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Fish Diversity in Relation to Physico-chemical Characteristics of Budhi Gandak River of Samastipur, Bihar

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Abstract: The present work on fish community of the Budhi Gandak river of Samastipur, Bihar in relation to physico-chemical parameters was studied by monthly samples of 10 freshwater fish species taken from January 2021 to December, 2021. The water of the river is used for fishery and irrigation. These 10 fish species belonging to 4 families *Labeo rohita, Cirrhinus mrigala, Labeo gonius, Catla catla, Rasbora daniconius, Puntius conchonius, Chanda ranga, Chanda nama, Mystus seenghala, Tilapia mossambica* were caught from the Budhi Gandak river. All fishes are useful as commercial, predatory food fishes, which are useful as ornamental and larvicidal fishes. The species diversity is peak in post monsoon, coinciding with favorable conditions such as sufficient water and ample food resources. The diversity was low in pre-monsoon probably due to the shrinkage of the water spread of the river. To save this diversity and to develop a sustainable fishery practices and proper documentation leading to diversity information system is an urgent need.

Keywords: Budhi Gandak river, fish, Physico-chemical

I. INTRODUCTION

India's inland water resources are diversified, as they are plentiful. The rivers contribute the single largest inland fishery resources both in terms of size and production potential. Fish fauna of a river basically represents the fish diversity and their abundance [1]. Indian rivers preserve a rich variety of fish species, which supports to the commercial fisheries [2]. Rivers present a good opportunity for studying the effect of scale on the relative importance of factors that determine diversity. Fish fauna of a supply fundamentally speaks to the fish decent variety and their plenitude [3]. Indian stores save a rich assortment of fish species, which backings to the business fisheries. The soundness of an oceanic environment relies upon the abiotic properties of water and the organic assorted variety of the biological system [4]. India is one of the Mega biodiversity nations in the World and possesses ninth position as far as freshwater Mega biodiversity [5]. Physico-chemical analysis and natural parameters assume critical part in the evaluation of water quality. The investigation of various water bodies is vital in comprehension of the metabolic occasions in sea-going biological community. Species assorted variety is a key pointer of the unpredictability and soundness of natural networks, giving data concerning the wealth of bury particular connections, biological community solidness and nature of ecological conditions [6]. India's inland water assets are expanded, as they are copious. Stores contribute the single biggest inland fishery assets both regarding size and creation potential. Fish fauna of a store essentially speaks to the fish assorted variety and their plenitude.Indian stores safeguard a rich assortment of fish species, which backings to the business fisheries. The targets of the present examination were to archive the fish species in connection to physico-chemical qualities of water and propose proper protection and administration systems.

II. MATERIAL AND METHODS

The Budhi Gandak River is located in the Samastipur, Bihar Latitude 25°51'47.7"N, Longitude 85°46'50.6"E. The fishes were collected from the Budhi Gandak River with the help of local fishermen during the year January 2021 to December, 2021. The fishes were preserved in 10% formaldehyde solution for taxonomic analysis. Identification and economic importance of fishes was carried out with the help of standard literature [7-10]. The fish diversity was subjected to diversity analysis using the index like Shannon-Weaver index [11].

H! =S/I = 1(sum (pi) (Log 2 pi)
Where H! = Shannon-Weaver index, sum represents a capital epsilon
S=number of species, pi= proportion of individuals of the total sample belonging to the **ith s**pecies calculated as ni/N for each **ith** species with ni being the number in species I and N, the number of individuals in the sample. The water samples were collected between 8 Am to 11 Am and further transported to the laboratory immediately for further analysis. Water temperatures was measured at the time of sampling using mercury thermometer, pH was measured with standard pH

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meter (Global DPH 500), while other parameters were analyzed in the laboratory according to the methods suggested by [12, 13].

III. RESULTS AND DISCUSSION

The analysis of physical and substance attributes of water gives a significant knowledge into the nature of water of a water body, which in turn determines its faunal diversity [14]. Mean seasonal variations of Physico-chemical parameters for a period of 12 Months for the sampling sites under study are in table-1. The Physico-chemical parameters were almost similar in the sampling sites under studied; however, the parameters showed marked seasonal variation. It was observed that atmospheric temperature and water temperature followed identical annual trends, showing optimum values for both the parameters during the monsoon and minimum were during post-monsoon winter season.

Water temperature

Average surface water temperature recorded was 18.5˚C-31.1˚C agreed with the ranges recommended. The results finding clearly showed that water temperature remained lesser than air temperature throughout the study duration. Water temperature highest values were recorded in the month of June and lowest values were recorded in the month of January.

Transparency

Transparency values ranged from 32.9-71.2 cm. This show that the fresh water contains adequate nutrients so, it is fairly turbid. In this study highest values were recorded in March and lowest values were recorded in the month of October at the stations.

pH

The pH values recorded between 7 -8.1. This values most suitable for maximum fish production. Tolerable pH range for most fish is 05-09. In present study the most elevated qualities were seen in February and least qualities were recorded in the long stretch of November at the stations. It is built up that water having pH goes between 5.5-8.0 have been most reasonable for in arrive

DO

DO recorded between 4.1- 7.6 mg/l this range documented by APHA for good water quality on fish production. In this study highest values were observed in April and lowest values were recorded in the month of August at the stations. Dissolved oxygen levels can affect fish respiration, as well as ammonia and nitrite toxicity.

Table 1: Physico-chemical parameters recorded for Budhi Gandak river were favorable for fish diversity.

Month/ Parameters	Temp. ˚C	Trans. cm.	pH	DO mg/l	Free CO_2 mg/l	TA mg/l	CL mg/l	BOD mg/l	P mg/l	N mg/l	S mg/l
Jan	18.5	51.8	7.9	5.3	29.7	209	74	3.1	2.37	0.62	6.3
Feb	21.9	59.7	8.2	6.5	31.3	221	79	4.2	1.55	0.58	8.5
March	27.5	71.2	8.0	6.8	29.6	217	83	4.3	0.67	0.59	9.7
April	28.9	69.5	7.8	7.6	35.5	227	91	4.5	0.70	0.80	10.9
May	31.1	65.7	7.3	7.3	44.9	239	93	4.8	0.59	0.79	8.7
June	27.9	47.5	7.6	5.1	54.3	178	67	3.4	0.39	0.59	7.9
July	26.3	42.1	7.1	4.1	60.5	116	59	3.6	0.33	0.61	7.1
Aug	27.1	43.5	7.3	4.1	62.7	86	61	3.1	0.27	0.63	7.9
Sep	26.3	39.2	7.2	4.7	65.9	81	62	3.0	0.21	0.71	7.1
Oct	24.2	32.9	7.1	5.0	49.0	120	75	4.1	0.30	0.72	6.2
Nov	21.1	45.9	7.0	5.4	35.9	135	78	3.4	1.33	0.64	6.7
Dec	19.5	49.7	7.9	5.3	40.1	160	87	3.0	1.45	0.61	5.9

Free CO2

Free CO_2 recorded between 29.6 – 65.9 mg/l this range documented by APHA for good water quality on fish production. In this study highest values were observed in March and lowest values were recorded in the month of September at the stations.

Total alkalinity

The range of total alkalinity recorded was 81 -239 mg/l this value suitable for fish culture. In this findings highest values were observed in May and lowest values were recorded in the month of September at the stations. Total alkalinity is the measure of the capacity of water to neutralize a strong acid. It is generally imparted by the salts of carbonates, bicarbonates, phosphates, nitrates, borates, silicates etc.

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Chloride

The range of Chloride recorded was 59-93 mg/l this value suitable for fish culture. In this study highest values were observed in May and lowest values were recorded in the month of July at the stations.

BOD

BOD ranges between 3.0-5.0 mg/l and found according to the values documented by APHA so, suitable for fish production. In this study highest values were observed in May and lowest values were recorded in the month of September at the stations. During rainy season, Biochemical oxygen demand values were low; this is because the temperature retards the rate of reproduction of organisms.

Phosphate

Phosphate values in water ranged between 0.24 - 2.37 mg/l is quite productive. In this study highest values were observed in January and lowest values were recorded in the month of September at the stations. Nitrates and Phosphates are good indicators of Eutrophication.

Nitrate

Nitrate values of water ranged between 0.58 - 0.79 mg/l nitrogen levels below 90 mg/l seem to have no effect on warm water fish. The relationship between fish and physicochemical parameters showed that no parameters can be singled out in relation to fish production. In this study highest values were observed in May and lowest values were recorded in the month of February at the stations.

Table 2: Growth performance of 10 fish species collected from sampling sites in Budhi Gandak river.

S.N.	Fish Species	Family
1	*Labeo rohita*	Cyprinidae
2	*Cirrhinus mrigala*	Cyprinidae
3	*Labeo gonius*	Cyprinidae
4	*Catla catla*	Cyprinidae
5	*Rasbora daniconius*	Cyprinidae
6	*Puntius conchonius*	Cyprinidae
7	*Chanda ranga*	Ambassidae
8	*Chanda nama*	Ambassidae
9	*Mystus seenghala*	Bagridae
10	*Tilapia mossambica*	Cichlidae

In India more than 1600 species of fishes have been found, has recorded 402 species [15]. The 10 freshwater fishes in the Budhi Gandak River was showed in Table 2. 10 major fish species collected from each of the chosen for the river was detailed analysis. 10 fish species belonging to 4 families *Labeo rohita, Cirrhinus mrigala, Labeo gonius, Catla catla, Rasbora daniconius, Puntius conchonius, Chanda ranga, Chanda nama, Mystus seenghala, Tilapia mossambica.* The five of these parameters (temperature, DO, transparency, pH and alkalinity) must be kept at satisfied level to guarantee high fish species. The seasonal occurrence and species composition in fish production is directly indirectly by Physico-chemical factors of the water. In the present findings, fish diversity showed highly related with Water temperature, Transparency, Dissolve Oxygen (DO), free carbon dioxide, pH, Nitrate, Phosphate, Sulphate, Total alkalinity, Biological Oxygen Demand (BOD). The pH range indicates that these confined water are well alkaline, it is obvious from the present data concentration of chlorides, Nitrates, total alkalinity and low concentrations of dissolved O_2 in river indicating the highly rich in nutrient pollutants.

CONCLUSION

The water quality conditions of the river control Dissolve Oxygen depletion; alkalinity was good for fish composition should be maintained. Further studies (based on fish diversity relation with Physico-chemical parameters of water) are also proposed which will be helpful in fish culture and production in Budhi Gandak River, Samastipur.

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