

Chapter 5: Conservation of Coastal Ecosystems

Audit sampled two coastal districts from each of the nine coastal states to assess the health of vulnerable and fragile marine ecosystems due to impacts of anthropogenic activities. Observations in this regard are discussed below.

5.1 Threats to biodiversity

(i) Threats to Corals in the Gulf of Mannar Biosphere Reserve, Tamil Nadu

Coral reefs are referred to as tropical forests of the ocean as they provide food, protection, shelter and breeding ground to nearly one-quarter of all the known marine species globally. They are classified as Ecologically Sensitive Areas under CRZ Notification 2011.

The key coastal habitats in the Gulf of Mannar are coral reefs, sea grass and mangroves. These habitats are some of the most diverse and valuable ecosystems on Earth. In 1989, the entire Gulf of Mannar area covering 10,500 sq. km was declared as the Gulf of Mannar Marine Biosphere Reserve by Government of India. The Gulf of Mannar Biosphere Reserve Trust (GoMBRT) was formed in 2002 to implement the UNDP-GEF (United Nations Development Program – Global Environmental Facility) funded project on the conservation and sustainable use of the marine resources of the Gulf of Mannar Biosphere Reserve. After completion of the project in 2012, the Government of Tamil Nadu took over the functions of the trust from 2013. The following deficiencies were noticed:

a) Absence of baseline data for marine environment at the Biosphere Reserve

Audit observed that no baseline data for monitoring the status of coral reefs had been maintained at the Gulf of Mannar Biosphere Reserve till 2018. It was only in 2019 that a Baseline survey of the Coastal habitats and associated biodiversity between Rameshwaram and Kanyakumari in the Gulf of Mannar was conducted by a research institute³⁶ that was centrally sponsored by the MoEF&CC under the National Adaptation Fund for Climatic Change.

b) Alien invasive algae species at Biosphere Reserve

Smothering effects of the *Kappaphycus alvarezii*, an algal species introduced for commercial cultivation³⁷ in 1990, on live corals in Gulf of Mannar were reported in 2007-08. An alarming increase in the percentage of dead corals in all four group of islands in the Gulf of Mannar was noticed during 1998-2014. Joint Physical Verification of Coral reefs in the island of Thalayari (Keelakarai group of islands, Ramanathapuram) with officials of the Wildlife Range, Keelakarai, confirmed this situation.

³⁶ Named Suganthi Devadason Marine Research Institute at Thoothukudi, Tamilnadu.

³⁷ An alternative livelihood income generation for the coastal community.



Fig. 21: Dead coral covered with algae

Audit observed that out of the 100 sq. km coral area in Gulf of Mannar Marine National Park, the department removed these seaweeds only to an extent of two sq. km (2% of the total reef area) during 2015-16 to 2019-20 as targeted in the management action plans for the Conservation and Management of Corals Scheme of MoEF&CC. Also, despite the serious reduction and degradation of the live coral cover, no viable strategy to mitigate the propagation of the invasive species had been devised or implemented by the Department of Forest, Tamil Nadu.

(ii) Absence of a monitoring system for coral reefs, Goa

As per the World-Wide Fund for Nature (WWF) India survey of coral reefs at Grande Island in 2018, one of the few coral sites in Goa, a long-term periodic monitoring system for the protection and conservation of the reefs was required. The corals are classified as CRZ IA. We however observed that:

- The Forest Department had not done any mapping or identification of the areas inhabited by corals and as a result, a management action plan for their protection was also not prepared.
- No guidelines from Forest Department or Goa CZMA were issued to the Department of Tourism or operators of waterborne vehicles who carry out water sports activities around Grande Island, with an aim to preserve the Corals in the area.
- WWF-India, in its survey, had found rare marine species in these reefs. However, no guidelines for the fishing activities around these reefs were issued by any state government authority to the Fisheries Department which regulated fishing activities in Goa with an aim to protect and conserve such species.

(iii) Olive Ridley Sea Turtles in Goa

Olive Ridley turtles are legally protected under Schedule I of the Wildlife Protection Act, 1972, which prohibits trade in the turtle products. Olive Ridley is the only species of sea turtle known to nest at the beaches of Goa. There are four designated nesting sites³⁸ as per the CRZ Notification. As per CRZ notification 2011, management plans for turtle nesting sites was required to be prepared. Audit observed that



Fig. 22: Olive Ridley Turtles³⁹

management plans for these sites were not prepared. Further, as per the provisions of the notification, no development activities were permitted in these turtle nesting sites. However, we observed shacks being allowed at the nesting sites of Agonda , Morjim and Mandrem beaches, as shown in the pictures below-



Fig. 23: Wooden huts at Agonda Beach



Fig. 24: Beach beds in intertidal zone (turtle nesting sites) at Morjim Beach

(iv) Coastal Sand Dunes in Goa

A coastal sand dune is a mount, hill or ridge of sand formed mainly by aeolian action that lies behind the beach affected by tides. They provide natural coastal protection against storm surge and high waves, preventing coastal flooding and structural damage, as well as providing important ecological habitat. The Coastal Regulation Zone, 2011 declared the sand dunes as CRZ I(a) areas and dressing or altering the sand dunes for beautification, recreation has been declared as prohibited activities within the CRZ.

To carry out mapping of coastal sand dunes along the Goa coast, on the request of the Goa Coastal Zone Management Authority (Goa SCZMA), the National Centre for Sustainable Coastal management (NCSCM) Chennai prepared a ‘Sand Dune Report’. The report assessed

³⁸ Mandrem and Morjim beaches in North Goa and Galgibag and Agonda beaches in South Goa

³⁹ Source: K Sivakumar, Wildlife Institute of India, Dehradun

the collective length of sand dunes demarcated across Goa⁴⁰. It also depicted that construction of hotels/resorts/guesthouses, dune reclamation for making approach road to the beaches, and landscaping were the major causes of destruction of sand dunes of Goa, prominently along the coastal stretches of Betul to Cansaulim, Sinqerium to Baga, Arambol, and middle of Morjim.

Audit observed that Goa SCZMA despite existence of sand dunes, gave permissions for infrastructure development and construction of hotel and residential houses in these areas. Some of these instances are highlighted below:

A. Goa SCZMA, in March 2015, granted recommendation to **Chakshu Properties Private Limited in for construction of a hotel in Morjim Village, Pernem Taluka, Goa**. The PP approached Goa SCZMA again in December 2015 with a revised plan for construction of villas instead of hotel consisting of two floors (Ground and First Floor). Despite the fact that the proposed site was a pristine beach area having sand dunes (three to four metres in height) covered with vegetation, Goa SCZMA recommended the revised proposal.

B. A proposed project for **Construction of four lane National Highway 17 B from Varunapuri to Sada Junction (Mormugao) near Baina beach** was recommended by the Goa SCZMA in 2015 despite observations of the site inspection team which stated that Baina beach contained sand dunes covered with vegetation and that it was prone to annual cycles of erosion which made it ecologically sensitive. The report also stated that digging of huge pits for the foundation of several columns was bound to disturb the ecological stability of a sensitive beach.

During a JPV, it was observed that the sand dune was cut and flattened to make space for new beach shacks as shown below:



Fig. 25: Destruction of sand dunes for new beach shacks

⁴⁰ 22.62 km (99 patches); with 6.90 km of the coastal stretch (24 patches) in North Goa and 15.72 km of the coastal stretch (75 patches) in South Goa

C. The Sand Dune report also revealed sand dune erosion along the coastal stretches of



Fig. 26: Motor vehicles plying on beaches

Morjim, Ashwem and Colva beaches. The South Goa Collector, under the provisions of the Motor Vehicle Act, issued directions in 2018 according to which movement of all kinds of motor vehicles were prohibited on beaches. However, audit observed that there was no monitoring to stop the vehicle movement on the beaches as vehicles were seen plying/parked on the beaches at Utorda and Morjim Beach (which is also designated Turtle Nesting Site).

(v) Mangroves

Mangroves are salt tolerant plant community found in tropical and sub-tropical inter tidal regions and are unique eco-systems which provide breeding and feeding ground for many aquatic species. Mangrove forests have also proved to be capable of acting as a protective belt against the tsunami waves and as such require effective conservation and scientific management intervention. They are designated as Ecologically Sensitive Areas (ESAs) under CRZ I under the CRZ notifications.

(a) Gaps in the Mangrove conservation efforts in Goa

In order to protect the mangroves that occupied about 2000 hectares of area⁴¹, the Government of Goa in 2011, notified 14 Mangrove species as protected species and their cutting and felling was banned. We, however, noted several instances of cutting of mangroves and other issues in conservation of mangroves in the state as detailed under:

- Goa SCZMA, in 2015, granted permission to the proposal of cutting of 247 mangroves for the **Construction of bridge over river Mandovi (Atal Setu) by M/s Goa State Infrastructure Development Corporation**. One of the conditions in the permission stipulated that the project proponent was to carry out plantation of the same number of mangroves on completion of the project. However, the replantation had not been carried out by the proponent.
- Goa SCZMA, in 2017 granted permission to the proposal of cutting of 69 Mangrove trees for **Construction of bridge across river Zuari on NH-17 by M/s Public Works Department, Panaji, Goa**. The permission envisaged a condition that the project proponent should deposit with the Mangrove Society of India, an amount for the plantation of the mangroves. However, it was observed that mangrove replantation had not been carried out.

⁴¹ Along the estuaries of Zuari, Mandovi, Terekol, Chapora, Sal, Talpona, Galgibag and Cumbarjua Canal.

(b) Failure of Gujarat SCZMA to restore mangrove destruction in Kutch, Gujarat

Deendayal Port Trust (DPT)⁴² a major port of India, owned by the central government, leased out areas (CRZ-I) to salt manufacturers for extraction of salt.

Audit noticed that though salt manufacturing was a permitted activity as per the CRZ Notification 2011, CRZ clearance for undertaking salt works in the area was not sought by the lessees. In 2018 Gujarat SCZMA received a complaint regarding large-scale destruction of mangroves at Nani Chirai and Moti Chirai areas of Bhachau Taluka, Kutch. Further, Kachchh Camel Breeders Association (KCBA), Bhuj besides making a complaint to DLC, filed an appeal before National Green Tribunal (NGT) regarding mangrove destruction in 2018. On the directions of NGT, Gujarat Pollution Control Board (Gujarat SPCB) and the Central Pollution Control Board (CPCB) conducted site inspection and prepared a report which revealed substantial work of bunding and blocking of creeks which restricted the flow of tidal water to the mangroves, thus, resulting in their destruction. On the orders of NGT, Gujarat SCZMA carried out assessment by remote sensing (July 2020) which revealed that the bunds⁴³ had been constructed in the Jangi area and nearly 32 hectares⁴⁴ of mangroves had been destroyed. The destruction of these mangroves in CRZ I areas not only proved to be costly to ecosystems like mangroves but also posed threat of extinction to unique breed of “Kharai” camels which were dependent on the mangroves in the area for their food. The decrease in mangrove areas as seen in satellite photos obtained by audit is shown below:

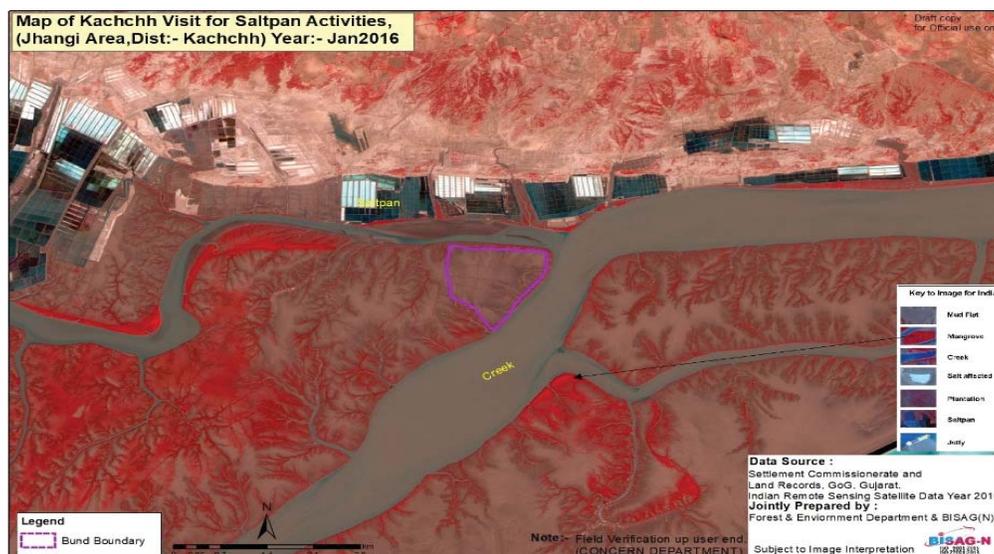


Fig. 27: Mangrove area (indicated in red shade) before allocation of lease in 2016

⁴² Erstwhile Kandla Port Trust.

⁴³ With a total length of 5,271 metres.

⁴⁴ Total mangrove area before allocation of lease in 2016 was 159.26 ha which was reduced to 127.34 ha in the year 2020 due to creation of bunds.

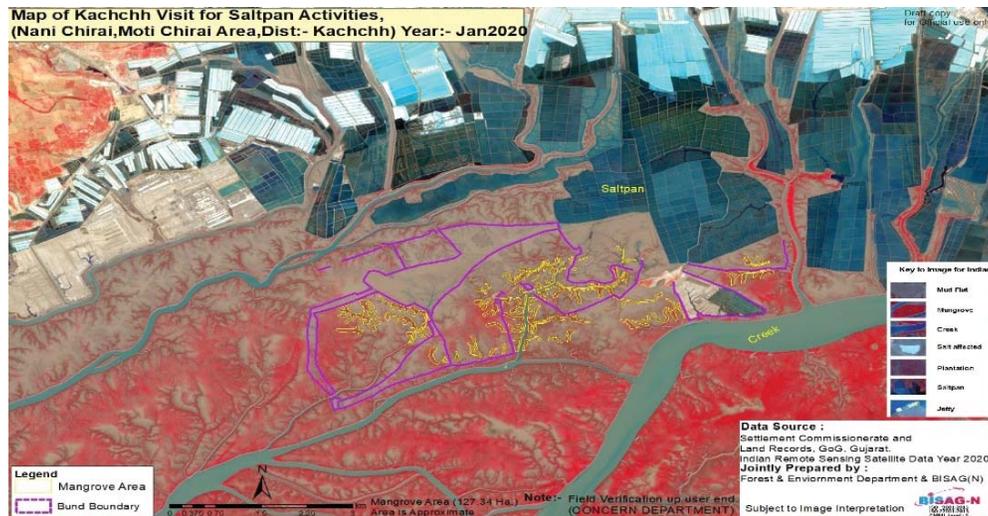


Fig. 28: Mangrove area (indicated in red shade) reduced to 127.34 hectares in the year 2020

The non-compliances as noticed by Audit are as follows:

- As per the NGTs order (September 2019), all obstructions in the creeks were to be removed and continuous flow of estuarine water in the creeks was to be ensured. Neither the persons responsible for obstruction of creeks were identified nor the restoration of mangroves was initiated even till February 2021.
- The NGTs order also stated that the quantum of damage caused to the mangroves shall be assessed by the Gujarat SCZMA the same shall be recovered from the persons responsible for the same within a period of one month from the issue of the order. However, Gujarat SCZMA could not ascertain whether creation of bund and destruction of mangroves was done by lease holders or by other miscreants. Therefore, no compensation for creation of bund and destruction of mangroves could be collected as of February 2021.
- NGT in its order directed the Forest Department, Government of Gujarat to take immediate action to restore the damaged mangroves within a period of 6 months from the issue of the order. It was observed that although Gujarat SCZMA directed DPT to carry out compensatory afforestation at the rate of three times of total mangrove destruction, no action for restoration of mangroves was taken till date.

(vi) Gaps in the management of Khazan lands in Goa

The eco sensitive low-lying areas that are influenced by tidal action known as Khazan lands are used primarily for cultivation, fish farming and salt panning. As they have been classified as ESA, all types of development activities were prohibited therein. We observed that the State of Goa had demarcated the Khazan lands and also had not prepared the Management plan these lands as required under the CRZ Notification. Details regarding the Khazan land was limited to that available with the Town Planning Authorities of Goa.

It was further observed that due to non-demarcation of Khazan lands by the State, Goa SCZMA granted approvals to projects which were otherwise impermissible in these protected areas. For instance, clearances for projects involving construction of a bypass from Bambolim plateau to Verna Plateau and for cutting of 69 mangroves and temporary land filing in the said area were granted by Goa SCZMA in December 2015 and October 2017, respectively, without ascertaining that the projects involved use of Khazan Lands. Although, Goa SCZMA in their reply stated that the permission granted by Authority for construction of bypass was temporary in nature, the fact that 12 columns constructed in the salt pans under the project were of permanent nature and were impermissible in the Khazan Land.

5.2 Pollution caused by untreated municipal waste

The CRZ Notification 2011 prohibited activities leading to the disposal of untreated wastes and effluents into coastal waters and dumping of city and town wastes like construction debris, industrial solid wastes in CRZ areas. It provided that the concerned authorities shall implement schemes for phasing out: (i) the existing practice of discharging untreated waste and effluents within a period not exceeding two years from the date of issue of the Notification; (ii) the existing practice of dumping of solid wastes within one year from the commencement of the Notification.

Audit observations of the test checked districts indicated that the sewage treatment plants were either altogether absent or were functioning without any monitoring, leading to discharge of harmful effluents into coastal waters as detailed below:

(i) Municipal sewage discharge into the sea at coastal districts of Karnataka

Out of the 12 Urban Local Bodies⁴⁵ located along the coast of Karnataka, only Mangalore City



Fig. 29: Flow of untreated sewage from wet wells of the western area of Mangalore City to the Arabian sea

Corporation had a sewage network to cover 100 per cent of its area with four STPs.

The City Municipal Council of Udupi, Karwar and Bhatkal had a partial sewerage network that catered to only 25 per cent, 14 per cent and 25 per cent area respectively.

Rest of the households either had individual septic tanks or soak pits to treat sewage. As per the Status of sewage generation, treatment and disposal in the coastal area prepared by the

⁴⁵ There 12 urban local bodies located along the coastline of Karnataka (Mangalore city Corporation, CMC Ullal, TMC Mulki, CMC Udupi, TMC Kuap, TMC Kundapura, TP Saligrama, TMC Bhatkal, TP Honnavar, TMC Kumta, TMC Ankola, CMC Karwar).

Karnataka Pollution Control Board (Karnataka SPCB) in December 2019, there was a gap of 26.85 MLD in sewage treatment in the coastal areas in Karnataka, out of which 7.6 MLD of untreated sewage was being discharged into the sea. The satellite pictures obtained by audit

show the flow of untreated sewage from the wet wells of western area of Mangalore City to the Arabian sea. We also observed that untreated waste from the coastal towns of Karwar, Murudeshwar was being let into the sea.



Fig. 30: Urban sewage directly entering coastal waters at Murudeshwar Beach

The matter of Urban untreated sewage being let into coastal waters was brought to the notice of Karnataka Pollution Control Board during 2017-19 by the State Environment Department of Uttara Kannada and Dakshina Kannada, however no further action was taken by Karnataka SPCB.

(ii) Inadequate monitoring of Sewage Treatment Plant effluents, Goa

A total of seven⁴⁶ STPs were functioning in Goa and another two STPs at Bandora and Colva were under construction as of December 2020. We observed that out of seven STPs, three STPs namely, Baina (20 MLD), Margao (20 MLD) and Durbhat (1 MLD) were functioning since 2017 without obtaining 'Consent to Operate' from Goa Pollution Control Board (Goa SPCB). We observed that these three STPs were discharging effluents directly into the sea. As per coastal data prepared by Goa SPCB for the month of October 2020, fecal coliform present in the coastal waters of eight out of 10 Goan Beaches⁴⁷ ranging from 110 to 140 (Most Probable Number/100ml) that were more than the prescribed limits (i.e.100 MPN/100 ml).

Goa SPCB while issuing (August 2018) a renewal of Consent to Operate for STP Margao, had specified that the treated effluent should not be discharged into any river/creek/nallah and should be recycled to the maximum with the remaining being used for gardening activities. However, this STP after utilizing some effluent for gardening and non- potable use in the premises was discharging treated effluent into River Sal. However, no action was taken by Goa SPCB.

⁴⁶ Panaji -Tonca (15 mld), Panaji Tonca (12.5 mld), Margao (20 mld), GMC Bambolim (1.35 mld), Vasco-Baina (20 mld), Ponda-Durbhat (1 mld), Sanquelim (0.80 mld).

⁴⁷ Samples taken from Miramar, Calangute, Morjim, Mobor, Baina, Galgibag, Colva and Vagator beaches.

(iii) Discharge of untreated sewage into the sea by the Municipal Corporations/ Municipalities in Maharashtra

On the request of Maharashtra Pollution Control Board, National Institute of Oceanography (NIO), Mumbai, carried out a study (2018) which showed that the domestic wastewater was the major contributor to degrading ecology of creeks and estuaries that received such wastes. The report suggested that the inshore areas should be freed from unplanned release of sewage.

We observed that nine⁴⁸ Municipal Corporations (MCs) in the coastal region of Maharashtra discharged untreated sewage into the rivers, seas and creeks during 2015-16 to 2019-20. 22 Municipal Councils coming under Palghar, Raigad, Ratnagiri and Sindhudurg districts of coastal region generated 71.80 MLD of sewage in 2015-2020, which was not treated at all and was disposed directly into water bodies.

The Mumbai region alone had 8 operational STPs. Audit analyzed the data relating to the annual performance evaluation of the STPs in Mumbai region by Maharashtra Pollution Control Board (MPCB) during 2015-16 to 2019-20 and observed that the treated sewage too, did not meet the standards prescribed by MPCB. We, further, observed that though the MPCB issued directions⁴⁹ to these local bodies wherein they were instructed to provide adequate STPs, achieve the consented standards prescribed by MoEF&CC and implement short term & long- term measures for treatment of sewage, no further action or follow up was taken up by MPCB against these bodies. In a few cases, it was observed that show cause notices issued by MPCB stipulated environmental compensation that was required to be paid by the errant local bodies for the discharge of untreated/ partially treated sewage. However, no efforts were made by the MPCB to ensure that the same had been paid by the offenders.

5.3 Waste from Fish processing industry at Veraval, Gujarat

Processing and preserving of fish, crustaceans in India annually generate 70 million m³ waste/ effluents. Among the coastal states, maximum fish processing waste generation was observed in Gujarat (30.51%) followed by Maharashtra (23%).

We observed the discharge of sewage generated at the Veraval Fishing Harbour directly into the sea. Though Veraval harbour was designed for 3,500-4,000 boats it was observed to handle approximately 8,000 boats, which would increase the waste being generated. The harbour lacked an effluent treatment facility due to which untreated effluents and the sewage generated at the harbour were being discharged directly into the harbour waters. Further, the directions issued by the Gujarat SPCB envisaged regular dredging of the harbour, provision for collection of fish waste from the harbour area to compost units. However, we observed that the Veraval Harbour did not comply with the directions issued by Gujarat SPCB.

⁴⁸ Greater Mumbai, Navi Mumbai, Thane, Bhiwandi, Nizampur, Ulhasnagar, Kalyan-Dombivli, Mira-Bhayander, Vasai Virar and Panvel.

⁴⁹ Under Water (Prevention & Control of Pollution), Act 1974.

Also, Gujarat SPCB took no further action against the harbour. Hence, Veraval Fishing Harbour continues to operate without Composite Consent and Authorisation (CCA) discharging untreated effluent into Veraval Sea.

5.4 Aquaculture Waste Discharge at Coringa Wildlife Sanctuary, Andhra Pradesh

Entire Coringa, East Godavari as well Krishna in Andhra Pradesh, has been identified as CVCA⁵⁰ site as per CRZ Notification 2011. The Government of Andhra Pradesh declared the Coringa Sanctuary as Coringa Wildlife Sanctuary (CWLS) in 1978⁵¹ and contains mangrove swamps, mudflats, sandy beaches and sandy islands. Coringa mangrove forest is the second largest mangrove region along the east coast of India.

It was observed that out of 1483.05 Ha. of land registered under aquaculture in Tallarevu Mandal, an area encompassing the CWLS on three sides, around 861.64 hectares was within the periphery of Coringa Sanctuary.

Audit observed that eleven aqua/shrimp units located around CWLS in Tallarevu Mandal were discharging their untreated effluents into the drains which eventually joined the Coringa river. Due to discharge of untreated effluents in Coringa waters, except for pH value which was within the set standards of Coastal Aquaculture Authority (CAA), the remaining values of the effluent analysis were found to be abnormally higher⁵² than the standards prescribed.

We observed that the Andhra Pradesh Pollution Control Board (APPCB) issued show cause notices to five out of the aforementioned 11 units during 2017-20 as most the units were operating without a 'Consent to operate'. However, no further action in the form of imposition of penalty or legal proceeding as per the provisions of the Water (Prevention & Control of Pollution), Act 1974 was taken by APPCB against these five units. Also, APPCB failed to take any action against the other 6 units that were also discharging their waste without treatment.

Audit observed that the Fisheries department accorded permissions for operating the aqua culture units without ascertaining the method for effluent treatment and the area for its disposal. The Regional Office, APPCB accorded Consents for Establishment (CFE) and Operation (CFO) without ascertaining the presence of facilities in the units for treatment of effluent. Audit noticed no ETP facility in any of the units during joint physical inspection with

⁵⁰ In all, there are 34 species of mangroves, 312 estuarine fish species, 14 species of prawns, 34 species of crustaceans, a wide range of 103 species of molluscs, 65 species of phytoplankton besides other species of snails and reptiles. As many as 257 avian species have been identified as visitors every year.

⁵¹ Under the Wildlife Protection Act, 1972.

⁵² Higher level of BOD results in more rapid depletion of oxygen in the stream and availability of less oxygen to higher forms of aquatic life. A greater amount of oxidizable organic material in a sample with high levels of COD, would reduce dissolved oxygen (DO) levels. Presence of abnormally high Total Suspended Solids (TSS) in the effluents discharged results in clogging of fish gills, either killing them or reducing their growth rate. They also reduce light to penetrate through which impairs the ability of algae to produce food and oxygen, which can be fatal to life below water which would adversely impact the marine ecosystems of the sanctuary.

the officials of APPCB. Further, prior recommendation from Andhra Pradesh SCZMA and clearance from State/Town Planning Authorities was mandatory as the area fell under CRZ-I, however, these were not obtained. Audit also observed that the zoning regulations related to CRZ were ignored which resulted in establishment of aquaculture units within the 100 meters zone from the high tide/flood line from the Coringa which was in contravention to the CRZ Notification 2011.

5.5 Conclusion

- There were many deviations from the approved CZMP which affected vulnerable biodiversity of the fragile ecosystems. Further, many activities which were banned in these sensitive coastal areas continued unabated, with the PCBs/SCZMAs not taking any action to stop these violations.
- State Government did not prepare management plans for vulnerable ecosystems such as the coral reefs, turtle nesting sites etc. which impacted their conservation. Despite the existence of CRZ notifications, coastal areas continued to be impacted by anthropogenic activity, often resulting in their degradation.