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Lingesh G
College of Fisheries, Mangaluru, Karnataka, India

HRV Reddy
College of Fisheries, Mangaluru, Karnataka, India

Narshivudu D
College of Fisheries, Mangaluru, Karnataka, India

Muthappa K
College of Fisheries, Mangaluru, Karnataka, India

Padmanabha A
College of Fisheries, Mangaluru, Karnataka, India

Correspondence
Lingesh G
College of Fisheries, Mangaluru, Karnataka, India

Seasonal phyto and zoo plankton dynamics in Karanja reservoir, Bidar

Lingesh G, HRV Reddy, Narshivudu D, Muthappa K and Padmanabha A

Abstract
In the present study, both qualitative and quantitative analyses of Phytoplankton were made to investigate their abundance and distribution in Karanja Reservoir located in the northern part of Karnataka between 17°22′30″ N latitude and 76°59′0″ E longitude. During the one year study period highest count of phytoplankton was recorded in winter season while low incidence was observed in monsoon season. High species richness and diversity indices of Phytoplankton were recorded during post monsoon season and low during monsoon season. A total of 54 genera of phytoplankton belonging to 4 groups viz, Chlorophyta, Cyanophyta Chrysophyta and Rhodophyta were identified during the study. Chlorophyta was the dominant group of phytoplankton contributing about 63.14% followed by Cyanophyta (23.78%), Chrysophyta (11.37%) and Rhodophyta (1.69%). During the present investigation the phytoplankton biomass (wet weight) varied from 0.34 mg/l during monsoon at station 3 to 2.97 mg/l at season 4 during winter and phytoplankton biomass (Dry weight) varied from from 0.11 mg/l during monsoon at station 3 to 1.95 mg/l at season 4 during winter. A total phytoplankton number varied from 28 to 807/l. In this study an attempt has been made to evaluate the Plankton diversity in the region and suggests mitigating measures.

Keywords: Reservoir, phytoplankton, distribution, abundance and diversity, Karanja

1. Introduction
Karnataka, the eighth largest State in India, is situated on the western edge of the Deccan plateau. The climate and physiography of the region make the state one of the most important in the country with regard to water resources. Total 74 reservoirs in Karnataka state cover an area of 2, 28,657 ha among them, 46 belong to the category of small reservoirs, (< 1000 ha) with a water spread area of 15, 253 ha, 16 medium reservoirs have water spread area of 29, 078 ha and the large reservoirs (> 5000 ha) over 1, 79, 556 ha. Among the small reservoirs, those less than 500 ha outnumber the rest. Thus, Karnataka has 4, 37,292 ha of water spread area under different categories of man-made impoundments. Large reservoirs constitute 80% of the total area, followed by the medium (13%) and small (7%) ones. The measurement of plankton's productivity helps to understand conservation ratio at various trophic level and resources as an essential input for proper management of reservoir. Some notable studies on phytoplankton and zooplankton diversity have been made by *Mishra et al., 2010, and Joseph and Yamakanamardi., 2011*. According to *Pawar et al., 2006.* The plankton study is very useful tool for the assessment of biotic potential and contributes to overall estimation of basic nature and general economic potential of water body.

2. Materials and methods
It is a major perennial reservoir of the district and located at Bhalki taluka of the Bidar district. It is created due to the construction of dam across the river Karanja, a tributary of Manjra River of Godavari system. It is a medium reservoir having water spread area of 5,673 ha with gross irrigation potential of 1, 62,818 hectares. Maximum depth is 10.5mtrs. Agricultural lands and villages surround the river. The present investigation was carried out to study the seasonal distribution and diversity of plankton (zooplankton and phytoplankton) reservoir for a period of one year from June 2016 to May 2017. Plankton samples were collected using plankton net made of bolting silk cloth (60µ pore size) by filtering 100 liters of water. The collected phytoplankton samples were filtered through 200µ pore filtering cloth to separate zooplankton. The filtrate along with the phytoplankton was preserved in logo's solution.

3. Experimental Results and Discussion

Seasonal variations in population density (No. /L) of phytoplankton in the surface water of the Karanja reservoir at different sampling stations were observed for 4 seasons (June 2016 to May 2017). Qualitative distribution of phytoplankton in terms of numerical abundance at various stations is presented in Table 17 to 21. The qualitative analysis of phytoplankton revealed the presence of large number of phytoplankton cells belonging four classes – the Chlorophyta, Cyanophyta, Chrysophyta and Rhodophyta. Throughout the study period, 54 different phytoplankton genera belonging to 4 groups were observed with a complete domination from Chlorophyta with 23 genus followed by Cyanophyta with 16 genus, Chrysophyta with 14 genera and Rhodophyta with one genera.

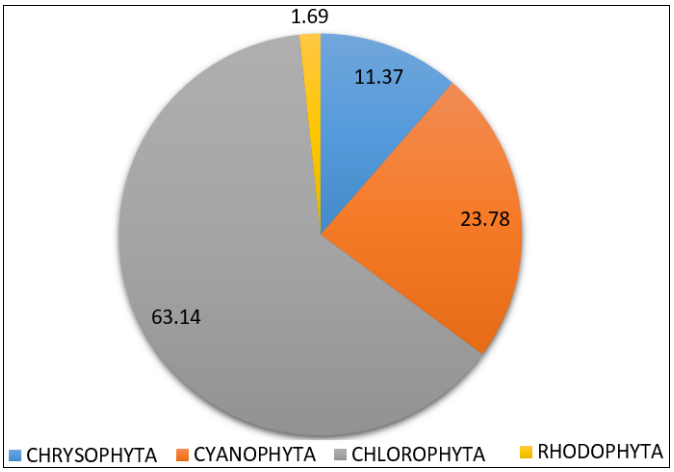

Fig 1: Percentage (%) contribution of different Phytoplankton groups at Karanja Reservoir

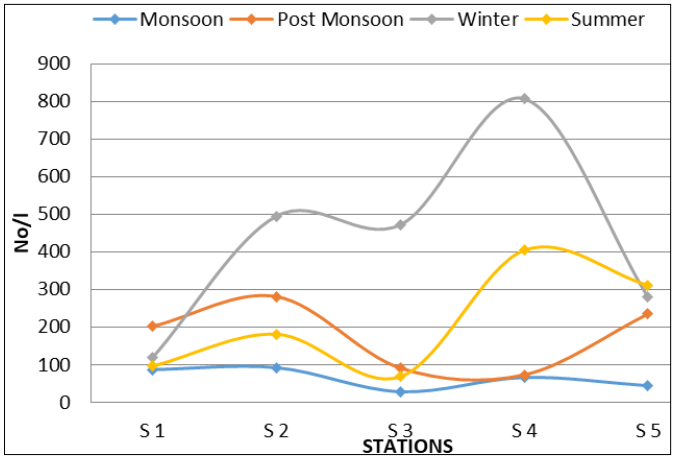

Fig 2: Variation of Total phytoplankton (No. /l) at different stations in Karanja Reservoir

4. Chlorophyta

During the present study Chlorophyta were the dominant group of phytoplankton contributing about 63.14% to the total phytoplankton production. Twenty three genera of Chlorophyta was reported during the investigation period in which Zygnema spp. is the most dominant group. The numbers varying from 0 counts/L during monsoon at station 3 to 745 counts/L at season 3 during winter.

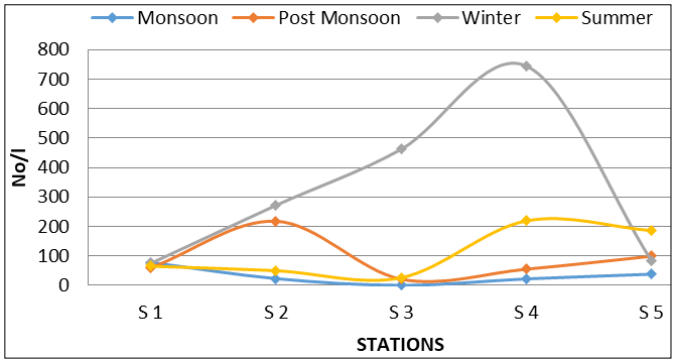

Fig 3: Variation of Chlorophyta (No./l) at different stations in Karanja Reservoir

5. Cyanophyta

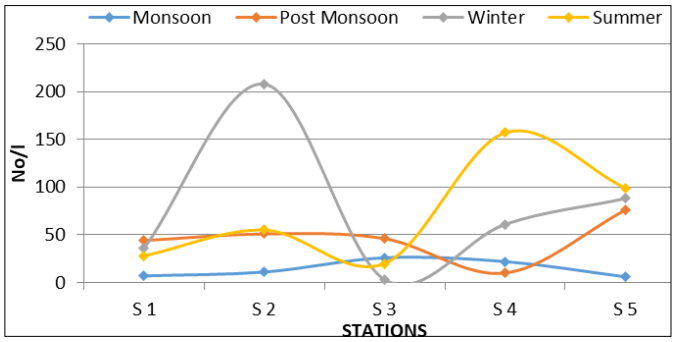

Fig 4: Variation of Cyanophyta (No. /l) at different stations in Karanja Reservoir

During the present investigation the Cyanophyta was the second largest group contributing about 23.78% to the total phytoplankton production. Sixteen genera of Cyanophyta were recorded during the study period in which Microcystis spp. is more dominant in group. The numbers varying from 3 counts/L during winter at station 3 to 208 counts/L at season 2 during winter.

6. Chrysophyta

Chrysophyta contributed about 11.37% to the total phytoplankton production during the present study. Fourteen genera of chrysophyta were recorded during the study period in which fragilaria.spp.is dominant in group. The numbers varying from 0 counts/L during monsoon at station 5 to 96 counts/L at season 5 during winter

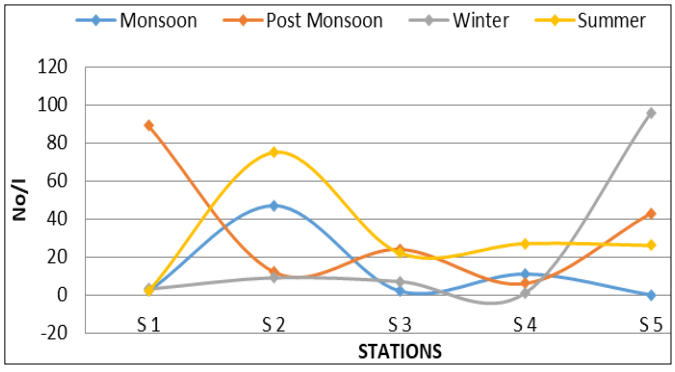

Fig 7: Variation of Chrysophyta (No. /l) at different stations in Karanja Reservoir

7. Rhodophyta

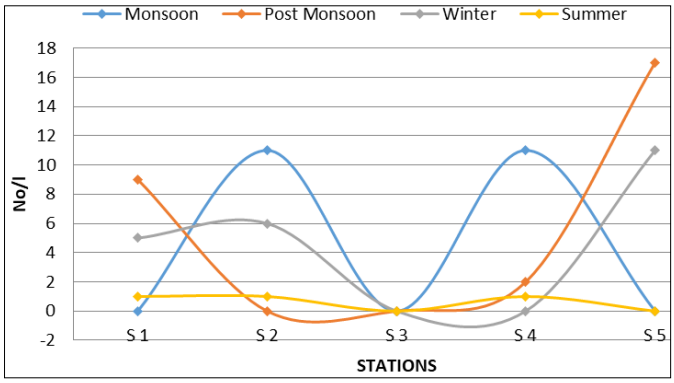

Fig 8: Variation of Rhodophyta (No. /l) at different stations

During the present investigation Rhodophyta are contributing about 1.69% to the total phytoplankton production. Only one genus i.e. *Lemanea* spp. was occurred rarely during the study period in all the stations in all the season.

8. Phytoplankton biomass

During the present investigation the phytoplankton biomass (wet weight) varied from 0.34 mg/l during monsoon at station 3 to 2.97 mg/l at season 4 during winter During the present investigation the phytoplankton biomass (Dry weight) varied from 0.11 mg/l during monsoon at station 3 to 1.95 mg/l at season 4 during winter.

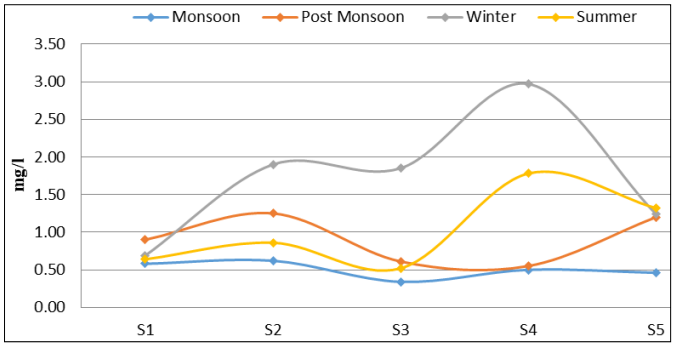

Fig 9: Variation of Phytoplankton Biomass (wet weight) (mg/l) at different stations

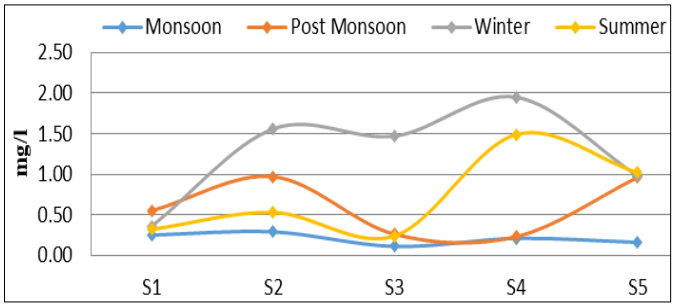

Fig 10: Variation of Phytoplankton Biomass (Dry weight) (mg/l) at different stations

Phytoplankton form the basic link of food chain in the aquatic ecosystems. The metabolic activities of these organisms depend on the physico-chemical factors of the aquatic environment. The quality and quantity of phytoplankton and their seasonal succession patterns have been successfully utilizing to assess the quality of water and its capacity to sustain heterotrophic communities. During the present investigation, 54 species of phytoplankton belonging to 4 groups (Chlorophyta, Cyanophyta, Chrysophyta and Rhodophyta) were observed in Karanja reservoir. The total phytoplankton population in Karanja reservoir was found to be high in winter season (2172 No. /l), minimum in monsoon (317 no. /l) and moderate in post monsoon during the investigation period. The phytoplankton population in Karanja reservoir was considerably low during the period of monsoon and this could be due to the heavy rain fall, excessive flooding, increased water volume, cloudy weather, low transparency, low temperature and low pH. The factors such as cloudy weather, low transparency, heavy flood (*Rajagopal et al.*, 2010) [11], increase in water volume, high turbidity, high rain fall dilution, over flooding (*Sharma, 2011*), cool conditions, decreased temperature and low pH (*Rajkumar et. al.*, 2009) [13] brings about the decline in phytoplankton population during monsoon season.

The study in the Karanja reservoir showed the high Palou's evenness values during post monsoon season and low in winter season. The highest species evenness in monsoon season indicates the evenly distributed species and it may be due to the increased water spread and ample turbulence in this season. Low evenness in pre monsoon season probably due to the shrinkage of water spread of the reservoir. The result of correlation coefficient between plankton and physicochemical parameters of Karanja reservoir showed that phytoplankton and hydrographical parameters was found to be positively correlated with Dissolved oxygen, COD, Nitrate, hardness, alkalinity and total dissolved solids while no other parameters exhibited any significant correlation with the numbers. *Mary Kensa* (2011) [5] also revealed positive correlation between plankton and temperature in different water bodies. *Ayoade et al.* (2009) [1] observed significant positive correlation between total plankton and transparency, total alkalinity, PO4, SO4 and potassium whereas negative correlation with nitrate in Tehri dam. Hence the plankton study is very useful tool for the assessment of biotic potential and contributes to overall estimation of basic nature and general economic potential of water body.

9. Conclusion

Being important reservoir of north Karnataka, it supports variety of Phytoplankton often consists of several indigenous groups with a distinct genetic makeup. The present results will serve as an authentic database for further studies in the Karanja reservoir. Being the largest reservoir in Bidar, Karanja reservoir can be turned as the important fish production site in the state and it can be used as drinking water source (Treatment is required before use). A small well equipped field laboratory may be established at Karanja reservoir for monitoring the productivity, hydrological parameters and other ecological conditions of the reservoir.

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