

Phytoplankton diversity and application of Boyd's diversity index to determine pollution level in Gogabil lake of Katihar district

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ABSTRACT

Gogabil lake of Katihar district is one of the month prominent ox-bow wetland of North Bihar. In the present study, pollution level of this lake was determined using Boyd's diversity index. The value of Boyd's index was less than one during the months of April, May and June which represent heavily polluted water. During the remaining months, the value of Boyd's index was recorded more than one which represents moderately polluted water. Phytoplanktons were collected at regular intervals from Jan-25 to Dec-25. Cyanophyceae was represented by maximum no. of species followed by Chlorophyceae. Desmidiaceae was represented by minimum no. of species. Maximum general of Phytoplanktons were recorded in the month of Feb, Sept and Oct (15) and minimum in the month of June (10).

Key Words - Phytoplanktons, Pollution, Boyd's index, Gogabil lake

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INTRODUCTION

Phytoplanktons are prominent algal flora found in lakes, ponds and other water bodies. These are good indicator of water quality. Phytoplanktons are vital source of energy as they are primary producers. Phytoplanktons are natural food for aquatic microfauna such as zooplanktons, Protozoa and Nematodes as well as for some fishes. The study of phytoplanktons of a water body is very useful in understanding the water quality and basic nature of water reservoir. Phytoplanktons also play an important role in biosynthesis of organic matter in aquatic ecosystem (Desikachari, 1959; Fogg, 1949; Fritch, 1945; Lackey, 1938 and Pielou, 1975). Phytoplanktons are chlorophyll containing organism so they are capable of photosynthesizing. They uptake carbon dioxide and release O₂. Gogabil

lake is an oxbow wetland located in trans-gangetic plain of Katihar district. It is flanked by Mahananda river to the north-east and the Ganga River to the south. It is Bihar's first community reserve and used for irrigation, extensive fishing, cattle wading and recreation. Livelihood of local people is supported by this lake.

MATERIAL & METHODS

Phytoplanktons were collected from Gogabil lake at regular intervals from Jan-2025 to Dec-2025. Samples were identified with the help of standard monographs (Desikachari, 1959; Smith, 1950) Total number of phytoplanktons were counted using Lackey's drop method. Value of Boyd's index was calculated by the formula:

$$H = \frac{S - 1}{\ln N}$$

where,

$\ln N$ = Natural logarithm

S = No. of genera of phytoplanktons

N = Total no. of phytoplanktons

RESULT

Phytoplanktons were collected at regular intervals from Jan-25 to Dec-25. Collected samples were identified and no. of genera in each month was counted. Total no. of phytoplanktons were also calculated from each class of Algae in each month. Maximum number of genera were recorded in the month of Feb, Sept and Oct (15) and minimum in the month of June (10). Highest no. of phytoplanktons in each month was recorded from class Cyanophyceae and lowest no. of phytoplanktons were from Desmidaceae. Maximum number of total phytoplanktons was recorded as 47662 in the month of Oct-25 and minimum (26982) in the month of May-25.

The value of Boyd's diversity index was calculated for each month. This value is the indicator of water pollution. The value of Boyd's index for clean water is >4 and for moderately polluted water this value ranges from 3-1. Boyd's index value less than one represent polluted water.

Table 1- Month wise no. of phytoplanktons and no. of genera in Gogabil lake

Months (2025)	No. of Phytoplanktons				Total no. of Phyto	No. of genera
	Cyano	Chloro	Bacill	Desmid		
January	23200	15500	8000	603	47303	14
February	22800	14300	7000	452	44552	15
March	21900	12400	5000	443	39743	12
April	19700	9200	3200	415	32515	11
May	15200	8600	2800	382	26982	11
June	16400	10400	3100	481	30381	10
July	17800	11500	3400	416	33116	12
August	21500	12600	4500	511	39111	14
September	22400	13700	6300	532	42932	15
October	24300	15800	7000	562	47662	15
November	23700	15200	7300	570	46770	14
December	23100	15100	7900	590	46690	14

Table 2- Boyd's diversity index of Gogabil lake

Months (2025)	No. of genera	No. of Phyto	Diversity index	Order of pollution
January	14	47303	1.2077	Moderately polluted
February	15	44552	1.3079	Moderately polluted
March	12	39743	1.0387	Moderately polluted
April	11	32515	0.9624	Heavily polluted
May	11	26982	0.9801	Heavily polluted
June	10	30381	0.8719	Heavily polluted
July	12	33116	1.0568	Moderately polluted
August	14	39111	1.2294	Moderately polluted
September	15	42932	1.3124	Moderately polluted
October	15	47662	1.2996	Moderately polluted
November	14	46770	1.2089	Moderately polluted
December	14	46690	1.2091	Moderately polluted

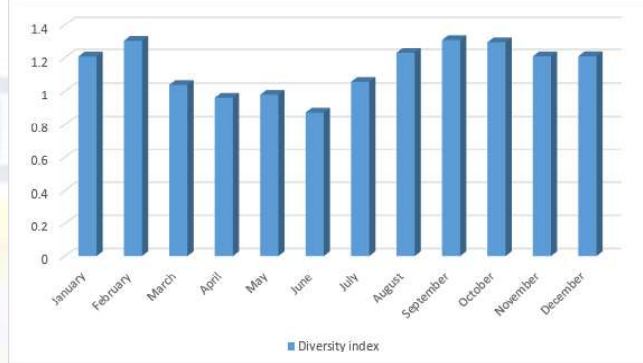


Fig. 1- Graph of Boyd's Diversity index

In the present study, it was observed that the value of Boyd's index ranged in between 1.0387 to 1.3124 in all months except April, May and June. During these 3 months value of Boyd's index was less than 1 showing that the water of Gogabil lake was heavily polluted during these 3 months.

DISCUSSION

Distribution of Phytoplanktons in a water body depends upon environmental conditions and seasons. Water quality and nutrient concentration directly affect the distribution of Phytoplanktons (Manickam *et al.* 2012). Physiocochemical parameters determine the abundance of phytoplanktons. In the present study, phytoplanktons belonging to class Cyanophyceae, Chlorophyceae, Bacillariophyceae and Desmidaceae were observed in Gogabil lake. Among four classes species of Cyanophyceae, Desmidaceae was represented by lowest number of species. Our finding is similar to Hujare (2008), Singh (2015), Presscotte (1984), Nidhi *et al.* (2022) and Soni & Choudhary (2022).

CONCLUSION

Order of pollution in Gogabil lake was studied by using Boyd's diversity index. Lake water was heavily polluted during the month of April, May and June while in other months water was moderately polluted. The value of Boyd's index was recorded as 0.9624 in the month of April, 0.9801 in the month of May and 0.8719 in the month of June. When the value of Boyd's index is less than 1, the water is considered as heavily polluted. The value of Boyd's index when ranges from 3-1, water is considered as moderately polluted. Value of Boyd's index above 4 represents clean water.

Phytoplanktons were collected from Jan-25 to Dec-25 at regular intervals. Maximum species of Cyanophyceae were recorded followed by Chlorophyceae. Desmidiaceae was represented by minimum number of species.

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