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

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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.
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.


VI Preservation of fishes - The collected fish samples were preserved in 10 percent Formalde-
Fig. 3. Photographs showing Collection of fish Sample in Mahanadi of shivrinarayan

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

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

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Parameter</th>
<th>Unit</th>
<th>Method of testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>pH</td>
<td>pH</td>
<td>Ph meter</td>
</tr>
<tr>
<td>2</td>
<td>Water Temperature</td>
<td>oC</td>
<td>Thermometer</td>
</tr>
<tr>
<td>3</td>
<td>Turbidity</td>
<td>NTU</td>
<td>Turbidity meter</td>
</tr>
<tr>
<td>4</td>
<td>D.O.</td>
<td>Mg/l</td>
<td>Winkler’s iodometric method</td>
</tr>
<tr>
<td>5</td>
<td>B.O.D.</td>
<td>Mg/l</td>
<td>Titrimetric method</td>
</tr>
<tr>
<td>6</td>
<td>Total alkinity</td>
<td>Mg/l</td>
<td>Titrimetric method</td>
</tr>
<tr>
<td>7</td>
<td>Total Hardness</td>
<td>Mg/l</td>
<td>Titrimetric method</td>
</tr>
<tr>
<td>8</td>
<td>Ca</td>
<td>Mg/l</td>
<td>Titrimetric method</td>
</tr>
<tr>
<td>9</td>
<td>Depth</td>
<td>Meter</td>
<td>Straight rod calibrated in meter</td>
</tr>
<tr>
<td>10</td>
<td>C.O.D.</td>
<td>Mg/l</td>
<td>Titration Method</td>
</tr>
<tr>
<td>11</td>
<td>Atmosphere</td>
<td>oC</td>
<td>Thermometer</td>
</tr>
<tr>
<td></td>
<td>temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Cl⁻</td>
<td>Mg/l</td>
<td>Titration method</td>
</tr>
</tbody>
</table>

Growth is calculated following Formula

\[
\frac{L_1 - L}{T_1 - T} = R \frac{W_1 - W}{T_1 - T}
\]

Where \( L_1 \) = total length at time \( T_1 \),
\( L \) = total length at time \( T \),
\( W_1 \) = total weight at time \( T_1 \),
\( w \) = 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.

Table 2. Physico-Chemical Parameter of River Mahanadi

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

Table 3. Fish Biodiversity in Mahanadi River of Shivrinarayan

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Order</th>
<th>Families</th>
<th>Genera</th>
<th>Species</th>
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<tbody>
<tr>
<td>1</td>
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<td>4</td>
<td>10</td>
<td>19</td>
</tr>
<tr>
<td>2</td>
<td>Perciformes</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Clupeiformes</td>
<td>2</td>
<td>2</td>
<td>3</td>
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<tr>
<td>4</td>
<td>Beloniformes</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>5</td>
<td>Mastacembeliformes</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>5</td>
<td>11</td>
<td>19</td>
<td>30</td>
</tr>
</tbody>
</table>

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>
<thead>
<tr>
<th>S. No.</th>
<th>Order</th>
<th>Family</th>
<th>Genus and species name</th>
<th>Genera</th>
<th>Number of species</th>
<th>Feeding habit</th>
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<tbody>
<tr>
<td>1</td>
<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo gonius</td>
<td>1</td>
<td>1</td>
<td>Herbivorous and bottom feeder</td>
</tr>
<tr>
<td>2</td>
<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo bata</td>
<td>1</td>
<td>1</td>
<td>Herbivorous and bottom feeder</td>
</tr>
<tr>
<td>3</td>
<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo fimbriatus</td>
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<td>1</td>
<td>Herbivorous and bottom feeder</td>
</tr>
<tr>
<td>4</td>
<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo callasus</td>
<td>1</td>
<td>1</td>
<td>Herbivorous and bottom feeder</td>
</tr>
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<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo pongiusa</td>
<td>1</td>
<td>1</td>
<td>Herbivorous and bottom feeder</td>
</tr>
<tr>
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<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo boggut</td>
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<td>1</td>
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<tr>
<td>7</td>
<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Labeo rehita</td>
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<td>1</td>
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<td>8</td>
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<td>Cyprinidae</td>
<td>Catla catla</td>
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<td>1</td>
<td>Omnivorous and surface column feeder</td>
</tr>
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<td>Cyprinidae</td>
<td>Cirrhinus mrigala</td>
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<td>1</td>
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<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Cyprines carpio</td>
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<td>1</td>
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</tr>
<tr>
<td>11</td>
<td>Cypriniformes</td>
<td>Cyprinidae</td>
<td>Punctius shophore</td>
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<td>1</td>
<td>Detritus and bottom feeder</td>
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<tr>
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<td>Cobitidae</td>
<td>Lepidocephalichthys guneta</td>
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<td>Herbivorous and bottom feeder</td>
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<td>Siluridae</td>
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<td>1</td>
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<td>14</td>
<td>Cypriniformes</td>
<td>Siluridae</td>
<td>Wallago attu</td>
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<td>1</td>
<td>Carnivorous and Middle feeder</td>
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<td>15</td>
<td>Cypriniformes</td>
<td>Bagridae</td>
<td>Mystus seenghala</td>
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<td>1</td>
<td>Carnivorous and middle feeder</td>
</tr>
<tr>
<td>16</td>
<td>Cypriniformes</td>
<td>Bagridae</td>
<td>Mystus vittatus</td>
<td>1</td>
<td>1</td>
<td>Carnivorous and subsurface column feeder</td>
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<td>Bagridae</td>
<td>Mystus aor</td>
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<td>1</td>
<td>Carnivorous and middle feeder</td>
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<td>Mystus bleckeri</td>
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<td>Omnivorous and middle feeder</td>
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<td>Carnivorous and surface feeder</td>
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<td>21</td>
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<td>1</td>
<td>Carnivorous and surface feeder</td>
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<td>22</td>
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<td>Glossogobius giuris</td>
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<td>1</td>
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<td>Anabantidae</td>
<td>Colisa lalii</td>
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<td>1</td>
<td>Carnivorous and bottom feeder</td>
</tr>
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<td>24</td>
<td>Perciformes</td>
<td>Nandidae</td>
<td>Nandus nandus</td>
<td>1</td>
<td>1</td>
<td>Carnivorous and bottom feeder</td>
</tr>
<tr>
<td>25</td>
<td>Beloniformes</td>
<td>Belonidae</td>
<td>Xenentodon cancila</td>
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<td>1</td>
<td>Carnivorous and bottom feeder</td>
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<tr>
<td>26</td>
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<td>Mastacembelidae</td>
<td>Macrognathus aculeatus</td>
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<td>1</td>
<td>Carnivorous and bottom feeder</td>
</tr>
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<td>27</td>
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<td>Mastacembelidae</td>
<td>Mastacembalus armatus</td>
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<td>Carnivorous and bottom feeder</td>
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<tr>
<td>28</td>
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<td>Notopteridae</td>
<td>Notopterus notopterus</td>
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<td>1</td>
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<td>1</td>
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</tr>
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<td>30</td>
<td>Clupeiformes</td>
<td>Clupeidae</td>
<td>Gonialosa manmina</td>
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<td>1</td>
<td>Herbivorous and middle feeder</td>
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</table>
Table 5. Showing the fish Growth (Length & Weight) in Mahanadi River of Shivinarayan from March 2020 to February 2021

<table>
<thead>
<tr>
<th>Name of fish →</th>
<th>Wallago attu</th>
<th>Cyprinus carpio</th>
<th>Labeo pangusia</th>
<th>Labeo bata</th>
</tr>
</thead>
<tbody>
<tr>
<td>S.N.</td>
<td>Months</td>
<td>Length (cm)</td>
<td>Weight (gm)</td>
<td>Length (cm)</td>
</tr>
<tr>
<td>1</td>
<td>March</td>
<td>12</td>
<td>65</td>
<td>12</td>
</tr>
<tr>
<td>2</td>
<td>April</td>
<td>15</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>3</td>
<td>May</td>
<td>18</td>
<td>108</td>
<td>16</td>
</tr>
<tr>
<td>4</td>
<td>June</td>
<td>19</td>
<td>198</td>
<td>21</td>
</tr>
<tr>
<td>5</td>
<td>July</td>
<td>26</td>
<td>340</td>
<td>23</td>
</tr>
<tr>
<td>6</td>
<td>August</td>
<td>28</td>
<td>420</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>September</td>
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<td>28</td>
</tr>
<tr>
<td>8</td>
<td>October</td>
<td>32</td>
<td>652</td>
<td>30</td>
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<td>9</td>
<td>November</td>
<td>34</td>
<td>780</td>
<td>36</td>
</tr>
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<td>10</td>
<td>December</td>
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<td>852</td>
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<td>11</td>
<td>January</td>
<td>44</td>
<td>980</td>
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</tr>
<tr>
<td>12</td>
<td>February</td>
<td>46</td>
<td>1000</td>
<td>45</td>
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<table>
<thead>
<tr>
<th>Season</th>
<th>Pre – monsoon</th>
<th>Monsoon</th>
<th>Post - monsoon</th>
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</thead>
<tbody>
<tr>
<td>Length (cm)</td>
<td>16</td>
<td>29</td>
<td>39</td>
</tr>
<tr>
<td>Weight (gm)</td>
<td>114</td>
<td>490</td>
<td>903</td>
</tr>
<tr>
<td>Seasonal Variation</td>
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<td>26</td>
<td>41</td>
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<tr>
<td>Length (cm)</td>
<td>110</td>
<td>443</td>
<td>1004</td>
</tr>
<tr>
<td>Weight (gm)</td>
<td>17</td>
<td>35</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td>241</td>
<td>770</td>
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</tr>
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<td></td>
<td>16</td>
<td>27</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td>232</td>
<td>616</td>
<td>1072</td>
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</tbody>
</table>
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


