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# Phytoplankton Diversity From Deoli Bhorus Lake (Maharashtra), India

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**Abstract:-**
The present paper deals with the study of phytoplankton diversity in a lake DeoliBhorus in ChalisgaonTaluka, Dist. Jalgaon, Maharashtra, India during the year 2006 to 2007. A total number of 31 species were recorded out of which 9 species belong to the class Chlorophyceae, 8 species belong to class Cyanophyceae, 7 species belong to class Bacillariophyceae, 5 species belong to class Euglenophyceae and 2 species belong to Dinophyceae. Maximum numbers of species were recorded from class Chlorophyceae during the study period.
**Key Words:-**DeoliBhorus Lake, Phytoplankton diversity, Water pollution.

## Introduction

The major habitats of freshwater includes the lotic bodies (rivers and streams), lentic bodies (ponds and lakes), groundwater zones and of ecotonal water bodies where two aquatic habitats meet (Palmer et al., 1997). Phytoplanktons (microscopic algae) occurs as unicellular, colonial organisms which grow photo-autotrophically in aquatic environments which is used as an indictors of water quality in lakes and reservoirs. They form basic link of food chain in aquatic ecosystem. The density and species composition of phytoplankton in tropical lakes and reservoirs demonstrate particular annual biological characteristics (Pongswat et al., 2004). The planktonic study is very useful tools for the assessment of water quality and type of water body also contribute to understanding of the basic nature and general economy of the lake (Pawar et al., 2006). Studies on the phytoplankton diversity of freshwater reservoirs in relation to their environmental condition have been made by Jafari and Gunale, (2006); Patil et al., (2012); Kumaraswamy et al., (2013).

The present study was undertaken to investigate the phytoplankton diversity in DeoliBhorus lake in different months during the period of December 2006 to November 2007. There is no earlier study on the diversity of phytoplankton of this lake, hence present study was undertaken.

## Materials and Methods

DeoliBhoras dam is one of the minor irrigation project located on Girna sub canal in TaqChalisgaonDistJalgaon.The area covered by DeoaliBhoras minor project falls under C.O.F. type (control of flow) which is having length of 224m, canal gate 1200 x 1500 mm. Right canal length 3.38m and water flow 12.42 (unit).The storage capacity of lake is having bottom sea level 100.05m full supply level 102.22m. Dead storage 0.200 mcm, gross storage 2.094 mcm, live storage 0.810 mcm.The Lake encompassage gross command area 270 hector, C.C.A. common area 240 hectors and actual irrigated area 214 hectors. Bhoras, Kargaon, Deoli ,Bilakhed ,Dhon, Digar, etc. are the villages having over 10,000 population and domestic animals are benefited by this lake for domestic, irrigational and drinking water purposes

**Sampling of phytoplankton :** -

The size of sample can be six liter if phytoplankton density is less than 500 u/ml .if density are higher 1 or 2 liters sample may be sufficient for qualitative and quantitative evolutions an unfiltered unstrained (whole sample)should be collected with van- Dorn water sampler. These samples successfully collect phytoplaktons – regardless of size. This includes various type of net plankton's for different size of phytoplankton such as nanoplanktons, micro planktons and ultra planktons ranging in size from 10 micron diameters to 60 micron Diameters. The Van Dorn p.v.c.samples (2 to 5 liter) are usually preferred because they collect all types of phytoplankton's.

**Preservation :-**

Preservation of the sample is done by using Lugols solution. Prepared Lugol iodine by dissolving 60 gm KI and 40 gm iodine crystals in 1000 ml distilled water. For preservation add 10 ml Lugols solution 1000 ml of the sample stored in dark. Normally sedimenatation requires 24 hours after which the sediment is collected after removing supernatant with the help of dropper or pipette. The collected sample with sedimented phytoplankton is diluted by adding the distilled water and once again preserved in Lugol's iodine for subsequent studies. The Lugol's iodine stains

cilia and flagella and considered as the best preservation.

**Concentration of samples :-**

Concentration of sample is done by technique sedimentation. Sedimentation is usually preferred method of concentration because it is non – selective and non destructive. The volume concentrated various inversely the abundance of organisms and is affected by sample turbidity. It may an inverted microscope to as much as 1 liter for general phytoplankton enumeration. The sample may be concentrated in series of steps by quantitatively transferring the estimate from the initial container to sequentially smaller ones. Setting chambers should be essentially to be kept over a vibration free surface. If requires setting should be moved carefully to avoid non random distribution of settled matter. The supernatant can be siphoned or decanted out.

**Mounting and preparation of slides for examination :-**

Agitate the settled concentrate and with draw a sub-sample accurately with the pipette, prepare wet mount by transferring 0.1ml of the sample to a glass slide placing a coverslip over the sample and rinsing the a cover slip with a adhesive such a clear nail polish to prevent evaporation for semi-permanent slide ,mix glycerin with the sample and the sample ages evaporates, leaving the organism embedded in glycerin.

**Identification and Counting :-**

Identification is done with the help of keys of APHA and kodarkar's methodology. The counting is done by using Sedgwick-Rafter(S-R) counting cell of 1 and 2 mm and micro-pipette of glass van grade I of 1,2and 5 ml capacity were used. For this purpose 1 ml of plankton sample was drawn and transferred to SR counting cell. Observation were made under the inverted microscope and counting was done up to genet level. The procedure was repeated 5 times to get an average. The Sedgwick – Rafter cell is a special kind slide similar to Haemocytometer. The cell has a 50 mm x 20 mm x 10mm rectangular cavity that holds 1 ml sample. The Cell is moved in horizontal direction on the stage of an inverted microscope and planktonic species ecountered in the field are enumerated a number of replicate samples are enumerated and total population of individual plankton genera in dam was calculated plankton / L by the following formula.

$$\text{Phytoplankton (U/L)} = \frac{N \times C}{V}$$

Where –

N = number of plankton in 1 ml.

C = volume of concentrate.

V = volume of sample in litter. (it represent total volume filtered / sediment.)

**Results and Discussion**

Phytoplanktons were collected from the study sites during the period of study. A total number of 31 species were recorded out of which 9 species belong to the class Chlorophyceae, 8 species belong to class Cyanophyceae, 7 species belong to class Bacillariophyceae, 5 species belong to class Euglenophyceae and 2 species belong to Dinophyceae. Maximum numbers of species were recorded from class Chlorophyceae during the study period.

Maximum number of species Closteriumfromchlorophyceae were observed in station A, whereas in station B Crucigenia species were maximum in number. It is the signs of eutrophication of lake due to agricultural runoff and anthropogenic activities as well as the physico-chemical parameters like nitrates, phosphate, temperature and alkalinity are favorable for the growth of phytoplanktons.

Highest number of individual was represented by Chlorophyceae, followed by Cyanophyceae, Bacillariophyceae, Euglenophyceae and Dinophyceae. A total of 31 forms of phytoplankton were recorded from the reservoir in table. The phytoplankton abundance monthly variation were studied and recorded in fig during the year 2006-2007.

The Chlorophyceae population was maximum during the month of August and minimum during February in station A, whereas it was maximum in August and minimum in January in station B. Cyanophyceae members were maximum during August and minimum during March in Spot A, whereas it was maximum in August and September (mansoon) and minimum during March and April (summer) in spot B. The maximum population of Bacillariophyceae were recorded in September and minimum in March in station A and B. The maximum population of Euglenophyceae was during month of December and minimum during month of February in station A and in station B it was maximum during

February and minimum during March. Dinophyceae members were recorded maximum during July and minimum during November and December in both spot A and B.

| Spot A | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Class &Sp | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Total | Abundance |
| | **Chlorophyceae** | | | | | | | | | | | | | | |
| 1 | Chlorella | 00 | 00 | 150 | 225 | 375 | 265 | 170 | 235 | 575 | 585 | 200 | 00 | 2780 | 3.709 |
| 2 | Scenedesmus | 00 | 00 | 79 | 150 | 310 | 299 | 45 | 30 | 200 | 125 | 75 | 00 | 1313 | 1.751 |
| 3 | Crucigenia | 300 | 20 | 75 | 200 | 900 | 102 | 50 | 35 | 475 | 800 | 980 | 400 | 4337 | 5.78 |
| 4 | Closterium | 102 | 15 | 60 | 175 | 550 | 325 | 275 | 925 | 990 | 902 | 302 | 250 | 4871 | 6.48 |
| 5 | Cosmaria | 15 | 10 | 15 | 12 | 30 | 50 | 70 | 100 | 70 | 50 | 00 | 00 | 422 | 11.26 |
| 6 | Pediastrum | 300 | 35 | 240 | 370 | 380 | 120 | 95 | 560 | 890 | 700 | 304 | 210 | 4204 | 5.6 |
| 7 | Oocystis | 250 | 30 | 60 | 170 | 350 | 550 | 770 | 975 | 1025 | 250 | 200 | 15 | 4645 | 6.17 |
| 8 | Dactyosphaerium | 45 | 15 | 38 | 105 | 205 | 330 | 360 | 875 | 379 | 500 | 300 | 105 | 3257 | 4.34 |
| 9 | Coelastrum | 55 | 15 | 20 | 30 | 42 | 85 | 12 | 20 | 45 | 93 | 122 | 40 | 579 | 1.3 |
| | Cyanophyceae | | | | | | | | | | | | | | |
| 1 | B.G.A. | 5000 | 5040 | 5300 | 2200 | 2800 | 3000 | 3200 | 3900 | 5800 | 5500 | 5300 | 4500 | 50540 | 6.74 |
| 2 | Microcystis | 800 | 270 | 475 | 900 | 1000 | 1150 | 1300 | 1800 | 1500 | 1600 | 250 | 930 | 11975 | 15.97 |
| 3 | Chrorococcus | 00 | 45 | 55 | 65 | 00 | 00 | 30 | 70 | 100 | 150 | 225 | 00 | 740 | 1.97 |
| 4 | Spirulina | 20 | 00 | 00 | 00 | 40 | 45 | 52 | 55 | 45 | 60 | 75 | 40 | 432 | 1.15 |
| 5 | Oscillatoria | 1700 | 500 | 00 | 00 | 00 | 90 | 1000 | 1100 | 1160 | 1300 | 2000 | 2100 | 10950 | 14.61 |
| 6 | Anabaena | 590 | 00 | 00 | 265 | 290 | 900 | 940 | 975 | 990 | 870 | 720 | 640 | 7180 | 9.57 |
| 7 | Myxosarcina | 20 | 00 | 00 | 00 | 40 | 45 | 52 | 55 | 45 | 60 | 75 | 20 | 412 | 1.09 |
| 8 | Aphanocapsa | 770 | 670 | 830 | 370 | 250 | 90 | 00 | 00 | 30 | 15 | 460 | 520 | 4005 | 5.43 |
| | **Bacillariophyceae** | | | | | | | | | | | | | | |
| 1 | Cyclotella | 15 | 00 | 00 | 00 | 45 | 140 | 75 | 65 | 30 | 105 | 75 | 55 | 605 | 1.61 |
| 2 | Synedra | 1000 | 990 | 985 | 920 | 1050 | 820 | 510 | 400 | 475 | 590 | 900 | 950 | 9590 | 12.79 |
| 3 | Eunotia | 1260 | 575 | 405 | 370 | 265 | 165 | 105 | 275 | 775 | 970 | 1075 | 1155 | 7395 | 9.8 |
| 4 | Navieala | 1120 | 1200 | 1400 | 1130 | 1360 | 1350 | 1545 | 1120 | 400 | 820 | 925 | 1020 | 13390 | 17.86 |
| 5 | Pinnularia | 00 | 00 | 00 | 35 | 70 | 140 | 102 | 250 | 460 | 970 | 345 | 95 | 2467 | 3.29 |
| 6 | Nitzscia | 580 | 00 | 00 | 265 | 290 | 970 | 940 | 100 | 970 | 870 | 720 | 630 | 7235 | 9.65 |
| 7 | Epithema | 20 | 00 | 00 | 00 | 40 | 45 | 52 | 55 | 45 | 60 | 75 | 40 | 432 | 1.15 |
| | **Euglenophyceae** | | | | | | | | | | | | | | |
| 1 | Phacus | 08 | 00 | 00 | 05 | 10 | 15 | 08 | 07 | 07 | 23 | 23 | 08 | 114 | 30.42 |
| 2 | Euglena | 07 | 07 | 17 | 14 | 50 | 55 | 30 | 27 | 24 | 24 | 24 | 13 | 292 | 77.92 |
| 3 | Petalomoncis | 10 | 17 | 30 | 50 | 55 | 60 | 70 | 35 | 38 | 40 | 20 | 15 | 440 | 0.02 |
| 4 | Trachelomonas | 15 | 05 | 20 | 35 | 65 | 70 | 75 | 40 | 40 | 30 | 20 | 20 | 435 | 1.16 |
| 5 | Lepocinclis | 10 | 12 | 12 | 15 | 18 | 63 | 27 | 30 | 35 | 10 | 15 | 18 | 265 | 70.71 |
| | **Dinophyceae** | | | | | | | | | | | | | | |
| 1 | Peridinium | 00 | 00 | 30 | 25 | 75 | 80 | 120 | 160 | 80 | 70 | 30 | 00 | 670 | 1.78 |
| 2 | Glenodinium | 00 | 80 | 100 | 150 | 195 | 230 | 80 | 50 | 135 | 102 | 68 | 00 | 1190 | 1.58 |

| | Spot B | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. | Class &Sp | Dec | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Total | Abundance |
| | **Chlorophyceae** | | | | | | | | | | | | | | |
| 1 | Chlorella | 00 | 00 | 80 | 160 | 410 | 300 | 45 | 30 | 175 | 105 | 75 | 00 | 1380 | 1.80 |
| 2 | Scenedesmus | 00 | 00 | 00 | 30 | 182 | 415 | 270 | 105 | 90 | 00 | 00 | 00 | 1092 | 1.45 |
| 3 | Crucigenia | 102 | 15 | 60 | 175 | 550 | 325 | 275 | 925 | 970 | 902 | 302 | 250 | 4851 | 6.47 |
| 4 | Closterium | 80 | 20 | 50 | 160 | 475 | 195 | 235 | 800 | 900 | 875 | 275 | 200 | 4265 | 5.69 |
| 5 | Cosmaria | 08 | 07 | 09 | 09 | 25 | 40 | 65 | 80 | 65 | 45 | 00 | 00 | 353 | 9.41 |
| 6 | Pediastrum | 195 | 25 | 200 | 300 | 295 | 275 | 80 | 60 | 495 | 380 | 230 | 175 | 3110 | 4.04 |
| 7 | Oocystis | 200 | 25 | 50 | 100 | 300 | 500 | 700 | 900 | 975 | 200 | 150 | 75 | 4175 | 5.57 |
| 8 | Dactyosphaerium | 35 | 10 | 30 | 80 | 175 | 295 | 300 | 800 | 300 | 490 | 275 | 75 | 2865 | 3.82 |
| 9 | Coelastrum | 45 | 10 | 15 | 25 | 29 | 75 | 08 | 15 | 30 | 80 | 95 | 30 | 457 | 1.21 |
| | **Cyanophyceae** | | | | | | | | | | | | | | |
| 1 | B.G.A. | 4000 | 4030 | 4095 | 1090 | 1050 | 1500 | 2900 | 3000 | 5000 | 5000 | 4000 | 4000 | | 2.64 |
| 2 | Microcystis | 705 | 200 | 400 | 860 | 900 | 1050 | 1200 | 1700 | 1400 | 1300 | 275 | 875 | | 7.82 |
| 3 | Chlorococcus | 00 | 35 | 45 | 50 | 00 | 00 | 20 | 62 | 90 | 100 | 190 | 00 | 592 | 1.57 |
| 4 | Spirulina | 15 | 00 | 00 | 00 | 30 | 35 | 40 | 45 | 35 | 50 | 70 | 35 | 355 | 9.4 |
| 5 | Oscillatoria | 1000 | 400 | 00 | 00 | 00 | 80 | 800 | 1000 | 1000 | 1200 | 1500 | 2000 | 8980 | 11.96 |
| 6 | Anabaena | 500 | 00 | 00 | 200 | 270 | 875 | 900 | 9000 | 900 | 800 | 720 | 600 | | 8.86 |
| 7 | Myxosarcina | 15 | 00 | 00 | 00 | 35 | 35 | 45 | 50 | 40 | 50 | 70 | 15 | 355 | 94.73 |
| 8 | Aphanocapsa | 700 | 600 | 800 | 300 | 200 | 80 | 00 | 00 | 30 | 10 | 400 | 500 | 3620 | 4.82 |
| | **Bacillariophyceae** | | | | | | | | | | | | | | |
| 1 | Cyclotella | 10 | 00 | 00 | 00 | 40 | 130 | 70 | 60 | 25 | 100 | 70 | 50 | 555 | 1.48 |
| 2 | Synedra | 875 | 900 | 970 | 900 | 10 | 80 | 500 | 300 | 400 | 580 | 875 | 900 | 9000 | 1.2 |
| 3 | Eunotia | 1200 | 560 | 400 | 360 | 250 | 150 | 100 | 270 | 700 | 900 | 1000 | 1100 | 6990 | 9.32 |
| 4 | Navieala | 1100 | 1200 | 1300 | 1100 | 1300 | 1300 | 1500 | 1100 | 875 | 800 | 900 | 1000 | | 17.97 |
| 5 | Pinnularia | 00 | 00 | 00 | 30 | 65 | 100 | 90 | 200 | 400 | 900 | 300 | 85 | 2170 | 2.89 |
| 6 | Nitzscia | 500 | 00 | 00 | 200 | 280 | 900 | 900 | 890 | 900 | 800 | 700 | 600 | 6670 | 8.89 |
| 7 | Epithema | 15 | 00 | 00 | 00 | 35 | 40 | 50 | 50 | 40 | 50 | 70 | 35 | 385 | 1.02 |
| | **Euglenophyceae** | | | | | | | | | | | | | | |
| 1 | Phacus | 70 | 00 | 00 | 03 | 08 | 10 | 05 | 05 | 05 | 20 | 20 | 05 | 151 | 3.8 |
| 2 | Euglena | 05 | 05 | 15 | 10 | 45 | 50 | 30 | 20 | 20 | 20 | 20 | 10 | 250 | 1.0 |
| 3 | Petalomoncis | 09 | 15 | 25 | 45 | 50 | 55 | 60 | 30 | 35 | 35 | 15 | 10 | 384 | 1.0 |
| 4 | Trachelomonas | 10 | 05 | 15 | 30 | 60 | 65 | 70 | 35 | 35 | 25 | 15 | 15 | 380 | 1.01 |
| 5 | Lepocinclis | 09 | 10 | 10 | 12 | 15 | 55 | 20 | 25 | 25 | 05 | 10 | 15 | 211 | 5.5 |
| | **Dinophyceae** | | | | | | | | | | | | | | |
| 1 | Peridinium | 00 | 00 | 25 | 20 | 70 | 70 | 100 | 150 | 70 | 65 | 25 | 00 | 595 | 1.05 |
| 2 | Glenodinium | 00 | 70 | 75 | 125 | 150 | 200 | 75 | 45 | 120 | 90 | 50 | 00 | 1000 | 1.33 |

Table shows Seasonal variation of dominant phytoplankton (unit/lit ) during 2006-2007

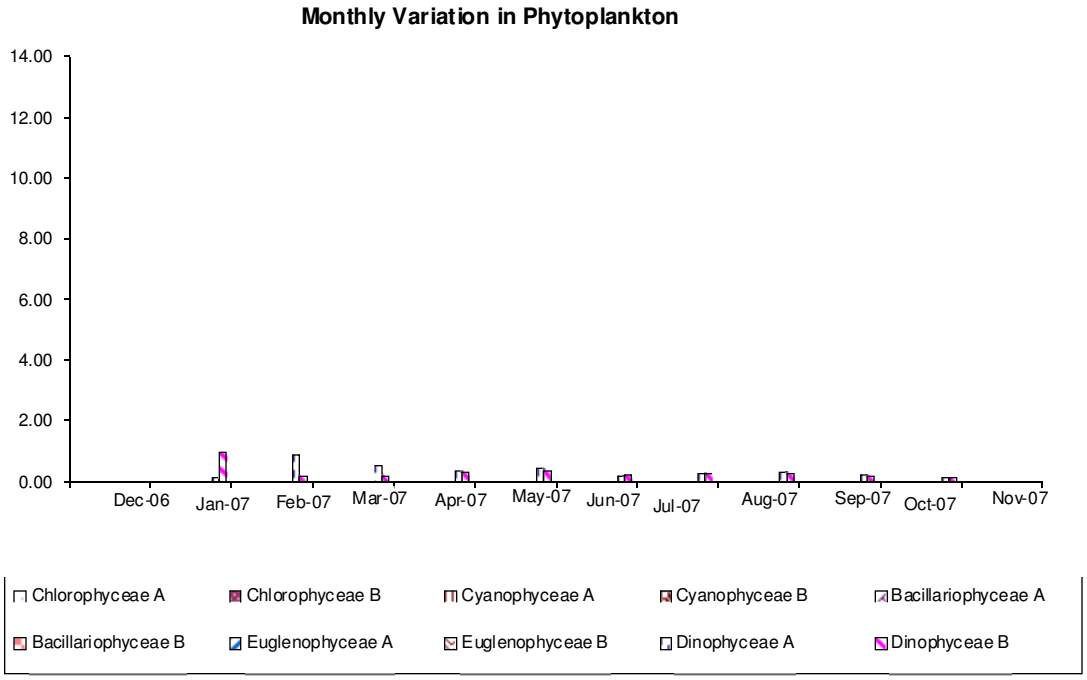
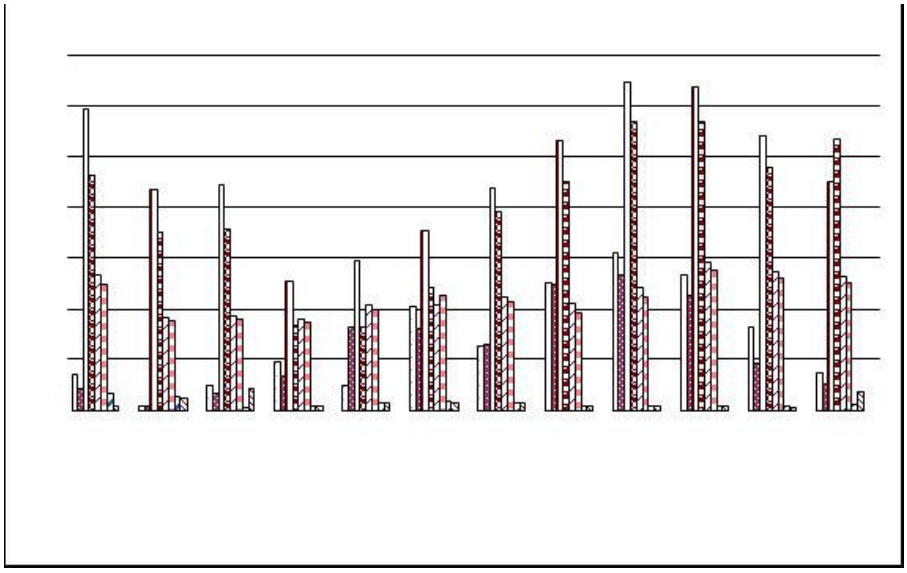



**Figure**. Monthly variation in phytoplanktons from DeoliBhoruslake.



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**Conclusion**

The present basic information of the diversity of phytoplankton would useful for further assessment and monitoring of the DeoliBhoruslake.

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