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## RESEARCH ARTICLE

## Population dynamics of Planktons in river Narmada at Omkareshwar

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## Abstract

Planktons are minute organisms and are essential links in food chain in aquatic system. The Narmada river is one among the important rivers in India with varied rich biodiversity. The river is an important source of drinking water and is considered as lifeline of Madhya Pradesh state. The present study was carried for the period of two years at Omkareshwar station, as the station is highly subjected to anthropogenic activities. The sampling was done twice in month during the morning hours. During the present study, 42 taxa belonged to phytoplankton were recorded. Out of this 24 species of family Chlorophyceae, 9 species of family Cynophyceae, One species of Euglenophyceae and 8 species of family Bacillariophyceae were recorded. The aim of the present study is to study the diversity of planktons in the river Narmada which are declining at an alarming rate.

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## Introduction

The water in a river is usually confined to a channel, made up of a stream bed between banks. In larger rivers there is also a wider floodplain shaped by flood-waters over topping the channel. Flood plains may be very wide in relation to the size of the river channel. This distinction between river channel and floodplain can be blurred especially in urban areas where the floodplain of a river channel can become greatly developed by housing and industry.

River Narmada is considered one of the important rivers of the country. Since independence rapid economic, agricultural and industrial development has taken place in all parts of Narmada basin. Growth of industries, development of agriculture with intensive use of fertilizers, pesticides, herbicides and other chemicals, tourism and rapid urbanization etc. are contributing significantly to the generation of pollution loads. The Narmada Basin extends over an area of 98.796 sq.km and lies between east longitudes 72o32' to 81o45' and north latitudes 21o20' to 23o45'. Lying in the northern extremity of the Deccan plateau, the basin covers large areas in the state of Madhya Pradesh and Gujarat and a

comparatively smaller are in Maharashtra. The Narmada Basin is bounded on the north by the Vindhya, on the east by the Maikala range, on the south by the Satpura and on the west by the Arabian Sea. The basin has an elongated shape with a maximum length of 953 km from east to west and a maximum width of 234 km from north to south.

Planktons are minute organisms and is essential links in food chain in aquatic system. Phytoplankton's and zooplanktons are the major group of plankton. Phytoplankton's play a phenomenal role in the biosynthesis of organic material while zooplankton forms important components of secondary production. The zooplankton forms of link between phytoplankton and micro invertebrates which in turn provide food to fishes and aquatic birds. Planktonic primal in fresh water are dominated by rotifers cladocerans and copepods. Rotifers are most sensitive bio indicators of water quality and their presence may be used as a reference to the physico-chemical characteristics of water (Hafsa and Gupta 2009).

Plankton abundance and distribution are strongly dependent on factors such as ambient nutrients concentration the physical state of the water column, and the abundance of other plankton.

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Planktons are of immense value as food and play an important role in the disposal of sewage and in the natural purification of polluted waters. However some plankton, from a harmful bloom that may cause high mortality among the aquatic organisms and pose a serious hazard in the water supply for domestic and industrial use (Hasan et al 2010).

Plankton are organisms of relatively small size mostly microscopic, which have either relatively small powers of locomotion or else none at all and which drift in the water subject to the action of waves, currents and other forms of water motion. Phytoplankton mainly includes diatoms and dianoflagellates. Plankton is of utmost importance in the freshwater ecosystem as these are the main source of energy and having a very high nutritive value (Mishra and Joshi 2003).

Biodiversity and conservation of freshwater ecosystems has been the focus of regional assessments recently since along with their terrestrial counterparts, aquatic ecosystems have been increasingly placed under pressures to provide renewable resources while being exposed to the ravages of poor planning and pollution. Listed among the identified impacts on aquatic biodiversity are deforestation, agriculture (including pesticides and irrigation), urban and industrial development, river regulation for water and hydropower production, mining, petroleum extraction, introduction of exotic species, dumping of solid wastes, dredging and channelization, overfishing and the aquarium trade identified Trinidad and Tobago's freshwater ecosystems as being of local importance in terms of biological distinctiveness, but endangered in term of conservation status. They concluded that they are a priority area for conservation at the regional scale. The aim of the present study is to study the diversity of planktons in the river Narmada which are declining at an alarming rate.

## Material and Methods

### Study area

Omkareshwar is a famous place of pilgrimages, situated 77 km from Indore in Khandwa District Madhya Pradesh. It is about 12 miles (20 km) from Mortakka in Madhya Pradesh. Omkareshwar is formed by the sacred river Narmada. This is one of the most sacred of rivers in India and is now home to one of the world's biggest dam projects. It is shaped like the holy Hindu Symbol 'OM'. This sacred island, on the conflux of the river Narmada and Kaveri is visited by pilgrims from all over the country to seek blessing at the temple of Shri Omkar Mandhata. There are steamboats across the Narmada

river and also two connecting bridges to reach the temple. It derives its name from the sacred Hindu symbol of Om. The place is a pilgrimage site, as there are a number of Hindu temples and Jain temples located here. It is basically an island, in the shape of Om, on the confluence of the rivers Narmada and Kaveri.

It's Latitude (D M S) – 22°15' 1" N and Longitude – (DMS) 76°8' 48" E

### Biological Analysis:

The samples for plankton analysis were collected once in a month from the station for a period of two years from October 2009 to September 2011. The samples were collected from the surface water by filtering 100 liters of water through plankton net having a mesh size of 30 m. The samples were allowed to settle by adding Lugol's iodine, centrifuged and the concentrate was made up to 20 ml with 4% formalin.

### Collection, preservation and Identification of Plankton:

The plankton samples were collected following Lind (1979), Welch (1953), Wetzel (1975), by filtering 40 Liters of water through plankton net having pore size 64 µ. The concentration plankton samples were fixed in 4% formalin and Lugol's solution for zooplankton and phytoplankton study respectively.

The phytoplankton's were Identify with the help of keys given by Prescott (1962), Smith (1950), Agarkar (1975), Edmondson (1959).

Counting of the individual plankton was done by "Lac Keys" dropping method (1935). Using the formula.

$$\text{Plankton units/Liter} = \frac{N \times C}{Y} \times 10$$

N = Number of plankton counted in 0.1ml. concentrate.

C = Total volume of concentrate in ml.

Y = Total volume of water filtered for sample in liters.

The phytoplankton density was expressed on units/liter and zooplankton density was expressed on individuals/liter.

## Results

During the present study from October 2009 to September 2011, a total of 81 taxa were recorded from Narmada river of which is 42 taxa belonged to phytoplankton were recorded. Among phytoplankton's, 24 species of family Chlorophyceae, 9 species of family Cynophyceae,

One species of Euglenophyceae and 8 species of family Bacillariophyceae were recorded.

The species composition, distribution, abundance of phytoplankton population is governed by the various physico-chemical factors of the water body. The population of Plankton fluctuates in different seasons and months.

#### Population dynamics of Phtoplanktons:

##### Chlorophyceae – (Green algae)

The Chlorophyceae (green algae) was the dominant group among the phytoplanktons recorded during the present investigation from river Narmada at Omkareshwar. However, this group dominated during winter and summer months and considerably were very low in number during rainy months of the both years.

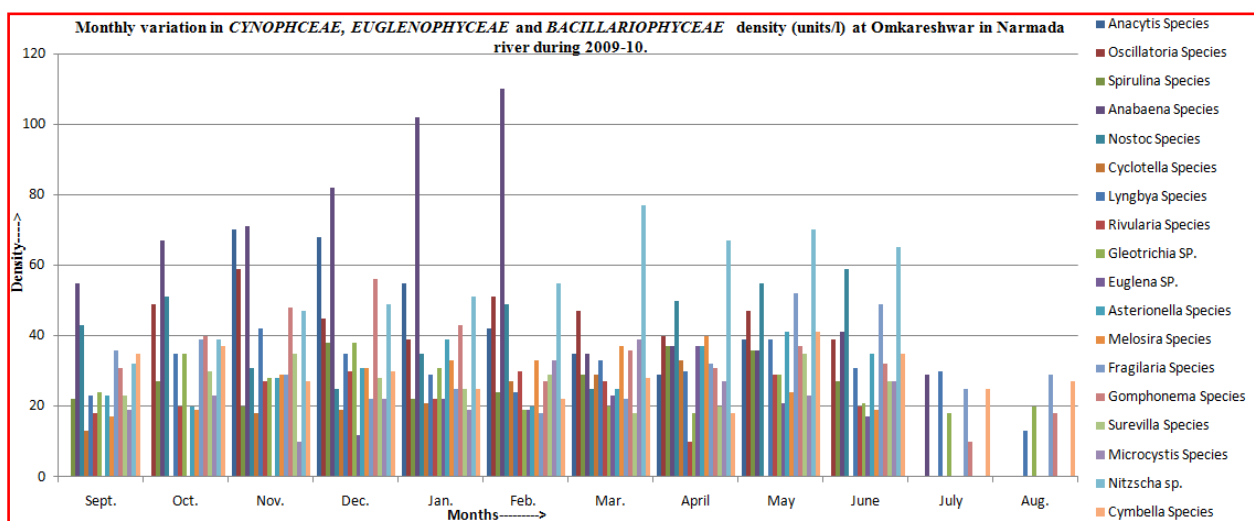
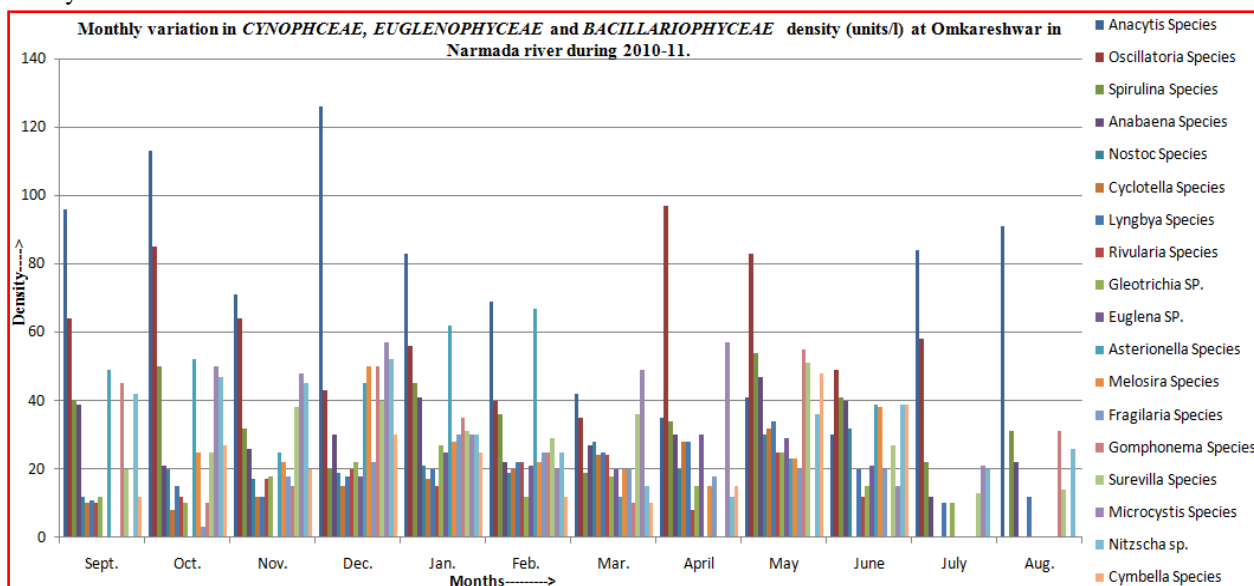
of this group was recorded in February to April months in both years due to abundance in food. The diversity of this group was minimum from July to September months due to rainfall and heavy floods, poor water quality and less food availability.

##### Euglenophyceae

During the study period, only one species of family Euglenophyceae was recorded. Its diversity was maximum in winter and summer seasons. This group was totally absent during the rainy season.

##### Bacillariophyceae

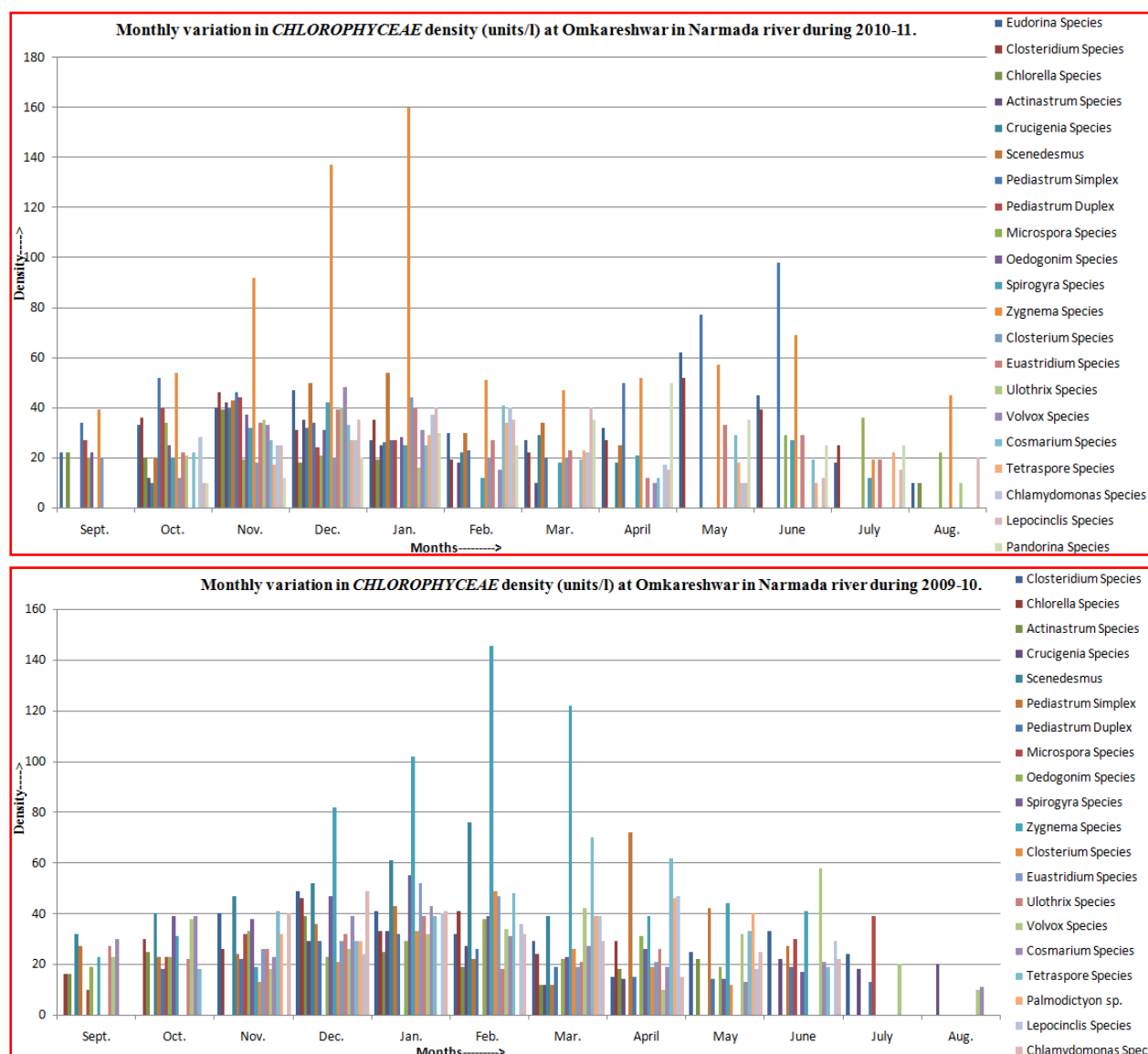
During the present investigation, 8 species of family Bacillariophyceae were recorded from river Narmada at Omkareshwar.



##### Cynophyceae

During the study period, 9 species of family Cynophyceae were recorded. The maximum diversity

This group dominated during winter and summer months and considerably was very low in number during rainy months of the both years.



## Discussion

The Narmada river is one of the important river of the India yet to be polluted. The Narmada river has varied diversity of phytoplankton's. The water quality of river is decreasing day by day due to anthropogenic activities, domestic wastes, cattle grazing and other factors.

Ecosystems are structurally well demarcated and functionally well auto controlled with in biosphere. The biotic parameters of an ecosystem, whether aquatic or terrestrial, are outcome of the abiotic characteristics. The living forms of an ecosystem are determined by prevailing conditions of photoperiodically, temperature, humidity various gases and nutrients essential for biochemical cycles. The changes in the quantities of various organic components result into alteration in flora and fauna.

Hence two water bodies even very close to each other differ in their community compositions.

During the present study the great diversity of phytoplankton were recorded at the Omkareshwar station. Among phytoplanktons the family chlorophyceae was found dominant throughout the season. Among chlorophyceae, the Zygnema was recorded in maximum number followed by Scenedesmus species. Among cynophceae, the Anabaena species was recorded abundant in number, while the cyclotella species was present in less number throughout the study period. Among Bacillariophyceae, the species Gomphonema, was present in abundant number followed by Nitzscha species. Seasonally, phytoplankton showed dominance during summer season followed by winter and monsoon season.

During summer, increasing temperature enhances the rate of decomposition due to which the water becomes nutrient rich similarly due to concentration followed by evaporation in summer season the nutrient concentration increases and abundant food present in form of photosynthesis (Santhanam and perumal, 2003). The high phytoplankton population density during the summer season could be related to stable hydrological factors and low water level; while low density during the monsoon season attributed to heavy flood and fresh water inflow. They were resumed again in monsoon due to dilution and high water level (Krishnamoorthy et al., 2007).

Hassan et al. (2010) reported minimum density of phytoplankton during monsoon and maximum during summer in Euphrates river, Iraq. Similarly, Laskar and Gupta (2009) reported minimum density of phytoplankton during monsoon and maximum during summer in Chatla Lake, Assam. Banakar, (2005) reported the peak of phytoplankton during April while lowest peak in July and August in village pond at Imalia (Vidisha) India.

## Conclusion

From the present study it was concluded that there was a continuous declining in the number of species due to various anthropogenic activities. When the previous literature was cited and compared with the present study, there was declination recorded in the species number. Besides this the species recorded in the July to Sep. months were few in number due to low food availability. The various preventive measures should be done in order to conserve the plankton biodiversity. As the planktons serve as an important link in the food chain and they are the main source of food of other organisms, thus efforts should be done for their biodiversity conservation.

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