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Impact of treated effluent discharges of rubber industry on zooplankton diversity and abundance in small tributaries of Kalu Ganga in Kaluthara district, Sri Lanka

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The present study was carried out to evaluate the impact of effluent discharges from rubber industry on the water quality and zooplankton communities in three selected small tributaries of the Kalu Ganga in the Kaluthara district of Sri Lanka. The streams receive effluent discharges from aerobic treatment plants of three selected rubber factories located in Neboda, Kiriwanaketiya and Govinna. Temperature, salinity, pH, total dissolved solids (TDS), conductivity, chlorophyll-a, Chemical Oxygen Demand (COD), phosphate and nitrate concentrations of stream water were measured and zooplankton was sampled monthly (June – November, 2017) from the effluent discharge point and from upper (100 m) and lower reaches (100 m) of each selected stream. Zooplankton were identified using standard keys. Species richness, Pielou's evenness index, Shannon-Wiener diversity index and total abundance of zooplankton at each site were calculated accordingly. Water temperature and pH showed no significant difference among sampling sites. Conductivity, TDS, COD, nitrate and phosphate levels of stream water were significantly higher ($p < 0.05$ one-way ANOVA) at the effluent discharge point than upper and lower reaches of streams. According to PCA, upper reaches of streams were characterized by water DO and pH, where lower reaches were by temperature, nitrate, phosphate, conductivity, TDS and COD for PC1 and PC2. The effluent discharge points were characterized by COD, chlorophyll-a, conductivity, TDS, nitrate and phosphate for PC1 and PC2. Twenty five zooplankton species belonging to nine orders (Bdelloidea, Flosculariacea, Ploima, Cyclopoida, Harpacticoida, Sessilida, Choreotrichida, Tintinnida, Centrohelida) were identified. The total abundance of zooplankton was higher in effluent discharge point (192 ± 49) and below (295 ± 119) than that in the upper reach (141 ± 15) of streams. This may be attributed to high nitrate, phosphate, conductivity, TDS and chlorophyll-a levels at discharge points and lower reaches of streams. Pielou's Evenness index, species richness and Shannon-Wiener diversity index were comparatively higher in discharge points and lower reaches than upper reaches. *Rotaria neptunia*, *R. rotaria*, *Canthocampus sp.*, *Filinia longiseta*, *Mytilina mucronata*, *Acanthocystis*, *Lecane luna*, *Anuraeopsis fissa*, *Testudinella patina*, *L. lunaris*, *Vorticella sp.* and *Euchlanis dilatata* were capable of tolerating water quality conditions of effluent discharge points and lower reaches (PCA). Discharge of treated effluent of rubber industry has a positive impact on diversity and abundance of zooplankton in the streams studied in the Kalutara district, Sri Lanka.

Keywords: Rubber industry, Zooplankton diversity, abundance, Kalutara district

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