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COMPREHENSIVE STUDY OF DIFFERENT AREAS OF PHYTOPLANKTON DIVERSITY OF BHIMA RIVER TALUKA KHED, DIST. PUNE[#]

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Abstract

The Bhima river is largest river in Maharashtra, The River is originates at Bhimashankar on the western side of the Western Ghats near Karjat, at an altitude of 945 m above sea level. In order to study phytoplankton diversity in various sites of Bhima River at Khed Tahasil, dist. Pune. Based on sampling on various locations, it was found that the river stretches of Bhima River are polluted. The phytoplankton are very sensitive to water pollution, the phytoplankton diversity are correlated to one another. The sample collection was made at early morning. According to given study four groups of phytoplankton was observed. In that Chlorophyceae was abundant as compare to Bacillariophyceae, Myxophyceae and Euglenophyceae. The relation of Phytoplankton diversity and diversity indices was studied.

Key words- Phytoplankton diversity and Diversity indices.

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#Short Communication
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Introduction

The Bhima River is one of the largest River in India as well as Maharashtra, (Kumar and Khanna,2006) The River is originates at Bhimashankar on the western side of the Western Ghats near Karjat, at an altitude of 945 m above sea level. It flows 861 Km through Maharashtra, Karnataka and Telongana and then it enters in Krishna River. It is Major River in Pune District. The Khed tahasil is on the bank of Bhima River, a fertile agricultural area which is densely populated. The some Industrial waste water, sewage water has polluted all tributaries of Bhima River. In given study in order to phytoplankton diversity of different area of Bhima River.

Phytoplankton diversity has related to productivity in ecology (Newall & Vallina, 2011). The diversity Indices is used for habitat Characterization (Domitrotic & Cardsa, 2012).Diversity index of phytoplankton varied from unstable to stable moderate. (Hefni Effendi& Kawaroe, 2016) The importance of Phytoplankton communities in these study area for conservation. We assumed that these are different dimensional distribution and diversity of phytoplankton inseveral sampling location.

Material and Method

The study was performed in Bhima River at Khed Tahasil, Distict Pune. The sample was collected from 4 sites. Plankton sampling was carried out by using plankton collecting net. The filtered water sample are stored in sample bottle and preserved in 10% Lugol solution. The samples are observed under binocular microscope and by using key of identification from slandered books. The abundance of plankton was calculated by diversity indices.

The analysis approach was use to describe biological diversity can be quantifier=ed in different easy. The two main factors taken in to consideration are Richness and evenness which on Shannon and Simpson Diversity index with following formula-

Simpson Diversity Index: This value range between 0 and 1. More will be value of indexgreater will be sample diversity.

$$\text{Simpson's Diversity Index} = 1 - \frac{\sum n(n-1)}{N(N-1)}$$

Where,
n = number of individuals per liter
N = Total number of individuals per liter.

Shannon Diversity Index: This is another index which commonly used for characterize thediversity of species within sample. Like above Simpson index it shows both abundance and evenness of the species represent.

$$\text{Shannon Diversity Index } H = \sum_{i=1} \left(\frac{n_i}{N} \ln \frac{n_i}{N} \right)$$

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Where,
n = number of individuals per liter *N* = Total number of individuals per liter. *s* = Species number, *H*=species diversity in bits of information per individual

Species Richness:

Species richness (SR) = $\dfrac{s-1}{\log_e N}$

Where,

N = Total number of individuals per liter.
s = Species number

Evenness of Equability index-

Evenness Index (J) = $\dfrac{H}{\log_e S}$

Where,
H=species diversity in bits of information per individual calculated above
s = Species number

Phytoplankton data were calculated using Diversity Indices to determine related betweensampling station and phytoplankton diversity richness and eveness.

Results and Discussion

Phytoplankton Diversity
In present study from the study area is presented in Table 1. The total number of phytoplankton recorded in each of the four sites, Varied considerably. The phytoplankton consist of 23 species belongs to Chlorophyceae (9), Bacillariophyceae (6), Myxophyceae (5), and Euglenophyceae (3). The highest number of species was observed at site A & C as compare to site B & D.

During the present investigation on Bhima River of the two year phytoplankton population, it was observed that the class Chlorophyceae is dominant in four classes of Phytoplankton. Seasonal fluctuation observed during study period shows that phytoplankton are abundant in summer season than Monsoon & winter season All these above noted results were similar with that of Chandrasekhar (1996), Chauhan Ramesh (1988),Chaudhary R. Pillai (2009), Jhingran A.G. (1989), Pradhan et al (2008), Manisha Giripunje (2013) and Monickam N (2014) .

Diversity Indices
The plankton diversity is studied with Shennon method for Diversity and Simpson method for Dominance.

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Table 1: Diversity of Phytoplankton in Bhima River

No	Class	Site A	Site B	Site C	Site D
1.	*Pediastrum sp.*	+++	++	+++	
2.	*Chlorella sp.*	++++	++	+++	
3.	*Scendesmus sp.*	++	-	++	
4.	*Ulothrix sp.*	+++	++	++	
5.	*Volvox sp.*	++	--	+	
6.	*Spirogyra sp.*	++++	++	++++	++
7.	*Ankistrodesmus sp.*	++	+	++	
8.	*Coelastrum sp.*	+	-	+	
9.	*Tetraedron sp.*	++	+	+	
10.	Bacillariophyceae				
11.	*Navicula sp.*	++	+	+	
12.	*Diatoma sp.*	++++	++	+++	
13.	*Cyclotella sp.*	++	+	++	
14.	*Cymbella sp.*	++	+	+	
15.	*Synedra sp.*	+++	+	++	
16.	*Gyrosigma sp.*	++	+	++	
17.	Myxophyceae				
18.	*Microcystis wesenbergii*	++	++	+++	
19.	*Microcystis elegans*	++++	++	+++	
20.	*Anabaena sp.*	++++	+++	+++	+++
21.	*Merismopedi elegans*	+++	++	++++	
22.	*Nostoc sp.*	++	+	++	
23.	Euglenophyceae				
24.	*Euglena acus*	++	+	++	
25.	*Euglena spirogyra*	++	+	++	
26.	*Euglena ehrenbergii*	++	+	++	

In the present study population of phytoplankton shows the high value of Shannon index(H) which was recorded as 3.070 for the site B and site D, followed by 3.030 for the site A and 3.043 for the site C. It means that diversity index 'Delta' of site A, site B, site C and site D are categorized as moderate stable community.

The Simpson index for Dominance (D) varies from 0.046 to 0048. The value D was highest at site A & site C as 0.048 followed by site B which ranges between 0.046 and 0.047, and at site D it is 0.046. The index ranges from 0 to 1 so it shows moderate dominance since the value was less than 0.050.

Table 2: Phytoplankton Diversity Indices

Site	Station-Year	Shennon	Simpson	Richness	Evenness
A	2017-2018	3.030	0.048	23	0.966
	2018-2019	3.028	0.048	23	0.966
B	2017-2018	3.070	0.046	23	0.979
	2018-2019	3.063	0.047	23	0.977
C	2017-2018	3.043	0.047	23	0.970
	2018-2019	3.031	0.048	23	0.967
D	2017-2018	3.070	0.046	23	0.979
	2018-2019	3.066	0.046	23	0.978
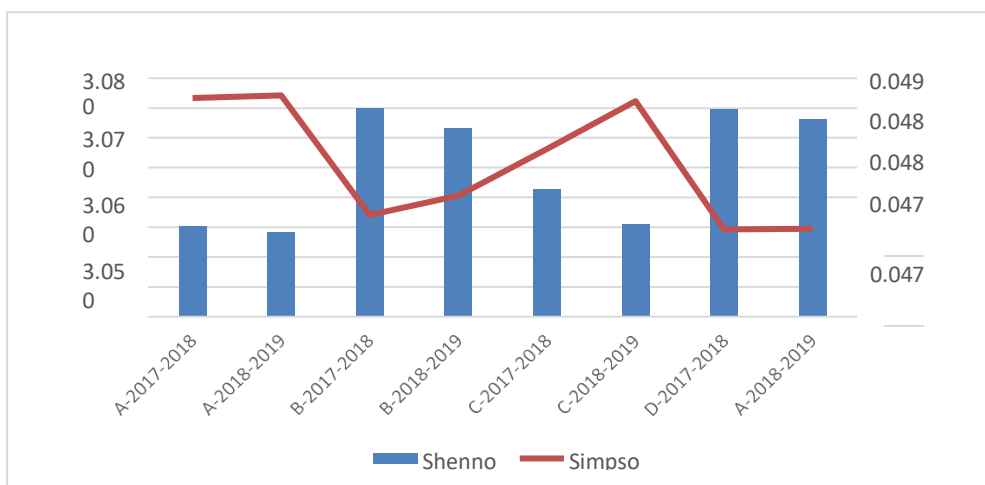
Fig. 2: Phytoplankton Diversity Indices Variation among Four Sites for 2017-18 & 2018-19

At site A, B, C and D, four classes of Phytoplankton were recorded. Out of those four classes, Chlorophyceae was found to be dominant at all sites in the given study period. In the present study population of phytoplankton shows diversity index 'Delta' of site A, site B, site C and site D are categorized as moderate stable community. The Simpson index for Dominance (D) varies from 0.046 to 0048. The value D was highest

at site A & site C as 0.048 followed by site Bwhich ranges between 0.046 and 0.047, and at site D it is 0.046. The index ranges from 0 to 1 so it shows moderate dominance since the value was less than 0.050.

Conclusion

Phytoplankton diversity is an biological indicator in environment. In Bhima River of Khed tahasil, district Pune, phytoplankton diversity is in normal status. Chlorophyceae is highly abundance as compare to Bacillariophyceae, Myxophyceae and Euglenophyceae. Diversity indices of phytoplankton varied from unstable to stable moderate. Diversity and aboundance of phytoplankton is most important for ecosystem.

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