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Research Article

STUDIES ON THE BIOMASS PRODUCTION OF *MACROBRACHIUM ROSENBERGII* (GIANT RIVER PRAWN) IN RELATION TO PHYSIOCHEMICAL PARAMETERS AT RIVER KOSI, SAHARSA, BIHAR

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ABSTRACT

The current study describes the giant river prawn (*Macrobrachium rosenbergii*) survival rate, mean body weight, length, and biomass production in relation to the water quality parameters at the two distinct sites of the river Kosi viz. Mahisi block and Nauhatta blocks at Saharsa, Bihar. Together with physiochemical data including temperature, pH, dissolved oxygen, and salinity, the study demonstrates seasonal variation. The study was carried out over the course of four seasons- monsoon, winter, spring and summer - from July 2019 to June 2020. These physiochemical parameters have a significant impact on *M. rosenbergii* growth and development. Dissolved oxygen and salinity are the two key variables that have an effect on the biomass production of prawns, as well as their size, length, and survival rate. The study also demonstrates that the water quality, which is caused by industrial area pollution as well as domestic wastes, weeds, etc., causes the quantity and quality of prawns (*M. rosenbergii*) to decline in Mahisi block Saharsa, Bihar, whereas the Nauhatta blocks area exhibits better water quality than Mahisi block as well as increases in biomass production and giant river prawn numbers. As a result, the study sheds light on the physiochemical analysis of water, particularly dissolved oxygen and salinity, which have a significant impact on the development and flourishing of the giant river prawn. These prawns are of the wild type and are found in the river water of Kosi, a freshwater stream, without any human intervention.

Keywords: *Macrobrachium rosenbergii*, Mahisi block, Nauhatta block, Seasonal variation.

INTRODUCTION

Freshwater prawns are an important part of global aquaculture, generating employment and revenues. Freshwater prawn culture is environmentally sustainable since it is practiced at low stocking density (Ahmad and Diana, 2015; Laxmappa and Krishna, 2015). One of the primary rivers that are essential to many locals' livelihoods is the River Kosi. In addition to having a freshwater ecosystem, it was formerly stated that gold was a significant element that could be found in this river. It is a rain-fed river with several minerals and a range of habitats for fish and other aquatic life. The giant freshwater prawn *Macrobrachium rosenbergii* offers high potential for its farming due to its faster growth rate, better survival rate, disease susceptibility, tolerance to wide range of temperature and high international export value (Indulkar *et al*., 2007). Prawns (*M.rosenbergii*) are one of the exceptional invertebrates that are readily available in this river (New, 2002; New, 2005) and are mostly found in this area throughout all four seasons of the year. There are a few other types, but *M.rosenbergii* dominates in terms of predominance in this location. Its production is acquired organically with seasonal change and is based on the quality of the water.

The fishermen had previously said that the number of prawns in this area was declining at an alarming rate day by day. Many years ago, production was strong, but it sharply declined due to residential waste, and numerous other issues. Biomass production is one of the research methods that provide statistically accurate numbers, but local people are still unaware of this technique because they still rely on the labor- and money-intensive manual counting method. These factors can only be identified by checking the physiochemical parameters of water quality. The biomass

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theory limits the production of prawns in the majority of India's coastal regions where prawn farming has developed and there is a high demand for them. Moreover, several studies and tests have been conducted on numerous prawn species, including *P. indicus*, *P. vannamei*, *P. monodon*, and many others. As a result, the study's objective is to gather data on *M.rosenbergii* biomass production through the seasonal variation of water quality factors in order to monitor its production and growth.

MATERIALS AND METHODS

Seasonal research was done from July 2019 until June 2020. The two locations of the River Kosi were included in the study; the first site is in Mahisi block Saharsa, Bihar, located between latitude 25.8543767°N to and longitude between 86.4650201°E. while the other site is at Nauhatta block, Bihar located between latitudes 25.9973256°N and longitude 86.4807744°E. Early in the morning, the samples were gathered at random. Water samples were collected annually in glass bottles, and titration was carried out in the lab using the Weinkers method in accordance with the recommended protocols of (APHA 2012) for physiochemical analysis, which include factors such water temperature, pH, dissolved oxygen, and salinity. In order to gather samples of the prawns for the seasonally repeated physiochemical analysis and biomass production, a net with a mesh size of (35 meshes/cm) was used. The characteristics include biomass output, length, survival rate, and mean body weight. On both sites, prawns (*M.rosenbergii*) were measured for length using scales and rulers and weighed (wet weight) using electronic precision scales in (0.01 gramme). The prawns were counted manually after being measured, and they were then put right away into the river.

Throughout the study period, the ANOVA (Analysis of Variance) approach was used for the computation and evaluation of the *M.rosenbergii* survival rate, mean body weight, length, and biomass production parameters. The results were calculated using the following formulas. The formulas employed by Karim (2007) and Zonnveld *et al*. (1991) were utilized to calculate the survival rate.

SR = Nt/No x 100

Where, SR = Survival rate

Nt = No. of total population of prawns

No = No. of initial population of prawns Mean Body Weight

MBW = Weight of the prawns/ no. of prawns Length of the prawns was done in cm

Biomass Production = SR x MBW

RESULTS AND DISCUSSION

The water quality indicators, including salinity, pH, dissolved oxygen, and temperature, were monitored and analyzed during the study period and were found within acceptable range for freshwater prawn rearing (Correia *et al*., 2000; New, 2002; Mallasen *et al*., 2003). The temperature of the water varies similarly to that of the surroundings; it is higher in the summer and during wet weather and lower in the fall and winter. Its temperature range, which varies from 30.2°C to 19.0°C, is relatively typical and changes with the season. The pH scale also runs from 7.1 to 7.8. These factors create a habitat that is conducive to prawn growth. Dissolved oxygen (DO), according to Boyd (1990), is one of the essential components for an aquatic habitat's successful growth. Consequently, dissolved oxygen (DO) is one of the most crucial elements that affect the stability of aquatic life as well as the development of numerous other creatures, including prawns. The range of the dissolved oxygen regime is 4.4 to 7.0 mg/l. The river Kosi is a transboundary river, and during the monsoon, the water level rises and the river runs vigorously, resulting in the lowest quantity of dissolved oxygen, which is 4.4 mg/l. This occurrence happens primarily during the monsoon season. A good physical and biological process is provided by the high DO level value, which is 8.0 mg/l, to maintain the right balance in the aquatic habitat. One measure of water quality that is significantly impacted by changes in the habitat of rivers is dissolved oxygen.

According to Fujaya (2004), the prawn's respiration could be affected by a reduction in oxygen delivery, and prawns can only maintain better respiration and remain alive with adequate oxygen supply. Through the course of the study, it was discovered that prawns respond better to oxygen supply, flourishing in their growth in size, length, and along the weight of the prawn. Conversely, when dissolved oxygen (DO) was reduced during the rainy season, the number of prawns decreased at a miserable rate, whereas during winters and summers, the survival rate and prawn production increased as a result of the increase in DO. Boyd (1990) demonstrated that as oxygen supply increases, shrimp energy and food consumption rise; conversely, if DO is low, prawn appetite falls. River Kosi has an extremely low salinity of 0.04 to 0.12 ppt because it is a freshwater stream. *M.rosenbergii* is still within this range and is easily found at the sites, demonstrating its ability to withstand changes in water salinity and their adaptability to freshwater streams. According to Dholakia (2010), salinity, which varies from freshwater 0.00 ppt to saltwater 35 ppt, affects a variety of physiological processes, including growth, migration, metabolism, osmotic behaviour, and reproduction.

The survival, growth, and biomass production of *M.rosenbergii* (giant river prawn) are observed to be primarily influenced by salinity and dissolved oxygen during the study period. We looked at the prawns' average body weight, length, survival rate, and biomass production. The analyzed data is presented in Table I, which demonstrate a high association between salinity and dissolved oxygen (DO), two indicators of water quality, and prawn development and abundance. Environmental variables, seasonal variations, and changes in size, mean

body weight, length, and biomass production all have an impact on prawn development and production. The biomass yield is higher in the spring and summer, but it declines significantly during the monsoon season as dissolved oxygen and salinity levels fall due to the severe changes in water level. The size of *M.rosenbergii* decreases during the winter, and biomass production and survival rates are moderate but not significantly better than in the spring and summer.

Table 1. Showing physiochemical analysis seasonally, mean body weight, length, survival rate and biomass production of giant river prawn at two different sites of River kosi.

Site I Mahisi block				Site II Nauhatta block			
Mean Body weight (gm)	Length (cm)	Survival rate	Biomass production	Mean Body weight (gm)	Length (cm)	Survival rate	Biomass production
4.0 ± 0.5	7 ± 0.5	45.21 ± 0.9	172.22 ± 13.2	4.5±0.5	10 ± 0.5	48.28 ± 0.91	212.22 ± 13.2
3.2 ± 0.9	8 ± 0.4	59.12 ± 1.2	180.56 ± 15.2	3.4±0.8	9 ± 0.4	63.22 ± 1.22	210.56 ± 15.3
2.8 ± 0.9	10 ± 0.5	63.02 ± 1.5	189.36 ± 16.3	2.9±0.10	11 ± 0.5	62.02 ± 1.51	179.36 ± 12.3
4.5 ± 0.6	15 ± 0.3	92.15 ± 1.23	403.25 ± 23.4	5.6±0.2	17 ± 0.3	97.15 ± 1.03	490.25 ± 22.4

CONCLUSION

It was discovered during the study period that physiochemical factors such water temperature, pH, dissolved oxygen, and salinity have an impact on the survival rate, mean body weight, length, and biomass output of prawns. The findings indicated that all of these factors, but particularly DO and salinity had a significant impact on the development and growth of prawns (*M.rosenbergii*), which are wild prawns that naturally occur at the two river sites. Due to residential activity, pollution, etc., the water quality of the river at the Nauhatta block site is significantly better than that of the Mahisi block,Saharsa. As comparison to Mahisi block, Saharsa site at River Kosi, Nauhatta block region of River Kosi shows substantially superior results in terms of biomass output and survival rate.

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