



Coral Reef in India: Threats, Conservation and Management

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Coral reefs are known as the "Tropical Rainforests of the Sea" because of their incredible diversity of life and unique individuality. Reefs also benefit millions of people all over the world by providing a variety of economic and environmental benefits. Coral reefs are now being devastated at a rising rate underwater as a result of both natural and manmade processes, despite their tremendous value. According to a 2011 report by the World Resources Institute, 75% of the world coral reef are threatened, with a 25% of them already destroyed below recovery. If current destruction rates are forced to continue, 90 percent of reefs would be threatened by 2030, and virtually all will be threatened by 2050. Experts predict hunger, poverty, and political uncertainty throughout the worldwide when coral reefs totally vanish, as millions of people's livelihoods would be lost. The current state of coral reefs, as well as the rising threats to them, are important concerns. Magnus Ngoile (1998) reported that coral reefs cover a worldwide area of 6, 00,000 km² (about the same as France), from which 60,000 km² have been destroyed and 1, 80,000 km² are endangered. Mangrove forests shelter coral reefs from intense storms, while corals prevent silting, provides nursery grounds for fish that mature stage is in the reef region, and obtain nutrients from the terrestrial environment, softening the impact on reefs that require less nutrients. According to Venkataraman (2011), the Indian Ocean is home to a large share of the universe coral reefs, there are 199 species on Indian reefs, classified into 37 genera. There are 18 families recorded from throughout the world, including 15 from India.

Coral Reef in India

India has roughly 8129 kilometres of coastline. The reef formation, on the other hand, is limited to four main areas: - Gulf of Kutch, Gulf of Mannar, Lakshadweep Islands and Andaman and Nicobar Islands. According to (DOD and SAC 1997) in India, the total area of coral reefs is estimated to be 2,375 square kilometres. The coral reefs in each of these areas are not the same. The structure and kind of reef varies by location. Reefs come in several forms. (i) Fringing reefs: The Gulf of Mannar and Palk Bay both have fringing reefs. Along the Gulf of Kachchh, platform reefs can be found. Patch reefs may be found near the coastlines of Ratnagiri, Malvan, and Kerala. The Andaman and Nicobar Islands have both fringing and barrier reefs. (ii) Barrier reefs: are found in the Andaman and Nicobar Islands and are separated from the mainland or island coast by lagoon. (iii) Atoll reefs in India are found only in Lakshadweep.

Benefits of coral reef ecosystems

Food and Fisheries: They serve as nurseries for around a quarter of the ocean's fish, providing a key supply of nutrition. They also generate earnings for communities, national

and international fishing grounds, Around 15 tonnes of fish and other seafood may be harvested from reefs.

Medicinal Advances: Coral reefs may play a pivotal role to curing life-threatening disorders like heart disease, ulcers, leukaemia, lymphoma, and skin cancer. Furthermore, the specific skeletal composition of coral has been exploited to develop the most modern bone-grafting technologies.

Rich Minerals: Limestone is abundant on coral reefs, and it is frequently utilised as a cement alternative in the building sector.

Protection of Coastline: Reefs operate as natural barriers, shielding coastal cities, villages, harbours, and beaches from pounding ocean waves, prevent soil erosion, damage to property, and loss of human life. Barrier reefs also promote in the stabilisation of mangroves and seagrass beds, which may be uprooted quickly by strong waves and currents.

Filtration of water: The majority of corals and sponges is filter feeders, means they eat suspended fine particles in the water column. The near-shore waterways will benefit from improved quality and clarity as a function of that one.

Air Quality Maintenance: Corals produce new reefs by using dissolved carbon dioxide in the sea water. The carbon dioxide levels in the water are controlled by this gas conversion to limestone shell.

Recreation and Tourism Services: Scuba trips, fishing expeditions, resorts, hotels, and other businesses located near coral reefs provide millions of jobs and billions of dollars across the world. Through widespread tourism, coral reefs are frequently a backbone for coastal economies.

Threats to Coral Reefs

Coral reefs are vulnerable to a variety of natural and anthropogenic challenges because of their sensitivity.

Natural threats include:

Predation through the Crown: Snails couldn't eat the starfish because there are not enough of them. This resulted in an increase in starfish populations, which fed coral reefs. In India's Gulf of Mannar and Lakshadweep islands, the situation is particularly significant.

Natural Breakdown: Many fish feed dead or alive corals, altering their shape and making them more vulnerable to other physical and chemical hazards.

Anthropogenic Threats include:

Coral Mining: Corals are frequently collected and used to construct buildings and generate lime. In the 1980s, a cement business leased the mining of coral sands in the Gulf of Kutch. A million tonnes of coralline debris, including living corals, were taken away every year, destroying a substantial percentage of the reefs. According to Rajasuriya *et al.*, (2000) significant impact in the Gulf of Mannar, where 250 m³ of corals are mined every day.

Destructive Fishing Methods: Fishermen commonly use dynamite under water, which causes fish to be narcotized and shocked, causing them to come to the top to be collected. This activity has an effect on the variety of coral species in the Lakshadweep Islands, where tuna fishing is a key stream of income.

Boat Anchors: The chain is dragged across the corals when the anchor falls on them, or when the boat drifts. This has the capability to uproot corals by breaking their branches. When reef fishing, many fishermen anchor small vessels in shallow water.

Coral Collection: Beautiful black and white corals are picked for jewellery, while branching corals are commonly collected as mementos. Coral collection has severely harmed the Gulf of Kutch and the Andaman and Nicobar Islands.

Mangrove Destruction: When mangroves is destroyed on a wide scale, it has an indirect impact on the corals that live in their shadow. The ability of mangroves to bind mud helps them filter the quantity of silt that reaches the ocean floor and settles on corals.

Pollution: Oil and metal pollutants are extremely harmful to corals. Reefs in the Gulf of Kutch that are close to harbours are doomed from the beginning. Corals beneath water are suffocated by the muck and silt sinking. Thermal pollution has a negative impact on reefs as well.

Climate Change

Coral Bleaching: Coral bleaching may occur when sea temperatures rise. Corals can eject the algae (zooxanthellae) that live in inside tissues if the water is warm, causing the coral to bleach entirely white. According to Goldberg and Wilkinson (2004), 16% of the world's coral reefs have been lost.

Rising Sea Level: Glaciers melt as the world warms, causing sea levels to increase. Corals are expected to sink deeper down, absorb less sunlight, and develop more slowly as a result.

Stronger Storms: Stronger and more forceful waves are produced by these storms, which can damage coral branches and topple coral colony.

Ocean Acidification: The chemistry of the seas alters when CO₂ is absorbed, making it more acidic. Corals and other marine animals find it difficult to produce skeletons and shells. Corals as well as other reef animals' calcification processes already have begun to decline.

Status of Coral Reefs in India

Gulf of Mannar: In the Gulf of Mannar, over 3,600 species have been reported in the three primary habitats (coral reefs, mangroves, and sea grass beds). There are 117 hard coral species on the reefs, with *Acropora*, *Montipora*, and *Porites* being the most abundant. Sacred sharks, pearl oysters, sea turtles, dugongs, and dolphins are among the other resources in the region. *Gelidiella*, *Gracilaria*, *Sarconema*, *Sargassum*, *Hydrodathrus* and *Turbinaria* are the most common seaweeds. Many shallow water corals in the Gulf of Mannar were damaged by a bleaching in 1998, with coral reef cover decreased by 60-80% and just approximately 25% of live corals left. Branching *Acropora spp.* and *Pocillopora spp.* were the most impacted species. One year following the bleaching surveys conducted by the Zoological Survey of India found patchy coral rebuilding on the continental shore.

Andaman and Nicobar Islands: On the islands, there are 203 coral reef species, 120 algae species, 70 sponges' species, 200 fish species, 8 shark species, and spiny lobsters. More than 1200 fish species were identified in the Andaman and Nicobar Islands, including 571 reefs fish species recorded in recent random surveys. The islands are also home to dugongs, dolphins, and sea turtles. In comparison to other coral reef regions in India, the Andaman & Nicobar Islands were less affected by the bleaching phenomenon.

Lakshadweep Islands: Lakshadweep is home to just 95 hard coral species and 603 fish species (both reef-dwelling and oceanic). The 1998 bleaching events damaged most of the live coral reefs cover near Lakshadweep, with estimates ranging from 43 percent to 87 percent loss of live coral reefs. In Kadmat Island, the living coral cover has decreased to roughly 10%, although there have been no noticeable effects on fishery resources.

Gulf of Kutch: There are only 37 species of hard coral. Findings of coral bleaching in 1998 range from 70 percent live coral loss to far less impacts.

National Conservation and Management of Coral Reefs

The Department of Forests and Wildlife is in control and it is their obligation to monitor, manage, and maintain these coral reefs eco-systems. The Ministry of Environment and Forests has the authority to design a positive action plan for managing reef resources and provide recommendations for coral reef sustainability. In India's National Conservation

Strategy and Environment Action Plan (UNDP, 1997), the management of coral reef ecosystems is also supported. There are some legislation in the nation that can be activated for the protection of coral reefs areas such as in the the 'Environmental Protection Act (1986) and the 'National Protection Strategy and Policy Statement on Environmental Development (1992) both include coral reef conservation and Protected areas and some marine species are covered under the 'Wildlife Protection Act (1972). Corals are still being brought under the legislation, and more strict enforcement of protective measures is being supported. Some other policies which would have a direct effect on coral reef areas are indeed the Indian Forest Act (1927), the Forest Conservation Act (1980) and the Indian Fisheries Act (1896) that is of vintage origin. The 'Environmental Protection Act 1986' and the 'National Protection Strategy and Policy Statement on Environmental Development 1992' both include coral reef conservation. The 'Action Plan of the Ministry of Environment and Forests' designates this ministry as the focal point for the Indian Coral Reef Monitoring Network and the International Coral Reef Initiative, as well as the conservation and management of coral reef resources. The Coastal Regulation Zone (CRZ) Notification (1991) provides the only legal rights for all coral reefs in India, and the CRZ1 category includes all coral reef habitats. The Coastal Regulation Zone Notification (1991), issued by the federal government, controls onshore development activities that have an influence on coastal habitats and strictly restricts the collecting and trafficking of corals. For the islands of Andaman, Nicobar, and Lakshadweep, a specific category CRZ 4 has been created.

Marine Protected Areas in India

India has five marine protected areas: Gulf of Kutch Marine National Park (400km²); Gulf of Mannar Biosphere Reserve (10,500km²); Great Nicobar Biosphere Reserve (GNBR - 885km²); Wandoor Marine National Park in Andamans (282km²); and the Rani Jansi Marine National Park (RJMNP) in the Andaman Islands. In 1996, a marine protected area (Perumal Marine Park) was planned for Lakshadweep, but no proof of its declaration has been discovered. These protected areas are poorly managed, mainly those near the subcontinent, because human influences from resource usage, urbanisation, and rapid industrialization are significant. Corals reef in the Gulf of Kutch Marine Park have been neglected, with monitoring restricted to irregular EIA assessments related with development initiatives, and there are rising fears that portions of the park would be repealed for industrial development. Protected areas on the Andaman and Nicobar Islands, as well as those in Lakshadweep, are in better physical condition, but only because human effects are reduced. These MPAs are indeed vulnerable to crown-of-thorns starfish and bleaching, both of which are essentially uncontrollable at the regional management. In the Lakshadweep, Andaman, and Nicobar Islands, surveys are limited to a few easily accessible places. Fish surveys have not been included in monitoring programmes, and sampling in deeper locations is impossible due to a lack of skilled divers and scuba gear. Long-term monitoring requires a small number of trained and skilled workers, and there is little NGO or community support in reef management.

The ICRMN has launched Coral Reef Monitoring Action Plans (CRMAs) for all reef regions except the Gulf of Kutch, which were developed during the first phase of the GCRMN (1997-98). Government assistance has been provided to establish CRMAs and educate individuals to observe the reefs; nevertheless, operations are still in their early stages, and management and monitoring capability is still lacking.

Other important international coral reef programs in India include: India-Australia Training and Capacity Building (IATCB) programme; UNDP-GEF Projects on the Gulf of Mannar and Andaman and Nicobar Islands; The UK Department for International Development (DFID) supported the Integrated Coastal Zone Management Training Project

(ICZOMAT) (DFID) and the Coral Reef Degradation in the Indian Ocean project (CORDIO) (Rajasuriya et al., 2002).

References

1. Baswapoor, S., & Irfan, Z. B. (2018). *Current Status of Coral Reefs in India: Importance, Rising Threats and Policies for its Conservation and Management* (No. 2016-175).
2. D. O. D. and S. A. C. (1997), "Coral Reef Maps of India", *Department of Ocean Development and Space Application Centre*, Ahmedabad, India.
3. Goldberg, J., and C. Wilkinson (2004), "Global Threats to Coral Reefs: Coral Bleaching, Global Climate Change, Disease, Predator Plagues and Invasive Species", *Status of Coral Reefs of the World*, 67-92.
4. Ngoile, M. (1998), "Coral Reef Biodiversity Loss".
5. Rajasuriya, A., Zahir, H. U. S. S. E. I. N., Muley, E. V., Subramanian, B. R., Venkataraman, K., Wafar, M. V. M., Whittingham, E. M. M. A. (2002). Status of coral reefs in South Asia: Bangladesh, India, Maldives, Sri Lanka. In *Proceedings of the Ninth International Coral Reef Symposium, Bali, 23-27*, (Vol. 2, pp. 841-845).
6. Venkataraman, K. (2011), "Coral Reefs in India by National Biodiversity Authority", In eds. "*Encyclopaedia of Modern Coral Reefs: Structure, Form and Process*".