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SEASONAL FLUCTUATION OF PHYTO AND ZOOPLANKTONS OF PONNERI TANK (CHOLAGANGAM) ARIYALUR DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

A study was undertaken to record the seasonal fluctuation in phyto and zooplankton population in Ponneri Tank (Cholagangam) in Udayarpalayam Taluk, Ariyalur District, Tamil Nadu, India, for a period of two years (January 2015 to December 2016). In this study, 10 species diatoms (Bacillariophyceae), 12 species of blue green algae (Cyanophyceae), 15 species of green algae (Chlorophyceae) and 16 species of zooplanktons were recorded. In the present observation, Navicula sp. (Bacillariophyceae), Oscillatoria sp. (Cyanophyceae), Spirogyra varians (Chlorophyceae) and zooplankton rotifers were found to be dominant groups. Plankton density and diversity is higher in summer then the winter and monsoon seasons.

KEY WORDS

Phytoplanktons, Zooplanktons, Diversity, Water samples.

INTRODUCTION

Planktons both phyto and zooplanktons are important biotic community in an ecosystem which responds to ecosystem alterations rapidly. This effect is due to their key role n the turnover of organic matter and energy through the ecosystem. Hence, plankton data is importance for aquatic ecosystem studies for the various reasons. Plankton plays an important role in producing (phytoplankton) and structuring the matter, energy and information fluxes (zooplankton) in any aquatic ecosystems. Planktons respond quickly to the ecosystem stress and any imbalance in functions of the pelagic components leads to eutrophication and accumulation of nutrients in bottom an aquatic ecosystem. Plankton serves as the food for fish and other aquatic organisms. Autecology of model plankton species and regularities of dynamics of structural and functional parameters of pelagic communities contribute to the knowledge on the function of an aquatic ecosystem (Alimov, 2000).

Phytoplanktons are the integral part of an aquatic food chain. Since they respond to change in aquatic environment, they are good indicators of stress like water pollution. They are used as bioindicators in pollution monitoring studies which is the basic aspect for an environmental impact assessment program. The phytoplankton and zooplankton are practically suitable choice as bioindicators of water quality. Monitoring biological parameters is rapid, inexpensive and reliable. Nutrient enrichment by the addition of fertilizers, supplementary feeding and other eutrophication processes may cause blooming of algae. Preponderance of blue green algae then others is due to their ability to assimilate a variety of biogenic organic compounds.

Plankton is the natural food for many species of fishes, especially the zooplanktons constitute important food item of many omnivorous and carnivorous fishes. The larvae of carps feed mostly on zooplankton (Dewan *et al*., 1977) because zooplankton required amount of protein for the growth and maturation. According to

Prasad and Singh (2003), the zooplankton forms the principal food source for fish and the zooplankton alone contribute to 82% of the food items of *Anabas testudineus.*

Islam *et al*. (2000) studied the ecology and seasonal abundance of zooplanktons in Rajshahi pond water. Homyra and Naz (2005) studied limnology of an artificial lake of Rajshahi. Chowdhury and Mamun (2006) worked on physico-chemical conditions and their influence on plankton population of two fish ponds in Khulna. Many researchers worked on the percentage composition, seasonal variation and occurrence of freshwater zooplankton. In the present investigation, seasonal fluctuation of phytoplankton and zooplankton were studied in Ponneri Tank (Cholagangam) in Udayarpalayam Taluk, Ariyalur District, Tamil Nadu, India for a period of two year from January 2015 to December 2016.

MATERIALS AND METHODS

Water samples were collected from Ponneri Tank (Cholagangam) in Udayarpalayam Taluk, Ariyalur District, Tamil Nadu, India which is located at latitude 11° 18' North South, 79° 29' East West on Southern part of India. The collection were made early in the morning by using the standard plankton net nylobolt (no.25) with 20 cms mouth diameter and length of 1 m. The integrated samples were made by pooling the samples collected from two sides and centre of the tank. One hundred liters of water was filtered through plankton net for qualitative estimation of plankton. Samples were preserved in 5% formalin. Then the samples were made up to 100 ml and counting was done in a Sedwick-Rafter cell (Welch, 1952). From this, the number of cells per liter was calculated and the percent composition of various groups of phytoplankton and zooplankton were computed and graphically represented.

Freshwater planktonic diatoms were collected using phytoplankton net (mesh size 20) from different stations in Ponneri tank. Water samples were centrifuged, and pellet of diatom samples were collected and fixed in 4 per cent formalin. For better viewing and identification, diatom cells were washed with saturated solution of chromic acid (potassium dichromate dissolved in conc. H_2SO_4). The slides were prepared by mounting in glycerin and photomicrographs of the frustules were taken using microscope and canon 5-megapixel digital camera.

RESULT

Bacillariophyceae

Seasonal fluctuation in phytoplankton, Bacillariophyceae density of Ponneri tank water samples were presented in Table 1. This study was conducted for a period of two years from January 2015 to December 2016. During this period, 10 species diatoms (Bacillariophyceae) were recorded. Of the 10 species of phytoplantons, *Navicula* sp. was dominant. The maximum numbers were recorded in summer and minimum density of Bacilliariophyceae was recorded in winter season during the study.

Cyanophyceae

The seasonal fluctuation in cyanophyceae density of Ponneri tank water samples were presented in Table 2. In the present observation, totally 12 species of blue green algae (Cyanophyceae) were recorded and *Oscillatoria* sp. was dominant. The maximum numbers of cyanophyceae recorded in summer and minimum density was recorded in winter season.

Chlorophyceae

Seasonal fluctuation in chlorophyceae density of Ponneri tank was presented in Table 3. In the present investigation, 15 species of green algae (Chlorophyceae) were recorded and the *Spirogyra varians* was dominant during the study period.

Zooplankton diversity

The qualitative and quantitative analysis of zooplankton contents showed the presence of seven groups. In the present study, 16 species of zooplanktons were collected they belong to seven major groups namely protozoa, rotifers, cladocerans, copepods, ostracods, nekton and bivalvia. Out of which 3 species of protozoa, 6 species of rotifers, 2 species of cladocerans, 2 species of copepods, 1 species of ostracods, one species of nekton and one species of bivalivia were identified and recorded. Among the zooplankton rotifers were dominant group than the other group of zooplankton. Though all the species were recorded the maximum species density of zooplankton were recorded during summer and the minimum was recorded in winter (Table 4).

Table 1. Bacillariophycae phytoplankton of Ponneri tank water samples (January 2015 – December 2016)

S.No.	Biotic composition	Ponneri tank water samples		
		Winter	Summer	Monsoon
1	*Asterionella glacialis*	8	14	3
2	*Bacillaria paradoxa*	5	13	11
3	*Cymbella cymbliformis*	4	9	7
4	*Diatoms moniliformis*	14	22	18
5	*Diatoms vulgaris*	8	14	5
6	*Eucampia zoodiacus*	7	10	8
7	*Gomphonema clavatum*	8	13	9
8	*Hantzschia amphioxys*	11	21	16
9	*Navicula henneydii*	9	16	12
10	*Navicula mutica*	15	21	18

Table 2. Cyanophycae phytoplankton of Ponneri tank water samples (January 2015 – December 2016).

S.No.	Biotic composition	Ponneri tank water samples		
		Winter	Summer	Monsoon
1	*Anabaena sp.*	13	15	3
2	*Cylindrospermosis sp.*	8	12	4
3	*Crococcus sp.*	15	18	14
4	*Microcystic sp.*	14	15	15
5	*Navicula hustedtii*	13	14	3
6	*Nostac sp.*	5	7	4
7	*Oscillatoria geminata*	3	15	3
8	*Oscillatoria nitida*	7	19	9
9	*Phormidium tenue*	3	19	15
10	*Spirulina major*	10	14	3
11	*Synechococcus crassa*	9	12	7
12	*Ulothrix sp.*	7	8	5

Table 3. Chlorophycae phytoplankton of Ponneri tank water samples (January 2015 – December 2016).

S.No.	Chlorophycae	Ponneri tank water samples		
		Winter	Summer	Monsoon
1	*Ankistrodesmus flacatus*	7	15	13
2	*Cosmarium sp.*	14	26	17
3	*Chlorella vulgaris*	12	14	7
4	*Cosmarium pachydermum*	3	15	11
5	*Dictyosphaerium pulchellum*	5	8	-
6	*Eudorina elegans*	8	22	7
7	*Gonium pectorale*	10	21	15
8	*Kirchneriella contorta*	4	7	5
9	*Lagerheina balatonica*	5	8	6
10	*Lagerheina ciliata*	12	13	3
11	*Oedogonium anomalum*	15	27	20
12	*Scenedesmus sp.*	3	30	5
13	*Spirogyra varians*	20	23	3
14	*Spirogyra* sp.	12	11	18
15	*Volvax sp.*	6	15	8

Table 4. Zooplankton of Ponneri tank water samples (January 2016 – December 2015).

S.No.	Zooplanktons	Ponneri tank water samples		
		Winter	Summer	Monsoon
	Protozoa			
1	*Ceratium fusus*	6	30	21
2	*Paramecium bursaria*	11	23	14
3	*Verticella microstoma*	8	15	5
	Rotifera			
4	*Brachionus durgae*	9	31	15
5	*Brachionus angularis*	20	35	28
6	*Euchianis dilatata*	5	6	3
7	*Filinia bory*	3	5	-
8	*Rotaria rotatoria*	4	11	6
9	*Trichocerca stylata*	6	9	2
	Cladocerans			
10	*Daphnia carinata*	5	15	9
11	*Nauplius sp.*	6	9	6
	Copepods			
12	*Cyclops sternous*	11	25	19
13	*Heliodiaptomus viduus*	17	38	33
	Ostracods			
14	*Cyclocypris globosa*	9	31	25
	Nekton			
15	*Notonecta glauca*	3	8	-
	Bivalvia			
16	*Dreissena polymorpha*	2	6	4

DISCUSSION

Biodiversity of an ecosystem plays an important functional role of the ecosystem. The ecosystem productivity is related with the phytoplankton and its fluctuation is studied in various aquatic environments (Vallina and Montoya, 2017). Yazdandoost and Katdare, (2000) reported variations in distribution of phytoplankton in different locations of several rivers in Pune and recorded a higher density of Chlorophyceae in the Holkar Causeway (Mula river) and it is least in Kasarwadi (Pauna river), higher density of the Cyanophyceae in Sanghai (Pauna river) and lower density of the same in Bund garden (the Mula Mutha river). The study correlates the abundance of the planktons as a function of water quality. There is a drop-in species and number as a function of pollution. Dwivedi *et al.* (2005) reported Chlorophyceae as the dominant one in the selected water bodies of North India.

Kumar and Saha (1993) documented 126 taxa of phytoplankton belonging to Bacillariophyceae, Chlorophyceae and Cyanophyceae from a reservoir at Bhagalpur. Pati and Sahu (1995) reported Cyanophyceae as dominant among the phytoplankton followed by Chlorophyceae and Bacillariophyceae. Siddiqui and Ahmad (1995) observed 36 species of diatoms belonging to 11 genera from the Dharabhanaga of North Bihar. More and Nandan (2000) reported four algal groups from three different places in Panzara river, Maharashtra where microcystis bloom was found in summer; during winter other groups of zooplankton were found to be dominate. Hameed and Sherief (1999) recorded 32 species of zooplankton in river Cauveri, while Jha and Kaushal (1999) reported a single species of zooplankton in the Gobind Sagar reservoir, Himachal Pradesh. Isaiarasu *et al.* (2001) reported 12 species of zooplankton in a tropical pond near Sivakasi, South India in which Rotifer, Cladocera and Copepoda evenly distributed throughout the period of study.

Zooplankton diversity in river Dhamodar at Drugapur was studied and in rotifer was the dominant taxa irrespective of seasons of 8 species reported the study

by Biswas and Konar (2001). Zooplanktons were represented by Protozoa, Rotifera and Cladocera. Prakash *et al.* (2002) reported 20 species of zooplanktons and their dynamics in wetlands of brick-kiln and found maximum density in April and minimum in January. The annual periodicity showed that domination by rotifers, which constitute 53.95% of the total zooplankton population followed by Cladocerons (23.04%). Variation in the density zooplankton correlated with the phytoplankton biomass as evidenced in the Danube flow (Cadjo *et al.*, 2008). A number of species of rotifer family Brachionidae indicate eutrophication (Pal *et al*., 2015), abundance of Brachionus calyciflorus (zooplankton group: Rotifera, Family: Brachionidae) indicates organic pollution (Pandey *et al*., 2013) and eutrophication.

CONCLUSION

The present study was undertaken to record the phytoplanktons and zooplanktons diversity in Ponneri Tank (Cholagangam) in Udayarpalayam Taluk, Ariyalur District, Tamil Nadu. From this investigation it is observed, plankton density and diversity is higher in the summer season compared to winter and monsoon seasons.

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