

Assessing the ecological status of Muthukandiya wetland by using aquatic macrophyte-based limnological condition index and water quality index

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Abstract

Aquatic macrophytes are excellent ecological indicators in aquatic ecosystems. The present study used the aquatic macrophyte-based limnological condition index (LICOI), water quality index (WQI), and aquatic macrophyte-based diversity indices to assess ecological status of the Muthukandiya wetland ecosystem. Water quality and abundance of aquatic macrophyte were studied in five sites, namely, sites A, B, C, D and E where site A was located at the upstream of the wetland, site B was at the boarder of paddy fields, site C was at the outlet of the wetland closer to the weir, site D was at the boarder of a natural forest, and site E was located near human settlements. In each site, pH, temperature, dissolved oxygen content (DO), visibility, salinity, conductivity, nitrate content (TN), total phosphate content (TP), biochemical oxygen demand (BOD₅), chemical oxygen demand (COD), chlorophyll-a concentration, total dissolved solid, total solid content and abundance and diversity of aquatic macrophytes were investigated. Spatial variations of the water quality parameters and abundance of aquatic macrophytes were observed using One way ANOVA followed by Tukey's pairwise comparison. Correlation relationship between the water quality parameters and abundance of aquatic macrophyte species was assessed by Pearson correlation analysis. Site D associated with natural forest showed significantly low temperature ($27.48 \pm 0.08^{\circ}\text{C}$) whereas site E associated with human settlement showed significantly high salinity ($0.132 \pm 0.008\%$) and high total solid content ($1056.0 \pm 193.6\text{ppm}$) ($p < 0.05$). A total of 5 species were identified including *Salvinia molesta*, *Nelumbo nucifera*, *Nymphaea pubescens*, *Ipomoea aquatica*, and *Cyperus rotundus*. Shannon Weiner diversity index (H') of the study sites ranged from 0.59 to 1.48 and the Pielou's evenness index (J) ranged from 0.53 to 1.22. Wetlands are categorized according to levels of pollution on the value of LICOI; $\text{LICOI} > 35$: slightly contaminated, $17 < \text{LICOI} < 35$: moderately polluted, $4 < \text{LICOI} < 17.5$: heavily contaminated, and $\text{LICOI} < 4$: severely contaminated. The percentage biotic index of the study sites ranged from 59.02 to 60.59. LICOI of the study sites ranged from 39.4 to 40.98. WQI of the study sites ranged from 6.23 to 28.22. According to the limnological categorization based on pollution index, percentage biotic index and LICOI all sites of the Muthukandiya wetland were categorized as the slightly contaminated sites with excellent limnological conditions.

Keywords: *Aquatic macrophytes, Physico-chemical monitoring*