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Marine Biodiversity and Its Conservation

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India, with its rich biodiversity and associated traditional knowledge is considered as a megadiverse country. The country has a tradition of conservation and sustainable use of its natural resources. With a coastline of over 8000 km and Exclusive Economic Zone of 2.02 million sq.km, India has the responsibility to optimally exploit, develop and conserve the marine living resources up to 200 nautical miles from the coastline. It has been estimated that the Indian Ocean constituting 29% of the global oceans, accounts for 30% of the coral reefs of the world, 10% of mangroves, 13% of the marine organic carbon synthesis, 10% of capture fisheries and 90% of culture fisheries. India has 246 estuaries besides coastal lagoons and backwaters. The wide range of coastal ecosystems of the country is characterized by unique biotic and abiotic properties and processes. Study of the bio-resources of India was initiated two to three centuries ago, as surveys and expeditions, mainly by the westerners. This was followed by the setting up of several Central and State-owned institutions and universities which, along with non-government agencies, involved themselves in research on marine bio-resources. As a result, India is today one among the few Asian countries with a long record of inventorisation of marine biodiversity.

Even though the importance of biodiversity is widely known, the necessity for protecting the bioresources is genuinely accepted and conservation efforts are being taken up, continued decline in the case of several species worldwide, is being reported. Many species have already been wiped out of the face of the earth and several others are on the brink of becoming extinct. Of an estimated 30 million species on the earth, our knowledge of their diversity is limited to a catalogued 1.4 million with nearly 20% in the oceans (Devaraj, 1996). Biodiversity emerged as an environmental issue in the early 1980s. The International Convention on Biodiversity Conservation held at Rio de Janeiro in 1992 highlights our ethical obligation to strive for a sustainable development that meets the needs of the present without compromising the ability of the future generation, to meet their own needs. Biodiversity now has become a frame work for examining the whole range of questions raised by human relationship with other species and the natural environment, involving both ecological and social systems. Human beliefs and attitudes, science and technology are all key players in biodiversity conservation.

Biological resources

India today, ranks among the 12 mega-biodiversity countries and 25 hotspots of the richest and highly endangered eco-regions of the world. Venkataraman and Wafar (2005) made an attempt to summarise the coastal and marine biodiversity of the Indian seas and their various ecosystems from the literature available, museum records and other sources of information and suggested that the number of species known could be more than 13,000 though the inventory is very weak when it comes to the minor phyla and microbial organisms. A thorough inventorisation of all the major and minor resources in our waters, covering different kinds of ecosystems, remote islands and small estuaries and lagoons is yet to be attempted. Over 200 species of diatoms, 90 dinoflagellates, 844 algae, 14 seagrasses and 39 mangrove species have been reported from our waters. The marine algae include Rhodophyta, Chlorophyta, Phaeophyta and Xanthophyta. Tamil Nadu has the maximum number of species of seaweeds followed by Gujarat and Maharashtra. A number of products such as agar, alginates, carrageenan, liquid fertilizers and bio-active compounds are produced from seaweeds. Foraminiferans (> 500 species), sponges (> 480 species), coelenterates (> 840 species), polychaetes (>

250 species) and echinoderms (> 765 species) have been studied by several researchers. Crustaceans form one of the biggest groups including both commercially important and lesser known organisms. Commercially important groups such as molluscs (> 3370 species) and fishes (>2546 species) are more or less well documented.

Among the reptiles, sea turtles have assumed a lot of importance due to their peculiar breeding habits and the world famous nesting grounds. Of the 5 species of turtles reported from India, the leatherback sea turtle is a very rare species. Twenty five species of marine mammals belonging to the orders Cetacea and Sirenia are reported from Indian waters. Different aspects of the faunal diversity in India have been studied by Chandramohan (1997), Rao (1998), Thomas (1998), Venkataraman and Krishnamoorthy (1998), James (2000), Rajagopalan and Menon (2003), Venkataraman *et al.* (2003), Kaliaperumal and Kalimuthu (2004), Keesing and Irving (2005), Mohan Joseph *et al.* (2008) and others.

It is heartening to notice that species new to science are getting reported almost everyday, as a result of awareness created, among the researchers and the general public, of the dimension of our bioresources. The cause of protection and conservation of important ecosystems, both terrestrial and aquatic, is being taken up by both the government and non-government organizations. The importance of biodiversity is now recognized world over. Incredible new forms of life have recently been reported around super-hot (>100^0 C) seafloor vents as well as from under 700 m of Antarctic ice. Life abounds in total darkness, under tremendous pressure and with wild extremes of temperature. Organisms reported from the periphery of the hydrothermal vents somehow survive the extreme concentrations of heavy metals from the vent fluids. Even though the first hydrothermal vent was found only 30 years ago, more than 100 are already known. Species are different from each other in different ocean basins and chances for finding new species, especially bacteria, are immense.

Marine habitat conservation in India

A number of laws have been promulgated by the Government of India for the conservation of living organisms both in the terrestrial and marine habitats. Intensive surveys have been taken up along the Indian coast by different agencies for identifying areas to be declared as protected marine parks. The first National Marine Park came into existence in the Gulf of Kutch in 1980. The Wild Life Protection Act of India (1972) provides legal protection to many marine animals. Chapter IV of this Act dealing with sanctuaries, national parks, game reserves and closed areas is applicable to Marine reserves and biospheres also. A National Committee on mangroves, wetlands and coral reefs was constituted in 1993 with a mandate to advise the government on relevant policies and programmes. The mangrove and coral reef areas were declared as ecologically sensitive areas under the Environment Protection Act, 1986. The Coastal Regulation zone (CRZ) notification came in 1991 prohibiting developmental activities and disposal of wastes in the fragile coastal ecosystems. Some of the national parks and sanctuaries in India were declared exclusively as marine protected areas in the 1980s and 1990s. There are a total of 31 major marine protected areas in India. They cover coastal wetlands, especially mangroves, coral reefs and lagoons and have been notified under Wildlife Protection Act, 1972. The three notified Biosphere Reserves in India are the Sundarban Biosphere Reserve, Great Nicobar Biosphere Reserve and the Gulf of Mannar Biosphere Reserve. IUCN has defined a Marine Protected Area as 'any area of intertidal or subtidal terrain, together with its overlaying water and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect part or all of the enclosed environment'.

The country took one more step ahead with the promulgation of the Biological Diversity Act of India 2002 and the Biological Diversity Rules 2004. A National Biodiversity Authority with state-level

Boards and district-level Management Committees was established under this Act. The main functions of the Authority is to advise the government on matters related to the protection and conservation of biodiversity, sustainable use and equitable sharing of its components, Intellectual Property Rights, etc.

Natural threats and human impacts

The loss to marine biodiversity can be attributed to natural causes such as global warming and calamities. Anthropogenic activities which cause biodiversity loss include habitat destruction and fragmentation, invasion of introduced species, over-exploitation of living resources, pollution, tourism and modern agricultural/forestry practices. Today, the threats to biodiversity are the unsustainably high rate of human population growth and consumption of natural resources, the steadily narrowing selection of traded products from agriculture, forestry and fisheries, economic systems that fail to value economic resources, inequity in ownership, deficiencies in knowledge and application and legal and institutional systems that promote unsustainable exploitation.

Conservation of biodiversity in India can be achieved by taking concrete and effective steps to minimize the harmful effects of environmental impacts and to totally avoid all kinds of destruction from anthropogenic activities. Guidelines and programmes should be formulated for revitalizing the inventory in order to manage and conserve the bioresources in a sustainable manner, restoration of degraded habitats, establishment and management of Marine Protected Areas, ecosystem based fisheries management, implementing fishery management advisories and policy measures and economic evaluation of biological resources.

Conclusion

The biodiversity is so vast that we have not yet succeeded in fully exploring the same. In the meanwhile, unfavourable environmental parameters and harmful anthropogenic activities have already wiped out quite a few species from the face of the earth. In fact we may lose a number of species even before we realize that they ever existed on our planet. This underlines the urgency and importance of research, management and conservation of biodiversity. Hence, recognition of the fragile ecosystems and the precious living organisms they protect, understanding the problems and their underlying causes and rising to the occasion with proper and powerful management strategies should be considered as the need of the hour.

References

Chandramohan, D. (1997) Recent advances in marine microbiology: The Indian scenario. J. Mar. Biotech., 5 (2): 73-78.

Devaraj, M. (1996) Coastal biodiversity – Conservation and sustainable management. In: Menon, N.G. and Pillai, C.S.G. (eds.) Marine Biodiversity Conservation and Management. Cent. Mar. Fish. Res. Inst., Cochin, pp.177-192.

James, D.B. (2000) Sea cucumbers. In: Pillai V.N. and Menon N.G. (eds.) Marine Fisheries Research and Management, CMFRI, Kochi, India: 124-151.

Kaliaperumal, N. and S. Kalimuthu (2004) Commercial exploitation of seaweeds in India. Souvenir National Symposium and Exposition, p 34-38.

Keesing, J. and T. Irving, (2005) Coastal biodiversity in the Indian Ocean: the known, the unknown and the unknowable. Indian J. Mar. Sci., 34 (1): 11-26.

Mohan Joseph M., Manisseri, M.K. and Rani Mary George (2008) Marine bioresources and their conservation in India. In: Natarajan *et al.* (eds.) Glimpses of Aquatic Biodiversity. Rajiv Gandhi Chair (CUSAT) Spl. Pub., 7: 1-9.

Rajagopalan, M. and N.G.Menon (2003) Marine turtles and mammals. In: Joseph M.Mohan and A.A.Jayaprakash (eds.). Status of exploited marine fishery resources of India. CMFRI, Kochi: 240-245.

Rao, S.N.V. (1998) Mollusca. In: Faunal Diversity in India. Zool. Surv. India: 104-117.

Thomas, P.A. (1998) Porifera. In: Alfred J.R.B., Sanyal A.K. and Das A.K. (eds.) Faunal Diversity of India, Zool. Surv. India, Kolkata: 27-36.

Venkataraman, K. and P. Krishnamoorthy (1998) Crustacea. In: Alfred, J.R.B. , A.K.Sanyal and A.K.Das (eds.). Faunal Diversity in India, Zool. Surv. India, Kolkata, p133-134.

Venkataraman K., Sathyanarayana Ch., Alfred J.R.B. and Wolstenholme, J. (2003) Handbook on hard corals of India. Zool. Surv. India, Kolkata: 266.

Venkataraman K. and M. Wafar (2005) Coastal and marine biodiversity of India. J. Mar. Sci., 34 (1): 57-75.