

Study on Biodiversity, Feeding and Growth of Fishes With Reference to Physico – Chemical Parameters of Mahanadi River in Shivrinarayan District – Janjgir-Champa Chhattisgarh, India

Prakash Kumar Jaiswal¹, Peeyoosh Tiwari Jaiswal² and K. R. Sahu³

¹Department of Zoology, Govt. E.R.R.P.G. Science College Seepat Road, Bilaspur 495 006, Chhattisgarh, India

²Department of Zoology, Dr. C. V. Raman University Kargi Road Kota Bilaspur 495 113, Chhattisgarh, India

³Department of Zoology, Govt. PT. Madhav Rao Spare College. Pendra Road Gaurella-Pendra, Marwari 495 119 Chhattisgarh, India

(Received 27 August, 2023; Accepted 30 October, 2023)

ABSTRACT

Mahanadi is longest river originating from Chhattisgarh, Mahanadi is also called Ganga and life line of Chhattisgarh, many animals are found in the water of Mahanadi river, fish is a major vertebrate animal found in the water of Mahanadi River which spends their entire life in water, hence the quality of water affects the life of fish and their various Biological activities. This investigation was carried out from March 2020 to February 2021 in selected study area. During the study period water samples were collected through sampling bottle and its physico-chemical properties were also analyzed as per following standard method given by APHA (2005), which show variation according to the season. The fish samples of river water were collected by using different types of nets like gill net, cast net and crafts, through the help of local fishermen, collected fishes were photographed and fixed into 10% formalin Solution. The collected fishes were identified with the help of standard books and keys, the feeding habit of river fishes were also studied by the observation of food substance found in their stomach, and to study the Growth of fishes we collected them at monthly intervals and measured their length and weight, during the entire study period a total number of 30 fish species were recorded on particular water parameter. Most of the Physico – chemical parameters analyzed in the Mahanadi river water at Shivrinarayan were in acceptable range. This study we come to know that the Mahanadi river water quality of Shivrinarayan area is suitable for biodiversity, feeding and growth of fishes.

Key words: Physico-chemical parameter, Water quality, Mahanadi River, Feeding habit.

1 Introduction

The variety and variability of plants, animals and microorganisms within an ecosystem is known as

biodiversity and in the aquatic ecosystem, the study of aquatic biodiversity is done, Aquatic ecosystem is the biggest ecosystem of the world. Water is the major component of all types of aquatic ecosystems.

(¹Ph.D. Research Scholar, ²Ph.D. Research Scholar, ³Head)

Mahanadi is the longest river originates from Chhattisgarh. Mahanadi is also called as the Ganga and life line of chhattisgarh, many animals are found in the water of Mahanadi River, fish is a major vertebrate animal found in the water of Mahanadi River which spends its entire life in water, and hence the quality of water affects the life of fish and their various Biological activities. This investigation was carried out from March 2020 to February 2021 in selected study areas.

2 Materials and Methods

I Study area– The Present study was carried out a period of one year from March 2022 to February 2023 in Mahanadi river of Shivrinarayan area district Janjgir - Champa Chhattisgarh. India.

II Collection of fish sample – The fish samples were collected by help of local fishermen through

different type of nets and crafts

III Collection of water sample – water sample was collected through sampling bottle at monthly intervals between 10 to 12 Pm.

IV Study of physico chemical parameter of Mahanadi River sample water – Analysis of physicochemical parameters of Mahanadi water were done through the following methods as described by APHA 2005.

V Photography of fishes- Collected fishes were photographed by Nikon digital Camera.

Identification of fish specimen – The Collected fish were identified with the help of standard books of Francis day (1958), Gopalji Shrivastva (1998), Jayaram (1991), Shrivastva (2011) and S.K. Gupta (2006).

VI Preservation of fishes - The collected fish samples were preserved in 10 percent Formalde-

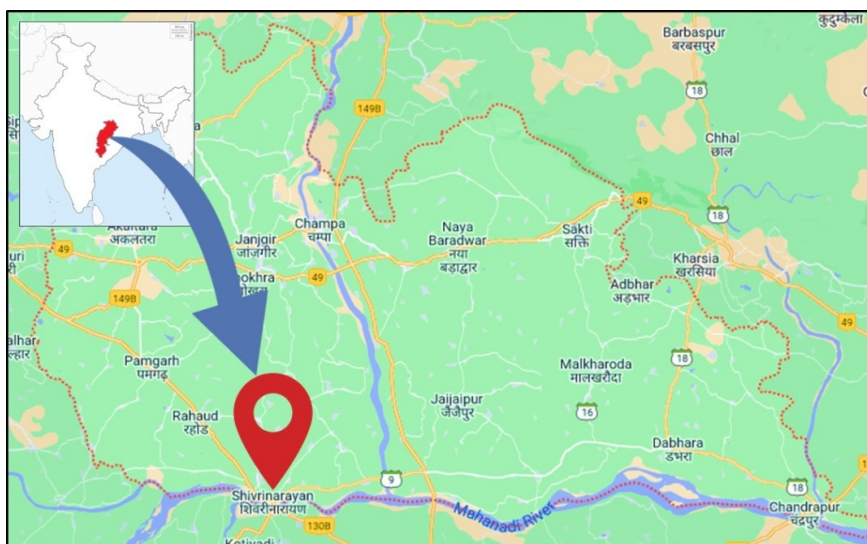


Fig. 1. Geographical map showing location of study area



Fig. 2. Photographs Showing Mahanadi of Shivrinarayan area



Fig. 3. Photographs showing Collection of fish Sample in Mahanadi of shivrinarayan



Fig. 4. Collection of water sample in Mahanadi River of Shivrinarayan

hyde solution and stored in a plastic container for further study.

VII Study of the Fish Population Growth: The increase in size of Population is called Growth. To Study population Growth in fishes, we were collected Fish and their fingerling from sampling station in monthly intervals and measured their length

Table 1. Physico – Chemical Parameters of River Mahanadi at Shivrinarayan District –Janjgir-Champa, Chhattisgarh

S.N.	Parameter	Unit	Method of testing
1	pH	pH	Ph meter
2	Water Temperature	°C	Thermometer
3	Turbidity	NTU	Turbidity meter
4	D .O.	Mg/l	Winkler's iodometric method
5	B.O.D.	Mg/l	Titrimetric method
6	Total alkanity	Mg/l	Titrimetric method
7	Total Hardness	Mg/l	Titrimetric method
8	Ca	Mg/l	Titrimetric method
9	Depth	Meter	Straight rod calibrated in meter
10	C.O.D.	Mg/l	Titration Method
11	Atmosphere temperature	°C	Thermometer
12	Cl ⁻	Mg/l	Titration method

and weight with the help of Electronic weight machines and tape. The data's were noted down and recorded.

Growth is calculated following Formula

$$\frac{L_1 - L}{T_1 - T} \text{ OR } \frac{W_1 - W}{T_1 - T}$$

Where L₁ = total length at time T₁

L = total length at time T

W₁ = total weight at time T₁

w = total weight at time T

VIII Study feeding behavior of fishes: To study the feeding habit of fishes found in the Mahanadi river of Shivrinarayan region, we dissect the stomach of fishes and analyzed the food items found in it.

3 Results and Discussion

Table 2. Physico-Chemical Parameter of River Mahanadi

S. N.	Parameters	Minimum	Maximum	Mean
1	Water Temperature (°C)	18	40	29
2	pH	7	9	8
3	B.O.D.	4	13	8.5
4	C.O.D.	11	30	20.5
5	Conductivity (cm)	310	880	595
6	Turbidity (NTU)	19	305	162
7	Total alkanity	82	255	168
8	Total Hardness	76	130	103
9	Depth	9	39	24
10	Ca	10	50	30
11	Atmosphere temperature	12	44	28
12	Cl ⁻	30	84	57

Table 3. Fish Biodiversity in Mahanadi River of Shivrinarayan

S.N.	Order	Families	Genera	Species
1	Cypriniformes	4	10	19
2	Perciformes	3	4	5
3	Clupeiformes	2	2	3
4	Beloniformes	1	1	1
5	Mastacembeleformes	1	2	2
Total	5	11	19	30

During the period of investigation a total numbers of 30 fish species have been identified which are belonging to 11 families of 05 orders; the cypriniformes was the most dominant group representing 19 species.

Table 4. Fish Biodiversity and Feeding Habit in Mahanadi River of Shivrinarayan

S. No.	Order	Family	Genus and species name	Genera	Number of species	Feeding habit
1	Cypriniformes	Cyprinidae	<i>Labeo gonius</i>		1	Herbivorous and bottom feeder
2	Cypriniformes	Cyprinidae	<i>Labeo bata</i>		1	Herbivorous and bottom feeder
3	Cypriniformes	Cyprinidae	<i>Labeo fimbriatus</i>		1	Herbivorous and bottom feeder
4	Cypriniformes	Cyprinidae	<i>Labeo calbasu</i>		1	Herbivorous and bottom feeder
5	Cypriniformes	Cyprinidae	<i>Lebeo pangusia</i>		1	Herbivorous and bottom feeder
6	Cypriniformes	Cyprinidae	<i>Labeo boggut</i>		1	Herbivorous and bottom feeder
7	Cypriniformes	Cyprinidae	<i>Labeo rohita</i>	1	1	Herbivorous and bottom feeder
8	Cypriniformes	Cyprinidae	<i>Catla cata</i>	1	1	Omnivorous and surface column feeder
9	Cypriniformes	Cyprinidae	<i>Cirrhinus mrigala</i>	1	1	Herbivorous and bottom feeder
10	Cypriniformes	Cyprinidae	<i>Cyprines carpio</i>	1	1	Herbivorous and bottom feeder
11	Cypriniformes	Cyprinidae	<i>Punctius shophore</i>	1	1	Detritus and bottom feeder
12	Cypriniformes	Cobitidae	<i>Lepidocephalichthys guneta</i>	1	1	Herbivorous and bottom feeder
13	Cypriniformes	Siluridae	<i>Ompok bimaculatus</i>	1	1	Carnivorous and middle feeder
14	Cypriniformes	Siluridae	<i>Wallago attu</i>	1	1	Carnivorous and Middle feeder
15	Cypriniformes	Bagridae	<i>Mystus seenghala</i>		1	Carnivorous and middle feeder
16	Cypriniformes	Bagridae	<i>Mystus vittatus</i>		1	Carnivorous and subsurface column feeder
17	Cypriniformes	Bagridae	<i>Mystus aor</i>		1	Carnivorous and middle feeder
18	Cypriniformes	Bagridae	<i>Mystus bleekeri</i>	1	1	Carnivorous and bottom feeder
19	Cypriniformes	Bagridae	<i>Rita rita</i>	1	1	Omnivorous and middle feeder
20	Perciformes	Centropomidae	<i>Chanda ranga</i>		1	Carnivorous and surface feeder
21	Perciformes	Centropomidae	<i>Chanda nama</i>	1	1	Carnivorous and surface feeder
22	Perciformes	Gobiidae	<i>Glossogobius giurris</i>	1	1	Carnivorous and middle feeder
23	Perciformes	Anabantidae	<i>Colisa lalius</i>	1	1	Carnivorous and bottom feeder
24	Perciformes	Nandidae	<i>Nandus nandus</i>	1	1	Carnivorous and bottom feeder
25	Belontiiformes	Belontiidae	<i>Xenentodon cancila</i>	1	1	Carnivorous and bottom feeder
26	Mastacembeleformes	Mastacembelidae	<i>Macrognathus aculeatus</i>	1	1	Carnivorous and bottom feeder
27	Mastacembeleformes	Mastacembelidae	<i>Mastacembalus armatus</i>	1	1	Carnivorous and bottom feeder
28	Clupeiformes	Notopteridae	<i>Notopterus notopterus</i>		1	Carnivorous and bottom feeder
29	Clupeiformes	Notopteridae	<i>Notopterus chittata</i>	1	1	Carnivorous and bottom feeder
30	Clupeiformes	Clupeidae	<i>Goniiossa marmina</i>	1	1	Herbivorous and middle feeder

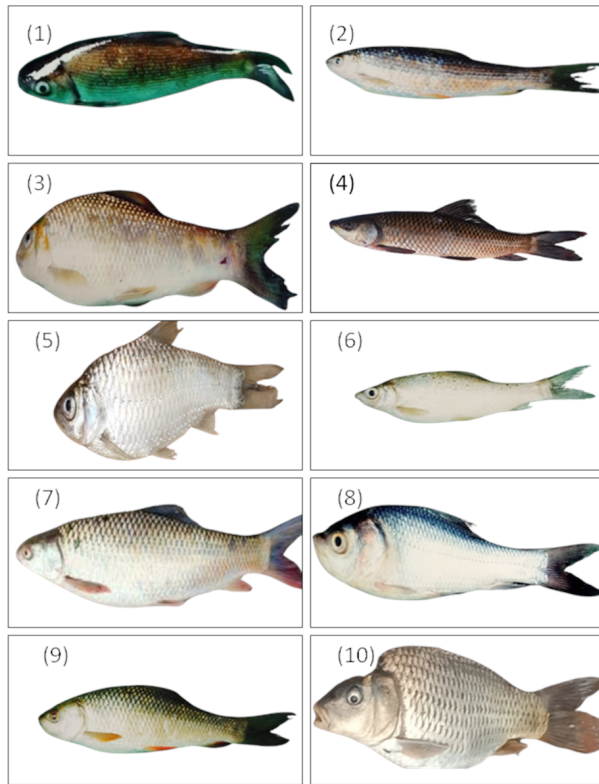


Fig. 5. Name of the collected fish in Mahanadi River - 1. *Labeo gonius* 2. *Labeo bata* 3. *Labeo fimbriatus* 4. *Labeo calbasu* 5. *Labeo pangusia* 6. *Labeo boggut* 7. *Labeo rohita* 8. *Catla-cata* 9. *Cirrhinus mrigala* 10. *Cyprinus carpio*

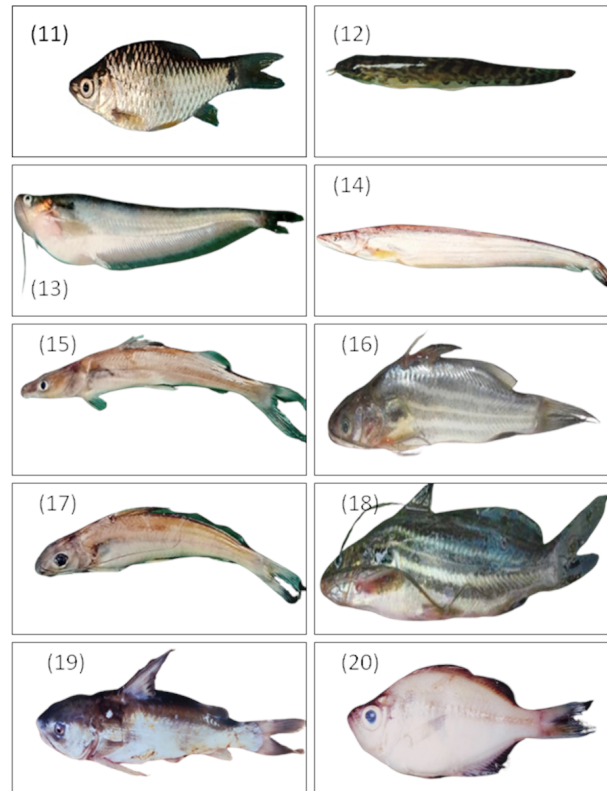


Fig. 6. Name of the collected fish in Mahanadi river- 11. *Puntius sophore* 12. *Lepidocephalichthys guneta* 13. *Ompok bimaculatus* 14. *Wallago attu* 15. *Mystus seenghala* 16. *Mystus vittatus* 17. *Mustus aor* 18. *Mystus bleekeri* 19. *Rita rita* 20. *Chanda ranga*

Table 5. Showing the fish Growth (Length & Weight) in Mahanadi River of Shivrinarayan from March 2020 to February 2021

S.N.	Name of fish → Months	<i>Wallago attu</i>		<i>Cyprinus carpio</i>		<i>Labeo pangusia</i>		<i>Labeo bata</i>	
		Length (cm)	Weight (gm)	Length (cm)	Weight (gm)	Length (cm)	Weight (gm)	Length (cm)	Weight (gm)
1	March	12	65	12	62	12	80	10	86
2	April	15	86	14	82	16	192	15	120
3	May	18	108	16	105	18	286	19	270
4	June	19	198	21	192	22	406	22	452
5	July	26	340	23	256	30	608	25	506
6	August	28	420	25	402	35	709	29	572
7	September	30	550	28	456	38	856	35	630
8	October	32	652	30	660	40	909	38	756
9	November	34	780	36	808	41	1060	40	858
10	December	35	852	42	1020	42	1200	46	1060
11	January	44	980	43	1040	43	1500	48	1170
12	February	46	1000	45	1150	44	1650	50	1200
	Season	Seasonal Variation							
	Pre - monsoon	16	114	15	110	17	241	16	232
	Monsoon	29	490	26	443	35	770	27	616
	Post - monsoon	39	903	41	1004	42	1352	46	1072

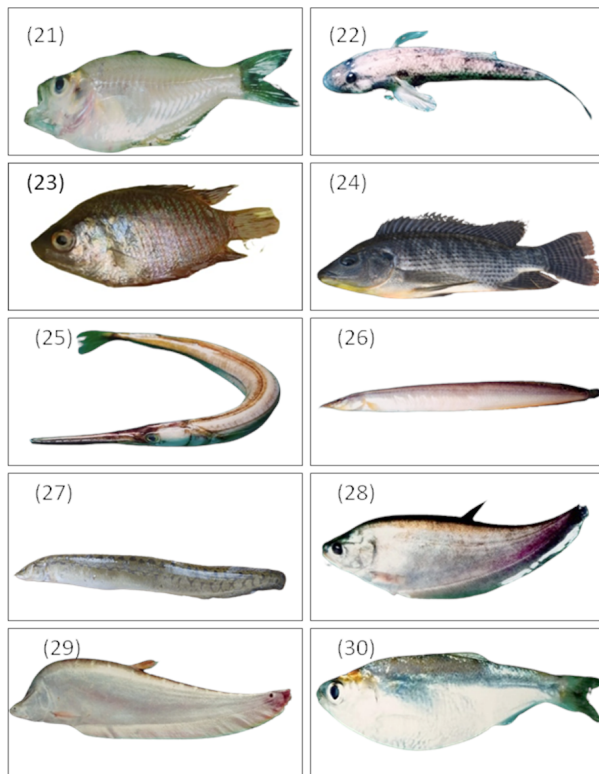


Fig. 7. Name of the collected fish in Mahanadi River –
 21. *Chanda nama* 22. *Glossogobius giuris* 23. *Colisa lalius* 24. *Nandus nandus* 25. *Xenentodon cancila* 26. *Macrornathus aculeatus* 27. *Mastacembelus armatus* 28. *Notoperus notopterus* 29. *Notopterus chitata* 30. *Gonialosa manmaina*

4 Conclusion

Most of the parameters analyzed in the Mahanadi River's water at Shivrinarayan was found in acceptable range. As a result of this study we could prove that the quality of Mahanadi River's water quality at Shivrinarayan area is suitable for Biodiversity, Feeding and growth of Fishes.

5 References

APHA, 2005. *Standard Methods for the Examination of Water and Wastewater*. American Public Health Association, Washington D. C. 1000P

- Baghel Singh Rajkishor, Banafar Singh Amit and Topoo Deepika, 2019. Study on Food and Feeding Habits Of *ChhannaPuncatus* From Water bodies of Saruguja district Chhattisgarh. *IJFAS*. 7(6):12-15.
- Chandanshive, N.E. 2013. THE Seasonal Fluctuation of Physico-Chemical parameters of River Mula-mutha at Pune ,India and their Impact on Fish Biodiversity. *ISCN Research Journal of Animal, Veterinary and Fisheries*. 1(1): 11-16.
- Chandrawanshi Sarita, Singh R.K. and Sahu K.R. 2019. Study of Seasonal Variation Physico-Chemical Change of Shivnath River at Madku Dweep District Mungeli Chhattisgarh. *JETIR*. 6(6): 654-660.
- Choubey, K. and Qureshi, Y. 2013. Study of Ichthyofaunal Biodiversity Rajnandgaon town, Chhattisgarh, India. *International Research Journal of Biological Science*. 2: 21-22
- Das, A.K., Manna, R.K., Rao, D.S.K., Jha, B.C., Naskar, M. and Sharma, A.P. 2017. Status of the River Krishna water quality and reverien environment in relation to fisheries. *Aquatic Ecosystem Health and Management*. 20 (1-2): 160-174.
- Day, F. 1958. *The Fishes of India*. London William Dawson & sons LTD. Vol – I and Vol –II. Jayaram, K.C. 1981. *The Freshwater Fishes of the Indian Region*. Narendra publishing house New Delhi.
- Jayaram, K.C. 1999. *The Fresh Water Fishes of the Indian Region*. Narendra Publishing House, Delhi, 6: 551.
- Jayaram, K.C. and Majumdar, N. 1976. On a collection of fish from the Mahanadi. *Records the Zoological Survey of India*. 69: 305-323.
- Meshram Lata, 2015. Limnological Study of Shivnath River near Shivnath Temple Durg C.G. India. *IJSR*. 4: 1470-1474.
- Pathak, S. and Patel, M.L. 2021. Ichthyofaunal and physico-chemical parameter study of sub-urban ponds in Mungeli, Chhattisgarh. *International Advanced Research Journal in Science, Engineering and Technology*. 8: 575-580.
- Tirkey Jermina and Singh, R.K. 2018. Studies the fish diversity and physicochemical parameters in tiger point water fall of MainpatHill, in Surguja District. Chhattisgarh. *IJDR*. 8(6): 21008-21011.
- Trivedy, P.M., Dahegaonkar, N.R., Zade, S.B., Khune, C.J. and Lonkar, A.N. 2008. Studies on physico-chemical and biological parameters of Chorgaon Lake, Chandrapur, India. *Environ. Cons.* J. 9 (1&2): 7-11.