



# Hemato-biochemical alteration in the bronze featherback *Notopterus notopterus* (Pallas, 1769) as a biomonitoring tool to assess riverine pollution and ecology: a case study from the middle and lower stretch of river Ganga

Nitish Kumar Tiwari<sup>1</sup> · Trupti Rani Mohanty<sup>1</sup> · Subhadeep Das Gupta<sup>1</sup> · Shreya Roy<sup>1</sup> · Himanshu Sekhar Swain<sup>1</sup> · Raju Baijath<sup>1</sup> · Mitesh Hiradas Ramteke<sup>1</sup> · Basanta Kumar Das<sup>1</sup>

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## Abstract

Fishes are poikilothermic animals and are rapid responders to any sort of ecological alteration. The responses in the fish can be easily assessed from their hematological and biochemical responses. To study the variation in the hemato-biochemical parameters in respect to ecological alteration and ecological regime, a study was conducted at six different sampling stations of the middle and lower stretches of river Ganga. Various hematological and biochemical responses of fishes were also monitored in response to multiple ecological alterations. For the assessment of ecological alteration, various indices were calculated such as the water pollution index (WPI), National Sanitation Foundation-water quality index (NSF-WQI), and Nemerow's pollution index (NPI) has been calculated based on various water quality parameters such as dissolved oxygen (DO), pH, total dissolved solids (TDS), total alkalinity (TA), total hardness (TH), electrical conductivity (EC), biochemical oxygen demand (BOD), chlorinity (CL), total nitrogen (TN), and total phosphorus (TP). The hematological parameters such as WBC, RBC, platelet, hemoglobin, and hematocrit were monitored. The serum biochemical parameters such as SGPT, SGOT, ALP, amylase, bilirubin, glucose, triglyceride (TRIG), and cholesterol (CHOL) were investigated. The study revealed that NSF-WQI varied from 45.08 at Butar to 110.63 at Rejinagar and showed a significantly positive correlation with SGPT, SGOT, ALP, TRIG, CHOL, and WBC, whereas a significantly negative correlation was observed between TRIG and RBC. WPI varied from 19 to 23 and showed a significant positive correlation with SGOT and a negative correlation was observed with total nitrogen. The PCA analysis illustrated the significance of both natural as well as anthropogenic factors on riverine ecology. Strong positive loading was observed with SGPT, SGOT, ALP, and platelet. The study signified the need for monitoring the hemato-biochemical responses of fishes in response to alterations in the ecological regime.

**Keywords** River Ganga · Hematology · Serum biochemical response · Water pollution index · NSF-WQI · NPI

## Introduction

The river Ganga is the lifeline for the majority of the Indian population as it harbors a vast number of aquatic as well as terrestrial organisms (Pandey and Radhakrishnan 2022).

The river Ganga has great economic, ritualistic as well as ecological importance (Sharma and Singh 2021). Its role in rendering the aquatic ecosystem as well as providing drinking water for the citizens is remarkable. The augmented human dependency due to the multiple-fold amplified rise in population across the river bank has increased the ecological stress on the river system by the means of river pollution. The increasing riverine pollution has led, riverine as well as human health under threat due to their direct or indirect dependency (Tiwari et al. 2022b). The river Ganga is also much susceptible to any sort of ecological alteration due to diversified natural factors such as rainfall, changing weather conditions, river flow, and so on, and has

Responsible Editor: Bruno Nunes

✉ Basanta Kumar Das  
basantakumard@gmail.com

<sup>1</sup> National Mission For Clean Ganga Laboratory,  
ICAR-Central Inland Fisheries Research Institute,  
Barrackpore 700120, Kolkata, India