



## Studies of Phytoplankton Ecology in Narmada River of West Nimar, MP, India

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### Abstract

Phytoplankton which are present in a variety of aquatic habitats were studied with respect to their species taken for one complete year (2011-2012). The present study was carried out on Narmada river situated in west Nimar of Madhya Pradesh. The plankton were collected, counted and identified by using the method suggested by APHA (1985), Prescott (1969) and fresh water biology. Different class such as Chlorophyceae, Cynophyceae, Trebouxiophyceae, Ulvophyceae and Zygnematophyceae were identified. Ten species of phytoplankton have been collected from various freshwater habitats in the West Nimar. Out of 10 genera Cynophyceae (4), Charophyceae (3), Trebouxiophyceae (1), Ulvophyceae (1) and Zygnematophyceae (1). The study among all these phytoplankton Cynophyceae were recorded as a dominant class in Narmada river. The study was carried out monthly but was tabulated seasonally by using statical method. Result shows that diversity of species Cynophyceae where 40% Charophyceae 30%, Trebouxiophyceae 10%, Ulvophyceae 10% and Zygnematophyceae 10% were composed.

**Keywords:** Studies phytoplankton, ecology, Narmada river.

### Introduction

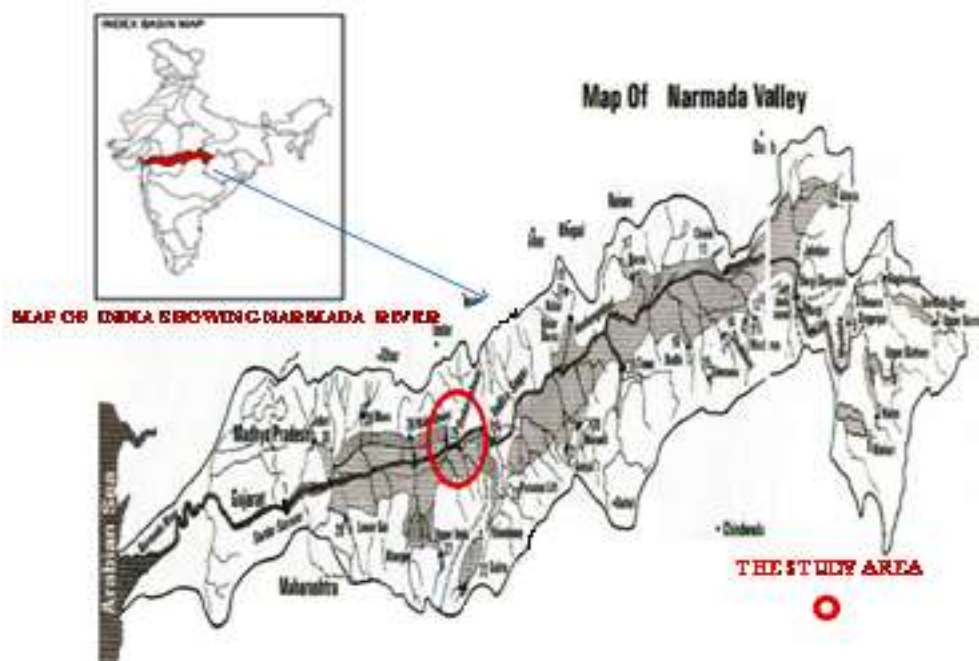
The term Phytoplankton comes from the Greek term, phyto means Plants and planktons means drifter. Planktons are composed of tiny plant called phytoplankton. Phytoplankton is often an important link in the transformation of energy in ecosystem. Phytoplankton plays an important role to make climax community. Phytoplankton is indicator to pioneer community. Rivers are the major sources of drinking water, besides their usages in agriculture, washing, bathing etc. Water is essential element of life for growth and vital activities of human beings on the earth. Only small amount of water that occurs in fresh water rivers, streams, lakes and tanks is available for the terrestrial life<sup>1</sup>. The river Narmada is the third holy and fifth longest west flowing river of India and the biggest west flowing river of the state of Madhya Pradesh. Narmada River covers large areas in the state of Madhya Pradesh<sup>2</sup>. Narmada flows through Mandla, Jabalpur, Narsingpur, Hosangabad, Harda, Raisen, East Nimar, West Nimar, Dewas and Dhar district. Water pollution in India has come to a critical point. Almost all major river of India are facing the problem of pollution<sup>3,4</sup>. Anthropogenic activities, urbanization, industrialization have influence the water resources quantitatively and qualitatively. Pressure on revering ecosystems is enormously increasing due to fast industrial and urban growth. The growth and diversity of aquatic micro flora in river system is influenced by several physicochemical parameters. These factors affected the ecosystem of river. Many

studies on water quality of fresh water have been conducted from all over India<sup>5-8</sup>. A study was carried out highlighting the role of changing water condition in determining the abundance and succession of phytoplankton in a set of samples collected in Narmada River.

### Material and Methods

**Study Area:** The Narmada River originates from an elevation of 1051 M in Maikala highlands near Amarkantaka under Shahdol district, Madhya Pradesh at 2240 N Latitude and 8145 E Longitudes<sup>9</sup>. The Narmada River is also called Maikalsutha or Rewa in central India and fifth largest river in the Indian subcontinent. The study was carried out during 2011-2012. The Narmada valley having rich biodiversity of phytoplankton.

The plankton were collected, counted and identified by using the method suggested by APHA (1985), Prescott (1969) and fresh water biology<sup>10</sup>. The Planktons samples were collected from five different sampling stations in west Nimar of Madhya Pradesh. The water samples were collected in sterile glass bottles. Sample were analyzed by following the methods as described by APHA. The phytoplankton's were collected filtering 60 liters of water through a plankton net. Water sample were kept in five percent of formalin solution for phytoplankton study respectively. The systematic identification of planktons was made by standard keys of APHA, Adoni<sup>11</sup>, Battish and Gaikawad. Water samples of Narmada River were collected from five sampling station in west Nimar of Madhya Pradesh.



Maps of the study area

**Sampling stations: Station –I Kasrawad:** Kasrawad is culturally rich town and located in western part in Khargone district of Madhya Pradesh. This city is situated on the north bank of sacred river Narmada. This city is located on the Agra Mumbai highway and at near about 85 km away from Indore, the commercial capital of the state and it is also called mini Mumbai. The climate of the area is very pleasant.

**Station –II Rajghat:** This station is on the north bank and location is used for bathing, rituals etc. The domestic sewage and agriculture runoff drain here.

**Station –III Pendra:** Located on south bank and domestic sewage of the village Pendra drains here. It is 2 Km. away from Narmada River and 46 km away from Bawangaja (Barwani).

**Station –IV Bhilkheda:** This is final sampling station 1 km downstream from Rajghat. River receives domestic sewage of Barwani town.

**Station –V Koteshawar:** This is located on north bank of Narmada River. It is located 95 km away from Indore. The climate of the area may be divided into four seasons. The cold season (December-February), Monsoon season (June to September), Post monsoon (October to November) & Hot season (March-June).

## Results and Discussion

The present investigation had been discussed to the phytoplankton frequency of the aquatic environment. Most of the algae were planktonic, free floating and few are

epizoic. Distribution of phytoplankton shown in table-1. Seasonal fluctuation of phytoplankton shown in table-2. Composition of phytoplankton shown in table-3. Percentage of phytoplankton shown in figure 1. The planktonic algal forms belong to Chlorophyceae, Cyanophyceae, Tebouxiophyceae, Ulvophyceae and Zygnematophyceae. Out of ten genera Cynophyceae (4), Charophyceae (3), Trebouxiophyceae (1), Ulvophyceae (1) and Zygnematophyceae (1). In all ten genera of phytoplankton were identified at different sampling station during the period of investigation. Similar groups of phytoplankton in river Narmada was also reported by Palharya and Malviya<sup>12</sup> and Shrivastawa<sup>13</sup>. Counting of the individual plankton was done by 'Lac keys' are dropping method (1935). Using the formula.

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

N = Number of plankton counted in 0.1 ml concentrate. C = Total volume of concentrate in ml. Y = Total volume of water filtered for sample in liters, The plankton density was expressed on individuals/liter.

The availability of phytoplankton in the river ecosystem depends upon its physiographic. Reduced numbers of phytoplankton had been reported from acidic water and it was supported by Lewitus et.al.<sup>14</sup>. The maximum phytoplankton population found form post monsoon, it may be due to the favorable condition of the water. In monsoon season the population was low, probably due to increased rainfall, increase turbidity runoff and dilution effect of flood. Similar results had also been observed by Sharma et.al.<sup>15</sup>.

**Table-1**  
**Distribution of Phytoplankton**

PHYTOPLANKTON	SITES				
	KSR	RJG	PND	BHLK	KTSH
<i>Anabaena ambigua</i> Rao forma					
<i>Chara zeylanica</i> Willd.	+	-	+	-	+
<i>Chlorella vulgaris</i> Beyernick	+	+	-	+	-
<i>Ulothrix zonata</i>	+	+	-	-	+
<i>Closterium monoliferum</i> (Bory) Ehrenb.	+	-	+	+	-
<i>Lyngbya dendrobia</i> Bruhlet.Biswas	-	-	+	-	-
<i>Gloeotrichia raciborskii</i> Wolosz.forma	+	+	-	-	-
<i>Nostoc linckia</i> (Roth.) Born.et Flash .Forma	-	-	+	+	-
<i>Oedogonium sylvaticum</i> Halles forma	+	+	-	-	+
<i>Spirogyra elongata</i> Kg.	+	-	+	+	+

Abbreviations: (+)-Present,(-)-Absent, KSR-Kasrawad, RJG-Rajghat,PND-Pendra,BHLK- Bhilkheda, KTSH-Koteshawa

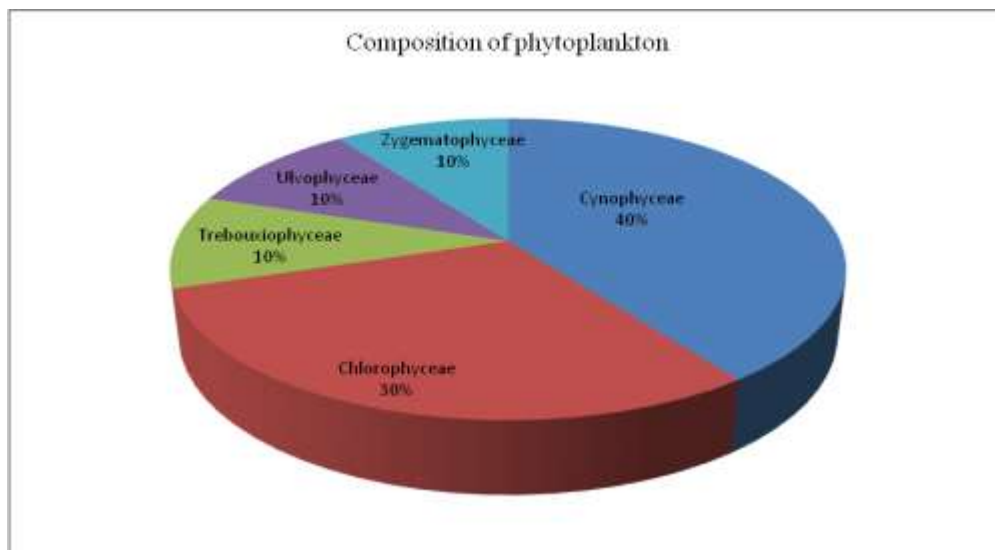
**Table-2**  
**Seasonal Fluctuation Of Phytoplankton**

Season	Station	Charophyceae	Cynophyceae	Trebouxiophyceae	Ulvophyceae	Zygnematophyceae	Total
Monsoon	KSR	12	30	24	15	20	101
	RJG	14	65	45	24	51	199
	PND	15	40	34	35	76	200
	BHLK	13	17	25	25	64	145
	KTSH	15	21	15	16	52	121
	Mean	13.8	34.6	28.8	23.6	52.6	153.2
Postmonsoon	KSR	16	38	10	35	51	150
	RJG	18	72	59	46	43	238
	PND	17	18	65	35	35	171
	BHLK	11	79	78	76	62	306
	KTSH	10	87	67	70	25	259
	Mean	14.9	58.8	55.8	52.4	43.4	224.8
Primonsoon	KSR	13	18	56	65	46	198
	RJG	15	53	45	64	65	242
	PND	16	25	34	55	56	186
	BHLK	19	36	23	23	46	149
	KTSH	12	65	12	21	52	164
	Mean	15	39.4	34.4	46	53	187.8

Abbreviations: KSR-Kasrawad, RJG-Rajghat,PND-Pendra,BHLK- Bhilkheda, KTSH-Koteshawa

**Table-3**  
**Composition of phytoplankton**

ALGAL GROUPS	COMPOSITION OF PHYTOPLANKTON DURING STUDY PERIOD	
	GENERA	TAXA
Cynophyceae	4	4
Chlorophyceae	3	3
Trebouxiophyceae	1	1
Ulvophyceae	1	1
Zygnematophyceae	1	1



**Figure-1**  
**Percentage of Phytoplankton**

**Conclusion**

Therefore from the above study it is concluded that Cynophyceae is dominant in Narmada River. The total plankton count. /ml. is minimum in monsoon and maximum in post monsoon in Narmada river .Local people who are engaged in washing cloths and discharges soap water and people from the surrounding area discharge their waste and domestic sewage directly into the river. These are some reasons of water pollution.

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