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Fish based Index of Biotic Integrity (FIBI) for water quality assessment of Kelani river, Sri Lanka

T Athauda and A De Alwis*

Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Nugegoda

An index of biological integrity (IBI) was developed based on fish for the assessment of water quality in the Kelani River in Sri Lanka. The original IBI, developed for streams in the U.S. Midwest streams, was modified to reflect the fish assemblage composition and structure for Kelani River. The validity of water quality assessment using this modified IBI was further compared with the water quality index (WQI) developed using physico-chemical parameters of river water.

The assessment program was carried out in two sites in upper reach (i.e. Kaduwela) and lower reach (i.e. Thotalanga) of the study section of Kelani River basin from January to July 2012. Fish samples were caught by gill nets (3 m length, 2.5 m height and 2-3 cm mesh). Information on fish assemblages, selected biological parameters (i.e. zooplankton, phytoplankton) and physico-chemical parameters of water in 6 selected sampling points covering 3 from each selected site were studied once a month.

The comparison of data such as dissolved oxygen (DO), biological oxygen demand (BOD₅), conductivity, sulphide and transparency of water with minimum, maximum permissible limits of water quality standards clearly showed that the Kaduwela site was within these limits while the Thotalanga site showed a significant deviation. For example, mean DO of water at Kaduwela (6.2 mg/l – 7.4 mg/l) was always higher than the minimum permissible limit while at Thotalanga (1.8 mg/l - 3.2 mg/l), it was always below the minimum permissible limit. BOD of water at Kaduwela (1.4 mg/l - 3.9 mg/l) was always below the maximum permissible limit while at Thotalanga it (5 mg/l – 6.2 mg/l) was always higher than the minimum permissible limit. Calculated Shannon-Wiener Index values for zooplankton suggested a moderately polluted condition at Kaduwela site (1.227) and a heavily polluted condition at Thotalanga (0.219). Shannon-Wiener Index values for phytoplankton also suggested a moderately polluted condition at Kaduwela site (1.423) and a heavily polluted condition at Thotalanga (0.051)

The IBI was constructed using the selected 14 metrics of fish species occurring in two sites. A scoring system using a modified trisection method was adopted to define five integrity classes of overall quality of water. The Fish IBI (FIBI) obtained for these two sites was categorized using these integrity classes. Accordingly, overall quality of water at Kaduwela site (FIBI Score = 28) was 'fair' while that of Thotalanga site (FIBI Score = 40) was 'poor'. A similar comparison was done for the two sites by developing a WQI using an independent set of physico-chemical data. Accordingly Kaduwela site (57.35) was ranked as having a 'fair water quality' while Thotalanga (36.9) was ranked as having a 'poor water quality'. When the two methods are compared both gave similar observations with regards to quality of the water at sites. However, the WQI reflects the condition of the water at any given time while



the fish based IBI reflects long term effects of overall habitat degradation including the quality of water through the acquired/altered characters of fish. Thus, the FIBI becomes a better tool in determining long term effects and obtaining an overall picture of habitat quality.

Keywords: Index of biological integrity, Kelani River, water quality assessment