



### Short Communication

# Phytoplankton population in relation to physico-chemical properties of River Tapi, Surat, Gujarat, India

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Available online at: [www.isca.in](http://www.isca.in), [www.isca.me](http://www.isca.me)

Received 30<sup>th</sup> November 2016, revised 7<sup>th</sup> February 2017, accepted 27<sup>th</sup> February 2017

## Abstract

Monthly variation in Phytoplankton population in relation to Physico-Chemical properties of Tapi river was analysed from September-2015 to February -2016. Water samples and plankton samples were collected from two pre-selected sites. Water samples were analyzed for Temperature, pH, Nitrate, Nitrite, Silicate and Phosphate by using standard methods. Quantitative estimation of Phytoplankton was done by using standard method. Pearson correlation was calculated among the various Physico-Chemical variables and Phytoplankton density.

**Keywords:** Physico-Chemical properties, Correlation, Phytoplankton, Tapi, Surat.

## Introduction

Phytoplankton are the Pioneer of the aquatic food web as they are autotrophic in nature. Phytoplankton are either present as unicellular, colonial or filamentous forms in the water body. Phytoplankton population observation may be used as reliable tool for biomonitoring studies to assess the Pollution status of aquatic bodies<sup>1</sup>. Many Physico-Chemical parameters influence the composition and abundance of Phytoplankton. So they are important biological tool for monitoring the ecology of any river system.

The change in the water quality tends to change the living conditions, especially in the number, diversity and the distribution of the biota of the ecosystem<sup>2</sup>.

Das and Panda<sup>3</sup> recorded the water quality and Phytoplankton Population in the sewage Fed rivers of Mahanadi, Orissa, Komala *et al.*<sup>4</sup> assessed plankton diversity and abundance of Arkavathi River with reference to pollution.

Waghmare and Kulkarni<sup>5</sup> assessed the Phytoplankton Population and Seasonal variation in Lendi River, District Nanded, Maharashtra and found the Bacillariophyceae, Chlorophyceae and Cyanophyceae in which 20 genera were recorded.

Sharma *et al.*<sup>6</sup> studied the Phytoplanktonic Diversity and its relation to Physico-chemical Parameters of water at Dongarwada Ghat of River Narmada.

The main Objective of the study was to determine the water quality and Phytoplankton Population in Tapi River and to study correlation between Physico chemical parameters and plankton density.

## Materials and methods

The present study was carried out monthly during the September-2015 to February-2016. Two sites were selected for the study: i. Utran which is a Fresh water zone of Tapi River located near the Thermal Power plant and ii. Ashwanikumar which is also Freshwater zone polluted due to anthropogenic activities and Human cremation ground waste. Physico-chemical parameters of water were analyzed once in month from September-2015 to February-2016. Water samples were collected from both the sites. Temperature and pH were recorded immediately at the sites. Other Physico-chemical parameters viz. Nitrite, Nitrate, Phosphate and Silicate were analysed in to the laboratory by using standard methods. For Phytoplankton analysis, surface Water samples were collected on monthly basis at selected sites. The Phytoplankton samples were collected by filtering 50L of water through plankton net of having 20 $\mu$  mesh size.

The samples were concentrated up to 100ml and preserved with 4% formalin and Lugol's iodine solution. The quantitative a estimation of Phytoplankton were carried out by Lackey's drop method. Qualitative estimation also done by using standard literature Sarode and Kamat<sup>7</sup>, Desikachary<sup>8</sup> and APHA<sup>9</sup>. Pearsons Correlation was done to correlate the Physico-chemical parameters and Phytoplankton population.

## Results and discussion

Physico-chemical parameters of water and Phytoplankton population were shown in Table-1. Table-2 shows the correlation coefficient between Physico-chemical parameters and Phytoplankton population.

**Table-1:** Physico-chemical parameters of water and Phytoplankton population at site-1 and site-2.

Month	site	T °c	pH	Nitrite mg/L	Nitrate mg/L	Silicate mg/L	Phosphate mg/L	Phytoplankton population(unit/L)					Total
								Bacillariophyceae	Chlorophyceae	Cynophyceae	Euglenophyceae	Dinophyceae	
Sept. 2015	1	30	8.10	0.047	4.42	80.65	0.15	452	26	652	-	-	1130
	2	31	8.21	0.051	7.15	85.91	0.08	372	46	720	-	-	1138
Oct. 2015	1	29	8.64	0.021	3.82	55.05	0.14	438	34	44	-	-	604
	2	30	8.78	0.048	6.86	65.31	0.35	504	42	38	2	-	586
Nov. 2015	1	28.5	7.81	0.060	4.70	80.12	1.68	364	56	16	-	-	436
	2	28	7.90	0.051	6.40	84.55	1.40	404	48	30	-	-	482
Dec. 2015	1	24	7.83	0.045	5.73	72.98	0.22	356	96	22	-	-	474
	2	23	7.67	0.044	6.02	76.44	0.03	502	50	12	-	-	544
Jan. 2016	1	25	7.59	0.029	3.60	72.70	0.03	314	220	30	-	6	570
	2	25	7.43	0.056	7.17	57.60	0.06	320	112	14	-	4	450
Feb. 2016	1	26.5	7.39	0.038	2.13	69.88	0.19	216	186	20	-	12	434
	2	26	7.16	0.036	2.86	71.67	0.09	114	52	34	-	4	204

Temperature is the most important factor that affects the metabolic activities of organisms. During the study temperature ranged between 25 -30°C and 23 - 31°C at site-1 and site-2 respectively.

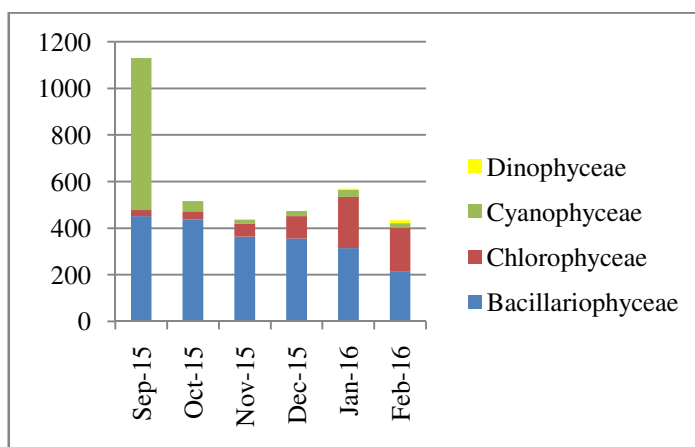
pH found 7.43-8.64 and 7.39-8.78 at site-1 and site-2 respectively. Nitrite ranged between 0.021-0.047mg/L and 0.036-0.056 mg/L at site-1 and Site-2 respectively.

Nitrate ranged between 2.13-5.73 mg/L and 2.86-7.17 mg/L at site-1 and Site-2 respectively. Phosphate varies between 0.03-1.68 mg/L and 0.03-1.40 mg/L at site-1 and Site-2 respectively. Silicate during the study ranged between 55.05-80.65 mg/L and 57.60- 85.91mg/L at site-1 and Site-2 respectively.

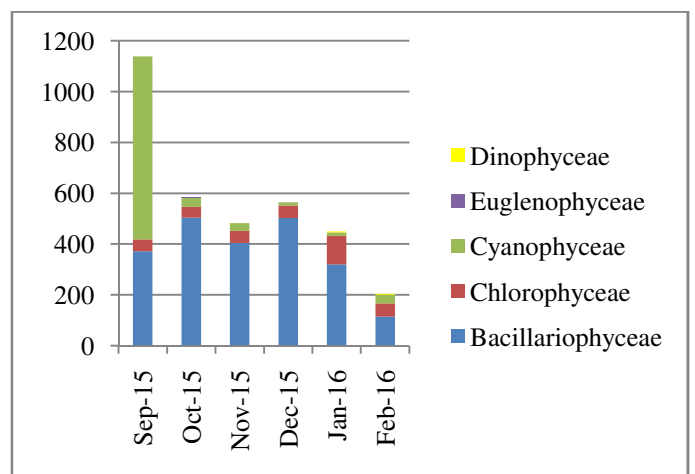
Nitrite, Nitrate, Phosphate and Silicates are the nutrients which are the responsible for growth of Plankton.

Phytoplankton are the base of aquatic food. So, to understand the aquatic ecosystem phytoplankton population study is very useful. The Phytoplankton segregated into five groups: Bacillariophyceae, Chlorophyceae, Cyanophyceae, Euglenophyceae and Dinophyceae. Bacillariophyceae group of organisms found throughout the study period. The density ranged between 216-438 unit/L and 114-652 respectively at site-1 and site-2. Chlorophyceae group of organisms found between 26-220 unit/L and 42-112 unit/L respectively at site-1 and site-2 and Cyanophyceae density ranged between 16-652 unit/L and 42-112 unit/L respectively at site-1 and site-2. Euglenophyceae found in October-2015 at site-2. Dinophyceae found at both the site at January -2016 and February-2016.

Figure-1 and 2 Shows the Monthly variation in Phytoplankton Population at site-1 and site-2 respectively.



**Figure-1:** Monthly variation in Phytoplankton Population at site-1(Utarn).



**Figure-2:** Monthly variation in Phytoplankton Population at site-2 (Ashwanikumar).

**Table-2:** Shows the correlation coefficient between Physico-chemical parameters and Phytoplankton population.

	Temp	pH	Nitrite	Nitrate	Silicate	Phosphate	Bacillario phyceae	Chloro phyceae	Cyano phyceae	Eugleno phyceae	Dino phyceae
Temperature	1										
pH	.689*	1									
Nitrite	.155	-.071	1								
Nitrate	.147	.380	.635*	1							
silicate	.222	-.116	.448	.144	1						
phosphate	.235	.058	.502	.103	.394	1					
Bacillario phyceae	.301	.755**	.183	.585*	.065	.115	1				
Chloro phyceae	-.506	-.512	-.287	-.409	-.179	-.232	-.465	1			
Cyano phyceae	.626*	.290	.196	.203	.498	-.242	.194	-.337	1		
Eugleno phyceae	.345	.581*	.117	.326	-.239	-.007	.390	-.195	-.120	1	
Dino phyceae	-.336	-.601*	-.306	-.623*	-.246	-.274	-.685*	.816**	-.274	-.181	1

\*, Correlation is significant at the 0.05 level 2-tailed), \*\*, Correlation is significant at the 0.01 level (2-tailed).

Pearson correlation between phytoplankton population and physico-chemical parameter: In the present study, the correlation between phytoplankton population and physico-chemical parameter revealed that Bacillariophyceae was statistically significantly positively correlated at 1% level of significance with pH. Alkaline pH supports the growth of Diatoms. Bacillariophyceae was also positively correlated with Nitrate. Cyanophyceae is positively correlated with Temperature. Euglenophyceae was positively correlated with pH while, Dinophyceae was negatively correlated with pH.

### Conclusion

Nutrient level in the river water fluctuates throughout the study period. The results shows that the throughout the study period Bacillariophyceae group of organisms found abundantly. While density of Chlorophyceae groups and Cyanophyceae group of organisms fluctuates. So this study can be used for further ecological monitoring of Tapi River.

### References

1. Fouzia Ishaq, D.R. Khanna and Aamir Khan (2013). Physico-chemical and phytoplanktonic characteristics of river Tons at Dehradun(Uttarakhand), India. *Journal of Applied and Natural Science*, 5(2), 465-474.
2. Sharma D.K. and Singh R.P. (2013). Correlation between Physico-Chemical parameters and Phytoplankton of Tighra reservoir, Gwalior, Madhya Pradesh. *International Journal of security and Networks*, 4(1), 90-95.
3. Das M. and Panda T. (2010). Water quality and Phytoplankton population in sewage Fed river of Mahanadi. *Journal of Life science*, 2(2), 81-85.
4. Komala H.P., Nanjundaswamy L. and Devi Prasad A.G. (2013). An assessment of plankton diversity and abundance of Arkavathi River with reference to pollution. *Advance in applied Science Research*, 4(2), 320-324.
5. Bimbisar D. Waghmare and A.N. Kulkarni (2015). An Assessment of Phytoplankton Population and Seasonal variation in Lendi River, District Nanded, Maharashtra, India. *Intrnational Journal of Science and Research*, 4(12), 936-940.
6. Sharma Jyoti, Parashar Alka, Bagre Pratibha and Qayoom Imtiyaz (2015). Phytoplanktonic diversity and its relation to Physico-Chemical Parameters of water at Dogarwada ghat of River Narmada. *Current world Environment*, 10(1), 206-214.
7. Sarode P.T. and Kamat N.D. (1984). Freshwater diatoms of Maharashtra. Saikrupa Prakasan.
8. Desikachary T.V. (1959). Cyanophyta. Indian council of Agriculture Research, New Delhi.
9. APHA (2005). Standard Method for the Examination of Water and Wastewater. American Public Health Association.

