Plankton Studies in Salaganeri Mottur Lake,Tamil Nadu,India

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***Abstract*—Plankton communities are important indicators of freshwater ecosystem health and productivity. The present study assesses the composition and percentage distribution of phytoplankton and zooplankton in Salaganeri Mottur River (Station 1) and Umaiyanur (Station 2), Krishnagiri District, Tamil Nadu, India, during August 2022–January 2023. Monthly water samples were collected and analyzed using standard plankton sampling and microscopic identification methods. A total of 30 phytoplankton species belonging to major groups such as Cyanophyceae, Chlorophyceae, Bacillariophyceae, and Euglenophyceae were recorded. Cyanophyceae and Euglenophyceae dominated Station 1, while Chlorophyceae and Bacillariophyceae were dominant at Station 2. Zooplankton was mainly represented by rotifers, protozoans, and cladocerans. Seasonal variations indicated higher plankton abundance during summer. The study highlights plankton as effective indicators of aquatic ecosystem health.**

I. INTRODUCTION

Water is an essential source for the existence of life on the planet. Available freshwater is the form of surface and ground water; the need for preserving the surface water lead to the rise of dams in turn creating several reservoirs in many water deficit areas across the world. Fresh water is becoming scarce day by day as there is a progress in human civilization, man depends on these water bodies for satisfying their daily needs, also utilize them as disposal system for domestic and industrial wastes there by exploiting precious water resources, thus creating stress on the availability of drinking water.

According to the food and agriculture organisation inland fisheries contribute approximately 12% of all fish used for human consumption. The agricultural industry accounts for 70% of freshwater inhibited from the ecosystem for its practice such as irrigation and about 35% of agricultural water are lost through evaporation and leakages (Lanza,1997).

PLANKTON

The plankton is Greek adjective which mean is uncontrollable and transgressing and by extension wander or traveller. It was termed by victor sarasvathi A A Vetriselvi(2022). The plankton is Greek adjective which mean is uncontrollable and transgressing and by extension wander or traveller. It was termed by victor,Hens of winds and currents The study of plankton as an index of water quality with respect to industrial, municipal and domestic pollution has been reported earlier (Acharjee*et. al.,*1995..

Phytoplankton forms the vital source of energy as primary producers and serves as a direct source of food to the other aquatic plants and animals Nandan and ahur. Phytoplankton is the pioneer of an aquatic food chain. The phytoplankton is the base of most of the lake food webs and fish production is linked to phytoplankton salve and Hiware(2010).The phytoplankton are the primary producers in the food chain Phytoplankton diversity responds rapidly to changes in the aquatic environment particularly in relation to silica and other nutrients Chellappan,(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.Phytoplankton are chlorophyll bearing suspended microscopic organisms consisting mainly of algaeMiah *et.al.,*(2013). Phytoplankton serve as

food for zooplankton which in turn serve as food to almost all larval formsTas *et.al.,*(2007)

Zooplankton derived from the Greek word(zoon) meaning is animal. The zooplankton of pond and lakes are dominated by three members of group viz Rotifera, Cladocera and copepoda. Zooplankton diversity is one of the most important ecological paramaters in water quality assessment. Considering the importance of plankton diversity and variation in their density, several studies have been made in this field.

Zooplankton having limited powers of locomotion and animal capable of swimming independently of turbulence-the latter referred to as nekton is often diffuse. Freshwater zooplanktons are dominated by four major groups of animals: protozoans rotifer and two subclasses of the crustacea, Cladocera, cladocerans and copepods. Fresh water zooplankton plays an important role in ponds, lakes and reservoirs ecosystem and food chain Manickam *et.al.,*(2014). Zooplankton feed on phytoplankton . They are responsible for eating millions of little algae that may otherwise grow to an out-of-control state . In future, the loss of biodiversity and its effects are predicted to be greater in aquatic ecosystem than terrestrial ecosystem.

STUDY AREA

Karapattu is a village in uthangarai block in krishnagiri district, Tamil Nadu, India. It is located 46 km towards East from krishnagiri.15km from uthangarai. 234 km from Chennai.

Karapattu located on 12.36ºN 78.54ºE longitude. The study area is located at the North-East coast of Bay of Bengal and the distance is 234km from Chennai. Karapattu enjoys tropical wet and dry climate, summer prevails in the months of April and May while days in mid-may are the hottest (Agni) period during a year with temperature regularly reaching 100ºF. December and January are winter months. Karapattu receives average rainfall of 750-900 mm per annum most of the rainfall is received by the north-east monsoon.

In the present study, two station were selected. They were salaganeri mottur river (station 1) umaiyanor (station 2).

SALAGANERI MOTTUR RIVER (STATION – 1)

The salaganeri mottur river is a highly dynamic one on the north east of india and it has variable environments. It has a connection with Thenpannai river. The lake is about 20 acre in size. The surface water sample were collected from the study area at monthly intervals for a period of six month from august 2022 to January 2023 situated 3 km away from the karapattu station 1 (salaganeri mottur river) located just opposite to the umaiyanoor.

UMAIYANUR (STATION – 2)

This station is two km away from station 1 salaganerimottur river. Generally, it is shallow with slow water movement. The depth is increased from few hours to few days as observed during the rainy season. The umaiyanur is useful for irrigation, fishing. The fishing consist mostly of local carps, major carps and other varieties such rohu, catla,thilapia, mirgala etc… About 50 inland fisherman are engaged in fishing and the production of fish form inland water resources. Inland fishing is carried out mainly by fish net.

II. MATERIALS AND METHODS

SAMPLING OF PLANKTON

FREQUENCY OF SAMPLING

The present study was carried out over period of 6 months during August 2022-January 2023.Throughout the study period, sampling of water was carried out on a monthly basis the last week of every month. Sampling was done usually during the morning hours, between 8.00 am to 10.00 am.

SAMPLING PERIOD

In Tamil Nadu, North-East monsoon is normally prevalent during October-December of every year. The study area also receives the minimum of rainfall during same period. Four seasons are recognized in calendar year viz., pre-monsoon (July- September), monsoon (October- December),post-monsoon (January-march)and summer (April-June) for the convenience and easy interpretation of results.

SAMPLING METHOD

Plastic containers were cleaned with dilute nitric acid and rinsed several times with tap water and finally rinsed once with sample water, collected from the

habitat. Two liters of water samples were collected in these containers and transported to sampling site of karapattu. The planktons are observed from water sample in lab. The sample were stored in a refrigerator further use.

PLANKTON STUDY

Phyto and zooplankton samples were collected at monthly intervals from the water of the study area by towing a plankton net (0.35µm mouth diameter) made up of bloting silk (No.30. mesh size 48µm and No. 10 mesh size 158µm, respectively for phyto and zooplankton) for half an hour. These sample were preserved in 4% neutralized formalin and used for qualitative analysis. For the quantitative analysis of phytoplankton, the settling method was adopted. Numerical plankton analysis was carried utermoh´s inverted plankton microscope.

SAMPLING OF PHYTOPLANKTON AND ZOOPLANKTON

Planktons were observed under a light microscope at a magnification of 10×10×.In generals, systematic identification was done at the level of hight taxa using standard keys.

Phytoplankton and zooplankton samples were collected at monthly intervals from the waters of the study area by towing a plankton net (0.35µm mouth diameter) made up of bolting silk No. 30, mesh size 48 for phytoplankton and No. 10, mesh size 158µm, for zooplankton for half an hour. These samples were preserved in 4% neutralized formaline and used for qualitanalysis. For the quantitative analysis of phytoplankton , the settling method was adopted. Numerical plankton analysis was carried out using utermohl's inverted plankton microscope.

III. RESULT

PHYTOPLANKTON PERCENTAGE COMPOSITION (fig 1 and 2)

The percentage composition of phytoplankton at different station of the study area according to the descending order are:

Station 1 :Cyanophyceae>Eugelenophyceae>others.
Station 2 :Chlorophyceae>Bacillariophyceae>others

A total of 30 phytoplankton species, were identification in salaganerimottur river and umaiyanur fresh waters during the study period. Of these 10 species belong to centric diatom, 15 species belong to pinnate diatom 3 species belong to dinoflagellates and 2 species belong to blue green algae these *Trichodesmiumerthraeum, Coscinodiscus centralis, Planktoniellasol Stephanopyxis palmeriana Odontellasinensis, Bellerochee malleus, Pleurosigma elongatuma, nelongatum aviculaforcipta, ceratiumfurca, trichodesmiumerythraeum, olanktoniella sol, stephanopyrxis palmeriana, odontella sinensis, bellerochea malleus, thalassionemanitzschioides, Pleurosigma elongatum, naviculata for cipata, coscinodiscuscentalis, stephanopyxispalmeriana, odontella sinensis, thlassionemanizschioides, ceratiumfurca, chlamydominoas sp., skeletonemacostatum, euglena spirogyra, Anabena sp., Oscillatoria sp., Euglena geniculatea, Nostacpruniforme, Microcystis flosaquae.*

The groups of phytoplankton were recorded Euglenophyceae, Cyanophyceae, Cryophyceae, Chlorophyceae, Pyrophyceae, Bacillariophyceae. While Bacillariophyceae was the largest contribution in term of density 6% among phytoplankton followed by cyanophyceae60%, Euglenophyceae 15%, Chlorophyceae 13%, Bacillariophyceae 12% in the order of abundance at station 1.

Cyanophyceae 50%, Bacillariophyceae 23%, Euglenophyceae 15%, Clorophyceae 13%,in station 2. At both the station, the average percentage composition of different phytoplankton groups are Bacillariophyceae 14%, Pyrophyceae 13%, Cryanophyceae 13%, Euglenophyceae 37%, Cyanophyceae 20%, Chlorophyceae 12%, were shared their contributions during the present study period (August 2022-January 2023)

Fig 1 percentage composition of different phytoplankton groups in Salaganeri mottur lake (station 1) from August 2022 to January 2023.

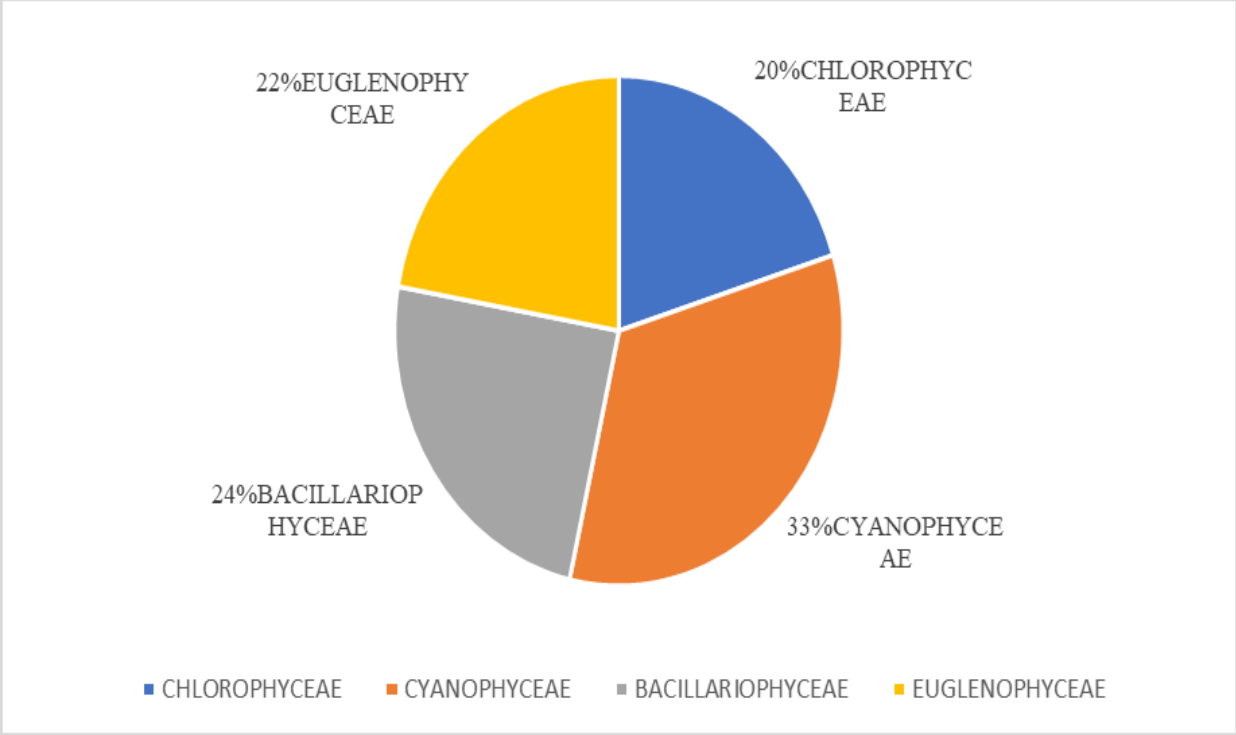

Fig 2 percentage composition of different phytoplankton groups in Salaganeri mottur lake (station 2) from August 2022 to January 2023.

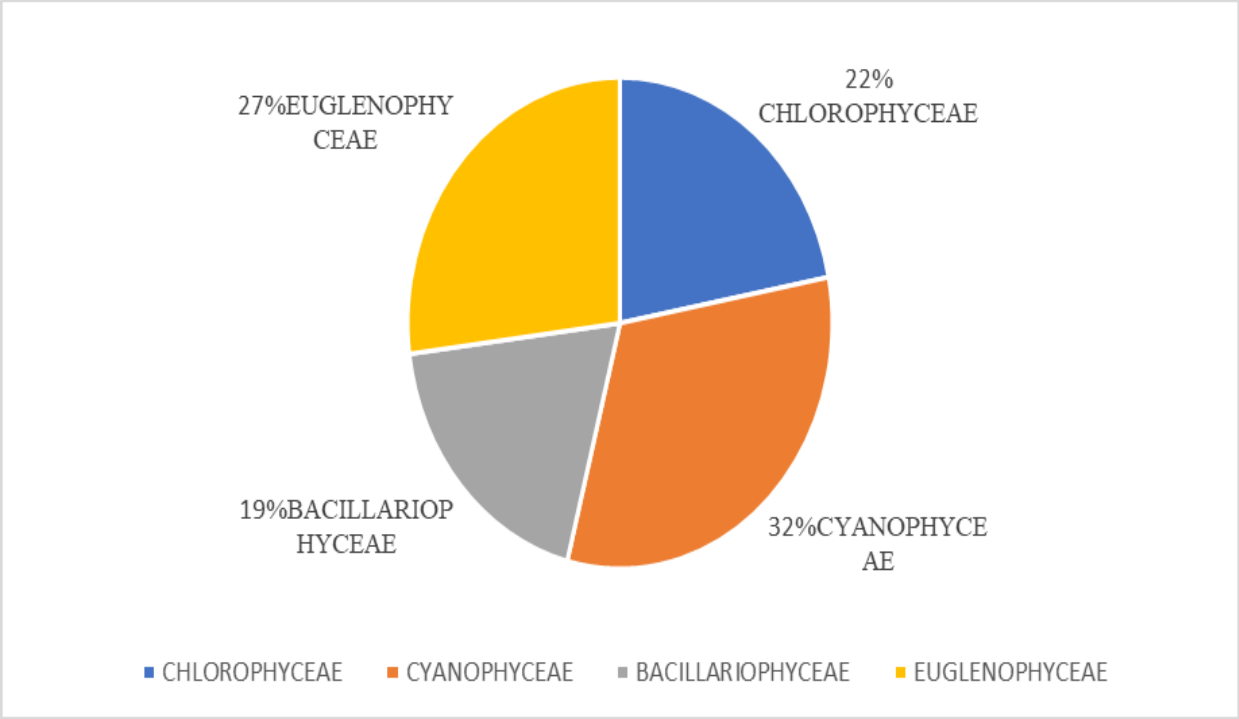

Fig 3percentage composition of different zooplankton groups in Salaganeri mottur lake (station 1) from August 2022 to January 2023.

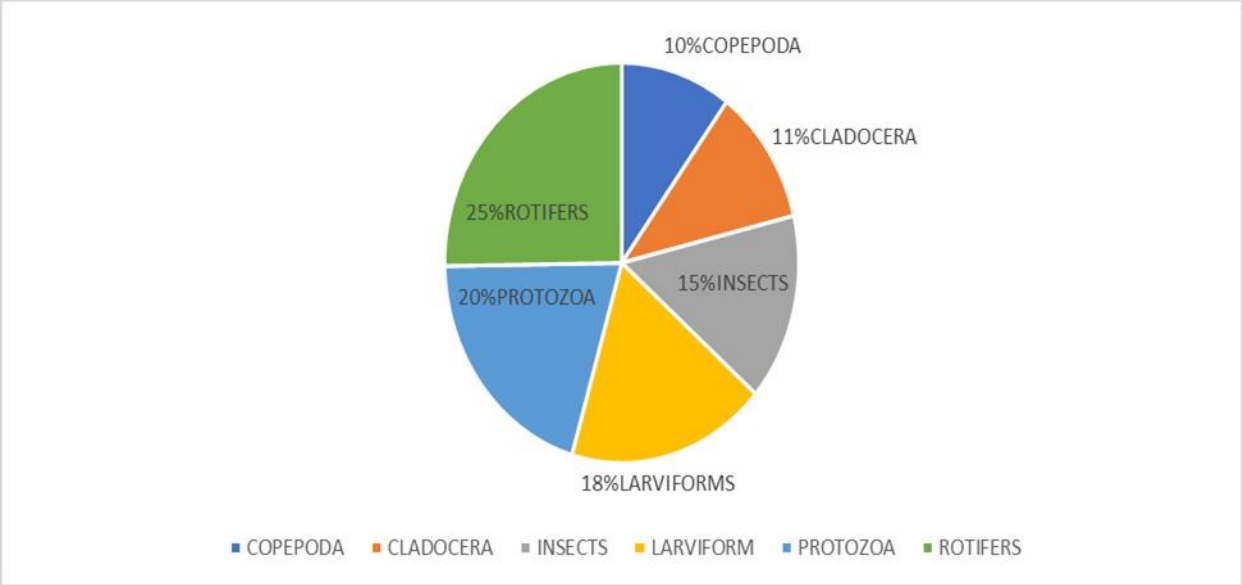

Fig 4percentage composition of different zooplankton groups in Salaganeri mottur lake (station 2) from August 2022 to January 2023.

IV. DISCUSSION

PHYTOPLANKTON COMPOSITION

The aquatic phytoplankton act as a primary producer using radiant energy, phytoplankton species undergoes spatiotemporal changes in their distribution due to the differential effects of changing physical, chemical, and biological facts on individual species. More ever, the productivity of the aquatic ecosystem is largely determined by the phytoplankton population. Phytoplankton production contributes to about 95% total population in the river environment. It was clearly understood that the percentage composition of species at river water (station 2) was more than that (station 1) with the maximum in summer and minimum in monsoon season in which Chlorophyceae and Cyanophyceae were of high value In station 1 the percentage composition was low. The maximum phytoplankton population density during the summer can be attributed to the increased salinity, PH, temperature, dissolved oxygen, and more intensity of light that prevailed during the season.

The aquatic phytoplankton act as primary producers using radiant energy. They initiate the aquatic food chain and the secondary (zooplankton) and tertiary (nektons like finfish and others) producers which depend on zooplankton directly or indirectly for food. Phytoplankton species undergo spatiotemporal changing physical, chemical, and biological factors of individual species. Phytoplankton composition influences various processes such as nutrient recycling, grazing, pesticides, sinking, and food webs. The success or failure of the pelagic fishery is depend upon the availability of plankton.

The aquatic biotic components, phytoplankton can be used as bioindicators since they even the subtle change taking place immediate environment by changing their species composition, biomass, community structure, chlorophyll content, and productivity. More ever, the productivity of the river and aquatic ecosystem was largely determined by their phytoplankton population.

The percentage composition of species at station 1 was different from that of station 2 since it is purely a freshwater zone. At station 1, minimum values were observed during the Monsoon and summer seasons respectively. Among station 2, the percentage composition was dominated by diatoms and blue-green algae this group executed more percentage at station 2.

In the present study, diatoms formed the dominant group followed by dinoflagellates, blue-greens, greens, and others at station 2. The percentage composition of each group of phytoplankton was thus in decreasing order, as indicated below :

Station 1: Eugelenophyceae>Cyanophyceae>others.

Station 2: Chlorophyceae>Bacillariophyceae>others.

Of the station investigated, station 2 recorded more percentage composition than station 1, probably owing to its autochthonous species in addition to the allochthonous estuarine species. Further, the biomass of phytoplankton and zooplankton was dominant at station 1 and station 2. This indicated that station 1 had high biomass, species composition, and diversity. The phytoplankton and zooplankton constitute the main food for fish and fish larvae. Thus, phytoplankton has a direct bearing on the secondary and tertiary producers.

V. ZOOPLANKTON COMPOSITION

Similar results are observed by Boero et.al., (2008) who have reported that the zooplankton function as an intermediate link in the pelagic food web they transfer energy derived from the phytoplankton to the higher tropical levels. In the present study, maximum and minimum zooplankton composition was observed during the monsoon season and summer season. The maximum was observed in salaganeri water (station 1), whereas the minimum was observed in Station 2. In addition temperature, PH, phytoplankton density, and gross primary productivity also exhibited a positive correlation with the zooplankton population density in both stations.

The zooplankton communities, especially copepods which are very important in assessing the health of rivers with salinity regimes. Among the 3 suborders of the orders- copepods the sub-order calanoids represented the bulk of the copepods with 18 species. This might be due to their continuous breeding behavior, and quick larval development conditions of the river. Further, among the calanoids, Acartia sp. dominated the other forms throughout the study period.

The low zooplankton productivity during monsoons may be due to the non-availability of food, low temperature, and low salinity. The disturbance of the food web and minimum production of plankton during the monsoon season has been observed in many estuaries. The low salinity would drastically affect the plankton abundance. In the present investigation, the increase or decrease of salinity in the water column exerts the appearance or disappearance of some forms and replacement by others. The second effect is probably due to the migration of some species from one station to another to avoid low or high salinity. The indirect effect might be due to the scarcity of food caused by the fluctuations of salinity in the water ultimately affecting the population abundance of zooplankton.

REFERENCE

[1] Acharjee, B., A.Dutta,M.Chaudhury and B.Pathak: Phytoplankton species diversity indices in dighali beel, Assam. India Environ.Ecol.,13(3),660-662(1995).

[2] Chellappan, N.T.,Borba, J.M., and Rocha,O., 2008. Phytoplankton community and physicochemical characteristics of water in the public reservoir of cruzeta, R.N.Brazil.Braz.J.Biol.,68;477-494.

[3] Dhanapathi, M.V.S.S.S. (2000). Taxonomic Notes on the Rotifers, From India, Indian Association of aquatic Biologist (IAAB)

[4] Lanza, G.R. (1997) , Where have all the rivers gone! Biosciences vol.47,460-461.

[5] Manickam N, Saravana Bhavan P, Santhanam P, Murali Sankar T, Srinivasan V, Radhakrishnan S, Vijaya Dhevan K , Chitarasu P & Jawahar Ali A (2014). Seasonal variations of Zooplankton Diversity in a Perennial Reservoir at Thoppaiyar, Dharmapuri DT, South India. Austin Journal of Aquaculture and Marine Biology;1(1):1-7

[6] Miah, M.F., Roy, S.,Jinnat,E. & Khan, Z.K. (2013). Assessment of Daphnia, Moina, Cyclopes in Fresh Water Ecosystem and the Evolution of Mixed Culture in Laboratory. American International Journal of Research formal, Applied and Natural Science, 4 (1): 1 - 7.

[7] Pawar, S.K., Pulle, J.S. and Shinde, K.M. 2006. The Study of Phytoplankton population in relation to abiotic factors of a fresh water pond at Barwani (MP). Poll.Res.21(1):1-6.

[8] Salva, V.B. and Hiware C.J. (2010). Zooplankton Diversity of Wan Reservoir, Nagpur (MS) India. Trends Research in Science and Technology, 2 (1), 39-48.

[9] Sarasvathi, A, A. Vetriselvi , (2022). Seasonal Variation of Phytoplankton from temple pond of Vellore District, Tamil Nadu. WWJMRD 8(2):155-164.

[10] Tas, T., Beyhan,S., and Gonulol , A., 2007. An ecologic and taxonomic Study on Phytoplankton

of a shallow lake, Turkey. J.Environ.Biol.,28: 439-445.S