

Indicating the levels of eutrophication of Diyawanna Lake wetland in Sri Lanka using phytoplankton abundance

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Diyawanna Lake is an urban wetland located in Sri Jayewardenepura Kotte. Most areas of this wetland have been rehabilitated recently by digging, restoration of banks and removing aquatic vegetation to increase its water retention capacity to reduce flooding, for recreational purposes and landing sea planes. The non-rehabilitated area in the wetland is rich in biodiversity and provides habitats for several threatened and endemic species.

Present study was carried out from March to November 2015 with the objectives of determining the trophic status of the non-rehabilitated and rehabilitated areas and identifying possible indicator phytoplankton species of the trophic conditions. Sampling was carried out in March, May, July, September and November to represent the inter-monsoonal and southwest monsoonal periods in five randomly selected study sites; two in the non-rehabilitated area and three in the rehabilitated area. On each sampling, water and phytoplankton samples were collected from each site in triplicate. Phytoplankton were collected by dragging a 50 μ phytoplankton net to a known distance. They were identified to the species level and Sedgwick rafter cell was used to quantitative analysis. Standard methods were used to analyze total nitrate and total phosphorous levels in water samples. Data were analyzed using two way ANOVA.

Mean total phosphorous content in the two sites in the non-rehabilitated area (32 and 31 μ g/L) were significantly lower ($p < 0.05$) than those in the rehabilitated area (52, 64 and 57 μ g/L). However, these values within each area were not significantly different ($p > 0.05$). The mean nitrate content in non-rehabilitated area (27 μ g/L and 24 μ g/L) were also significantly lower ($p < 0.05$) than those in the rehabilitated area (45, 56 and 48 μ g/L). These values within each area were also not significantly different ($p > 0.05$). According to the total phosphorous and nitrate contents, the non-rehabilitated area of can be considered as meso-eutrophic while the rehabilitated area can be considered as eutrophic. A total of 61 species of phytoplankton were identified and none of these species were confined either to meso-eutrophic or eutrophic areas. Hence identification of any particular phytoplankton species as an indicator organisms of meso-eutrophic or eutrophic conditions was not possible. However, abundance of *Microcystis aeruginosa*, *Scenedesmus acuminatus* and *Melosira islandica* were significantly higher and that of *Closterium moniliferum* was significantly lower in the eutrophic sites than in the meso-eutrophic sites ($p < 0.05$). According to the present study, abundance of *Microcystis aeruginosa* above 110 Nos/L, *Scenedesmus acuminatus* above 30 Nos/L and *Melosira islandica* above 13 Nos/L indicate eutrophic conditions. Abundance of *Closterium moniliferum* above 12 Nos/L indicate meso-eutrophic conditions. However, more research using several wetlands is needed to determine the exact ranges of abundance for demarcating the trophic conditions.

Keywords: Indicator organisms, Phytoplankton, Meso-eutrophic, Eutrophic