Article Id
AL04152

CORAL REEFS IN INDIA: THREATS, STATUS AND CONSERVATION

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Coral reefs are primitive and most diverse eco-systems on earth. Despite they occupy less than 1% of the sea floor; they are shelter to more than 25% of all recorded marine species. There are about 4000 varieties of fish, 700 species of coral, and thousands of other fauna and flora in the reef ecosystem, all of which contribute an unique and crucial function. 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 states of coral reefs, as well as the rising threats to them, are important concerns. Ngoile, (1998) reported that coral reefs cover a worldwide area of 6,00,000 km^2 (about the same as France), from which 60,000 km^2 have been destroyed and 1,80,000 km^2 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. The aim

is to shed light on the growing exploitation of corals, to comprehend their significance and to examine government policies aimed at their protection and management. Presents an overview of the worldwide policy framework on coral reefs, as well as a comparison of these policies with those in India.

Coral Reef in India

India has roughly 8129 sq. km 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 utilized 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.

Pounding by Waves: Violent waves and storms have the greatest impact on corals living in shallow seas. Corals can be killed, especially during hurricanes.

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 m^3 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 are 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.

Ozone Layer Depletion: Coral reefs have such a naturally sunlight to defend themselves from UV light, at increased levels which can harm corals in shallow seas at high rates.

National Initiate ior Coral Reef Conservation

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 '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.

These protected areas are poorly managed, mainly those near the subcontinent, because human influences from resource usage, urbanization, 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 (CRMAPs) 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 CRMAPs 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).

Conclusions

Human factors involved with expanding populations and coastal erosion, particularly unregulated exploitation of resources, coral mining, and the consequences of sediment and pollutants, continue to harm coral reefs. Natural factors such as the crown-of-thorns starfish and climate change-related effects such as coral bleaching and storms have a role in coral reef deterioration. The GCRMN Network for India, the Maldives, and Sri Lanka has strengthened the ability to monitor reef resources through training initiatives. India has made significant progress in biophysical monitoring, especially to continuing training funded by the ICRMN. However, there is currently a shortage of capability for periodic socioeconomic monitoring of reef resources, and monitoring data is only used infrequently in management. Strengthen the

ICRMN's function and authority to operate as the key coordination organization for coral reef policies and programmes, to improve cooperation between government agencies, institutions, and local organizations, and to assist in the execution of Management Action Plans; Enhance monitoring operations and improve ability to monitor reefs. To better understand the ideas of development and preservation use of coral reef resources, promote awareness and training development at all levels. The GCRMN Node and the CORDIO initiative are providing support for additional training in socioeconomic monitoring as well as demonstrative monitoring projects. The GCRMN Node is also developing national coral reef databases to make it easier to apply socioeconomic and biophysical data to management.

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