolphin sightings are common in the nearshore waters of the islands. The Pitti island is a haven for terns where more than 5000 terns nest every year.

Conclusion

Management of the Marine biodiversity of Lakshadweep

Today, more emphasis is placed on the biodiversity found within a "Large Marine Ecosystem (LME)" as a measure of the condition of any region's living resources. The marine and coastal habitats of India are facing environmental crisis due too many reasons and the worst affected habitats in the country seem to be coral reefs and reef resources. The fact that our knowledge of marine biodiversity is yet highly insufficient to inform our action fully, a cautious approach may need to be followed such as creation of marine refugia or reserves. Considering the status, exploitation level and conservation needs, the Indian Wild Life (Protection) Act, 1972 made amendments in schedule I, III and IV of the act and in which it was recommended to insert sharks, sea horse and giant groupers in part II (A), all corals and

sea fans in IV (B), 9 species of molluscs in IV (C), while sea cucumbers and calcareous sponges are included in the schedule II which also included 15 species of other molluscs (Lakshadweep Gazetteer, 2001).

Lakshadweep is a fragile coral ecosystem and is deteriorating due to natural and manmade causes. It is imperative that conservation measures be urgently implemented in some of these islands to preserve and protect these habitats for scientific, cultural and economic purposes. Establishment of marine parks and reserves can be helpful in the conservation of the biodiversity of Lakshadweep. However, it should be clear that the idea of protected area status to few islands and lagoon systems is to give protection to the corals and associated fauna and not to prevent the entry of islanders and fishermen whose livelihood depends entirely on the ecosystem. Therefore, the livelihood of islanders and their rights to the limited utilization of resources should be taken into consideration. This includes rights of artisanal fishing activities within the protected areas. Also, before taking any steps, there is need to identify species that are in need of immediate conservation. Tuna fishing contributes in major way to the economy of the islanders. These fishermen spend six months of the year in the uninhabited islands viz. Suheli Valiakara, Suheli Cheriyakara, Tinnakara and Cheriyabani & Valiabani islands. While the faunal diversity is highest in these areas, disturbance from fishing is limited and negligible. However, besides fishing, any other anthropogenic pressure such as tourism promotion, mechanized fishing, artificial lighting and construction activities will certainly have severe impact on the marine biodiversity of this area. Therefore, there is a need for the protection of lagoons and marine ecosystems of Lakshadweep to safeguard the biodiversity as well as the fisherfolk who depend on the coral ecosystem. No conservation programme is successful without people's participation. Therefore it is also essential that the fishermen and islanders should be involved while formulating any policy and guidelines concerned with marine biodiversity conservation in the archipelago.

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A Sanctuary For Terns In The Arabian Sea

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About 25 km north-west of the Kavaratti island of Lakshadweep is a tiny sandy patch hardly 2m above sea level covering an area of approximately 200x300 yards, called the Pitti island. The sand bank of Pitti is well known for its bird nesting. Thousand of terns migrate to this island every year for nesting.

The Pitti island is inhabited by three species of Terns namely the Noddy Tern (or Brown Noddy) (*Anous stolidus pileatus*) Sooty Tern (*Sterna fuscata nubilosa*) and the Brown winged Tern (or Bridled Tern) (*Sterna anaethetus*). The biology and migration of these birds are little known but they are reported to migrate every year to Pitti for nesting as early as 1903 by Gardiner during his flora and fauna survey in Maldives and Laccadives. The islanders from Kavaratti have long visited Pitti for the collection of eggs but have contradictory opinions on the nesting of terns. Some claim that bird nesting occurs in Pitti throughout the year, but according to others, the birds leave by end of September. The Sooty Tern is known to occur along the coastal states of India and its Bay islands coast, Burma, Mauritius and Seychelles areas whereas the Noddy Tern is basically a oceanic bird that is less seen along the mainland coast.

During my survey for turtles in 2001-02, I had visited Pitti several times and observed different flocks in different months but the February visit was the most significant. I could see countless birds in several flocks through out the Pitti island. The nesting season was perhaps approaching as I saw a majority of the birds in nesting position. I also observed a few solitary eggs on the sand and eggs looking very fresh, which must have been laid within the past couple of days. From a safe distance, I identified the nesting flock from their colour. The Sooty Tern flock was black and white where as the Noddy Tern flock was smoky brown. The nesting area was widely separated for the two species.

Mathew & Ambedkar (1964) of Bombay Natural History Society have reported the Brown winged Tern nesting at Cheriyanani island of Lakshadweep and during my visit I observed them in Pitti too. But I could not confirm the nesting as they were very few in number and not in nesting position. However when I returned to Kavaratti, islanders told me that this species nests in Pitti during the monsoon, when the chicks of Sooty and Noddy Tern start flying.