

Current Status of Mangroves in Gujarat: A Review

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Abstract: In this paper we have tried to understand the status of diversity of mangroves in south Gujarat viz. Gulf of Cambay, Porbandar, Gujarat Marine National Parks Society (MNPS) and Kachchh. There is a need to study and monitor the potential threats to these sensitive ecosystems. The continuous infrastructure development in the coastal regions and other human activities should be monitored continuously. The potential mangrove area mapping has been done by many workers. There is a continuous need to study the increase or decrease in the mangrove cover along the coast of Gujarat. We have enlisted the potential natural as well as anthropogenic threats to the mangrove ecosystems in the state. We have also covered the status of inland mangroves of Shraavan Kavadia, Kachchh in this paper.

Keywords: Mangroves, Kharai Camel, Gulf of Kachchh, Gulf of Khambhat, Avicennia Marina, Olpad

1. Introduction

Mangroves are woody shrubs, palms, herbs, ferns, or tree plants that are extensively found in tropical and sub-tropical latitudes that grow at the interface between the land and the sea. (Primavera *et al.* 2004) Mangroves are vital ecosystem that provide ecological, economic, and social benefits to the human beings and environment. As per the recent data about the coverage of mangroves from Mangrove Alliance Report 2024, the global mangrove area is approximately 147, 256 km². (Spalding, 2024) It is estimated that mangroves are spread over 118 countries globally. Approximately 75% of the global mangroves are found in 15 countries with Asia having the highest cover at 42% followed by Africa at 21%. (Spalding, 2024)

According to Indian State of Forest Report 2023 the total mangrove area in the country is about 4, 991.68 km². (India state of forest report, 2023) The major cover of Mangroves in India is Sundarbans in West Bengal which is about 42.45% followed by Gujarat that is 23.66%. The other state and union territories are A&N Islands, Andhra Pradesh, Maharashtra, Odisha, Tamil Nadu, Goa, Karnataka, Kerala, Daman & Diu and Puducherry.

The state of Gujarat holds the second largest position in the country for mangrove cover which is 1177 sq. km. (PCCF & HoFF, 2016 Government of Gujarat) The mangrove cover of the state is distributed over four regions, Kachchh, Gulf of Kachchh & Saurashtra and South Gujarat (including Gulf of Khambhat - Dumas Ubharat areas). However, the mangrove cover is distributed unevenly over these four regions and Kachchh has the highest mangrove cover (71.5%) of the State. Further, Gulf of Kachchh, Saurashtra and South Gujarat (including areas of Gulf of Khambhat and Dumas - Ubharat) have 15.6%, 0.3% and 12.6% of the total mangrove cover of the State respectively. (PCCF & HoFF, 2016 Government of Gujarat)

2. Species diversity of Mangroves in Gujarat

Total 15 species of mangroves are found in Gujarat (Naik & Dhabe, 2018). 90% of mangrove area is covered by single species which is Avicennia Marina (Pandey and Pandey, 2013). Other species are Avicennia officinalis, Avicennia alba, Acanthus ilicifolius, Aegiceras corniculatum, Bruguiera cylindrica, Bruguiera gymnorhiza, Ceriops tagal, Ceriops decandra, Excoecaria agallocha, Kandelia candel, Lumnizera racemosa, Rhizophora mucronata, Rhizophora apiculata, Sonneratia apetala (Devi & Pathak, 2016).

The study found that total eight true species of mangroves has been recorded in the area of Gulf of Kachchh with Avicennia Marina being the dominant one (ICMAM 2004; GEC and BISAG 2008). Some other species are Avicennia officinalis, Avicennia alba, Bruguiera cylindrica, Rhizophora mucronata, Aegiceras corniculatum, Ceriops tagal, and Ceriops decandra (Mudita Zankat *et al.*, 2025).

Gulf of Khambhat has four districts of mangrove cover which are Bharuch, Navsari, Surat and Bhavnagar. The study conducted by Bhatt *et al.*, (2011) founded fourteen species of mangroves namely Avicennia marina (Forsk.) Vierh, A. officinalis L., A. alba BL., Bruguiera cylindrica (L.) BL., B. gymnorhiza (L.) Savigny, Ceriops tagal (Perr.) Robinson, C. decandra (Griff.) Ding Hou, Rhizophora mucronata Lamk., Aegiceras corniculatum (L.) Blanco, Excoecaria agallocha L., sonneratia apetala Buch. Ham., Kandelia candel (L.) Druce, Acanthus ilicifolius L., Lumnizera racemosa Wild.

The Purna Estuary in South Gujarat recorded seven different mangrove species, including Avicennia marina, Sonneratia apetala, Acanthus ilicifolius, Rhizophora mucronata, Ceriops tagal, Bruguiera cylindrica, and Aegiceras corniculatum (Bhatt *et al.*, 2009).

3. Natural Threats to Mangroves in Gujarat

The Kharai Camel found in the Kachchh district of Gujarat also known as swimming camel, can swim up to three kilometers in sea water to reach mangroves (Ohte *et al.*, 2025). The study conducted by Ohte *et al.*, (2025) concludes that traditional grazing practices by Kharai camels do not harm mangrove ecosystems. Instead, they support sustainable mangrove growth and coexistence. Grazing also facilitates the requirements of young saplings, promoting healthier mangrove growth. On the other hand, Keshta *et al.* (2020a) said that camel grazing can negatively impact both sediment properties and mangrove population growth because of trampling.

The research conducted by Ohte *et al.*, (2025) shows that rising sea level and saltwater intrusion leads to the displacement of mangroves. Also, the 1999 cyclone caused significant decline in mangrove areas.

4. Anthropogenic Threats

Mangrove ecosystem experiences an annual loss of 0.16% to 0.39%, with South Asia witnessing a 0.18% yearly loss (Hamilton & Casey, 2016; Richards & Friess, 2016). Key drivers of mangrove loss include aquaculture, agriculture, urban development, overexploitation and pollution (Friess *et al.*, 2019). The study conducted by Patel Bhavik and Vachrajani Kauresh (2013) had found that heavy metals like Cu, Zn, Cr, Ni, Pb, Hg, Cd, Co and Mn were recorded from water and soil sample of mangrove ecosystem of Mahi and Dadar river estuaries. He had also recorded heavy metals from root, stem and leaves of *Avicennia marina* as well as from samples of crab tissue.

Research presented by Goldberg *et al.*, (2020) shows that globally 62% of mangrove areas losses is due to conversion to aquaculture and agriculture between 2000 and 2016.

When mangrove areas are converted into aquaculture, it causes significant changes to hydrodynamic regimes. These changes occur because of alterations to the landscape caused by land use changes, such as clearing mangroves, constructing aquaculture facilities, or modifying coastal terrain. Such shifts in hydrodynamics can impact sedimentation, water quality, and the overall health of the mangrove ecosystem (Ronnback, 2002). The study conducted on the impacts of aquaculture on mangrove ecosystem in Olpad taluka in Surat district found that over 151.258 hectares of mangrove area were converted into aquaculture ponds between 2007 and 2013, as revealed by geospatial analysis using LISS III and IV satellite images. the soil organic carbon (SOC) content in aquaculture regions was found to be 1.59 to 2.83 t/ha, which is significantly lower compared to the mangrove areas with an average of 6.05 t/ha (Bhavsar *et al.*, 2013).

Mangroves are heavily disturbed in recent years due to industrial development that include expanding factories, salt pans, sea ports and docks. As a result, mortality of mangroves increased and natural mangrove regeneration decreased significantly (Saravanakumar *et al.* 2009).

5. Water quality in the Mangroves

Here, Tuteja, D. *et al.* (2023) elaborates that, based on the analysis results, it appears that the water Sample contains excessive amounts of phosphate and heavy metals, including Fe, Mn, and Zn, which are beyond the acceptable range. The highest concentration of heavy metals was found at Kantiyajal, while the lowest was detected at Tadatalav, followed by Vadgam. He further adds that, the water quality in the Gulf of Cambay's Mangrove ecosystems is degrading. He also explains about the bioaccumulation of high level of heavy metals present in the water and sediments and the threat of biomagnification in the grazing animals and cattle that consume these contaminated plants.

The study conducted by Maurya *et al.*, (2022) shows that current status of mangroves is studied and analysed in ISFR Report 2019 (Forest Survey of India, India State of Forest Report 2019) for the Gulf of Khambhat area which shows 5.23 sq. m. decrement in mangrove covers while the mangrove cover in the Gulf of Kachcha region is increased by 45 sq. m. Further adds that LULC mapping of Bharuch district validates the same.

6. Mangroves Restoration Initiatives in Gujarat

Gujarat is predicted to have 258 to 1153 sq. km of mangrove regeneration potential scattered across the shores of ten districts (Upadhyay *et al.*, 2015). Gujarat Biodiversity Board in 2012 published a report stating that in 1970's Gujarat's mangrove cover got depleted to its lowest levels. Gujarat Ecology Commission and State Forest Department implemented mangrove restoration programs during 2002 - 2007 with financial support from India Canada Environment Facility (ICEF). From 1983 - 84 to 2007 - 08, the Gujarat Forest Department (GFD) planted approximately 50, 000 ha of mangroves in coastal areas and islands of the state (Pandey and Pandey, 2011)

7. Monoculture Threats

Singh, 2012 has published a paper stating that the Gujarat Forest department began small scale afforestation of mangroves in 1983 with the planting of *Avicennia marina*, which was later scaled up to cover massive area in the intertidal mudflats. Here, Bhatt *et al.*, (2009) says about Purna Estuary in south Gujarat shows the dominance of *Avicennia Marina*. The Diu Island in the natural habitat dominated by *Avicennia Marina* mangrove species in the southeast coast of Saurashtra in Gujarat state of India (Patale & Tank, 2022)

Maurya *et al.*, (2022) in research found that the *Avicennia marina* is a dominant species found in the coastal area of the Gulf of Khambhat., Gujarat. The other mangrove species found in the study area is *Rhizophora mucronata* is either present in a very low number or disappeared from that site

8. Status of Mangroves in Gujarat

Mangroves and coral reefs of MNP&S have faced considerable damage due to anthropogenic as well as natural causes. Kumar *et al.*, (2017). He further says that however, in addition to focusing on monospecific plantation of *Avicennia* (which of course has proved very successful), attempts should also be made to grow other mangrove species such as *Rhizophora*, *Sonneratia*, *Bruguiera*, *Ceriops* etc. It was noticed during the study that the mangroves present in Porbandar are at threat due to negligence of the authorities. The authorities are not aware about the CRZ laws or are knowingly dumping the construction waste in the mangroves. The photo - plate - 1, 2, 3 and photo - plate - 4 gives the idea about the exact condition of mangroves in Porbandar.

Rapid Urbanisation and boat construction activities are the culprits for mangrove ecosystem degradation. The Gulf of Cambay has the presence of Clusters of chemical factories. The malpractices in terms affluent discharge in the estuaries and the illegal aquaculture ponds constructed inside the mangroves in Olpad - Dandi near Surat is a case study for conservationists and authorities.

The epidemic degradation of unique inland mangrove “Shravan Kavadiya” might be due to the ignorance of its ecological importance, natural attack of wood borer and other natural factors. Pandey & Mahato, (2019). The definition given by Pandey & Mahato, (2019). explains that due to changing weather and inclement conditions there are a few mangroves which get either low or no direct connection to the sea water and hence they are called as Inland mangroves

9. Conclusion & Probable Future Threats to Mangroves in Gujarat:

After reviewing about the mangrove ecosystems of Gujarat we believe that the large infrastructural future projects like “Kalpsar” might alter the natural salinity levels in the Gulf of Cambay area resulting to devastation of brackish water ecosystems present in the gulf. The Kutch mangroves are at threat because of illegal Saltpans, dredging near ports, and the industries in the region. The Gulf of Cambay Mangroves are also threatened due to the chemical industries present in the Industrial zone. The mangroves of Olpad, Dandi are threatened due to the illegal Aquaculture Ponds established by locals. Whereas the Porbandar Mangroves are at threat due to illegal dumping of waste by Porbandar Mahanagarपालिका officials.

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Photo Plate - 1



Photo Plate - 2



Photo plate - 3



Photo Plate - 4