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Fish diversity in relation to physico-chemical characteristics of Haro Reservoir of Ghatol, Banswara (Rajasthan)

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Abstract

The fish community of the Haro reservoir in relation to physico-chemical parameters was studied by monthly samples taken from Jan-2017 to Dec-2017. This water body is situated at 23° 42' 25" N latitude and 74° 23' 20" E longitude located near Ghatol town of Banswara district, Rajasthan and the confluence of the Haro River. The water of the reservoir is used for producing electricity, fishery and tourism activities. Calculated for 15 freshwater fish species collected during January–December 2017 in Haro river. 15 fish species belonging to 5 families *Labeo rohita*, *Puntius ticto*, *Puntius sarana*, *Cirrhinus mrigala*, *Labeo gonius*, *Puntius sophore*, *Catla catla*, *Rasbora daniconius*, *Danio Devario*, *Puntius conchoniis*, *Chanda ranga*, *Chanda nama*, *Mystus seenghala*, *Tilapia mossambica*, *Wallego attu* were caught from the Haro River. Besides identification, relative occurrence and economic importance of fishes are discussed. Every one of the animal varieties decent variety is crest in post rainstorm, matching with positive conditions, for example, adequate water and abundant sustenance assets. The decent variety was low in pre monsoon most likely because of the shrinkage of the water spread of the repository. The high estimation of broke down oxygen combined with low biochemical oxygen request and other supplement levels show that the water body is modestly oligotrophic in nature. The elements in charge of declining populace of fish species is talked about in detail. To spare this decent variety and to build up a reasonable fishery hones and legitimate documentation prompting assorted variety data framework is an earnest need.

Keywords: Diversity, fish fauna, Physicochemical, Haro reservoir

Introduction

Fish fauna of a supply fundamentally speaks to the fish decent variety and their plenitude. Indian stores save a rich assortment of fish species, which backings to the business fisheries. Repositories show a decent open door for concentrate the impact of scale on the relative significance of components that decide assorted variety. On an expansive scale, supplies are later and their networks are a blend of animal types from the previous riverine angle fauna and additionally presented species ^[1, 2, 3]. Which can be essentially increased in view of data on assorted variety of fish-sustenance creatures. 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-compound 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. The parameters impact each other and furthermore the silt parameter, and additionally they represents the wealth and dispersion of verdure. The historical backdrop of fish presentation goes back a few hundred years, generally little is thought about the purposes behind progress or disappointment of a presented species and natural results have been ineffectively reported ^[6] Ripeness of the supplies is reliant more on the idea of catchment zone, than on the bowl soil. 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 ^[7]. 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.

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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.

Materials and methods

Sampling area

The Haro reservoir is located in the Ghatol, Banswara (Raj.)

Latitude-23° 42' 25" N,

Longitude- 74° 23' 20" E.

Type of Dam: - Earthen Dam,

Name of river: – Haro River

Nearest city: – Ghatol

Length: – 570 Meter

Maximum height: – 46' (14 MTR)

Catchment area: – 56.00 sq. Mills.

Description of the Study Area

The fishes were collected from the Haro reservoir with the help of local fishermen during the year Jan 2017 to Dec 2017. 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^[8, 9, 10, 11]. Fish diversity was subjected to diversity analysis using the index like Shannon-Weaver index^[12].

$$H' = S/I = 1(\text{sum}(\pi) (\text{Log } 2 \pi))$$

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 species 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. 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 meter (Global DPH 500), while other parameters were analyzed in the laboratory according to the methods suggested by^[13, 14].

Results

Physico-chemical parameters

The investigation of physical and substance attributes of water gives a significant knowledge into the nature of water of a water body^[15] which in turn determines its faunal diversity. Mean seasonal variations of Physico-chemical parameters for a period of one year for the sampling sites under study are presented in table-1. Physico-chemical parameters were almost similar in the sampling sites under study; 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).

Table 1: The various Physico-chemical parameters recorded for Haro 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	18.0	52.1	8.0	5.4	30.4	210	76	3.3	2.46	0.66	6.6
Feb	22.1	60.2	8.2	6.6	31.9	224	82	4.4	1.60	0.60	8.9
March	27.2	70.4	8.1	6.9	30.2	220	90	4.6	0.70	0.62	10.2
April	28.6	69.1	7.9	7.7	36.1	230	96	4.8	0.74	0.81	11.1
May	31.2	66.2	7.6	7.4	45.2	241	98	5.0	0.62	0.85	9.1
June	28.1	48.3	7.7	5.2	56.1	186	70	3.6	0.41	0.62	8.2
July	24.0	40.3	7.2	4.2	60.1	120	60	3.8	0.36	0.64	7.3
Aug	26.2	42.6	7.4	4.0	63.2	90	62	3.2	0.28	0.66	8.0
Sep	25.0	38.1	7.3	4.8	67.3	85	64	3.0	0.22	0.76	7.1
Oct	23.1	32.2	7.2	5.1	49.1	120	78	4.2	0.32	0.77	6.4
Nov	20.0	46.7	7.1	5.5	36.1	135	82	3.6	1.38	0.66	6.9
Dec	18.2	50.3	7.9	5.4	40.2	160	90	3.2	1.48	0.63	6.0

Water temperature

Average surface water temperature recorded was 18°C-31.2°C agreed with the ranges suggested. The results clearly showed that water temperature remained lesser than air temperature throughout the study period. Water temperature values were recorded in the month of June and lowest values were recorded in the month of January.

Transparency

Transparency values ranged from 32.2-70.4cm. This show that the fresh water contains adequate nutrients so, it is fairly turbid. In this study highest values were observed in March and lowest values were recorded in the month of October at the stations. High turbidity due to degradation of blue green algae which reduced the light penetration^[16].

pH

The pH values recorded between 7.1-8.2. This values most suitable for maximum fish production. Tolerable pH range for most fish is 05-09. In this investigation most elevated

qualities were seen in Feb 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 Coka Dam angle culture and pH esteem more than 8.5 was observed to be unsatisfactory as CO₂ in not accessible. Mortality of fishes happens at about pH^[17].

DO

DO recorded between 4.0- 7.7 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.

Free Co₂

Free Co₂ recorded between 30.2 - 67.3 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 85 -241mg/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 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.

Chloride

The range of Chloride recorded was 60-98 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 0.22 - 2.46 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. Phosphorus along with Nitrogen causes explosive growth of algal species ^[18].

Nitrate

Nitrate values of water ranged between 0.60 - 0.85 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 15 fish species collected from sampling sites in Haro River.

S.N.	Fish Species	Family
1	<i>Labeo rohita</i>	Cyprinidae
2	<i>Puntius ticto</i>	Cyprinidae
3	<i>Puntius sarana</i>	Cyprinidae
4	<i>Cirrhinus mrigala</i>	Cyprinidae
5	<i>Labeo gonius</i>	Cyprinidae
6	<i>Puntius sophore</i>	Cyprinidae
7	<i>Catla catla</i>	Cyprinidae
8	<i>Rasbora daniconius</i>	Cyprinidae
9	<i>Danio Devario</i>	Cyprinidae
10	<i>Puntius conchonius</i>	Cyprinidae
11	<i>Chanda ranga</i>	Ambassidae
12	<i>Chanda nama</i>	Ambassidae
13	<i>Mystus seenghala</i>	Bagridae
14	<i>Tilapia mossambica</i>	Cichlidae
15	<i>Wallego attu</i>	Siluridae

In India more than 1600 species of fishes have been found, has recorded 402 species ^[19]. The 15 freshwater fishes in the

Haro River was tabulated in Table 2. 15 major fish species collected from each of the chosen for the Haro River was detailed analysis. 15 fish species belonging to 5 families *Labeo rohita*, *Puntius ticto*, *Puntius sarana*, *Cirrhinus mrigala*, *Labeo gonius*, *Puntius sophore*, *Catla catla*, *Rasbora daniconius*, *Danio Devario*, *Puntius conchonius*, *Chanda ranga*, *Chanda nama*, *Mystus seenghala*, *Tilapia mossambica*, *Wallego attu*.

Discussion

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 study, 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 O₂ in river indicating the highly rich in nutrient pollutants.

Conclusion

Water quality conditions of the River control DO 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 Haro River.

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