



# Macrobenthic Pollution Bioindicator for Ecological Monitoring in Riverine Ecosystem



Shreya Roy, Canchyal Johnson, Supriya Bayen, Tupti Rani Mohanty, Archisman Ray, Manisha Bhor, Himanshu Sekhar Swain and Basanta Kumar Das\*

ICAR- Central Inland Fisheries Research Institute, India

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\*Corresponding author: Basanta Kumar Das, ICAR- Central Inland Fisheries Research Institute, Barrackpore, Kolkata 700 120, India

## Abstract

Freshwater riverine systems are facing series of stress due to different anthropogenic activities, eutrophication and geomorphological alterations. Pollution is the current ecological hazard leading to the deterioration in river water quality and thereby modifying the quantitative distribution of the inhabiting organisms. In the present study, four major eco-physicochemical parameters are selected to correlate with the available benthic species distributed in the entire stretch of river Ganga, India. Total nitrogen, total phosphorus, total chlorophyll and soil organic carbon are considered to be the primary indicators of water and soil pollution and hence, contemplated for correlation with benthic distribution. Out of the total recorded 69 species from river Ganga, 13 species belonging to three different phyla viz. Mollusca, Arthropoda and Annelida was observed to be influenced ( $p < 0.05$ ) by the abovementioned indicating parameters. Among these 13 species, four species belong to class - Gastropod (*Physella acuta* and *Melanoides cyclops*) and class - Bivalvia (*Parrercula corrugata* and *Ledostoma undulocostata*); seven species belong to class Insecta (*Aedes* sp., Dragonfly Nymph, *Notonecta* sp., *Gerris* sp., *Allysipterus* sp., *Philopotamus* sp. and *Chironomus* larvae); and two species belong to class Chelicerata (*Tubifex tubifex* and *Lumbriculus variegatus*). The strong negative correlation of *Melanoides cyclops* with total phosphorus indicated that the species can be marked as an essential aquatic riverine indicator species. The present study can conclude that these identified benthic species can be used as bioindicator organisms for pollution monitoring and riverine health.

**Keywords:** Pollution; Bioindicators; Macrobenthic fauna; Ecophysiological parameters; Ganga

## Introduction

Bioindicators are referred to the accumulation of all the biological and physicochemical reactions in the ecological platform. Benthic organisms, settled in the sediment of an aquatic ecosystem are regarded as the key indicating species for environmental pollution. Aquatic environment vandalism is primarily noticed due to the consequences of hazards on the ecosystem [1-3]. Conventional methods of water quality analysis have been taking place through repeated sampling procedures, but this may not be a precise way to conclude the quality until one combines the abiotic factor with the biotic community. Bioindicating species are rudimentary organisms that can thrive in a planktic or benthic habitat of the aquatic ecosystem. The Ganga river system is one of the oldest and most primitive riverine flowing through extensive land is under constant monitoring to maintain the river health [4]. A constant observational study was carried out on the physicochemical as well as the biological parameters of the river mainly biological oxygen demand (BOD), chemical oxygen demand (COD), dissolved oxygen (DO), pH, water temperature, total coliforms, faecal coliforms etc. [4]. Hydrological

and chemical alterations have a prolonged effect on the riverine biota that could be accessed through monitoring surveys [5]. The aquatic ecosystem is a valuable asset to humans as it constitutes more than 71% of the Earth and comprises 90% biodiversity of the biosphere [6].

Thus, benthic organisms are commonly considered as bioindicators to assess the pollution impacts of the aquatic environment. Numerous authors have depicted the beneficial usage of macrobenthic organisms for biological assessment in the natural environment [7]. Alterations in the chemical composition of water and sediment along with a change in primary productivity can have a greater effect on the sedentary community which leads to a decrease in diversity or escaping off the community species along with mass mortality and physiological interchanges [3]. Precise differences in the physiological activities like feeding, locomotion and life cycle depict the sensitivity of the benthic individuals to tolerate certain types of pollution [8]. Through the changes that occurred in the natural system, due to contamination, we can predict the degree of pollution by studying these organisms [9].