

Full Length Research Paper

A Study of Water quality and Phytoplankton diversity of Sharavathi River basin, Central Western Ghats, Karnataka, India

J.Narayan^{1*}, Savinaya M S² and Manjunath S³

¹-Chairman, Department of PG Studies & Research in Environmental Science, Kuvempu University, Shankaraghatta, Pin-577451, India.

²-Project Fellow, Department of PG Studies & Research in Environmental Science, Kuvempu University, Shankaraghatta, Pin-577451, India.

³-Research Scholar, Department of PG Studies & Research in Environmental Science, Kuvempu University, Shankaraghatta, Pin-577451, India.

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Corresponding Author:

J.Narayan

Chairman, Department of PG Studies & Research in Environmental Science, Kuvempu University, Shankaraghatta, Pin-577451, India.

Abstract

Planktons are the microscopic and aquatic form of animals and plants that freely float in aquatic environment. Their absence in the water body indicates an aquatic disproportion. The study has been conducted to assess the water quality in relation to phytoplankton density to evaluate the present status of Sharavathi river basin. It has been observed that many species are sensitive to the nutritional loading but equally good numbered are pollution tolerant. The physico-chemical characteristics indicate the quality of the water at best. For Qualitative and Quantitative analysis of Phytoplankton, Linganamakki reservoir site is chosen. In this study, recorded sixteen species of Chlorophyceae belonging to five genus, four species of Cyanophyceae belonging to four genus, seventeen species of Diatom belonging to six genus and only one species of Dinoflagellate. Among the sixteen species of Chlorophyceae, thirteen were desmidiales. If we consider the concentration of silicate and diatom population, it is clear that the concentration of silicate will influence the diatom existence.

Keywords: Aquatic ecosystem, Environmental change, Pollution tolerant, aquatic disproportion.

Introduction

The quality of water in any ecosystem provides significant information about the available resources for supporting life in the ecosystem. Good quality of water resources depends on a large number of physico-chemical parameters and biological characteristics. Monitoring of these parameters is essential to identify magnitude and source of pollution. These characteristics can identify certain conditions for the ecology of living organisms and suggest appropriate conservation and management strategies. The physical and chemical characteristics of water bodies affect the species composition, abundance, productivity and physiological conditions of aquatic organisms (Bagenal, 1978). Many factors affect the chemical, physical and biological characteristics of a water body. They may be either natural like geology/ weather or anthropogenic, which contribute to the point and non-point source of pollution. Developmental projects like construction of dams may change the quality of water as it involves blocking the natural flow. It impacts aquatic organisms and changes the nature of the stream itself. As water slows down and backs up behind a dam, various changes in its physico-chemical and biological characteristics take place. Water quality monitoring involves recording data about these various characteristics and usually involves analysing and interpreting these data. Monitoring helps to ensure that a particular water body is suitable for its determined use (Ramachandra.T.V et al., 2012). The physical and chemical properties of water immensely influenced its uses, the distribution and richness of the biota (Courtney and Clement, 1998; Unanam and Akpan, 2006). The physical and chemical characteristics of water bodies affect the species composition, abundance, productivity and physiological conditions of aquatic organisms (Bagenal, 1978). The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Phytoplanktons are among the rapid detector of environmental change. This is because of their quick response to toxins and other chemicals. In the present study an attempt has been made to assess the water quality, distribution and diversity of phytoplankton in Sharavathi River Basin.

Materials and method**Study area**

Sharavathi river originates near Ambutheertha at an elevation of 730 m (2,395 ft) in Theerthahalli taluk, Shivamogga district. The river runs 132km to join Arabian Sea at Honnavara. The river basin falls in two districts of Karnataka namely, Shivamogga and Uttar Kannada. The drainage basin has an area of 2985.66 Sq km with upstream of 1988.99 Sq km and downstream of 996.67 Sq km. The western and southern streams run through rugged terrain clad in evergreen to semi-evergreen forests, and through narrow valleys lush with areca gardens and paddy fields. Total five sampling sites were selected both in upstream and downstream.

Ambutheertha at 13°47'32"N Lat & 75°10'36"E Lon, Honnemaradu at 14°10'29.48"N Lat & 74°52'44.21"E Lon, Kesavinamane at 14°7'28.85"N Lat & 74°57'16.89"E Lon, Bangaramakki at 14°14'22.50"N Lat & 74°39'8.62"E Lon and Honnavar at 14°17'56"N Lat & 74°25'27"E Lon.

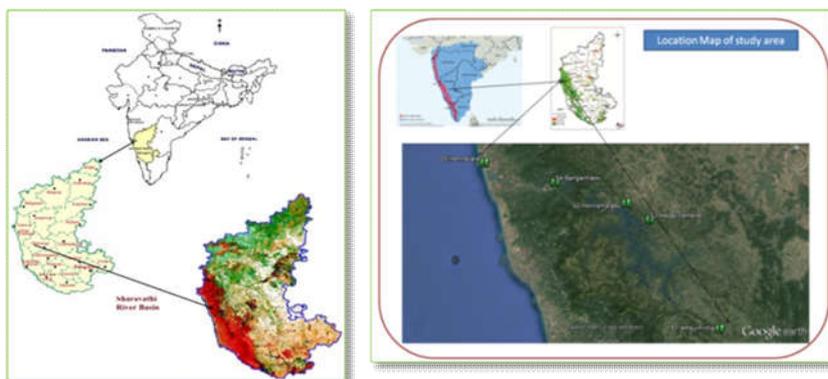


Fig 1: Location of sampling sites in Sharavathi river basin

Method of sample collection

Water samples were collected in Polyethylene cans at regular intervals to identify the characteristics and the changes in their quality. Water samples for Qualitative and Quantitative analysis of phytoplankton diversity were taken using Plankton net.

Lab analysis

The water samples for phytoplankton analysis preserved by adding 1% lugol's solution. Then the concentrated solution used for observing under Microscope and noted the species presented. Physico-chemical analysis of samples was analyzed according to the standard methods and the values were compared with World Health Organization and Indian Standard Specifications (IS: 1050-1983; IS: 2490 –1982). Air and water temperature(°C) measured on the site using Mercury Thermometer. Total Dissolved Solids (mg l^{-1}), pH, Conductivity (mS) and Salinity (ppt) were analysed using electrometric method. Dissolved oxygen (mg l^{-1}), Biological oxygen demand (mg l^{-1}), Acidity (mg l^{-1}), Alkalinity (mg l^{-1}), Chloride (mg l^{-1}), Total Hardness (mg l^{-1}), Calcium Hardness (mg l^{-1}), Magnesium Hardness (mg l^{-1}) were analysed using titrimetric method. Fluoride, Sulphates, Nitrates, phosphates, Silicates, Iron and Copper were estimated using Spectrophotometer.

Results and discussion

Water analysis

The air temperature ranges from 25°C to 32°C. Maximum temperature recorded at estuarine site, Honnavara in the downstream. Upstream water sample show pH 7. Dissolved oxygen in the upstream ranged between 7 to 12.8 mg l^{-1} . In downstream it is around 9 mg/L . This clearly illustrates the good health of water. Maximum DO (13 mg l^{-1}) recorded in upstream water samples. BOD of two sites in downstream are high compared to upstream. In the upstream less BOD was recorded. This indicates the organic pollution is higher in downstream when compared to upstream. Calcium shows least concentration among all the sites that the maximum value is only 0.82 mg l^{-1} in the Site5, estuary. The considerable amounts of silicate in the upstream supported the diatom population effectively well.

Phytoplankton diversity and density

In the present study, Three species of chlorophyceae belonging to genus *Cylindrospermum*, *Ankistrodesmus*, *Mougetia*, four species of cyanophyceae belonging to 4 genus *Spirulina*, *Oscillatoria*, *Phormidium*, *Anabnae*, seventeen species of diatom belonging to genus *Navicula*, *Pinnularia*, *Synedra*, *Melosira*, *Mastogolia*, *Frustulia*, 12 species of desmids belonging to three genus *Straurastrum*, *Tetradon*, and *Scenedesmus* and one species of dinoflagellate were recorded. Shannon wiener and Simpson's Diversity Index for the Linganamakki reservoir water samples are 3.5069 and 9.667 respectively. The density of Phytoplankton 51,667/L was recorded.

Conclusion

The physico-chemical characteristics indicate that the water in all the sites are clear and the quality is good. The estuarine site (site5) show slightly high than all other sites as evident from sulphates, phosphates, nitrates, TDS, total hardness, BOD. pH is almost neutral except at site5. DO values show 13 mg/L at the reservoir site (site2 & site3) and less DO recorded in estuarine site (site5). BOD being high in site5 indicates the organic pollution. Acidity is high at site1, may be due to dilution with acidic salts because of surrounding areca plantation. Magnesium hardness contributes more for total hardness in the site5. Silicates recorded in all the sites considerably and it is evidenced the presence of Diatom.

Ethics

All the authors read and approved the manuscript and no ethical issues involved.

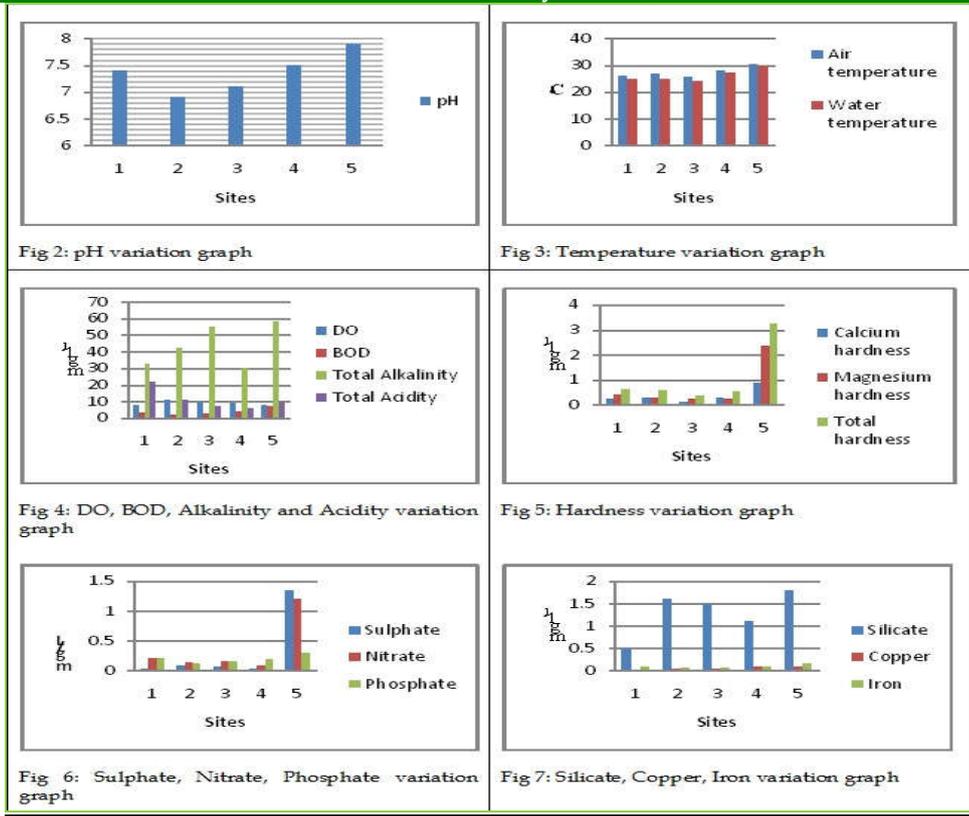
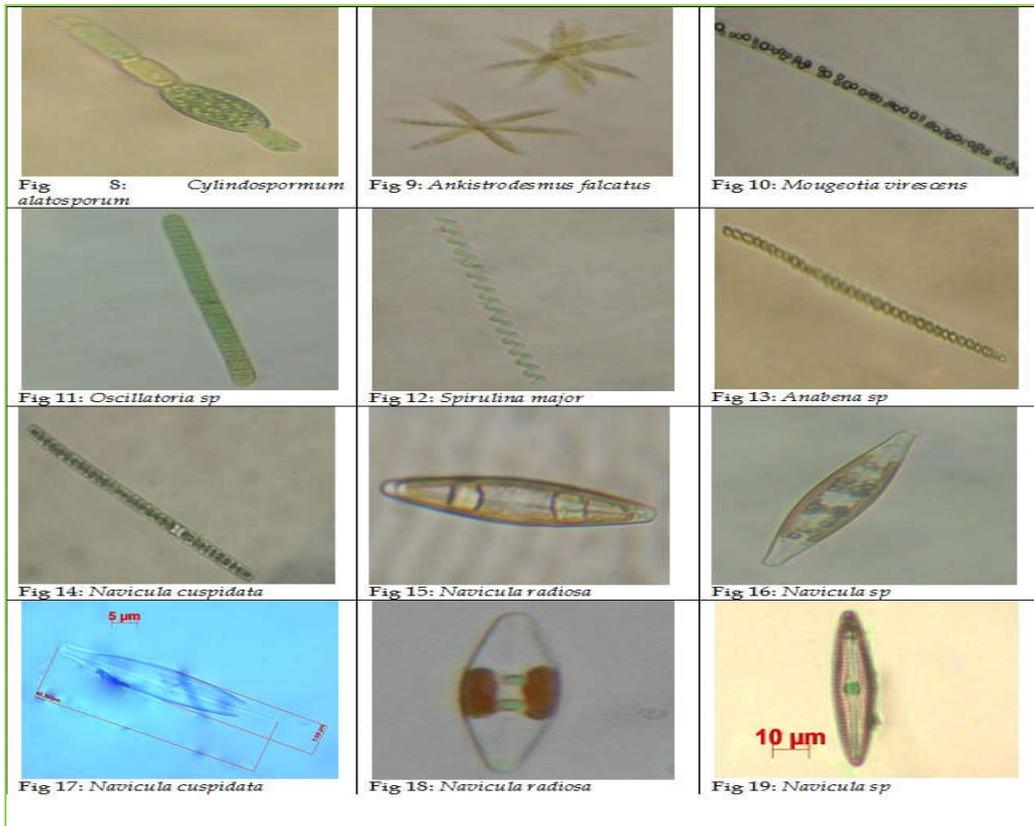


Fig. 2 to Fig. 7: Graphs of variation in physico-chemical parameters



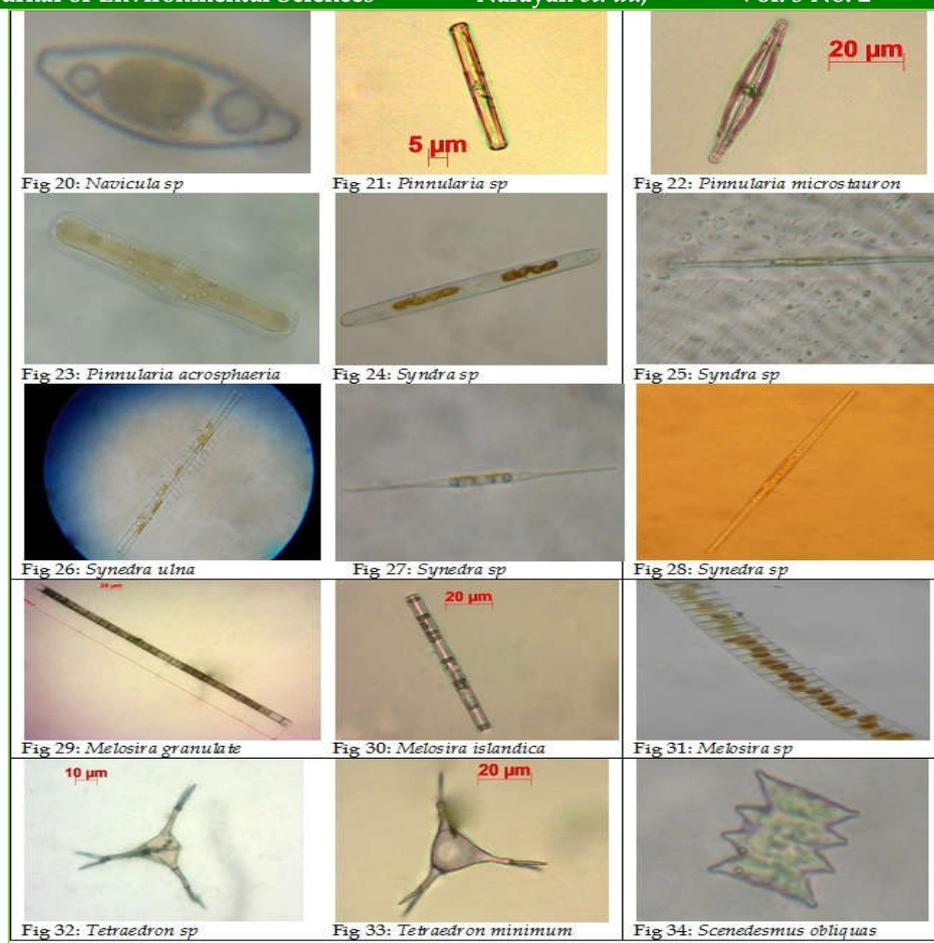


Fig. 8 to Fig. 34: Phytoplankton recorded in the Linganamakki reservoir site of Sharavathi river basin

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