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**Status
of Coastal
and Marine
Protected Areas
in Gujarat**

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Summary

Gujarat's coastline supports a large human population that is dependent on the rich coastal and marine resources and ecosystem services, which play a significant role in economic growth. These resources provides significant benefits to the coastal communities in terms of fisheries and tourism and supports their livelihoods. Gujarat has a 1600 km long coastline, which is the longest of any state in India. In the coastal zone is the most significant area in terms of marine biodiversity, the Gulf of Kachchh. The Gulf of Kachchh situated on the west coast of Gujarat. Its marine wealth and diversity include large mangrove areas, unique coral itats, a breeding population of the Whale Shark and the rare Dugong. The Gulf of Kachchh is also known as the 'Gulf of Rich' due to the economic activities in this region. The ever-growing industrialization in this coastal region is believed to be a major threat to sensitive marine ecosystems. Further, ecosystem degradation and destruction are taking place due to conversion of habitats to other forms of land use, overexploitation of species and associated destructive harvesting practices, the spread of invasive alien species and the impacts of agricultural, domestic and industrial sewage and waste. Moreover, the mushrooming of ports and harbours all along the coast is also threatening the coastal biodiversity of the state. Additionally, climate change is likely to have a growing impact on the coastal and marine ecosystems, including an increase in extreme weather events, a sea level rise, warming of sea surface temperatures and ocean acidification. Marine protected areas are used by the State Government of Gujarat as a tool to minimize these threats to the biodiversity. There are three marine protected areas in this state, covering an area of about 460 km². Further, the state government has declared about 1324 km² of the coastal area as mangrove forests and 460 km² as coral reefs. These two habitats have also been getting protection as per the Coastal Regulation Zone (CRZ) Notification.

Keywords : *Gujarat; Gulf of Kachchh; Marine National Park; Khijadia Bird Sanctuary; protected areas; conservation.*

Introduction

The coastal ecosystems are an important component of the global life system. Their biological productivity is very high throughout the world ocean. They store and cycle nutrients, filter pollutants and help protect shorelines from erosion and storms. Marine ecosystems also play a vital role in regulating climate as they are a major carbon sink and oxygen source. Environmental resources are also a critical part of the livelihoods of large populations. Therefore, a threat to these resources, due to environmental changes, also threatens people's security. The coastal zone of the world is under increasing stress due to development of industries, trade and commerce, tourism, human population growth and migration and deteriorating water quality. Industrial development along the coast has also resulted in degradation of coastal ecosystems and diminishing living resources. More than half the population of the world lives within 60 km of the coast, and this proportion is projected to rise to almost three quarters by 2020 (Anon 2002).

India has large coastal wetlands that extend over 40,230 km². Among the various types of coastal and marine ecosystems, tidal mudflats, mangroves, estuaries, lagoons, beaches, marshes and vegetated wetlands and coral reefs are the most extensive. A total of 97 estuaries, 34 lagoons, 31 mangrove areas and 5 coral reef areas have been mapped and identified in India for conservation and sustainable use (Singh 2003). These ecosystems are situated in nine coastal states and four union territories. The total extent of these ecosystems in Gujarat, including the Rann of Kachchh, is about 25,083 km² (62.3%), which is the highest among all the states in the country (Singh 2003).

Marine Protected Areas of Gujarat

Gujarat has a coastline of length 1650 km, which is the greatest among all the maritime states of India. Its continental shelf occupies an area of 1,65,000 km², and the exclusive economic zone (EEZ) has an area of 2,00,000 km² (9.9% of India's EEZ) (Anon 2000). Gujarat's coast is distinct from the other coasts of the country. It is shallow, the continental shelf is



wider and there are vast stretches of saline and tidal mudflats. While the area of the continental shelf up to a depth of 50 m is 64,810 km², the extent between depths of 50 and 200 m is 99,373 km². The coast is bordered by the Arabian Sea and the gulfs of Khambhat and Kachchh. The Gulf of Kachchh is aligned in an east-west direction, has and its depth is less than 20 m at the head, going up to about 60 m at the mouth (Nair et al 1982). The Gulf of Khambhat is aligned in a north-south direction, and the depth ranges from 5 to 27 m. The continental shelf off the west coast of Saurashtra slopes very gently to a depth of 60 m, over a distance of 350 km.

Table 1 : List of Marine Protected Areas in Gujarat

Sl. No.	Name	Categories	IUCN Categories	Area (km ²)	Year of establishment
1	Marine (Gulf of Kachchh)	National Park	II	162.89	1982
2	Khijadia	Sanctuary	IV	6.05	1981
3	Marine (Gulf of Kachchh)	Sanctuary	IV	295.03	1980

The coastline exhibits a wide diversity of geo-morphological features including mudflats, sandy beaches, coral reefs, rocky cliffs, estuaries and offshore islands. Gujarat has the greatest area under marine influence (coastal wetlands), was and this area is estimated to be between 25,100 and 28,500 km². This makes Gujarat unique among the states of India, being 62.3% of the area of all the coastal wetlands of the country (Garg et al 1998; Singh 2002). The beaches of Gasabara and Madhavpur are important Olive Ridley and Green Sea Turtle nesting sites. The intertidal mudflats extend from 3 to 3.5 km between the Mundra and Kandla areas of the Gulf of Kachchh. and Khambhat and Wadgham in the Gulf of Khambhat. The mudflat area in the Gulf of Kachchh and Gulf of Khambhat is about 2176 km² and 2588 km², respectively. The area of the mudflats is about 73% of the total area of coastal wetlands in Gujarat.

The Sabarmati, Narmada, Mahi and Tapi are the four major river systems that form an estuarine environment at their mouths. All these lie within the Gulf of Khambhat, and their course in south Gujarat is shaped by the muddy substratum. The Gulf of Kachchh is the only area in Gujarat where corals exist. Satellite imagery indicates that the total reef area of the Gulf of Kachchh was 217 km² in 1975 and that the extent has fluctuated since then. Bahuguna and Nayak (1998) accounted for the differences in coral cover and the distribution pattern in the Marine National Park (MNP) during a 15 year period, from 1987 to 1991. There are 34 islands in the gulf, out of a total of 42 in the MNP. Those close to Jamnagar were reported to support coral and coral reefs (ICMAM 2000), their age varying from 5240 to 45,000 years (Gupta 1972). Gujarat tops the list of the nine littoral states of India, accounting for 23.1% and 32.5% of the national marine fish production and exports, respectively (GES 2000). Marine fish production reached a maximum of 7,43,638 Metric Tonne in 2002-2003 (SOE 2005).

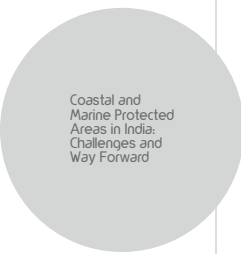
Gulf of Kachchh Marine National Park

The Gulf of Kachchh (22°15' to 23° 40' N, 68° 20' to 70° 40' E) is a wedge-like extension of the Arabian Sea that penetrates into the landmass of Saurashtra and Kachchh. The depth of the gulf ranges from less than 20 m (at the head) to 60 m at the central axis (Anon 2002). The Gulf of Kachchh is the only area in Gujarat that has coral reefs and mangrove vegetation with creeks and alluvial marshy tidal flats deep inland. This is an area of negative water balance because there is no continuous water runoff and rainfall is also scanty (Anon 1997). To provide total protection under legal authority, 42 islands in the southern part of the Gulf of Kachchh and the intertidal zone along the coast, from Jodiya, in the east, to Okha, in the west, were notified as the MNP. Both the MNP and Marine Sanctuary are now under one umbrella as a single ecological entity or marine protected area (MPA) for effective management.

Of the 42 islands in the MNP, 33 have coral reefs and 20 have mangroves around them (Anon 2002). Establishment of the MNP was considered as a pioneering effort towards protection of coastal and marine biodiversity of the region, but there is criticism is that the notification of the MNP and Marine Sanctuary was without any scientific background studies and purely based on anticipated threat perception. The Little and Great Ranns of Kachchh and the Gulf of Khambhat were also be considered areas of ecological importance, but none of them has the status of an MPA.

Khijadia Bird Sanctuary

Khijadia Bird Sanctuary, located near Jamnagar, was declared a sanctuary in 1982. It has an amazingly large number of resident and migratory birds in a relatively small area, particularly during winter, and it spreads over an area of 6.05 km². The sanctuary and the adjoining areas support a remarkable diversity of habitats and ecosystems including marine habitats, freshwater habitats, marshy lands, mangroves, salt pans, open mudflats, intertidal mudflats, creeks, scrub,



sandy beaches and adjoining farmlands. The adjoining area falls within the Marine Sanctuary, and therefore the entire Khijadia area forms an excellent and unique eco-system, the like of which is found nowhere else in India. It has a distinct assemblage of fresh and saline wetlands, providing a variety of microhabitats for water birds. The Khijadia lakes are formed by reclamation bunds that were built during the period of the erstwhile Saurashtra state. After independence, these bunds were repaired and strengthened to prevent the ingress of salt (Anon 2010).

Potential Threats

Gujarat is considered to be one of the most polluted states of India. Industrialization and consequent urbanization have brought environmental degradation inland and exerted pressures on coastal biodiversity too. Gujarat ranks second in industrial development among the Indian states. Industrial developments, its related urbanization, land reclamation, effluent discharge and spills, salt pans, mining-dredging, cattle grazing, natural catastrophes, etc. are the factors that generally threaten coastal ecosystems. All anthropogenic activities either destroy the environment directly or degrade ecosystems by simply adding pollutants into them.

Historical information shows that there were 84 ports in Gujarat during the medieval period and that there were about 62 ports in Saurashtra alone as late as 1842 (Thakker et al 2007). At present, Gujarat has the highest number of ports in the country: there are about 41 ports-29 minor ports, 11 intermediate one and 1 major port. Future cargo handling in Gujarat has been overlooked to be about 25% of the country's total, and the port traffic is expected to grow up in near future. Coastal pollution through the industries emerges mainly from the existing industrial estates located around or near the coast. According to Gujarat Pollution Control Board (GPCB), out of nine industrial estates that have been developed in the coastal zone of Gujarat, five are chemical industrial estates. Effluents and wastewater from these industrial estates enter the sea directly or in other ways. Thus in general the water quality is impaired along the coast. Sengupta and Deshmukhe (2000) estimated that the coastal waters of Gujarat receive 215 million m³ of industrial effluents annually.

Gujarat is emerging as the country's capital of Special Economic Zones (SEZs) in terms of size and number. An interesting thing is that the Government of Gujarat passed the state's SEZ Act-2004 before the Government of India cleared SEZ Act-2005, in May 2005. As several industries are proposed to be established in the SEZs, this may have a major impact on the larger productive areas such as agricultural land or forests and so many mangrove areas will also be denuded.

Conservation Measures

In India, Gujarat has taken the lead in the afforestation of mangroves, which is remarkable. The target in the state is higher than the total mangrove afforestation in the rest of the states of India. An area of 37,100 ha of intertidal mudflats has been afforested till 2005 (Singh 2006). According to the forest department, about 46,351 ha was planted with mangroves under different plantation schemes. The Forest Survey of India reported a gain of about 1200 ha of mangrove cover in the state with respect to its 2009 assessment (FSI 2011).

The coral fauna is less diverse compared with other parts of India. According to a taxonomic study conducted at 15 locations, there are 40 species of coral in the Gulf of Kachchh (GEC 1997). Reef-forming corals such as *Acropora*, *Pocillopora*, *Stylopora* and *Seriatopora* are not found at present, though semi-fossilized specimens of *Acropora* are found on some beaches in moderate densities (Pillai 1996). Currently, preventive measures have been taken in the mnp by the Zoological Survey of India, Jamnagar under the Integrated Coastal Zone Management Program, funded by the World Bank. These have resulted in restoration of the area under reefs significantly.

A Way Forward

The Porbandar coast of Gujarat is a well known nesting site for the Green and Olive Ridley marine turtles. Because of this, the Gujarat Forest Department has set up the Madhavpur Turtle Hatchery, which has been functional for over a decade. However, the offshore waters of the Porbandar coast have global significance now because of Whale Sharks. There is a joint project of the Gujarat Forest Department, Tata Chemicals Limited and Wildlife Trust of India, with the activities involving scientific studies of Whale Sharks through photo-identification, genetic analysis and satellite tagging to generate baseline data on the species to aid its long-term conservation in India (WTI 2008).

Under the recently established Indo-German Biodiversity Programme, the Wildlife Institute of India is recommending the Gujarat Government and MoEF, GOI to consider establishing the Porbandar Marine Conservation Reserve. Eco-compatible marine fisheries and other activities in the marine turtle nesting beaches of Porbandar can be regulated if the conservation reserve is established. The exact area of the proposed Porbandar Marine Conservation Reserve needs to be determined once an in-principle acceptance of its feasibility is established.

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