

A Comprehensive Study on Freshwater Aquatic Life Health Quality Assessment Using Physicochemical Parameters and Planktons as Bio Indicator in a Selected Region of Mahaweli River in Kandy District, Sri Lanka

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Abstract : Mahaweli River is the longest and largest river in Sri Lanka and it is the major drinking water source for a large portion of 2.5 million inhabitants in the Central Province. The aim of this study was to the determination of water quality and aquatic life health quality in a selected region of Mahaweli River. Six sampling locations (Site 1: 7° 16' 50" N, 80° 40' 00" E; Site 2: 7° 16' 34" N, 80° 40' 27" E; Site 3: 7° 16' 15" N, 80° 41' 28" E; Site 4: 7° 14' 06" N, 80° 44' 36" E; Site 5: 7° 14' 18" N, 80° 44' 39" E; Site 6: 7° 13' 32" N, 80° 46' 11" E) with various anthropogenic activities at bank of the river were selected for a period of three months from Tennekumbura Bridge to Victoria Reservoir. Temperature, pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), Dissolved Oxygen (DO), 5-day Biological Oxygen Demand (BOD₅), Total Suspended Solids (TSS), hardness, the concentration of anions, and metal concentration were measured according to the standard methods, as physicochemical parameters. Planktons were considered as biological parameters. Using a plankton net (20 µm mesh size), surface water samples were collected into acid washed dried vials and were stored in an ice box during transportation. Diversity and abundance of planktons were identified within 4 days of sample collection using standard manuals of plankton identification under the light microscope. Almost all the measured physicochemical parameters were within the CEA standards limits for aquatic life, Sri Lanka Standards (SLS) or World Health Organization's Guideline for drinking water. Concentration of orthophosphate ranged between 0.232 to 0.708 mg L⁻¹, and it has exceeded the standard limit of aquatic life according to CEA guidelines (0.400 mg L⁻¹) at Site 1 and Site 2, where there is high disturbance by cultivations and close households. According to the Pearson correlation (significant correlation at $p < 0.05$), it is obvious that some physicochemical parameters (temperature, DO, TDS, TSS, phosphate, sulphate, chloride fluoride, and sodium) were significantly correlated to the distribution of some plankton species such as Aulocoseira, Navicula, Synedra, Pediastrum, Fragilaria, Selenastrum, Oscillataria, Tribonema and Microcystis. Furthermore, species that appear in blooms (Aulocoseira), organic pollutants (Navicula), and phosphate high eutrophic water (Microcystis) were found, indicating deteriorated water quality in Mahaweli River due to agricultural activities, solid waste disposal, and release of domestic effluents. Therefore, it is necessary to improve environmental monitoring and management to control the further deterioration of water quality of the river.

Keywords : bio indicator, environmental variables, planktons, physicochemical parameters, water quality

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