



Diel variation of plankton in the highly impacted freshwater zone of Hooghly estuary in relation to ecological alteration

Trupti Rani Mohanty · Basanta Kumar Das · Nish Kumar Tiwari · Suman Kumari · Kausik Mondal · Sourav Kundu · Sobhadeep Das Gupta · Shreya Roy · Raju Baitha · Mitesh Hiradas Ramteke · Himanshu Shekhar Swain · Aurobinda Upadhyay

Received: 31 May 2023 / Accepted: 29 December 2023
© The Author(s), under exclusive licence to Springer Nature Switzerland AG 2024

Abstract Plankton are promising ecological monitoring tool that responds quickly to any sort of aquatic ecological alteration, of which many of them are much susceptible to ecological variations. Therefore, monitoring shifts in plankton composition can indicate changes in water quality and aid to identify potential pollution sources. In the present study, the variation in plankton dynamics in relation to ecological variables were monitored in the freshwater zone of the Hooghly estuary from May 2020 to April 2021. The study was conducted in the interval of every six hours, i.e., at 6 A.M., 12 P.M., 6 P.M., and 12 A.M. The present finding revealed the occurrence of 54 phytoplankton and 20 zooplankton taxa/species. Diel variation revealed that among different time intervals, the highest abundance of phytoplankton was recorded $28,307 \text{ cells l}^{-1}$ at 12 P.M, while the lowest was recorded $10,632 \text{ cells l}^{-1}$ at 6 A.M. However, the highest zooplankton abundance was observed 804 ind l^{-1} at 6 A.M., and the lowest was recorded 156 ind l^{-1} at 6 P.M. The ANOVA ($p < 0.05$) analysis indicated

significant diel variation for many planktonic genera. The CCA exhibited that most of the phytoplankton were influenced by multiple water quality variables such as temperature, turbidity, calcium, pH, salinity, DO, and nutrients. However, the majority of the zooplankton were affected by turbidity, total phosphorus, sulphate, calcium and available nitrogen. Significant seasonal variation in plankton composition has also been observed. The present study will help to determine the varying diel pattern of planktons in resort to alterations in the water quality parameters and varying ecological niches.

Keywords Plankton · River Ganga · Ecological factors · Diel variation · Multivariate statistical analysis · Diversity indices

Introduction

The productivity of the aquatic ecosystem mainly depends on the dynamics of its flora and fauna. About half of global primary productivity is contributed by phytoplankton, which constitutes the base of the aquatic food web (Hitchcock, 2022; Tian et al., 2023). Nowadays many of the researchers favoured planktons as the prime bio-monitoring assessment tool for the proper management of the aquatic ecosystem (Hu et al., 2022; Mohanty et al., 2022a, b). Phytoplankton executes photosynthesis with the help of sunlight and occupies the base position in the aquatic food chain

T. R. Mohanty · B. K. Das (✉) · N. K. Tiwari · S. Kumari · K. Mondal · S. Kundu · S. Das Gupta · S. Roy · R. Baitha · M. H. Ramteke · H. S. Swain · A. Upadhyay
NMCG Laboratory, ICAR-Central Inland Fisheries Research Institute, Barrackpore, Kolkata, India 700120
e-mail: basantakumard@gmail.com

H. S. Swain
ICAR-Central Institute of Freshwater Aquaculture, Kanakganj, Bhubaneswar, India 751002