Limnological Status and Aquatic Planktonic Biodiversity of River Tapti at District Burhanpur, Madhya Pradesh, India

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Abstract: The diversity of various types of plankton like phytoplankton and zooplankton were studied for river tapti near Burhanpur in M.P. The plankton was collected by a standard planktonnet from three different sites of River Tapti. The phytoplankton was represented by Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae, out of which genetics diversity of Bacillariophyceae was more. The zooplankton were identified in various Phyla like Protozoa, Helminthes, Rotifera, Annelida, Arthropoda etc. Diversity of Arthropods was highest. The percentage composition of various groups was calculated for the samples taken from different sites. The composition of plankton as percentage representation was correlated for different sites with sites characteristics. On the basis of different physicochemical and biological parameters, the status of River Tapti is eutrophic in nature and during period under study 12 fish species, 42 phytoplanktons (15 Bacillariophyceae, 18 Chlorophyceae, 09 Cyanophyceae) and 32 Zooplanktons (10 Rotifera, 03 Crustacea, 11 Protozoa, 06 Copeoda, 02 Ostracoda) Genera have been recorded.

Keywords: Limnology, Phytoplanktons, Zooplanktons, Tapti River, Burhanpur M.P., India

1. Introduction

The Tapti is also one of the sacred rivers of India. Amongst its various names tapti, paooshni, Tapti and Tapti are more commonly known. All these names can note one and the same meaning the Copler of the tap, meaning heat. The general direction of the river in nimar (East) is from north-east to south-west.it enters east Nimar at a distance of 120 mile (193km) from its sources. The diversity of various types of plankton like phytoplankton and Zooplankton were studied for river Tapti near Burhanpur in M.P, India. Planktons are poor swimming but most drifting small organism that inhabit called the water column of ocean and fresh water bodies the name comes from the Greek term, plankton-meaning “wanderer” and drifter plankton is composed of tiny plant called Phytoplankton and animal called Zooplankton, as well as organism that are not easily classified in to those two groups (such as protozoa and bacteria), Planktonic organism are suspended in water and are also small fat even slight current move them about, the occurrence and abundance of Zooplanktons depend on its productivity, which in turn is flow by abiotic factors and the level of nutrients in the water. In a fresh water system, the Zooplanktons from and important faunal group, are most of them life on primary producer and make themselves available to be eat in by higher organism IN FOOD chains including fish and contribute significantly to the biological productivity of this ecosystem (Michael 1973). The Phytoplankton are the primary producers as they trap solar energy and produces organic molecules by consuming CO2, phytoplankton are not only primary producers but also brings out biogenic oxygenation of the water during they time Welch, Wetzel, 1975, 1983).

I. Map. No.01-04: Maps showing study area of River Tapti at District Burhanpur, M.P., India
District Burhanpur is located between 21°. 21.05 - 21°.37 N Latitude and 75°.13 - 76° E Longitude in Madhya Pradesh. Tapti is one of the major perennial rivers flowing towards west coast of India is an important sources of fresh water to this region. The 720km. Long River originates near Multai in the Betul District of Madhya Pradesh. The Selected study sites in Tapti River are Bhatkheda, Jainabad, Dariyapur Kalan, looking to the importance of subject as research Topic “Limnological Status And Aquatic Planktonic Biodiversity of River Tapti At District Burhanpur, M.P., India” has been undertaken.

2. Materials and Research Methodology

Experimental Work

2.1 Sampling sites, culture, observation

Planktonic study is carried out seasonally, for which sampling were done 3-4 times in a month and in each day 3 times sample were taken. In each study site sample taken from 3 places. (The selected study sites in Tapti river are Bhatkheda, Jainabad, Dariyapur Kalan.) Sample taken from 2m. Depth below the surface water.

2.2 Biological Estimation

The plankton samples are collected following lind (1979, Welch 1953), Welzel (1975) by filtering 40 liters of water through plankton not having pure size 64 u. Concentration plankton samples are fixed in 4% formalin.


Counting of the individual plankton will be done by “lac keys” dropping method (1935) using the formula.

Plankton units /liter =NXCX10

Y = Number of phytoplankton counted 0.1 ml concentrate.
E = Total volume of concentrate in ml.
Y = total volume of water filtered for sample in liters.
The phytoplankton density was expressed on units / liter and Zooplankton density will be expressed in individuals / liter. During the period of study the range of variation in different physico-chemical parameters is as: On the basis of the observations that Tapti River are entropic in nature

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameter</th>
<th>Tapti River</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PH</td>
<td>7.4-9.4</td>
</tr>
<tr>
<td>2</td>
<td>Water Temperature</td>
<td>12-226 e</td>
</tr>
<tr>
<td>3</td>
<td>Transparency</td>
<td>20-60.0 cm</td>
</tr>
<tr>
<td>4</td>
<td>Dissolved Oxygen</td>
<td>2.2-11.6 mg/Lit.</td>
</tr>
<tr>
<td>5</td>
<td>Free CO2</td>
<td>Nil-18.0 mg/Lit.</td>
</tr>
<tr>
<td>6</td>
<td>Alkalinity</td>
<td>120-270 mg/Lit.</td>
</tr>
<tr>
<td>7</td>
<td>Total Hardness</td>
<td>100-220 mg/Lit.</td>
</tr>
<tr>
<td>8</td>
<td>Chloride</td>
<td>28-90.4 mg/Lit.</td>
</tr>
<tr>
<td>9</td>
<td>B.O.D.</td>
<td>8.0-26.3 mg/Lit.</td>
</tr>
<tr>
<td>10</td>
<td>Nitrate</td>
<td>0.6-2.2 mg/Lit.</td>
</tr>
</tbody>
</table>

3. Result & Discussion

Among the phytoplankton chlorophyceae species, Cynophyceae species, bacillariophyceae species and Euglenophyceae species were recorded from the Tapti River during sep. 2015 to feb.2016. Monthly variation was recorded among phytoplankton. Half yearly average percentage composition of various groups of phytoplankton at different sites was studied.

![Types of Phytoplankton and Zooplanktons in sampling sites](image)

Figure 4: Types of Phytoplankton and Zooplanktons in sampling sites

At site 1 bacillariophyceae and Euglenophyceae were dominant with 30% contribution of each group, at site 2nd chlorophyceae and Euglenophyceae with 35 % of each group were recorded and planktoic from representing chlorophyceae and Cynophyceae species were 30% each recorded from site 3rd. At site 3rd, second dominant group was bacillariophyceae about 25%. Seasonal variation in the amount of Euglenophyceae may be related to the influence of biotic factors (manoj, 1993). From unpolluted sites of several rivers of India, it has been observed that bacillariophyceae was dominating followed by the dominance of chlorophyceae. Similar observation has been recorded for four sampling sites also.

Protozoa and rotifer Zooplanktons were of nearly equal composition but arthropod more in percent composition at site 2nd whereas, other groups were protozoa and rotifers in decline manner. At site 3rd protozoa and rotifers were more in number as this site has less impact as well as less turbidity.

The diversity and density of Zooplankton certainly get influenced by the physic chemical properties of water (onshore et, ak, 1997)m that the density of Zooplankton remains more in the lower reaches of the rivers and very less density as well as diversity of Zooplanktons community has

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been reported from head water and first and second order streams. Further it is a fact that the diversity of Zooplanktons is always less in the flowing fresh water compared estuarine water or tidal influenced zone. The similar observation has been recorded for river like Narmada, Tapti, mahi and Sabarmati (Sharma, 1995. Nanda 2003).

Figure 5: Aquatic Flora (Flowering Plants) in Tapti River at Burhanpur, M.P., India
Images 1st – Phytoplanktons (Genera of Chlorophyceae 1 To 18)

Chlorophyceae, Genera-18
42.85%

Bacillariophyceae, Genera-15
35.71%

Myxophyceae, Genera-09
21.42%

Phytoplanktons = 42 Genera

Graph no- Showing Phytoplanktons at S1, S2, S3, of River Tapti.

Abbreviations: phr phytoplankton, ch Chlorophyceae, Ba Bacillariophyceae, Eu Euglenophyceae, My Myxophyceae S1 Sampling site I, S2 sampling site II, S3 sampling site III

Graph no- Showing Minimum & Maximum Dominant Classes (Dominant Class I- Ch, class II- Ba)

Volcano

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Images IInd – Phytoplanktons (Genera Of Bacillariophyceae 1 To 15)
Images Ilrd – Phytoplanktons (Genera of Myxophyceae 1 To 09)
IMAGES 1st – Zooplanktons, (Genera of Rotifera 1 To 10)

Protists, Genera-32
Copepods, Genera-06
18.75
Rotifera, Genera-10
31.25
Ostracods, Genera-02
6.25
Crustacea, Genera-03
9.37
Protozoa, Genera-11
34.37%

Fig. Available classes of Zooplanktons
Graph no: Showing minimum & maximum dominant classes of zooplanktons

- **Actinophrys**
- **Actinosphaerium**
- **Euglena**
- **Paramecium**
- **Peridinium**
- **Campenella**
IMAGES II-nd – Zooplanktons, (Genera Of Protozoa 1 To 11)

IMAGES III-rd – Zooplanktons, (Genera Of Crustacea 01 To 03)

Images IV – Zooplanktons, (Genera Of Ostracoda 01 To 02)
### Table 1: Biostatistical Estimation of species diversity:

<table>
<thead>
<tr>
<th>S No.</th>
<th>Types of Planktons</th>
<th>Group &amp; Genera</th>
<th>Name of Genera</th>
<th>Total (result)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Phytoplanktons</td>
<td>Chlophyceae, 18 (see image no.01)</td>
<td>Chlorella, Cosmarium, Oedogonium, Pediastrum, Scenedesmus, Chlamydomonas, Spirogyra, Ulothrix, Hydrodictyon, Cladophora, Chlorococcum, Microspora, Desmidium, Chara, Nitella, Zygenema, Syndesmus and Volvox</td>
<td>42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bacillariophyceae, 15 (see image no.02)</td>
<td>Navicula, Nitzschia, Fragilaria, Ceratoneis, Amphora, Caloneis, Synedra, Diatoms, Gomphonema, Pinnularia, Melosira, Tabellaria, Denticula, Cymbella and Cyclotella.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Myxophyceae, 09 (see image no.03)</td>
<td>Anabaena, Anacystis, Oscillatoria, Spirulina, Nostoc, Rivularia, Aphanizomenon, Coccolithus and Phormidium</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>Zooplanktons</td>
<td>Rotifer, 10 (see image no.01)</td>
<td>Keratella, Rotatoria, Testudinella, Ascomorpha, Polyarthra, Philodina, Asplancha, Pompohlix, Brachionus and Trichocera.</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crustacea, 03 (see image no.03)</td>
<td>Eubrachiounus, Moina, Nauplius</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Protozoa, 11 (see image no.02)</td>
<td>Actinophrys, Actinosphaerium, Euglena, Paranecium, Peridinium, Campenella, Epistyli, Vorticella, Arcella, Difflugia, Ceratium.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Copepoda 06 (See image no.04)</td>
<td>Cyclops, Diaptomus, Daphnia, Bosmina, Helobdella and Nauplius-stages</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ostracoda 02 (See image no.05)</td>
<td>Cypris and Stenocypris</td>
<td></td>
</tr>
</tbody>
</table>
4. Conclusion

On the basis of different physico-chemical and biological parameters, the status of River Tapti is eutrophic in nature and during period under study 12 fish species, 42 phytoplanktons (15 Bacillariophyceae, 18 Chlorophyceae, 09 Cynophyceae) and 32 Zooplanktons (10 Rotifera, 03 Crustacea, 11 Protozoa, 06 Copeoda, 02 Ostracoda) Genera have been recorded. In future with increasing human interference at the same rate, it is possible that the River Tapti will further be polluted. Therefore further studies need to be undertaken to suggest restorative measures, which are of great – socio – economic importance to the region. The current prevailing condition of physico chemical parameters of River Tapti and Aquatic diversity besides acting as potential bio indicators of tropic status requires the management strategies for the conservation of River Tapti at District Burhanpur, Madhya Pradesh, India. (See Table No.1)

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