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Ichthyofaunal and physico-chemical parameter study of sub-urban ponds in Mungeli, Chhattisgarh

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Abstract: In India ponds apart from being hydrological component of the ecosystem have many uses, including catering water need to agriculture, communities and livestock. They serve as breeding grounds for the aquatic species and aid in habitat restoration. Fishes are one of the most important fauna directly or indirectly influencing human health and economy. The physico-chemical health of the water bodies greatly affects the fish diversity as well as the reproduction. We have studies the relationship between some of the physic-chemical parameter and the diversity of fish in a selected pond of close to a suburban area.

Key words: Fish diversity, physic-chemical parameter, aquatic ecosystem, Ichthyofauna.

I.INTRODUCTION

India is blessed with abundant resources including rich biodiversity and water ecological heritage. Fish are the group of widespread vertebrate found abundantly in diverse group, shapes and sizes. The country has around 1, 26,334 Km. of canalsand ponds 45,000 Km. of rivers, 2.05 million hectares of tanks 2.36 million hectares reservoirs for fresh water fisheries. Out of 21,730 fish species recorded in the world nearly 11.7% are inhabitants of Indian water (Kar, 2003).

Freshwater resources in India have been utilized mainly for economic purposes. Although wetlands are socio-culturally associated with the native people, despite the fact for sake of conservation of freshwater ecosystem no substantial effort are made. Among the other freshwater fauna ichthyofauna diversity is much more important due livelihood concern of natives. More over freshwater bodies receive huge amount of sewage and industrial waste and are also suffering from irrational fishing practices. The water bodies are continuously receiving sedimentation, pollutions and water abrasion leading to declined diversity of freshwater aquatic fauna.

Mungeli district in Chhattisgarh is Located Between 21°48′35″ To 22 °40′30″ North Latitude, Between 81°29′45″ To 82 °02′10″ East Longitude and 288 meters above the sea level with 2750.35sqkm land area including 1100sq km forest . The temperature remains between Max – 43° Min – 11 ° and average rain fall of 1130 mm.

II.MATERIALS AND METHODS

Physico-chemical parameter study of water: The water samples were collected from three ponds of sub-urban area in Mungeli locals (S1, S2 and S3) during May –Dec. 2021(Figure 1.). The physico-chemical parameter study included the data for water temperature, pH, turbidity, conductivity, dissolved solids and suspended solids observed.

Water samples were collected from all the ponds at 07:00 AM to 09:00 AM at a depth varying from 5 cm to 15 cm from the surface. A separate sample was collected to calculate the dissolve oxygen. The water temperature and pH was determined in the field with the help of sensitive thermometer and BDH narrow range pH indicator paper respectively. The following Physico-chemical parameters were analysed according to APHA, 2005 & NEERI, 1979.

Fish diversity: The fish diversity study of selected ponds included methods of collection, photography, preservation, identification, morphometric and meristic study of collected fish specimens.

The fishes samples were collected with the help of groups of experienced fishermen by using variety of available sampling methods such as cast nets (16 mm., 18 mm., 22 mm.), gill nets (32 mm., 38 mm., 64 mm., 78 mm., 110 mm.), drag nets (4mm. 15x3 mtr.), jhara jal, scoop nets, and other local contrivances as per the requirement of habitat type. The sampled fishes from different sampling sites of each pond were washed gently and photographed.

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Fishes caught alive or narcotized or dead state were washed and preserved in 10% dilute formalin solution at the sampling site. Large sized fishes were eviscerated, average length fishes were preserved with injecting formalin in its visceral cavity, whereas small fish specimen were preserved directly without injecting and evisceration. Each sample was labelled and put into small containers, its date, place, time; color and other significant information were recorded in field diary.

Preserved fishes so collected were brought to the laboratory for further studies. The morphometric measurements and meristic counts were done and identified up to the species level, with the help of standard keys and books followed by Day (1878); Qureshi & Qureshi (1983); Jhingran (1991); Talwar and Jhingran (1991); Jayaram (1999).

III. RESULTS AND DISCUSSION

Temperature is one of the most important factors in the aquatic environment (Singh and Mathur, 2005). The temperature plays a crucial role in physico-chemical and biological behaviour of aquatic system (Dwivedi and Pandey, 2002). The temperature recorded almost similar in the entire pond during each month of test period. However, variations on water temperature noted month wise. The highest temperature ranging 27.1°C to 28.8°C recorded between April and June (Table 1). This was followed by 24°C to 25.7°C during March and August. The month of January and February recorded the lowest temperature ranging from 22.6°C to 23.4°C. The atmospheric temperature and water temperature have great relation and it is directly influenced by atmospheric temperature. The temperature influences the various life processes of aquatic organisms and that of fishes.

The pH value of water sample in all sampling stations showed seasonal variations. During the summers (April -August) the vale ranged from pH 7.9 to 8.5, which was lower ranging pH 7.4 to 7.8 in the cool months of January- March (Table 1). For good pond health the pH range of 6.5-9.5 is desirable, whereas the acceptable range is 5.5-10.0. The study data is similar and agreeable with the findings of Stone and Thomforde (2003. The decrease of pH during winter may be attributed to the reduction of photosynthesis and maximum during summer can be result of increase photosynthesis. (Zutshi and Vass, 1978)

Sampling site S2 and S3 had the highest specific conductivity had the highest specific conductivity during the month of July i.e. 94.3 µmhos/cm and 93.5 µmhos/cm respectively. This was followed by the values 88.3 µmhos/cm and 87.9µmhos/cm in the month of March. In contrast to this S1 high conductivity 94.1µmhos/cm was recorded in March followed by 68.8µmhos/cm in August. Same trend was maintained for the lowest conductivity value also. S2 and S3 showed lowest value 57.7 µmhos/cm and 55.3 µmhos/cm respectively in May whereas S1 had lowest value 94.1 in the month of March. The result resembles with the findings of Pandey and Pandey, 2003; Kulshrestha, 1989.

Clay silt, organic matter, planktons and other microscopic organisms cause turbidity in natural waters (Kishore et al., 2005). This has been recognized as valuable limiting factor in the biological productivity of the water bodies. The turbidity of all the sampling stations showed seasonal similarity. The maximum turbidity 12.3 NTU in S1, 14NTU in S2 and 13.6 NTU in S3 was noted in the month of May. Whereas, lower NTU was seen in the month of August, i.e. 7.0, 4.0 and 4.5 NTU in sampling sites S1, S2 and S3 respectively (Table 2.).

The suspended solids of the pond are reported to increase due to casting of sewage and other wastes into the pond (Hora and Pillay, 1992). The fish food which consists of 15% of protein has been known to increase suspended solids (Omitoyin et al., 2005). In our study site we found high suspended solid in all ponds in during the month of May to August which ranged from 208mh/l to 334mg/l. Significantly, lower suspended solids was found during January to April i.e. 17mg/l to 36mg/l in all three sites (Table 2.).

The highest suspended solid among the study period was in the month of June in S2 (5mg/l) and S3 (5.2mg/l). In case of studt site S1 highest value (3.5mg/l) was recorded in July. The lowest value of dissolved solids i.e. 0.6mg/l - 0.8mg/l was noted in the month of April in all three ponds (Table 2.). The high concentration of dissolve solids in enriches the nutrient status of water bodies are result of eutrophication of the aquatic eco-system (Swaranlatha & Rao, 1998, Singh & Mathur, 2005). The nutrients used for the fish food gradually increase the total dissolve solids in pond (Ogbeibu and Victor, 1989.

In our study we collected 1403 fished including 672 fishes from S1, 465 from S2 and 266 from S3. The fishes collected from all three ponds comprised of 50 species belonging to 26 genus. In sampling station S1 we found presence all 26 genus and 50 species. (Table. 3) The dominating populations of this site belong to genus *Mystus* (13.5%) consisting five species, *Labeo* (12.28%) consisting four species and *Puntinus* (10.27%) consisting six species. The remaining populations belong to 23 genus containing 35 species with their individual share ranged from (0.78-7.37%). In sampling site S2 we found 25 genera consisting of 49 species. Genus *Lobeo* (15.81) consisting of four species remain with highest population in this site. This was followed by *Puntis* (9.35%), *Chanda* (7.10), *Cirrhinus* (6.77%) and Gudusia (6.13%). Remaining 55% population consisted 29 species of 21 genus. In S3 we found 36 species belonging to only 17 genus out of which 39.48% population belong to three genus (*Labeo* 16.92%, *Puntis* 12.41 and *Gudusia* 10.15%) consisting 11 species. Rest 60.52% population was shared by 39 species of 14 genus.

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IV CONCLUSION

The species of Genus Labio (15%) were the dominant fish population in all study sites and genus Puntis (10.68%) were second dominant fish consisting of six species, *Puntis chola* being in highest populated in this genus. The third highest species noted were the members of *Mystus* (8.02%). Thus, it may be concluded that the physico-chemical and biological conditions of the present pond is favourable for production of above fish species.

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Table 1.: Physico-chemical parameter of water sample

	Temperature °C			**pH**			**Specific conductivity (µmhos/cm))**		
	S1	**S2**	**S2**	**S1**	**S2**	**S2**	**S1**	**S2**	**S2**
Jan.	23.4	22.8	23.2	7.4	7.5	7.4	64.8	66.3	65.5
Feb.	22.9	22.6	22.7	7.5	7.6	7.7	67.9	59.3	67
Mar.	25.8	26	25.7	7.7	7.8	7.8	94.1	88.3	87.9
Apr.	27.2	26.9	27.1	7.9	8.2	8.1	74.2	63.8	77.1
May	28.7	28.6	28.3	8.4	8.4	8.4	77.6	57.7	55.3
Jun.	28.8	28.6	28.7	8.5	8.5	8.5	87.1	79.4	82.4
Jul.	26	26.2	26	8.3	8.5	8.4	92.7	94.3	93.5
Aug.	24.8	24	24.4	8.2	8.4	8.5	68.8	69.9	68

Table 2.: Physico-chemical parameter of water sample

	Turbidity (NTU)			**Suspended solids (mg/l)**			**Dissolved solids (mg/l)**		
	S1	**S2**	**S2**	**S1**	**S2**	**S2**	**S1**	**S2**	**S2**
Jan.	6.8	7.2	7.5	29	25	25	1.63	1.32	1.28
Feb.	9	8.8	10	18	18	18	1.59	1.27	1.22
Mar.	10.5	11	11.2	19	20	17	1.66	1.29	1.26
Apr.	12	13.2	11.8	34	36	32	0.8	0.8	0.6

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May	12.9	14	13.6	233	240	208	1.4	1.4	1.2
Jun.	12.3	12.8	13.2	319	325	288	4.5	5	5.2
Jul.	7.2	5.8	6.4	326	334	303	3.4	4.1	3.6
Aug.	7	4	4.5	322	329	309	0.9	1.1	1.1

Table 3.: Fish diversity in study site

S. No.	Genus name	Name of Fish species	Sampling sites			Number of species
			S1	S2	S3	
1	*Anabas*	*Anabas testudineus*	17	14	12	42
2	*bagarius*	*bagarius bagarius*	7	9	7	23
3	*Catla-*	*Catla-catla*	20	23	12	56
4	*Chanda*	*Chanda nama*	13	9	8	29
		Chanda ranga	9	5	0	14
		Chanda ranga	9	5	0	14
		Channa gachua	14	12	9	35
		Channa marulius	5	2	0	7
5	*Channa*	*Channa punctatus*	20	17	12	48
		Channa striatus	16	11	8	34
6	*Cirrhinus*	*Cirrhinus mrigala*	12	26	11	48
		Cirrhinus reba	11	6	8	25
7	*Clarias*	*Clarias batrachus*	12	9	6	27
8	*Cprinous*	*Cprinous carpio*	10	0	0	10
9	*Esomus*	*Esomus dendricus*	8	7	5	20
		Esomus dendricus	8	7	5	20
10	*Eutrophiythes*	*Eutrophiythes vacha*	5	8	6	19
11	*Gudusia*	*Gudusia chapra*	17	29	27	73
12	*Glossogobius*	*Glossogobius guiris*	7	5	0	12
13	*Heteropneustes*	*Heteropneustes fossilis*	17	14	12	42
14	*Hypophth-almichthys*	*Hypophthalmichthys molitrix*	5	2	0	6
		Hypophthalmichthys molitrix	5	2	0	6
15	*Labeo*	*Labeo bata*	28	31	26	85
		Labeo calbasu	14	11	7	31
		Labeo gonius	16	18	0	34
		Labeo rohita	26	14	12	52
16	*Mastacembelus*	*Mastacembelus armatus*	6	0	0	6
		Mastacembelus armatus	6	0	0	6
		Mastacembelus puncalus	13	7	0	20
17	*Mystus*	*Mystus aor*	8	0	0	8
		Mystus cavastius	29	0	0	29
		Mystus seenghala	27	11	8	47
		Mystus tengara	13	5	0	18
		Nandus nandus	14	9	5	28
18	*Notopterus*	*Notopterus chitala*	28	12	0	40
		Notopterus notopterus	11	16	0	27
19	*Ompok*	*Ompok bimaculatus*	10	6	0	16
		Ompok pabda	2	8	0	10
20	*Oreochromis*	*Oreochromis mossambica (Tilapia)*	6	5	6	17
21	*Oxygaster*	*Oxygaster bacaila*	49	26	16	91

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22	*Puntius*	*Puntius chola*	38	37	29	104
		Puntius sarana	7	2	5	14
		Puntius sophore	8	0	0	8
		Puntius sophore	8	0	0	8
		Puntius ticto	4	2	0	6
		Puntius ticto	4	2	0	6
23	*Rasbora*	*Rasbora daniconius*	16	9	0	25
24	*Rita*	*Rita rita*	5	5	7	17
25	*Wallago*	*Wallago attu*	26	5	0	32
26	*Xenentoden*	*Xenentoden cancilla*	8	6	0	14

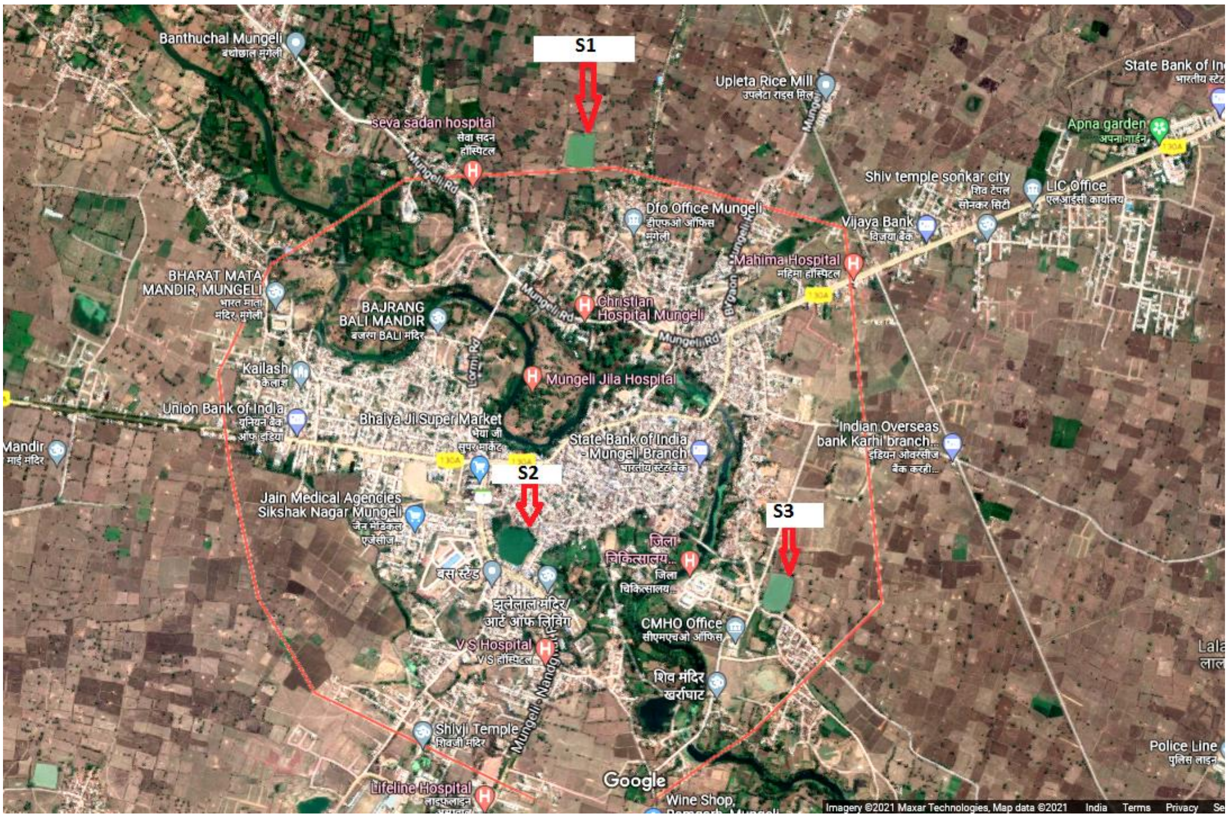

Figure 1.: Sampling pond sites (S1, S2, ans S3) in Mungeli Chhattisgarh, Courtesy: google map

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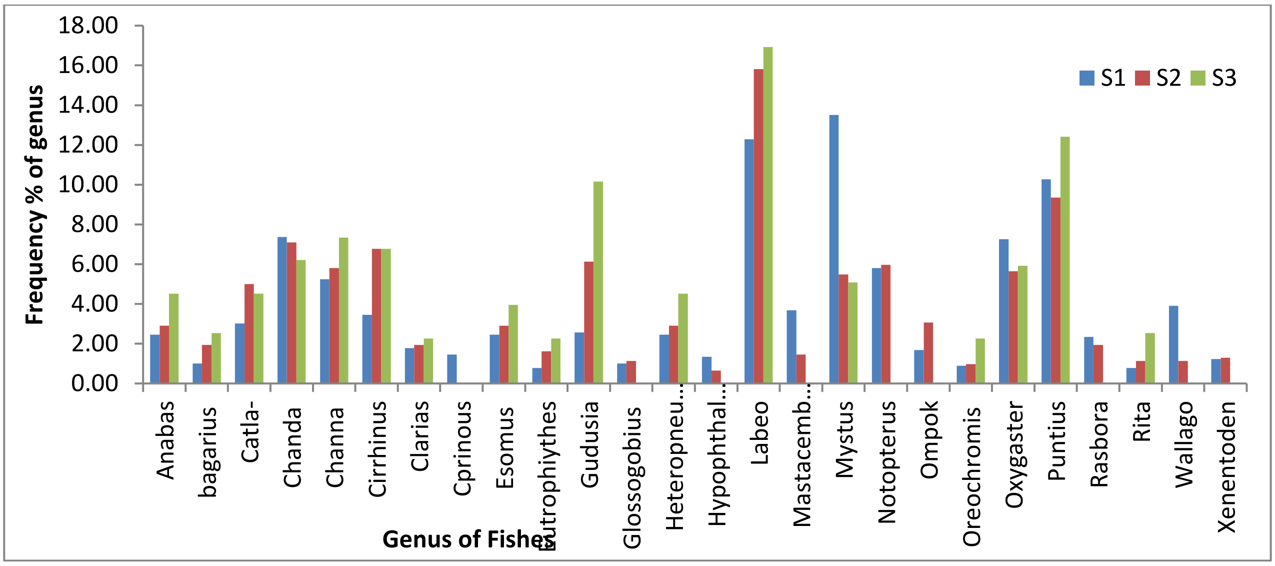

Figure 2. Percentage population of different genus of fish in sampling sites