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Analysis on ichthyofaunal diversity and water quality of Rajendra Mansoraver Ponds, Chapra

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Abstract
The ichthyofaunal study was led on the occasional premise from October 2016 to November 2016 according to water nature of Rajendra Mansoraver Pond, Chapra. The examination uncovered that physicochemical boundaries of Rajendra Mansoraver Pond, Chapra were pleasant for 45 industrially significance fish species, having a place with 7 requests, 17 families, and 32 genera. The Cypriniformes were prevailing with 18 species, trailed by Siluriformes (12), Perciformes (9), Clupeiformes (3), Osteoglossiformes, Mugiliformes and Synbranchiformes each with 1 species. About their protection condition, 38 species were least concern, 1 species was defenseless, 3 species were close to compromised and 3 species was information insufficient. The water quality boundaries, for example, temperature, pH, alkalinity, hardness, broken up oxygen, smelling salts, nitrate, nitrite and phosphate were recorded and discovered to be useful for water life.

Keywords: Ichthyofaunal, water quality, Rajendra Mansoraver Ponds

Introduction
Pond and River add to the single biggest inland fishery assets as far as both size and creation potential. Fishes are the significant marker of sea-going biological system and involve a striking situation from a financial perspective. Decrease in oceanic variety because of overfishing, lacking administration practices and territory debasement, which diminishes the odds of its supportability. Ecological changes are either because of characteristic causes or human action. As of now, most Pond and River on the planet are utilized by individuals for various purposes, for example, garbage removal, modern cycles, fisheries, amusement, and so forth distinguished territory modification and annihilation as the significant reason for most termination of freshwater fishes. In the flow study, our fundamental target was to appraise the appropriateness of water to support reasonable fishery, by inspect water quality boundaries. We clarify the ichthyofaunal variety in Rajendra Sarover Chapra Pond, in connection with the physicochemical boundaries of water.

Materials and Methods
For analysis of water quality parameters of Rajendra Sarover using standard methods [1-3] sampling were conducted between 9:00 AM and 11:00 AM. Water samples were directly taken in wide mouth pre cleaned plastic bottles for analysis of various physico-chemical properties. ELICO water quality analyzer PE 138 kit used for the determination of dissolved oxygen concentration or by winklers method on site. Samples were transported to the laboratory for analysis of other parameters, under standard ideal conditions. ELICO water quality analyzer model no.PE 138 was used for analysis of Temperature, pH and dissolved oxygen. ELICO SL27 spectrophotometer used measurement of Ammonia, nitrate, nitrite and phosphate. Through experimental fishing at all sampling sites of Rajendra Sarover alive fish samples were collected for identification at that place and also preserved in 10% formalin for further analysis at laboratory. Fishes are identified based on the work of Jhingran (1991) [4] with minor amendment as followed by Day's Fauna [5-7]. For catching fish mainly tow type of fishing nets gill net and cost net of varying mesh size were operated by local expert fisherman. During netting maximum care should be taken to avoid defecation or disgorgement of fish's organs due to stress. Collected specimens were identified on the basis of morphometric and meristic characters.

Table 1: Morphometric characters and metrological data of Rajendra Sarover.

Parameters	Rajendra Sarovar
Longitude	83°12'18" E
Latitude	26°56'38" N
Altitude (masl)	163
Area (ha)	2621
Maximum depth (m)	6.1
Surface area (km^2)	8.68
Catchment area (km^2)	7.25
Annual rainfall (mm)	2086

Results and Discussion

The mean values ± standard error of water quality parameters were shown in Table 2, and the fish diversity and seasonal availability are presented in Table 3, 4 and 5. The seasonal survey of the ichthyofauna showed the occurrence of 45 commercially importance indigenous fish species, belonging to 7 orders, 17 families, and 32 genera. The Cypriniformes were dominant with 18 species, followed by Siluriformes (12), Perciformes (9), Clupeiformes (3), Osteoglossiformes, Mugiliformes and Synbranchiformes each with 1 species. Similar results, a total of 29 fish species belonging to 10 families, 7 orders, and 15 genera were reported for the Halali Reservoir, Vidisha, Madhya Pradesh [8]. For fish growth and sustainable development of ichthyofaunal diversity aquatic habitat and water quality parameters play key role in aquatic ecosystem.

Table 2: Seasonal variation of physico-chemical parameters of water during the study period

Parameters	Summer	Winter	Monsoon
Temperature (0C)	30.00	20	27.00
pH	7.89±0.06	7.78±0.09	7.95±0.17
Alkalinity (mg l^{-1})	93.60±1.8	105.46±2.16	98.66±2.43
Hardness (mg l^{-1})	123.20±3.30	117.33±2.60	121.60±2.81
Dissolved oxygen (mg l^{-1})	5.49±0.11	6.01±0.08	5.94±0.07
Ammonia (mg l^{-1})	0.58±0.00	0.60±0.01	0.59±0.01
Nitrate (mg l^{-1})	0.70±0.12	1.39±0.22	1.43±0.16
Nitrite (mg l^{-1})	0.30±0.03	0.33±0.02	0.33±0.02
Phosphate (mg l^{-1})	0.25±0.01	0.21±0.01	0.21±0.01

Temperature is one of the important factors for the aquatic flora and fauna. Increase or decrease of temperature directly or indirectly impacts species distribution and the seasonality of production in fishes. Rajendra Mansoraver temperature were recorded 20 to 30 (0C) which is suitable for aqua life except winter season temperature goes down. pH is calculated mathematically by, the negative logarithm of hydrogen ions concentration. Carbon dioxide which is an acidic gas those concentration greatly influenced pH of natural water body. Rajendra Mansoraver has pH value ranges between 7.78±0.09 to 7.95±0.17. Between 6.7 and 9.5 suitable pH range for fish fauna. Alkalinities ranged were recorded between 93.60±1.10 $mgl^{-1}$to 105.46±2.16mgl^{-1}. During winter season maximum alkalinity values were recorded and during summer season minimum value of alkalinity were recorded. Rajendra Mansoraver hardness value ranged between 117.33±2.60 mgl^{-1} to 123.20±3.30 mgl^{-1} were recorded similar result also observed. During winter minimum concentration of total hardness were recorded and in the summer season maximum in concentration. Availability of dissolved oxygen was recorded in the Rajendra Mansoraver water ranges between 5.49±0.11 mgl^{-1} to 6.01±0.08 mgl^{-1}. During summer season dissolved oxygen concentration were recorded minimum, whereas maximum dissolved oxygen were concentration were recorded during winter season. DO level >5 mg l^{-1} is essential for support good fish production. Increased microbial activity and raise temperature depletion of dissolve oxygen in water. Decomposition of organic matter and protein metabolism after feed digestion ammonia excreted by bacteria and fish such as dead planktons and wasted food etc., concentration of ammonia were recorded 0.58±0.00 mg l^{-1} to 0.60±0.01mg l^{-1} during the investigation. Other parameters like nitrate, nitrite and phosphate were recorded under desired condition.

Table 3: Fish species diversity in Rajendra Mansoraver Chapra.

SL. number	Order	Family	Scientific name	Common name	Local name	IUCN Status	Seasonal Abundance	Economic value
1			*Gibelion catla*	Catla	Bhakur	LC	TY	Food fish
2			*Labeo bata*	Bata labeo	Bata	LC	TY	Food fish
3			*Labeo calbasu*	Black rohu	Karonchi	LC	TY	Food fish
4			*Labeo dero*	Kalabans	Khaira	LC	SM	Food fish
5			*Labeo rohita*	Rohu	Rui	LC	TY	Food fish
6			*Cirrihina reba*	Reba carp	Raia	LC	SM	Food fish
7			*Cirrhinus mrigala*	Mrigal	Nain/ Mrigal	LC	RS	Food fish
8			*Aspidoparia morar*	Morar	Kenwachi	LC	WN	Food fish
9	Cypriniformes	Cyprinidae	*Hypophthalmichthys nobilis*	Bighead carp	Briged	DD	TY	Food fish
10			*Ctenopharyngodon idella*	Grass carp	Grass	DD	TY	Food fish
11			*Cyprinus carpio*	Common carp	China	VU	TY	Food fish
12			*Esomus danricus*	Flying barb	Dendua	LC	TY	Ornamental
13			*Hypophthalmichthys molitrix*	Silver carp	Silver	NT	TY	Food fish
14			*Amblypharyngodon mola*	Mola carplet	Dhawai	LC	SM	Food fish
15			*Securicula gora*	Dariyari	Chal	LC	WN	Food fish
16			*Puntius sarana*	Barb/ Olive barb	Puthiya	LC	TY	Food fish
17			*Puntius sophore*	Pool barb	Jatpunti	LC	SM	Ornamental
18			*Puntius ticto*	Ticto barb	Tit punti	LC	SM	Food fish/Ornamental
19		Siluridae	*Wallago attu*	Fresh water shark	Padhani/Barari	NT	WN	Food fish/Ornamental
20		Bagridae	*Mystus bleekeri*	Tengar catfish	Tengra	LC	WN	Food fish/Ornamental
21			*Mystus cavasius*	Gangetic mystus	Sutahawa tengra	LC	SM	Food fish
22			*Mystus tengara*	Tengra catfish	Tengana	LC	SM	Food fish
23			*Sperata aor*	Long whiskered catfish	Dariai tengara	LC	TY	Food fish
24			*Sperata seenghala*	Giant river catfis	Dariai tengara	LC	TY	Food fish
25	Siluriformes	Schilbeidae	*Ailia coila*	Gangetic ailia	Patasi/Minti	NT	RS	Food fish/Ornamental
26			*Clupisoma garua*	Garua	Baikari/Karahi	LC	TY	Food fish
27			*Eutropiichthys vacha*	Batchwa vacha	Banjhoo	LC	TY	Food fish
28		Pangasiidae	*Pangasius pangasius*	Pangas catfish	Payasi	LC	TY	Food fish/Ornamental
29		Heteropneustidae	*Heteropneustes fossilis*	Stinging catfish	Singhi	LC	SM	Food fish/Ornamental
30		Clariidae	*Clarias batrachus*	Air breathing catfish	Mangur	LC	SM	Food fish/Ornamental
31		Clupeidae	*Gudusia chapra*	Indian River Shad	Suhia	LC	TY	Food fish
32	Clupeiformes		*Gonialosa manmina*	Ganga river gizzard shad	Majhali suhia	LC	TY	Food fish
33		Engraulidae	*Setipinna phasa*	Gangetic-hairfin anchovy	Phansi	LC	TY	Food fish
34	Osteoglossiformes	Notopteridae	*Notopterus notopterus*	Bronze featherback	Patra	LC	WN	Food fish/Ornamental
35	Mugiliformes	Mugilidae	*Sicamugil cascasia*	Yellowtail mullet	Yellowtail mullet	LC	RS	Food fish
36		Channidae	*Channa gachua*	Dwarf Snakehead	Chanaga	LC	TY	Food fish
37			*Channa marulius*	Great snakehead	Saur	LC	TY	Food fish
38			*Channa punctata*	Spotted snakehead	Girai	LC	TY	Food fish
39			*Channa striatus*	Asian snakehead	Sauri	LC	TY	Food fish
40	Perciformes	Ambassidae	*Chanda nama*	Elongate glass perchlet	Chanri	LC	TY	Food fish/Ornamental
41			*Parambassis ranga*	Indian Glassy Fish	Chanri	LC	WN	Food fish
42		Badidae	*Nandus nandus*	Gangetic leaffish	Dhebri	LC	RS	Food fish/Ornamental
43		Anabantidae	*Anabas testudineus*	Climbing perch	Kawai	DD	TY	Food fish
44		Osphronemidae	*Trichogaster fasciata*	Banded gourami	Khosti	LC	WS	Food fish/Ornamental
45	Synbranchiformes	Mastacembelidae	*Mastacembelus armatus*	Zig-zag eel	Bam	LC	TY	Food fish/Ornamental

WN= winter, SM = summer, TY = throughout the year, and RS = rainy season LC = least concern, VU= vulnerable, NT = near threatened and DD= data deficient.

Highest percentage shared by family Cyprinidae 40.00% comprising fish species are Gibelion catla, Labeo bata, Labeo calbasu, Labeo dero, Labeo rohita, Cirrhinus mrigala, Cirrihina reba, Aspidoparia morar, Hypophthalmichthys

nobilis, Ctenopharyngodon idella, Puntius sarana, Puntius sophore etc. Second largest share by family is Bagridae (11.11%) comprising fish species are Mystus bleekeri, Mystus cavasius, Mystus tengara, Sperata aor, Sperata seenghala followed by Channidae comprising four fish species Channa gachua, Channa marulius, Channa punctata, Channa striatus.

Table 4: Composition of the fish community by order.

S. Number	Taxa	Number of species	Percentage (%)
1	Order: Cypriniformes	18	40.00
2	Order: Siluriformes	12	26.67
3	Order: Perciformes	9	20.00
4	Order: Clupeiformes	3	6.67
5	Order: Osteoglossiformes	1	2.22
6	Order: Mugiliformes	1	2.22
7	Order: Synbranchiformes	1	2.22
Total		45	

Family Schilbeidae comprises only three fish species Ailia coila, Clupisoma garua, and Eutropiichthys vacha family Ambassidae and Clupeidae shared only two species each. Other family Notopteridae, Mugilidae, Badidae, Osphronemidae, Mastacembelidae, Siluridae, Pangasiidae, Heteropneustidae, Clariidae, Engraulidae and Anabantidae contributed only one species each. The fisheries of lake and reservoire are based on relatively large number of species and a wide range of fishing gears and craft. Habitat degradation, invasion of exotic fishes and fishing pressure are the main causes for loss of fish biodiversity in aquatic ecosystem. Environmental stress and fishing pressure are reflected in the fish community composition and biodiversity of fishes. However, more understanding and motivation is required on the value of indigenous fish diversity and conservation of aquatic resources to ensure the sharing of benefits of its utilization in an reasonable manner so that the aquatic ecosystem gets sufficient time to restore its natural community structure [9-11].

Table 5: Composition of the fish community by family.

S. Number	Taxa	Number of species	Percentage (%)
1	Family : Cyprinidae	18	40.00
2	Family : Bagridae	5	11.11
3	Family : Channidae	4	8.87
4	Family : Schilbeidae	3	6.65
5	Family : Ambassidae	2	4.44
6	Family : Clupeidae	2	4.42
7	Family : Notopteridae	1	2.20
8	Family : Mugilidae	1	2.20
9	Family : Badidae	1	2.20
10	Family : Osphronemidae	1	2.20
11	Family : Mastacembelidae	1	2.20
12	Family : Siluridae	1	2.20
13	Family : Pangasiidae	1	2.20
14	Family : Heteropneustidae	1	2.20
15	Family : Clariidae	1	2.20
16	Family : Engraulidae	1	2.20
17	Family : Anabantidae	1	2.20
Total		45	

Conclusion

In this paper after entire year analyze of Rajendra Mansorover we were recorded the ichthyofaunal variety and it was discovered that this lake is well off in ichthyofaunal variety yet preservation measure is likewise required. A change of physico-substance boundaries of this lake is legitimately or in a roundabout way corresponded with and organic profitability potential. Living space debasement, anthropogenic action, sewage removal, and so on are a portion of the purposes behind antagonistically influencing the event of ichthyofauna in this lake. Appropriate administration of this lake may assist with boosting the fish creation and living space preservation.

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