

## ABSTRACT

The present study, entitled “Limnochemistry, diversity of plankton and ichthyofauna of some rivers of the Dooars region, West Bengal”, was conducted for a period of two years from March 2014 to February 2016. Three rivers, such as the Teesta, Jaldhaka, and Torsa, and two sites for each river, were selected for study. The study was conducted in three sections, such as physico-chemical parameters of river water, plankton diversity, and ichthyofaunal diversity. Temperature, pH, TS, TDS, TSS, DO, free CO<sub>2</sub>, chloride, TA, and TH were determined by standard methods. The Pearson’s correlation coefficient matrix, two-way ANOVA among seasons and sites, and one-way ANOVA between the two years were calculated using SPSS 16.0 and PAST 3.0 software. PCA was done by PAST 3.0 software.

The air temperature, water temperature, depth of water, pH, dissolved oxygen, electrical conductivity, total dissolved solid, total suspended solid, total solid, total alkalinity, total hardness and chloride showed seasonal variation in the three investigated rivers. The water temperature, pH, TDS, TSS, TS, total alkalinity, total hardness, and chloride did not show any significant differences among the six sites of the three investigated rivers, but the depth of water, DO, and FC showed significant differences among the six sites.

Water temperature is the most important parameter that controls other physico-chemical parameters of water. The pH, electrical conductivity, DO, TA, and TH of the three investigated rivers are within the optimum range, making them suitable for fish and other organisms. The DO and FC of the three investigated rivers indicate the good quality of water. Total alkalinity and total hardness indicate that the water of the three investigated rivers is soft in nature.

The PCA concentrates variances of the original data of physico-chemical parameters into two principal components (PC1 and PC2) in the case of rivers Jaldhaka and Torsa and three principal components (PC1, PC2 and PC3) in the case of the river Teesta. PC1 represents more physical and less chemical, while PC2 represents more chemical and less physical. WT, TDS, TH, and TA are the most influential factors.

A total of 24, 26, and 25 genera of phytoplankton belonging to five groups were recorded during the study period from the rivers Teesta, Jaldhaka, and Torsa, respectively. A total of 28 genera of phytoplankton were recorded from the three investigated rivers. Chlorophyceae was the most dominant group in all the three rivers.

Phytoplankton density, numbers of phytoplankton genera, Shannon-Wiener diversity index, and Margalef's species richness index are positively correlated with pH, TDS, conductivity, dissolved oxygen, total alkalinity, total hardness, and chloride but negatively correlated with air temperature, water temperature, depth of water, TSS, and free CO<sub>2</sub>. Similar relations have been suggested by PCA.

A total of 17, 16, and 16 genera of zooplankton were obtained from the rivers Teesta, Jaldhaka, and Torsa, made up of protozoa, rotifera, cladocera, and copepoda. A total of 18 genera of zooplankton were recorded from the three investigated rivers. The density, number of genera, Shannon diversity index, and Margalef's richness index of phytoplankton and zooplankton also showed seasonal variation in the three investigated rivers. The density and number of phytoplankton and zooplankton genera, Shannon-Wiener diversity index, and Margalef's species richness index are positively correlated with pH, TDS, conductivity, dissolved oxygen, total alkalinity, total hardness, and chloride but inversely correlated with air temperature, water temperature, depth of water, TSS, free CO<sub>2</sub>. Similar relations have been suggested by PCA.

The density, number of genera, diversity index, and Margalef's species richness index of phytoplankton and zooplankton are positively influenced by PC2, meaning affected by the chemical properties of water such as DO, TDS, TA, TH, and CL. The number of genera, diversity index, and Margalef's species richness index of phytoplankton and zooplankton are negatively influenced by PC1. They are also negatively affected by the physical properties of water such as water temperature, TSS, TS, and free carbon dioxide. PCA biplots confirmed that phytoplankton and zooplankton density and/or number were the most influential factors which influenced the diversity indices.

A total of 147 fish species of ichthyoauna with remarkable variations in Teesta (140 species), Jaldhaka (119 species) and Torsa (131 species) were recorded. A total of 147 species belonging to 11 orders and 31 families were recorded over the study period from the three rivers. Out of 147 recorded species, 1 is Critically Endangered (0.68%), 20 (13.60%) are Endangered (EN) and 42 (28.57%) are Vulnerable (VU) (according to CAMP-NBFGR). But according to IUCN conservation status, 2 (1.36%) species are Endangered (EN) and 1 (0.68%) species is Vulnerable (VU). Out of 147 recorded species, 1 (0.68%) is Critically Endangered, 12 (8.16%) species are Endangered (EN), 23 (15.6%) species are Vulnerable (VU) and 33

(22.45%) species are near threatened (NT) (according to Barman). Of the total of fish species, only 10.20% (15 species) are endemic fish species recorded from the three rivers. Two endemic fish species are found only in North Bengal. CPUE, number of ichthyofauna genera, Shannon diversity index, and Margalef's species richness index of ichthyofauna showed seasonal variation in the three investigated rivers.

CPUE, density, Shannon-Wiener diversity index, and Margalef's species richness index exhibited significant and positive correlation with air temperature, water temperature, depth of water, TSS, TS, and free carbon dioxide but a significant and negative correlation with TDS, dissolved oxygen, conductivity, total alkalinity, total hardness, and chloride. Similar relations have been suggested by PCA. CPUE, NF, and DVF are influenced by PC1, meaning more physical parameters such as water temperature and depth of water, but negatively influenced by DO, TDS, TA, TH, and CL. PCA biplots revealed that CPUE and the number of fish genera were the most influential factors that influenced diversity indices.

Use of fine mesh size nets for fishing; river bed as an agricultural field; disposal of municipal waste; river embankment; presence of invasive fish species; mining of sand, gravel, and boulders from riverbed flood etc. are all threats to fish diversity.

*Key words*- Limnochemistry, diversity, plankton, ichthyofauna, Dooars, density, Shannon-Wiener diversity index, Margalef's species richness index, species dominance index.