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Original Research Article

Studies on the Diversity of Phytoplankton in Cauvery River, Thanjavur District, Tamil Nadu, India

A.Babu[1], Ravimanickam*[2], I.Joseph A. Jerald[1], Mohamed Shamsudin[1], and K.Prabakar[1]

[1]P.G. and Research Department of Zoology, Jamal Mohamed college Tiruchirapalli-620020, Tamilnadu, India
[2]Department of Animal Science, Bharathidasan University- Tiruchirapalli, Tamilnadu, India
Corresponding author

A B S T R A C T

The phytoplankton analysis for the present study were collected once in a month from two water bodies in near Thanjavur, for a period from October 2011 to September 2012. The qualitative and quantitative analysis of the variation in river Cauvery showed high quantity of phytoplankton during the study period. A total of 53 species (Station I) and 60 species (Station II) of cyanophyceae, 60 species (Station I) and 56 species (Station II) of Bacillariophyceae, 58 species (Station I) and 48 species (Station II) of chlorophyceae were recorded from river cauvery in Thanjavur areas. Lowest total number of cyanophyceae were recorded at station I and the highest number of species in Station II. The lowest number of Baillariophyceae and chlorophyceae were recorded at station I and highest species were recorded in Station II.

Keywords

Rivr Cauvery, phytoplankton, Diversity; Thanjavur District.

Introduction

Rivers have always been the most important fresh water resources, and most developmental activities are still dependent upon them. Rivers play a major role in assimilating or carrying industrial and municipal waste water, manure discharge and runoff which are responsible for river pollution (Toman, 2009; Suthar *et al.*, 2010).

The river Cauvery originates from Guddagumalai and flows through Karnataka and Tamil Nadu. In Tamil Nadu, it runs through Mettur, Bhavani, Komarapalayam, Trichy and Thanjavur and then into the Bay of Bengal at Kaveripoompattinam. The Cauvery river is one of the most important rivers of the indogangetic plains in India and numbers any other river in the number of industries on its bank. The waste from these industries, agricultural runoff and the drains carrying municipal sewage of the cities enter into the river and affect its water quality.

In India rivers are mainly used for agricultural purposes. Phytoplanktons are

microscopic organisms that swim or drift in water. They phytoplankton play an important role to the faunal biodiversity of aquatic ecosystems. Phytoplanktons are good source of food for fishes which in turn are good sources of food for water birds (Abater and Nolla, 1991).

The phytoplankton communities of slow flowing rivers are influenced by the development of communities in upstream reservoirs with species typical from sites with higher retention time. The qualitative and quantitative studies of phytoplankton have been utilized to assess the quality of water (Shekhar *et al.*, 2008).

Phytoplanktons are the primary producers forming the first tropic level in the food chain. Diversity of planktonic organisms in quite high in fertile standing water bodies. Phytoplankton diversity responds rapidly to changes in the aquatic environment particularly in relation to silica and other nutrients (Chellappan, 2008).

Plankton are very sensitive to the environment they live in any alteration in the environment leads to the change in the plankton communities in term of tolerance, abundance, diversity and dominance in the habitat. Therefore, plankton population observation may be used as a reliable tool for biomonitoring studies to assess the pollution status of aquatic bodies (Davis, 1995; Mathivanan *et al.*, 2008).

Phytoplankton forms the vital source of energy in the fresh water environment. They initiate the fresh water food chain, by serving as food to primary consumers, which include zooplankton, finfish, shell fish and others (Tas *et al.*, 2007).

Materials and Methods

Study areas

Two sampling stations of river Cauvery, namely Alakkudi (Station I) and (Station II) were selected and phytoplanktons collected from these locations (Table 1, 2 and 3). The study areas are situated in Thanjavur district, Tamil Nadu, India. Planktons were studied under microscope and identified with help of standard references (Adoni *et al.*, 1985).

The river Cauvery is one of the major perennial rivers in peninsular India, which originate at Coorge district in Karnataka state at Thalai Cauvery to enter into Thanjavur district. The rive Cauvery travels about 800 km and carries a large amount of nutrition, which probably promote the microbial species, richness both rationally and individually. The river Cauvery divides into many branches and wet land at Thanjavur, the Cauvery is one of the major tributaries of river Cauvery which passes through at near of the town Thanjavur. Though it is a perennial river, water is available throughout the year at Thanjavur, because of discharge of sewage water.

Analysis of phytoplankton

The plankton samples for the present study were collected once in a Month from the sampling stations. The collections were made early in the morning by using the standard plankton net nylobolt (No.25) with 30 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 river.

In case of the river the samples across the river were collected from various points including both banks. One hundred liter of water was filtered through plankton net for qualitative estimation of plankton. Samples were preserved in 5 per cent 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 litre was calculated and the per cent composition of various groups of phytoplankton were computed and graphically represented. Fresh water planktonic diatoms were collected using phytoplankton net (mesh size 20 μl) from two stations.

Results and Discussion

A total 37 numbers of cyanophyceae, 42 species of Bacillariophyceae and 40 species of chlorophyceae were recorded from river Cauvery (Alakkudi Station I) and (Rettippalayam, Station II) in Thanjavur . The phytoplanktons of Oscillatoria, Anabaena, Merismopedia and Microcystis of cyanophyceae were dominant, the other species such as Alphanotheca, *Aphanizomenon* sp., *Chroococcus* sp., *Chlorococcum* sp., *Chlorogloea*, C*oelosphaerium* sp., *Gleotheca* sp., *Gleocapsa* sp., *Gomphosphaeria* sp., *Hyella* sp., *Myxosarcina*, *Nostac* sp., *Phormidium* sp., *Pseudoanabaena* sp., *Rhabdonema* sp., *Spirulina* sp., and *Synecoccus* sp., were not dominant. Lowest total number of cyanophyceae were recorded at Station I (53 sp.), the highest number of specie were recorded from Station II (60 species) (Table 1).

Bacillariophyceae group of phytoplankton such as *Navicula* sp., *Gomphonema* sp., *Cyclotella* sp., *Cymbella* sp., *Nitzschia* sp., and *Pinnularia* sp., were dominant species. The other species such as *Acanthus brevipes, Amphora* sp., *Bacillaria paradoxa, Crycigenia quadrata, Diatoma moniliformis, Melosira varians, Gynosigma balticum, Fragillaria* sp., *Melocira* sp., *Rhizosolenia longlseta, Rhoicophaenia abbreviate*, *Stephanodiscus alpinus, Surirella* sp., and *Tabellaria* sp., was not dominant. The lowest total number of Bacillariophyceae were recorded at Station II (56 species) and highest total number of species were recorded at Station I (60 species), (Table 2).

A total of 40 species of chlorophyceae were recorded during the study period. *Chlorella* sp., *Ankistrodesmus* sp., *Chlamydomonas* sp., *Closterium* sp., *Eudorina* sp., and *Scenedesmus* sp., were the dominant species and other species was not dominant. The highest total number of chlorophyceae were recorded at station I (58 specie) and lowest total number of species was recorded at station I (48 species) (Table 3).

The phytoplankton fluctuates monthly and its productivity was high during June and low during December as evidenced earlier by Sadguru *et al.* (2002). Shekhar *et al.* (2008) reported that *Navicula membranacea* species as indicators of sewage pollution. Adesalu and Nwankwo (2008) reported that *Closterium* sp. as bacterial indicators of long standing pollution or hazardous pollution and increase with an increase in nutrients, which is in agreement with this study. Sreenivasan (1963) have observed that the peaks of phytoplankton occurred at different period in different yeas. Margalef (1968) suggested that phytoplankton population in fertile water is more diverse than those in fertile water.

Table.1 Cyanophyceae composition in Cauvery river at Thanjavur area

S. No.	Biotic composition	Station I	Station II
1.	*Anabaena* sp.	+++	+++
2.	*Anabaena affinis*	++	++
3.	*A. constricta*	++	++
4.	*Alphanotheca*	+	+
5.	*Aphanizomenon* sp.	+++	+++
6.	*A. flos-aquae*	+	-
7.	*Chroococcus* sp.	-	++
8.	*Chlorococcum* sp.	+	+
9.	*Chlorogloea*	++	++
10.	*Coelosphaerium knetzingianum*	+	-
11.	*Gleotheca* sp.	-	+
12.	*Gleocapsa* sp.	-	+
13.	*Gleocapsa minima*	+	++
14.	*Gomphosphaeria aponima*	+	++
15.	*Hyella* sp.	++	+
16.	*Merismopedia* sp.	+	++
17.	*M. minima*	+	-
18.	*M. punctata*	+	+
19.	*Microcystis aeruginosa*	+	+
20.	*M. delicatissima*	++	++
21.	*Microcoleus* sp.	++	++
22.	*Microcystis* sp.	++	++
23.	*Myxosarcina*	+	++
24.	*Nostoc* sp.	+++	+++
25.	*Oscillatra agardhii*	++	++
26.	*O. chlorine*	++	++
27.	*O. geminate*	+	+
28.	*O. redekei*	-	++
29.	*O. laete*	+++	+++
30.	*Phormidium* sp.	-	+
31.	*P. foveolarum*	+	++
32.	*Pseudoanabaena crassa*	-	+
33.	*Phrmidium ambiginum*	+	-
34.	*Rhabdonema* sp.	++	++
35.	*Spirulina* sp.	+++	+++
36.	*Syneccoccus* sp.	+++	+++
37.	*S. lividus*	+	+
		53	60

Table.2 Bacillariophyceae composition in Cauvery river at Thanjavur area

S. No.	Biotic composition	Station I	Station II
1.	*Acanthus brevipes*	++	+
2.	*Ampho0ra coffaeformis*	+	+
3.	*A. libyca*	+	++
4.	*Bacillaria paradoxa*	+	+
5.	*Crycigenia quadrata*	-	+
6.	*Cyclotella quadrata*	+	+
7.	*Cymbella tunida*	++	+
8.	*Cyclotella bodanica*	+	++
9.	*C. radiosa*	+	+++
10.	*Cymbella affinis*	+++	+
11.	*C. gracilis*	+	+
12.	*Diatoma moniliformis*	-	+
13.	*Melosira varians*	+	++
14.	*Navicula cincta*	++	+
15.	*Gomphonema* sp.	++	++
16.	*Gynosigma balticum*	-	++
17.	*Gomphonema clavatum*	++	-
18.	*G. constrictum*	+++	+
19.	*Fragillaria arcus*	+	++
20.	*F. capucina*	++	++
21.	*Gomphonema tenellum*	+++	+
22.	*G. lanceolatum*	++	++
23.	*Melocira granulate*	++	+
24.	*Navicula cuspidata*	-	++
25.	*N. gracilis*	++	-
26.	*N. hasta*	+	++
27.	*Nitzchia closterium*	+	+++
28.	*Navicula capitoradiata*	+	-
29.	*N. gregaria*	++	+
30.	*N. lanceolata*	++	-
31.	*Nitzschia acicularis*	++	+
32.	*N. dissipada*	+	++
33.	*Pinnularia maior*	+	-
34.	*P. viridis*	++	+++
35.	*P. fasciata*	+++	-
36.	*Rhizosolenia longiseta*	+	-
37.	*Rhoicosphaenia abbreviata*	++	+
38.	*Stephanodiscus alpinus*	+	++
39.	*Surirella brebissonii*	-	++
40.	*S. linearis*	+	+++
41.	*Tabellaria fenestrata*	+	+
42.	*T. flocculosa*	++	+
		60	56

Table.3 Chlorophyceae composition in Cauvery river at Thanjavur area

S. No.	Biotic composition	Station I	Station II
1.	*Acathosphaera zachariasii*	+	+
2.	*Actinastrum fluviatile*	++	+
3.	*Ankistrodesmus bibraianus*	+	-
4.	*A. fusiformis*	++	++
5.	*A. gracilis*	+	+
6.	*Chlamedomonas incerta*	++	++
7.	*Chlamedomonas* sp.	+++	+
8.	*Clastreum* sp.	+	+
9.	*Chlorella* sp.	++	++
10.	*Chladophora*	+	+
11.	*Chlorella botryoides*	+	+
12.	*C. vulgaris*	+	+
13.	*Closterium aciculare*	++	+
14.	*Coelastrum astroideum*	+	++
15.	*Coenocystis planctonca*	+	-
16.	*Cosmarium pachydermum*	+++	+++
17.	*Crucigenia neglecta*	-	+
18.	*Dictyosphaeariumgranulatum*	-	+
19.	*Dimorphococci lunatus*	-	+
20.	*Eudorina elegans*	+	-
21.	*Euastrum spinulosum*	+	+
22.	*Eudorina cylindrical*	+	-
23.	*Golenkinia radiate*	+	-
24.	*Hyaloraphidium contortum*	+	-
25.	*Kirchneriella controta*	-	+
26.	*Lobomonas ampla*	++	+
27.	*Micractinium quadrisetum*	+	+
28.	*Nephrocytium agardhianum*	++	-
29.	*Oocystis borgei*	+	-
30.	*Pondorina morum*	++	+
31.	*Oedogonium* sp.	+	++
32.	*Pediastrum* sp.	+++	+++
33.	*Scenedesmus* sp.	+++	+++
34.	*Skeletonema costata*	+	-
35.	*Spirogyra* sp.	+++	+++
36.	*Staurastrum gepalai*	-	+
37.	*Scenedesmus acuminatus*	++	+
38.	*Ulothrix* sp.	+++	+++
39.	*Volvox* sp.	+++	+++
40.	*Zygnema* sp.	+	+
		58	48

The low productivity of phytoplankton might be due to the grazing effect by zooplankton and fishes as evidenced earlier by Mathivanan and Jayakumar (1995). Phytoplankton count also registered higher value during non-rainy months, this result gains support from the similar observation Nazneen (1980).

In the present study total 42 numbers of bacillariophyceae, 40 species of chlorophyceae and 37 species of cyanophyceae were analysed from river Cauvery of Thanjavur area in Tamil Nadu. The highest number of cyanophyceae were observed in station II and lowest number of cyanophyceae was recorded in station I. The highest number of chlorophyceae were recorded in station I and lowest species in station II. The highest number of Bacillariophyceae was recorded in station I and the lowest species were observed from station II.

The present basic information of the phytoplankton diversity and abundance would form a useful tool for further ecology assessment and monitoring of these freshwater ecosystems of Cauvery river.

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