

Impact of dredging and opening of the sea mouth into the Pulicat lake at Rayadoruvu village of Vakadu Mandal, on the habitat of
Pulicat Bird Sanctuary, Andhra Pradesh
Final Report



Sálim Ali Centre for Ornithology and Natural History
(A Centre of Excellence under the Ministry of Environment, Forest and
Climate Change, Government of India)
P.O. Anaikatty, Coimbatore – 641108, Tamil Nadu

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Executive summary

Our study assessed the impact of dredging on flora, fauna, environmental parameters, socio-economics in and around Rayadoruvu inlet, and the immediate catchments surrounding Pulicat Sanctuary, Andhra Pradesh from January to March 2019. We recorded 141 bird species from 52 families and 18 orders which included a total count of 7358 wetland birds comprising of 79 species. Eight raptors and a wader listed under “Schedule I” as per the Indian Wildlife Protection Act (IWPA) 1972 were recorded. Four “Near threatened” waders and a “Vulnerable” raptor as per the IUCN Red list were also recorded. Of the 12 mammalian species recorded, five belonged to “Schedule II” category of IWPA. We recorded seven dead Olive Ridley Sea Turtles *Lepidochelys olivacea* near the mouth of Rayadoruvu inlet. The species is listed under “Schedule I” of IWPA 1972 and “Vulnerable” as per the IUCN Red List. Of the 107 plant species recorded from 46 families, we recorded 16 invasive plant species. Salinity (70 PSU), conductivity (183.7 $\mu\text{S}/\text{cm}$) and total dissolved solids (91.86 ppm) were three to four times higher in the lake than sea water (salinity 31 PSU, conductivity 47.94 $\mu\text{S}/\text{cm}$ and total dissolved solids 23 ppm), attributed to low water depth and high evaporation rate. Eighteen orders of phytoplankton, ten orders of zooplankton, seven orders of macrobenthos and nine classes of meiobenthos were recorded in the lake. Overall phytoplankton abundance was significantly lower in the lake than sea water while macrobenthos abundance was higher in the lake than sea.

Based on our findings we conclude that dredging of Rayadoruvu inlet will be beneficial for the Pulicat lake ecosystem. The exchange of water between sea and lake will stabilize the salinity levels, thereby increasing the diversity and abundance of planktons and fish availability in the lake. This in turn can help in sustaining larger wetland bird population in Pulicat Bird Sanctuary which lies in the Central Asian Flyway Region supporting several important migratory species including high altitude migrants such as the Bar-headed Goose *Anser indicus*. The proposed dredging area and its immediate environs does not include core flamingo habitats. Larger flocks of Greater flamingos *Phoenicopterus roseus* were recorded nearly 10 km away from the inlet, and minimal changes are only expected in the water level and salinity in this area after opening the sea mouth. Hence, no impact on flamingo population is expected from the proposed sea mouth opening. We conducted open-ended questionnaires for

252 respondents from 8 village clusters of which, Madhavapuram, a small island and Nawabpet had negative opinion on dredging as the former envisaged rise in water level surrounding their village and the latter perceived a lower harvest rate of prawns. Yet, nearly 93% of the respondents had a positive opinion on dredging. As per National Institute of Ocean Technology's predictive model, the variation in water depth after the opening of sea mouth during low (-0.1 m) and high tides (0.3 m) will not have any impact on flamingoes, nor will the rise in water level is likely to affect Madhavapuram village. The immediate catchment areas of Swarnamukhi and Kalangi river channels bringing freshwater inflow to the Rayadoruvu inlet needs improvement through effective catchment area treatment plans simultaneously along with the dredging of sea mouth for atleast 5 to 10 years. Afforestation measures along these catchments by planting native trees and shrubs will improve the green cover and thereby restore water availability in the catchments. No dredged material should be deposited in Pulicat Sanctuary and its catchment areas.

Dredging operations should be completed before the monsoon ends and before the bird migratory season (December to January). It is suggested not to perform dredging directly perpendicular to the mouth of the inlet in order to prevent maximum sea water entering the lake under the influence of strong tidal forces which in turn may lead to sudden changes in the lake ecosystem. Instead, it is suggested that the opening of training jetties may be tilted towards the north-east direction (Fig. 1a), considering the historical gradual flow of sea water into the inlet. We suggest that dredging is undertaken in proportion to the width of the inlet (Fig. 1a). This is essential so that the inter-tidal zone as designated in the Andhra Pradesh Coastal Zone Management Plan which comprises of edge habitats of mangrove patches and feeding grounds of shallow water feeders (Heron, Plover, Sandpiper, Stint, Whimbrel and Curlew) are kept intact. Dredging should not disturb the Olive Ridley Sea Turtle nesting site which is hardly a kilometer northwards from the sea mouth and hatchery and it should not overlap with the nesting period (mid-January to mid-March). Additional dykes/walls/groynes jutting into the sea from Sriharikota island eastwards may aid in deflecting the waves and movement of sediments arising from the nearest port activity towards Rayadoruvu sea mouth. It is important to conduct post-dredging impact

assessments on the flora, fauna, people's livelihood and hydrological parameters in Pulicat lake for atleast one year.

Fig 1a. The proposed dredging plan by SACON at Rayadoruvu inlet



Suggested steps for dredging at Rayadoruvu inlet

- The north training wall can extend up to approximately 350 m away from the coastline while the south training wall can be longer than the north training wall i.e 420 m from the coastline (NIOT 2017)
- The opening of 120 m at the entrance mouth at the sea side of the training walls facing the coastline is suggested to be maintained to allow adequate flow of sea water during low and high tides (NIOT 2017). While the gap between the north and south training walls facing the Rayadoruvu inlet should be maintained at 300 m (NIOT 2017).
- The height of both training walls should be according to the maximum wave height as measured by NIOT (2017). Therefore, the height of north and south training walls may be fixed at 7 m from the ground.
- Over time, it is possible that the training walls may weaken and collapse from weathering due to the impact of strong sea waves and currents and corrosive



nature of salt water, hence it is suggested that gabions maybe placed covering the training walls to keep the walls packed tightly together.

- Dredging should be undertaken in proportion to the width of the inlet i.e if the total width of the channel at any given point is 100 m then 80 m maybe allowed for dredging in the middle sub-tidal part of the channel leaving the edges of the channel intact to avoid any damage to mangrove vegetation and shallow feeding areas for birds.

Suggested steps for post-dredging activity and maintenance

- No dredged material should be disposed in and around Pulicat Sanctuary
- Dredging operations should be completed before the monsoon ends and before the bird migratory season (December to January).
- It is suggested that the Forest Department shall periodically monitor (once in three months) the Rayadourvu inlet to prevent further siltation of the sand bar subsequent to the proposed post-dredging operation as part of regular maintenance. Since the closure of tidal inlet is expected to occur in the summer season when there is less exchange of water and based on the sediment movement from south to north from littoral drift it is suggested that the removal of sand from both openings of the training walls can minimize siltation.
- It is suggested that there should be regular monitoring of the physio-chemical parameters at different sections of the lake using portable multiparameter probes to record the fluctuations in salinity and water levels on seasonal basis and to maintain the hydrological parameters within the acceptable range.
- For at least one year, post-dredging assessment of vegetation, wetland birds, water and sediment quality analysis, and socio-economic surveys must be conducted on a seasonal basis to assess the success of dredging operations.
- Wetland bird counts as part of the annual census should also include sites along Rayadoruvu inlet.

SUMMARY OF OBJECTIVES AND METHODS

Sr. No	Taxa/Parameter	Methods
Faunal and floral studies		
1	Birds	Point count
2	Mammals	Camera trapping
3	Vegetation	Quadrat sampling
4	Benthos	Grab sampling along transects
5	Phytoplankton	Water sample collection
6	Zooplankton	Net towing
Water and Sediment parameters		
7	pH	Multi-parameter Probe (Hanna HI98194)
8	Oxidation-Reduction Potential	Multi-parameter Probe (Hanna HI98194)
9	Oxygen Concentration	Multi-parameter Probe (Hanna HI98194)
10	Dissolved Oxygen	Multi-parameter Probe (Hanna HI98194)
11	Conductivity	Multi-parameter Probe (Hanna HI98194)
12	Resistivity	Multi-parameter Probe (Hanna HI98194)
13	Total Dissolved Solids	Multi-parameter Probe (Hanna HI98194)
14	Salinity	Multi-parameter Probe (Hanna HI98194)
15	Density	Multi-parameter Probe (Hanna HI98194)
16	Temperature	Multi-parameter Probe (Hanna HI98194)
17	Pressure	Multi-parameter Probe (Hanna HI98194)
18	Depth	Measuring tape
19	Light Penetration	Secchi disc
20	Water content (Moisture)	Gravimetric
21	Potassium	Flame Photometric
22	Calcium	Flame Photometric
23	Lithium	Flame Photometric
24	Organic carbon	Walanga method
25	Phosphate	Spectrophotometric
26	Nitrate	Spectrophotometric
27	Total phosphorous	Spectrophotometric
Remote sensing		
28	Sea mouth opening	Time series of Google earth images
29	Catchments	Temporal change detection tools



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