

## **Assessing Spatial and Seasonal Variations in Water Quality of the Jaffna Lagoon, Sri Lanka**

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### **Abstract**

The Jaffna lagoon is one of the main marine resources in the Jaffna Peninsula, which provides habitat for a number of fauna and flora, livelihood support for fishing communities and seafood for the local population. However, it has been neglected over the past three decades due to the prevailed unsettled conditions in the Northern region of Sri Lanka and believed to be polluted by various anthropogenic activities detrimental to the ecological health of the lagoon. Based on its uses, the Jaffna lagoon could be graded as a class III surface water body according to the EPA classification.

The present study focuses on the spatial and seasonal variations in water quality of the Jaffna lagoon to provide baseline information for future studies in the region and identify the potential risks to the Jaffna lagoon ecosystem. During the period from August 2014 – May 2015, surface water samples were collected monthly at forty geographical locations in the Jaffna lagoon along the coastline from Ponnalai to Kilaly and analysed for selected physicochemical and bacteriological parameters using standard methods. Then, the geometric mean values with standard errors of the respective analysed data were determined.

During the study period, surface water temperature of the lagoon varied from 28.3 to 30.4 °C. The mean pH ranged between 7.7±0.2 and 8.5±0.1 whereas the permissible pH range is 6.5-8.5 (EPA standards). Although marine ecosystems require DO in the range of 6-7 ppm for optimum growth and survival of aquatic life, variation in mean DO was observed between 6.0±1.0 and 13.7±2.2 ppm in the present study. Spatial and seasonal variations were observed in salinity and sulphate concentration of the lagoon water. Globally, salinity of surface sea water falls within a narrow range of 33 – 37 ppt at average surface temperature of 30 °C. In this study, mean salinity ranged spatially from 34.0±0.6 to 68±0.0 ppt and 29.7±1.7 - 49.7±0.1 ppt during the dry and wet seasons respectively. The exceptionally high salinity was recorded in the Thenmaradchi area that could be attributed to net evaporation and low mixing of water between the Jaffna lagoon and the Palk Strait. Similarly, mean sulphate concentration varied spatially from 2112.3±589.6 – 4854.9±57.1 ppm and 1691.8±378.6 - 3607.4±937.3 ppm during the dry and wet seasons respectively. Though the EPA permissible level for elemental phosphorus is 0.0001 ppm, the mean phosphate concentration varied between 0.2±0.2 and 4.4±0.7 ppm in our study. The increased phosphate levels indicate the presence of organic pollutants in the lagoon. This might be due to dumping of household wastes in coastal areas of the lagoon, agricultural and urban runoff and human and animal defecation into the lagoon. Even though the EPA bacteria criteria (1986) states that monthly average *E.coli* count shall not exceed 200 MPN/100ml in Class III surface water bodies, enormous *E.coli* count was detected in Pannai and Gurunagar areas which confirmed fecal contamination.

Thus, the Jaffna lagoon currently faces a number of serious environmental and ecological challenges and immediate measures must be taken to implement proper wastewater and solid waste management schemes and regular monitoring of water quality of the Jaffna lagoon and discharge only adequately treated effluents into the lagoon to sustain the productivity and biodiversity of the lagoon.

**Keywords :** *Jaffna lagoon, water quality, salinity, sulphate, phosphate, E.coli*