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DYNAMICS OF CHLOROPHYCEAE IN PHYTOPLANKTON OF LAKE MASUNDA, THANE (MAHARASHTRA).

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Key words : Masunda lake, Phytoplankton, Chlorophyceae, *Pediastrum spp.*

Abstract:

Phytoplankton study was carried out in Masunda lake from April 1999 to June 2000. Chlorophyceae was the most dominant class of phytoplankton of Masunda lake, Thane and it contributed 67.3% in total phytoplankton density. The class was represented by 14 genera and Chlorococcales was the dominating order. Maxima of chlorophyceae population was observed in the month of February 2000, (26,340 x 10^3 u/L) coinciding with total phytoplankton maxima. It was followed by drastic fall in density immediately in next month, March 2000 (80 x 10^3 u/L). *Pediastrum spp.* was observed to be the consistent and dominant genera in chlorococcales contributing to the peak of chlorophyceae. It exhibited high positive correlation with temperature, light penetration, dissolved oxygen and toal alkalinity. *Scenedesmus spp* and *Cosmarium spp* were other dominating genera.

Introduction :

Phytoplankton is the base of most of the lake food webs and fish production is linked to phytoplankton production (Ryder *et. al.*,. 1974). Moreover, number and species of phytoplankton serves to detertnine the quality of a water body . The present phytoplankton study was undertaken in Masunda, centrally situated in Thane city with an area of about 1,23,545.1 sq.ft. The lake is influenced by anthropogenic activities like washing vegetables, boating, idol immersion and commercial fishery.

Materials and Methods :

The study was conducted from April 1999 to June 2000. Water samples were analysed monthly for important physico-chemical properties (APHA, 1981). For phytoplankton, 500 mL water sample was collected in a separate container and for immediate fixation, Lugol's iodine solution was used in the field and later 4% formaldehyde was used for long term preservation. The phytoplankton were concentrated and identified upto genera level using standard keys (Fritsch, 1979;Bellinger, 1992).For quantitative estimation, the counting was done by Haemocytometer method (Trivedi and Goel, 1984). Simple correlation was carried out for water parameters and phytoplankton density.

Results and Discussion:

Total phytoplankton density in Masundra varied from 1600 x 10^3 to 30,360 x 10^3 u/L. The Phyto-plankton comprised of Chlorophyceae, Cyanophyceae, Bacilariophyceae, Xantho-phyceae, Eyglenophyceae and Dinophyceae members. Thirty different phytoplankton genera were recorded .

Chlorophyceae was observed to be the most dominant class of phytoplankton and it contributed 67.3% in total phytoplankton density. The class was represented by 4 orders Chlorococcales, Volvocales, Ulotricales and chlorophyceac population in Masunda, was observed in the month of February 2000, (26,340 x 10^3 u/L) coinciding with total phytoplankton

maxima. However it was followed by drastic fall in density immediately in next month, March 2000 (80 x 10^3 u/L).

Table 1: Monthly phytoplankton variation of Chlorophyceae (no x 10^3 /L) in Lake Masunda.

1999	Apr	May	Jun	Jul	Aug	Sep
Pediastrum	5200	5400	1600	16000	8000	3500
Scenedesmus	160	360	0	160	320	700
Crucigenia	0	0	0	640	0	0
Tetradron	0	0	0	0	0	0
Coelastrum	0	0	0	0	0	0
Chlorella	0	360	800	0	0	0
Volvox	0	0	0	0	0	0
Ulothrix	0	0	0	0	160	0
Carteria	0	0	0	0	0	0
Actinastrum	0	0	0	0	160	0
Kirchinerilla	0	0	0	0	0	0
Closterium	0	360	400	0	0	100
Staurastrum	0	180	0	0	0	0
Cosmarium	120	720	0	640	0	400
1999 - 2000	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**	**Mar**
Pediastrum	3680	10800	7680	8400	22000	640
Scenedesmus	80	1800	2160	700	3080	80
Crucigenia	0	0	0	0	0	0
Tetradron	0	0	240	0	440	0
Coelastrum	0	0	0	280	0	0
Chlorella	160	600	960	0	0	0
Volvox	0	0	0	1400	0	0
Ulothrix	0	0	0	0	0	0
Carteria	0	0	0	0	0	0
Actinastrum	0	01	0	0	0	0
Kirchinerilla	0	0	240	0	0	80
Closterium	0	0	0	0	220	80
Staurastrum	0	0	0	0	220	0
Cosmarium	80	600	0	0	680	0
2000	**Apr**	**May**	**Jun**	**Total**	**Average**	**%**
Pediastrum	1200	1680	5600	101380	6758.7	53.7
Scenedesmus	0	0	560	10160	677.3	5.38
Crucigenia	0	560	0	1200	80	0.64
Tetradron	0	0	0	680	45.3	0.36
Coelastrum	0	560	560	1400	93.3	0.74
Chlorella	0	560	0	3440	229.3	1.82
Volvox	0	0	0	1400	93.3	0.74
Ulothrix	0	0	0	160	10.7	0.08
Carteria	0	560	0	560	37.3	0.3
Actinastrum	0	0	0	160	10,7	0,08
Kirchinerilla	0	0	0	320	21.3	0.17
Closterium	0	0	0	1060	70.7	0.56
Staurastrum	0	0	0	400	26.7	0.21
Cosmarium	0	560	0	4000	266.7	2.12

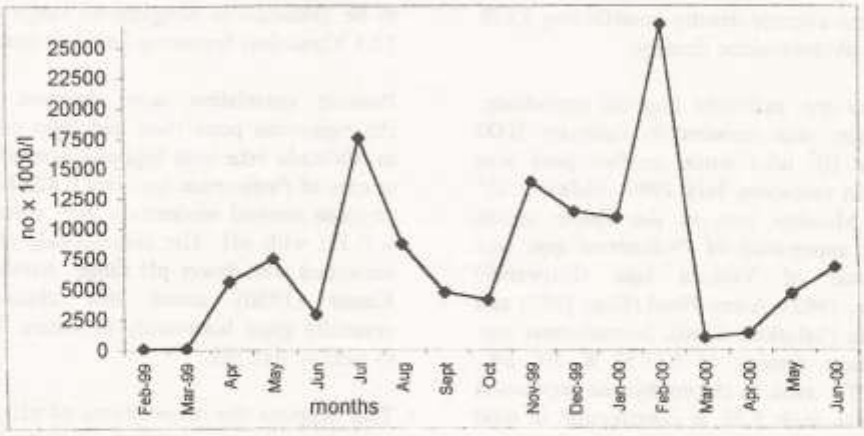

Fig. 1: Monthly variations of Chlorophyceae density in Lake Masunda, Thane.

Parameter	Average value	SD
Air Temp °C	27.2	9.4
Water Temp °C	27.4	9.6
Transparency (cm)	56	19.3
Total solids	753.3	398.3
Dissolved solids	526.7	337.2
Suspended solids	226.7	141.4
pH	7.8	2.6
Chlorides	0.1	0.1
Salinity	0.2	0.1
DO	6.1	2.3
Free CO_2	1.2	1.2
Pth. Alkalinity	1.5	2.9
Total alkalinity	141.9	62.2
CO_3	3	5.9
HCO_3	138.9	61.3
Total hardness	186.3	74
Ca hardness	128.3	57.8
Mg^{++}	14.1	9
Ca^{++}	51.4	23.2
Silicates	17.3	14.4
Phosphates (PO_4)	0.1	0.1
Nitrates (NO_3)	0.1	0.1

Table 2. Water quality of lake Masunda.
All values mg/L except pH

Zygnematales. Predominance of chlorophyceae has also been reported by Goel and Chavan (1991) and Choudhary *et al.* (2001). Maxima of

It was represented by 14 genera in lake Masunda, including *Pediastrum spp.,Scenedesmus spp., Crucigenia spp., Tetraedon spp., Chlorella spp., Carteria spp., Actinastrum spp. & Kirchinerilla spp.* (chlorococcales) *Volvox spp., Coelastrum spp.* (volvocales), *Ulothrix spp.* (Ulotrichales), *Closterium spp., Saurastrum Spp. and Cosmarium spp.* (Zygnematales-desmids). From among the total number of phytoplankton genera observed during the present study, maximum genera were from chlorophyceae. Lewis (1979) considered it logical, that a quantitatively dominating class should have more number of species, as the ecological differences are larger between, than within the classes. Thus chlorophyceae appears to be ecologically suitable for the environment of lake Masunda and hence it is quantitatively dominant with representation of maximum number of genera. Among 4 different orders of chlorophyceae, dominance of chlorococcales was the main feature. Palmer (1969) opined that continuous presence and dominance of chlorococcales is suggestive of eutrophic nature of the water body.

Pediastrum spp. was observed to be the consistent and dominant genera in chlorococcales contributing to the peak of chlorophyceae. It was also the phytoplankton

with highest average density contributing 53.78 % of total phytoplankton density.

Pediastrum spp. exhibited bimodal periodicity. Peak density was recorded in February 2000 (22,000 x 10^3 u/L) while another peak was observed in monsoon, July 1999 (16,000 x 10^3 u/L). In Mumbai area in the Thane region consistent appearance of *Pediastrum spp.* was characteristic of Varhala lake (Bhiwandi) (Dehadray, 1982), Aarey Pond (Bist, 1987) and Powai lake (Salaskar, 1996). *Scenedesmus spp.* with average density of 677.30 X 10^3 u/L, occupied 2nd rank in chlorophyceae population of Masunda, with 5.38 % contribution in total phytoplankton. Occurrence of *Pediastrum spp.* and *Scenedesmus spp.* in almost all the samples of lake Masunda was supported by earlier observations of Jain (1968) in the same lake. The exceedingly high values of *Scenedesmus spp.* in Masunda indicated presence of organic pollution, as *Scenedesmus* is pollution tolerant genera (Palmer, 1969).

During the study, 3 desmid varieties were recorded, *Closterium spp., Staurastrum spp.* and *Cosmarium.spp.* Among these *Cosmarium spp.* was the most dominant desmid and occupied 3rd position in order of abundance within chlorophyceae population of the lake. The peak density of Cosmarium Spp. (880 x 10^3 u/L) was observed in February 2000, coinciding with the peaks of other two dominant phytoplankton genera, *Pediastrum* and *Scenedesmus*.

Correlation with water parameters:

Chlorophyceae showed positive correlation with temperature. Philipose (1976) observed that chlorococcales can grow in wide range of temperature i.e. 19 to 37 ^{0}C. In the present investigation the abundance of chlorococcales was observed between the temperature range of 22 to 27.5 ^{0}C, while the density was comparatively lower at 30 ^{0}C and above. Thus, chlorococcales did not favour high temperature.

Among chlorococcales, *Pediastrum spp.* was the most dominating genera, which was also found to be abundant in temperature range of 22 to 27.5 ^{0}Cand thus favouring little low temperature.

Positive correlation was observed between chlorophyceae population and light penetration in Masunda lake with highest correlation value in case of *Pediastrum spp.* (r = 0.4250). Chlorophyceae showed moderately high correlation (r = 0.33) with pH. The chlorococale abundance coincided with lower pH range. Ashthekar and Kamat (1980) stated that chlorococcales generally grow luxuriantly in waters with low as well as high pH.

This supports the observations of pH influence on chlorophycean abundance of Masunda. Venkateshwaralu *et al* (1990) reported high DO content as one of the reasons for dominance of chlorophyceae. Chlorophyceac showed significant positive correlation with DO (r = 0.536) in Masunda the present study *Pediastrum* spp. and *Scenedesmus* spp. the dominant chlorococcales, showed higher positive correlation with DO. This study indicated, 6.45 to 7.05-mg/1 range of DO was favorable for abundance of *Pediastrum.* Chlorophyceae though showed positive correlation with phenolphthalein as well as total alkalinity, the correlation was much pronounced for total alkalinity. Among the chlorophycean members, the dominant genera and occasionally appearing genera exhibited different correlations. In Masunda, *Crucigenia spp., Carteria spp.* and *Actinastrum* spp. the occasional members showed significant positive correlation with phenolphthalein alkalinity, whereas the dominating genera like *Pediastrum spp.* and *Scenedesmus spp.* were highly correlated with total alkalinity. The dominant desmid, *Cosmarium* spp. from Masunda lake showed abundance in low as well as high alkalinity ranges.

Chlorophyceae though showed low positive correlation with calcium in Masunda (r = 0.4266), abundance of chlorococcales was observed at low calcium concentrations in water. *Pediastrum,* the most dominant genera of chlorococcales, showed weak positive

correlation with calcium. (r = 0.0796). Though chlorophyceae was dominant class it showed positive correlation with nitrates and weak negative correlation with silicates and phosphates.

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1. Name : Indian Association of Aquatic Biologists (IAAB) – Regional Chapter (RC) :

2. Mission: IAAB was conceived as a scientific NGO that will undertake activities in teaching, research and extension fields of Aquatic Biology in particular and Ecology and Environment in general. Keeping basic aims and objectives in mind different types innovative activities can be undertaken at Regional chapter.

3. Activities : (A) In accordance with aims and objectives of IAAB, (B) Region specific in accordance with aims & objectives of IAAB and (C) Collaboration with regional institutions

4. Institutional Mechanism : A regional chapter will have regional Advisory and executive committee on the line of IAAB, Hyderabad. Eminent persons from the region will be included in the advisory body. President IAAB (Hyderabad) will be one of the members. The executive body will have Regional President, Secretary, Jt. Secretary, Treasurer and Secretary IAAB (Hyderabad) as he ex-officio member.

5. Financial Mechanism : A joint account in the name of Regional President, Secretary and Treasurer of regional chapter to be operated by any two will be opened in a nationalized bank.

   A. The regional chapter will be authorized to sale publications of IAAB, Water analysis kit and Plankton nets and sale proceeds will be deposited in savings account of the regional chapter. The regional chapter can spend 25% of collected amount on its activities, while 75% shall be sent to the Secretary IAAB (Hyderabad) at the end of February every year.

   B. Donations / Endowments collected at regional level will be fixed deposited in the name of IAAB regional chapter's name and interest earned on such deposits can be used for regional activities.

   C. Constancy, advisory fees collected at regional chapter level will also be used for regional activities.

   D. The regional chapter can also raise money through innovative programs like ecological tours, educational activities, exchange programs etc. and finance so generated will be used for regional activities.

6. Responsibilities of the Secretary (Regional chapter) :

   A. Annual report of activities of the Regional Chapter shall be submitted by the end of March every year along with the audited statement of Income and Expenditure. The documents will be placed before the General Body of IAAB for information and the same will also be included in the annual newsletter - Hydrosphere - of the Association by the end of December.

7. Elections :

   Elections are an integral part of democratic functioning of any organization and Regional chapters shall also have elections with IAAB parental body. Next elections are due in 2002, during which the members of regional chapter will elect executive committee at head quarters as well as regional level. The executive body of the regional chapter will be ad-hoc up to 2002.

Editor adds : The Association has its regional chapters at Aurangabad (Central Chapter) and Visakhapatnam (Eastern Chapter). We are interested to start such chapters in Western (Coastal), North Western, Northern and North Eastern chapters in future. I would appeal to members to come forward with proposals to start Regional chapter of the Association. Further, suggestions to improve the above guidelines are always welcome.