



ORIGINAL RESEARCH ARTICLE

OPEN ACCESS

FISH DIVERSITY AND PHYSICOCHEMICAL PARAMETERS IN TIGER POINT WATER FALL OF MAINPAT HILL, IN SURGUJA DISTRICT, CHHATTISGARH, INDIA

^{1,*}Jermina Tirkey and ²Prof. Singh, R.K.

¹Ph.D. Research Scholar, Department of Zoology, Dr. C.V. Raman University Kargi Road Kota, Bilaspur -495113 (C.G.)

²Head, Department of Zoology, Dr. C.V. Raman University Kargi Road Kota, Bilaspur -495113(C.G.)

ARTICLE INFO

Article History:

Received 28th March, 2018
Received in revised form
16th April, 2018
Accepted 04th May, 2018
Published online 30th June, 2018

Key Words:

Physicochemical, Mainpat,
Tiger Point,
Water fall.

ABSTRACT

The present investigation has been made to investigate the physicochemical condition and fish diversity of Tiger point water fall of Mainpat hill from January to December 2017 During the entire study period total 18 fish species belonging 5 families and 14 Genera were recorded, Cyprinidae was the largest dominant family contributing 12 species. Family Cyprinidae was represented by the *Catla catla*, *Cirrhinus mrigala*, *Labeo rohita*, *Labeo calbasu*, *Labeo bata*, *Cyprinus carpio*, *Cirrhinus reba*, *Ctenopharyngodon idella*, *Puntius ticto*, *Hypothalmichthy molitrico*, *Oxygaster bacaila*, *Lepidocephalichthys guntea*, Cobitidae by *Channa marulius*, *Channa punctatus*, Mastacembilidae by *Mastacembalus armatus*, Clariidae by *Clarius batracus*, *Hetropneustes fossilius* and *mystus cavasius*. The observations recorded in the present study may prove valuable change due to the environmental condition in the locality. The physicochemical parameters of water fall varied seasonally such as temperature, Turbidity, Ph, dissolve, Oxygen, CO₂ Hardness, Transparency, Nitrate, Chloride, Conductivity, TDS, Alkalinity. Analysis of water is extremely important for understanding the fish diversity. Fish diversity is directly dependent on the physical and chemical parameters of water.

Copyright © 2018, Deepti D. Dhere et al. This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Citation: Jermina Tirkey and Prof. Singh, R.K. 2018. "Fish diversity and physicochemical parameters in tiger point water fall of mainpat hill, in Surguja District, Chhattisgarh, India", *International Journal of Development Research*, 8, (06), 21008-21011.

INTRODUCTION

Biodiversity is the degree of variation of life in a given ecosystem. Biodiversity is essential for stabilization of ecosystem, protection of overall environmental quality for understanding intrinsic worth of all species on the earth. Biologically biodiversity is a term used to describe the number, variety and variability of organism in a particular area. India is very rich in terms of biological diversity due to its unique biogeographic locations, diversified climatic conditions and enormous eco diversity and geo diversity. India is one of the mega biodiversity countries in the world and occupies the ninth position in terms of fresh water mega biodiversity. In India there are 2,500 species of fishes of which 930 live in freshwater and 1570 are marine (Kar et al., 2003).

*Corresponding author: Jermina Tirkey,

Ph.D. Research Scholar, Department of Zoology, Dr. C.V. Raman University Kargi Road Kota, Bilaspur -495113 (C.G.).

(Day 1994) described 1418 species of fish under 342 genera from British. (Jayaram 1981) listed 742 fresh water species of fishes coming under 233 genera, 64 families and 16 order from the Indian region. (Talwar 1991) estimated 2546 species of fish belonging to 969 genera, 254 families and 40 orders from India. About 21,730 species of fishes have been recorded in the world, of which about 11.7% are found in Indian water. Today the Fish diversity and associated habitat management is a great challenge and the ability to evaluate the effects of habitat change and other impact on the fish population. During the decades investigation on Indian reservoir and fish fauna has been conducted by a number of workers, but there is no record of fish fauna of river of Surguja. Hence I decided to study the Fish diversity of Surguja district with special reference to waterfalls of Mainpat hill. Diversity of fish is directly dependent on the physical and chemical condition of water. It is, therefore, important to know water quality parameters of Tiger Point water fall. Temperature controlling the metabolism and rate of biochemical reaction.

Turbidity desirable in fish life because it provide food for microscopic animal and filter-feeding fish. Water Ph affects metabolism and physiological process of fish. Mainpat is major hill in Surguja District in Chhattisgarh. It is known the name of Shimla of Chhattisgarh. Water quality is closely related to aquatic Ecology. Physicochemical condition of water play most important role in growing the fish and other aquatic animal. Fish diversity studied with reference to the environmental changes and fluctuations that according to physicochemical parameters of the environment. Water quality for fish must carry dissolved gases like oxygen and carbon dioxide, Minerals, ph, conductivity, TDS, alkalinity. Present study was carried out to fish diversity status with relation to major biochemical parameters. The physical conditions of water is greatly influenced with depth, temperature, turbidity, Colour and light. In this study identified to Temperature, Turbidity, PH, Dissolve oxygen, Dissolve CO_2 , Hardness, Transparency, Nitrate, Chloride, Conductivity, Tds, and alkalinity, of water fall.

MATERIALS AND METHODS

Surguja district is the northern part of the state of Chhattisgarh in India. The district borders on the state of Uttar Pradesh, Jharkhand and overlaps of the Southeastern part of the Vindhya, Baghelkhand region of peninsular India. It lies between $23^{\circ}37'25''$ to $24^{\circ}06'17''$ north latitude and $81^{\circ}34'40''$ to $84^{\circ}04'40''$ east longitude. 244.62 kilometers along east to west and 67.37 kilometers broad north to south, this land has as area of about 16359 square kilometers. Till now no studies have been done on fish fauna in Surguja. Mainpat is the first area where study of fish faunal diversity is done in Surguja district. Mainpat is an unexplored of Chhattisgarh state is located at a height of 1099 m from the sea level. Mainpat spreads over an area of 368 sq. Km. Tiger point, Fish point and Sarbhanja, Devpravah is main water fall in Mainpat. Tiger point water fall is situated at center of the Mahadev Muda River. Tiger point water falls from a height of 60 m. During winter the temperature dips to below 5°C (41°F) and during summer it rises above 46°C (115°F).

The fishes will be collected by local fisherman from Tiger Point waterfalls of Mainpat. Fisherman generally uses many types of nets like gill nets, cast nets, drag net etc. Fishes will be preserved in 10% formalin solution. Study period will be conducted from January 2017 to December 2017. Identification of fishes will be done on the basis of morphometric characters, descriptive characters and fin formula. Morphometric characters includes total length of body, standard length of the body, length and dept of the head, position and diameter of the eye, length of snout, maximum and minimum width and girth, length of pre dorsal fin, pre pectoral fin, pre anal fin and pre caudal fin. Descriptive character includes profile and shape of the body, skin texture and coloration, position and shape of the mouth, lips and snout and jaws, scales and lateral line system. Shape, size and type of median, paired and caudal fins, fin rays and fin formula, tail and special marking. A field kit measuring tape, rope, preservative, digital camera etc. will be prepared for regular use. Fishes will be classified and arranged based on standard key of Jhingran (1983), with slight modification as followed by Day's fauna (1958) and Srivastava (1998). Water samples are collected monthly from different sampling stations of Tiger point water fall. Water sample were analysis monthly from the sampling points during the study period January 2017 to

December 2017. The water quality Parameters such as water temperature was measured with the help of mercury thermometer. Ph level of the water in the studied with the help of Ph meter. Conductivity DO.TDS, transparency, alkalinity and dissolved oxygen was test with the help of water analyzer and Photo spectrometer.

RESULTS AND DISCUSSION

Tiger Point water fall of Mainpat in Surguja District is non polluted area in Chhattisgarh. In study period fish collected from Tiger Point water fall area. During the entire study period total 18 fish species belonging 5 families and 14 Genera were recorded, Cyprinidae was the largest dominant family contributing 12 species. Family Cyprinidae was represented by the *Catla catla*, *Cirrhinus mrigala*, *Labeo rohita*, *Labio calbasu*, *Labeo bata*, *Cyprinus carpio*, *Cirrhinus reba*, *Ctenopharyngodon idella*, *Puntius ticto*, *Hypothalmichthy molitrico*, *Oxygaster baccilla*, *Lepidocephalichthys guntea*, Cobitidae by *Channa marulius*, *Channa punctatus*, Mastacembilidae by *Mastacembalus armatus*, Clariidae by *Clarius batracus*, *Hetropneustes fossilius*, *mystus cavasius*.

The observations recorded in the present study may prove valuable change due to the environmental condition in the locality. Depth, temperature, turbidity constitute the important physical parameters on which the productivity of a water body depends. The month wise temperature water had been studied for experimental stations. It was measured at the time of sample collection. The samples were collected between 10 to 12AM on every month.

Temperature: The temperature is one of the most important factors. The temperature varies at different times of the day and also during different seasons of the year. The degree and annual variation in temperature of a water body have a great bearing upon its productivity in general. All organisms, including fish metabolic and physiological activity and life processes are greatly influenced by water temperature. The average annual temperature of water varies between 14.5°C to 39.1°C . The highest temperature of air (39.1°) was recorded in the month of June 2017. In other words, it can be said that the highest value of temperature recorded during summer periods, and lowest during winter months.

Turbidity: Turbidity is an important limiting factor in the productivity of natural water. Turbidity is responsible for the penetration of sunlight and hence controls the photosynthetic Activity. The average turbidity of the water of Tiger Point river fluctuates between 12.01cm to 120.65cm. The maximum turbidity was noted in the month of July and minimum in the month of May 2017. Turbidity values are higher during rains, but it showed decreasing trend in the winter and summer season.

Ph: The hydrogen ion concentration of a liquid is expressed as ph. It is an important environmental factor of natural water and its variations are linked with the animal and plant communities life processes inhabiting them. It is an important factor contributing to the productivity influencing the species composition and affects the availability of nutrients and the relative toxicity of many trace elements. The water, having ph value 7 is neutral. It is depends upon the gases and salts dissolved in it.

Table 1. Systematic position of fish fauna of Mainpat waterfalls

S N	Species	Order	Family
1	<i>Catla catla</i>	Cypriniformes	Cyprinidae
2	<i>Cirrhinus mrigala</i>		
3	<i>Labio bata</i>		
4	<i>Labio calbasu</i>		
5	<i>Labeo rohita</i>		
6	<i>Cyprinus carpio</i>		
7	<i>Cirrhinus reba</i>		
8	<i>Ctenopharyngodon idella</i>		
9	<i>Puntius ticto</i>		
10	<i>Hypthalmichthy molitricu</i>		
11	<i>Oxygaster bacaila</i>		
12	<i>Lepidocephalichthys guntea</i>		Cobitidae
13	<i>Channa marulius</i>	Channiform	Channidae
14	<i>Channa punctatus</i>		
15	<i>Mastacembalus armatus</i>	Perciformes	Mastacembilidae
16	<i>Clarius batrachus</i>	Siluriformes	Clarridae
17	<i>Heteroneustes fossiles</i>		
18	<i>Mystus cavasius</i>		

Table 2. Physicochemical characteristics of tiger point during January 2017 to December 2017

Month	Tem	Tur	Ph	DO	D Co ₂	Har	Transp	Nitrate	Cloride	Cond	Tds	Alk
	°C	NTU		mg/l	mg/l	mg/l	Cm	mg/l	mg/l	Micro mho/cm	mg/l	mg/l
January	14.5	21.00	7.03	9.9	4.1	65.8	29.82	21.0	54.4	361	195	60.0
February	19.4	17.00	6.8	9.2	3.7	54.8	31	21.3	50	375	198	64.4
March	25.4	12.25	6.70	7.4	3.3	36.0	32	22.2	55	387	207	12.0
April	27.2	12.07	6.70	7.3	2.9	66.8	33.22	22.5	56	408	222	19.7
May	38.4	12.01	7.05	6.8	3.1	70.5	35	23.3	58.0	422	236	34.8
June	39.1	15.86	7.01	6.1	3.6	65.9	32	23.5	180	374	212	37.7
July	23.2	120.65	6.9	6.2	3.9	35.0	19.82	24	112.0	328	181	11.5
August	24.7	118.67	6.5	6.9	4.5	36.0	16.46	25.2	117.5	209	119	12.8
September	23.5	41.00	6.8	8.9	5.4	76.5	23.25	23.6	80.0	256	151	56.9
October	23.4	39.05	7.03	9.3	5.1	76.8	26.37	22.3	76.8	288	165	65.8
November	21.3	27.00	6.7	9.6	4.5	80.0	28	22.1	57.0	326	173	65.9
December	17.0	29.80	6.7	9.8	4.2	79.2	28.27	21.7	55.4	349	183	75.5

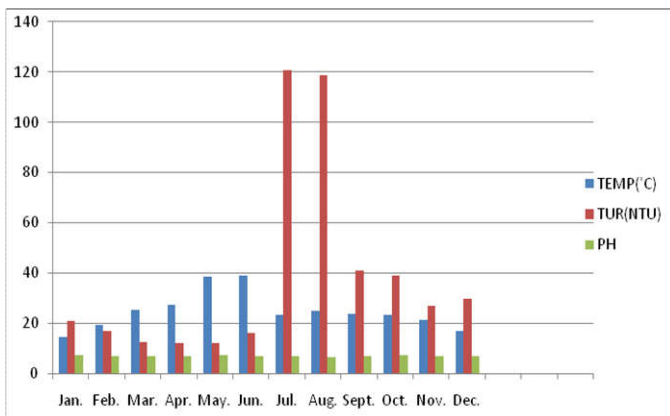
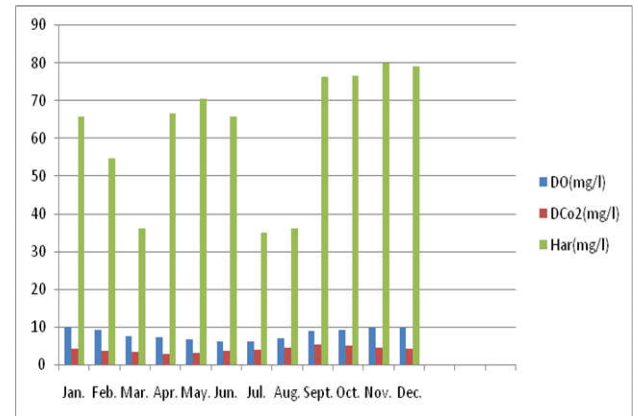


Fig. 1. Physicochemical characteristics (TEMP., TUR., PH.)2017

In the present study the observations on the ph values of the water recorded ph range was recorded 6.5 to 7.05. The ph value is lowest in the month of August and highest in the month of May.

Dissolved oxygen: Oxygen and Carbon dioxide are the important gases dissolved in water. Living organisms need oxygen for their metabolic processes. The concentration of dissolved oxygen was recorded for four sampling stations in the study period which are recorded. Its ranges an average of from 6.1 to 9.9 Mg/L. The average maximum value of dissolved oxygen concentration had been recorded 9.9 Mg/L in the month of January 2017 while minimum of 6.1 Mg/L in the month of June 2017.

Fig. 2. Physicochemical characteristics (DO., D Co₂, Har.)2017

The volume of dissolved Oxygen shows seasonal trends, it shows high values in the season of winter, while low values in the summer (April to June).

Dissolved Co₂: In the present study the values of Co₂ fluctuated from 2.9 to 5.4mg/lit. Which was the maximum in the September and least in April.

Total Hardness: Hardness depends on the amount of calcium and magnesium salts dissolved in water. The average maximum concentration of 5.4 mg/l of hardness was recorded in river water in the month of September and minimum 2.9 mg/l in the month of April 2017.

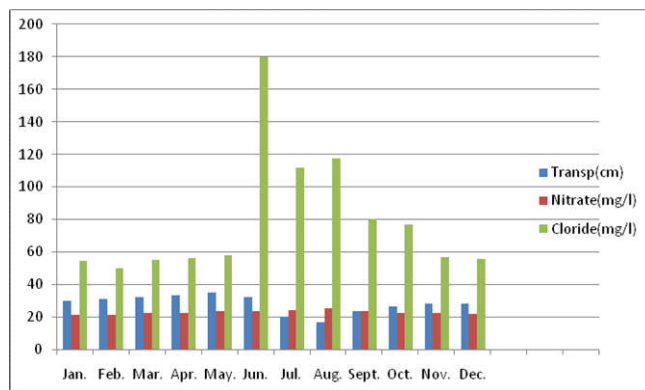


Fig. 3. Physicochemical characteristics (Transp., Nitrate., Chloride.) 2017

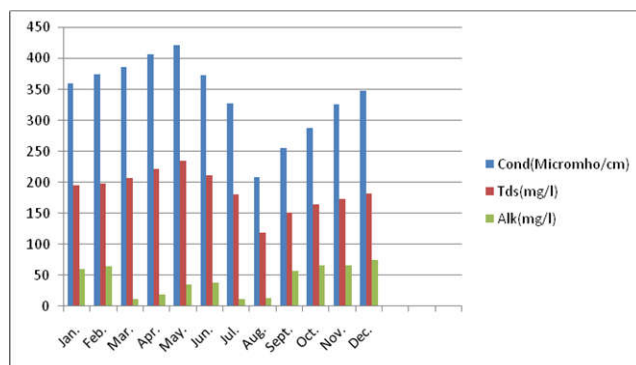


Fig. 4. Physicochemical characteristics (Cond., Tds., Alk.) 2017

Transparency: The transparency of water fall ranged from 35.0 to 80.0. During investigation periods the highest transparency was recorded during November and lowest values were recorded during August.

Nitrate: During the study highest Nitrate 25.2 in August and lowest 21.0 in January 2017.

Chloride-The chloride value of reservoir varied from 54.4 to 180 mg/lit. Which was observed maximum in summer while minimum value recorded in winter.

Conductivity-Conductivity is a measure of the ability of water to pass an electrical current. The specific conductivity of the water fall ranged between 256 to 422 micro mho/cm.

TDS-Total dissolved solids considered as salinity indicator for classification of water fall. The TDS in water is due to the presence of calcium, Magnesium, Sodium, Potassium, Bicarbonate, Chloride and Sulphate ions. In the study area TDS varied from 119.0 to 236.0.

Alkalinity shows increasing trend during the month of December. While it decreases in the month of July. The maximum average values were observed in the month of December 75.5 Mg/l. While its minimum values were 11.5 mg/l in the month of July. In this study Tiger Point water fall the zone provides the better biological production for all aquatic organism and fish.

Conclusion

Fish Biodiversity has become important aspect to understand different ecosystem and influence on them.

The result of this study shows that Mainpat Tiger Point water falls in biodiversity of fishes. First record of fish diversity was on waterfalls of Mainpat. During this study period has show a good indication of rich biodiversity. Waterfall management and public awareness would be essential to save the fish fauna of this river.

Acknowledgement

Author is thankful to Sinha chemist water testing lab P.H.E. Ambikapur for providing water sample analysis in Laboratory. And thank to staff of Zoology Department R.G.Govt P.G.College Ambikapur for help the Identification of Fishes.

REFERENCES

- Baghel. R. K. 2017. Limnological study of Ghunghutta Dam of Surguja District Chhattisgarh India. *International Journal of Zoology studies*. India.2:15-19
- Choubey K. Qureshi. Y. 2013. Study of Ichthyofaunal Biodiversity Rajnandgaon Town, CG, India. *International research journal of Biological science*. 2: 21-22
- Da. F. 1958. The Fishes of India. London William Dawson & sons LTD. I. II :
- Gupta. T. 2016. Water quality characteristics of Buri Ganga hill stream of Nahar Gaon, Daboka of Assam, India. *European Journal of pharmaceutical and medical Research*. 337-340
- Jayaram. K.C. 1981. The freshwater fishes of the Indian region. Narendra publishing. house, New Delhi.
- Jhingran. V.G. 1991. Fish and fisheries of India. Hindustan publishing corporation India. Delhi. 2:
- Kar. D.A. Kumar Bohra. C. Singh. L.K. 2003. Fishes of Barak drainage, Mizoram and Tripura; In: Environment, Pollution and management. APH publishing corporation New Delhi. 203-211.
- Mandal. S. Agarwal. R.K. Thiske. S. 2014. Ichthyofaunal diversity of the Pakhanjore Dam dist, Kanker, C.G. India. *www.biollife journal.com*, 2: 644-648.
- Minj. D.K. Agarwal. R.K. 2015. The study of Ichthyofaunal diversity in Dandia pond and Mahurband pond in Kanker city of North Bastar, Kanker district, CG India. *IOSR journal of Environmental science*. I: 34-38.
- Sahu. K.R. 2015. Studies on Piscian diversity of Mahanadi river Chandrapur district Janjgir. Champa CG. *Journal of Modern*.
- Sarma. R. Sharma. V. Sharma. M. S. Verma. B. K. Modi. Gaur. K. S. 2011. Studies on limnological characteristic, planktonic diversity and fishes (species) in lake Pichhola, Udaipur, Rajasthan India. *Universal journal of environmental research and Technology*. 1: 274-285.
- Shrivastava. G. 1998. Fishes of UP and Bihar. Vishwavidyalay Prakashan Chowk Varanasi India.
- Talwar. P.K. Jhingran. A.G. 1991. Inland fishes of India and Adjacent Countries. Oxford & IBH publishing, New Delhi.
- Tamboli. R.K. Jha. Y.N. 2010. Status of piscine diversity of river Mahanadi in Janjgir Champa district. *Int. Res. J. Lab to Land*. 139-143.
- Tamboli. R.K. and Jha. Y.N. 2012. Status of cat fish diversity of river Kelo and Mandin Raigarh district, CG India. *ISCA journal of Biological science*. 71-73.