

Diversity of Chlorophyceae related to physico-chemical parameters in Shetter lake of Navalgund, Dharwad District in Karnataka-India

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ABSTRACT

The present paper deals mainly with the study of Phytoplanktons belonging to the class Chlorophyceae in ShetterLake. Detailed Physico-chemical characteristics of this Lake were analyzed. The variable Temperature, pH, Turbidity, Alkalinity, Total hardness, Dissolved oxygen, Biological oxygen demand, Nitrates, Phosphates and Chemical oxygen demand were played an important role in the diversity of Chlorophyceae members. The values of Physico-chemical parameters which were found in the Lake always deviated from the drinking water quality standards. Therefore, it can be concluded that the water of the Lake is not fit for consumption according to drinking water quality standards (WHO, 1990).

Keywords: Chlorophyceae, Diversity, Physico-chemical parameters, Shetter Lake.

INTRODUCTION

Water has become synonym of life. Life arose in water and more than 90 per cent contents of each functional and dividing cell is water. Since the time immemorial man has been settling around rivers and lakes and in later period, migrating human populations have had dug water bodies to nurture all life forms (Guru and Goswami 2011). Most of the bio-chemical reactions that occur during metabolism and growth of living cells, involve water. The aquatic plants and animals bring about changes in the chemical composition of water. Phytoplanktons, which include blue - green algae, green algae, diatoms, desmids, euglenoids etc, are important among aquatic flora. They are ecologically significant as they form the basic link in the food chain of all aquatic floras (Ravikumar *et al.* 2006). Therefore, conservation of water bodies with basic biological output is the major challenge before biologists, environmentalists (Senapati *et al.* 2011; Hosmani 2012; Jaiswal 2013) and planners world over, more so in most Asian countries. In most townships in many Asian countries big lakes are one of the major sources of drinking water supply to millions of inhabitants of that area. Such a situation is most common in Indian subcontinent. The phytoplankton diversity in Shettar Lake of

Navalgund in Dharwad district has not been studied till now. Therefore in the present study phytoplankton diversity in relation to Physico-chemical parameters has been under taken (Kumawat and Jawale 2003; Panigrahi *et al.* 2005)

MATERIALS AND METHODS

Shetter Lake is a mid-sized lake lies in the Navalgund Taluka Dharwad district, Karnataka-India (Fig.1). Lake measures about 1.5 acres. The Lake is located 47 km away from Dharwad and 374 km from Bangalore. Geographically it is situated in between Latitude 15° 34' 0, 120" N Longitude 75° 22' 0, 120" E and altitude 1896 feet (578meters). Approximate population for 7 km radius from this point 37443. Winter temperature 20°C, summer temperature 39 °C.

The surface water samples were collected from the selected water body at an interval of one month, from May-2012 to April-2013. Polyethylene carbonyl cans of one liter were employed for this purpose. Winklerization was made in separate 300ml BOD Bottles for the estimation of dissolved oxygen. The Physico-chemical analysis of the water was carried out as per the standard methods of APHA (1995).

For Phytoplankton study

One liter of sample was separately collected and sedimentation was made in acid Lugol's solution. The supernatant was discarded. The phytoplankton sediment was concentrated to 30ml

by centrifugation. Diversity of Phytoplanktons was studied by Lackey's drop method (1938) and microphotographs were taken by using high resolution microscope (Plate.1)



Image Showing Shetter Lake

Figure: 1. Showing the Location of Shetter Lake in Navalgund Taluka of Dharwad District in Karnataka-India

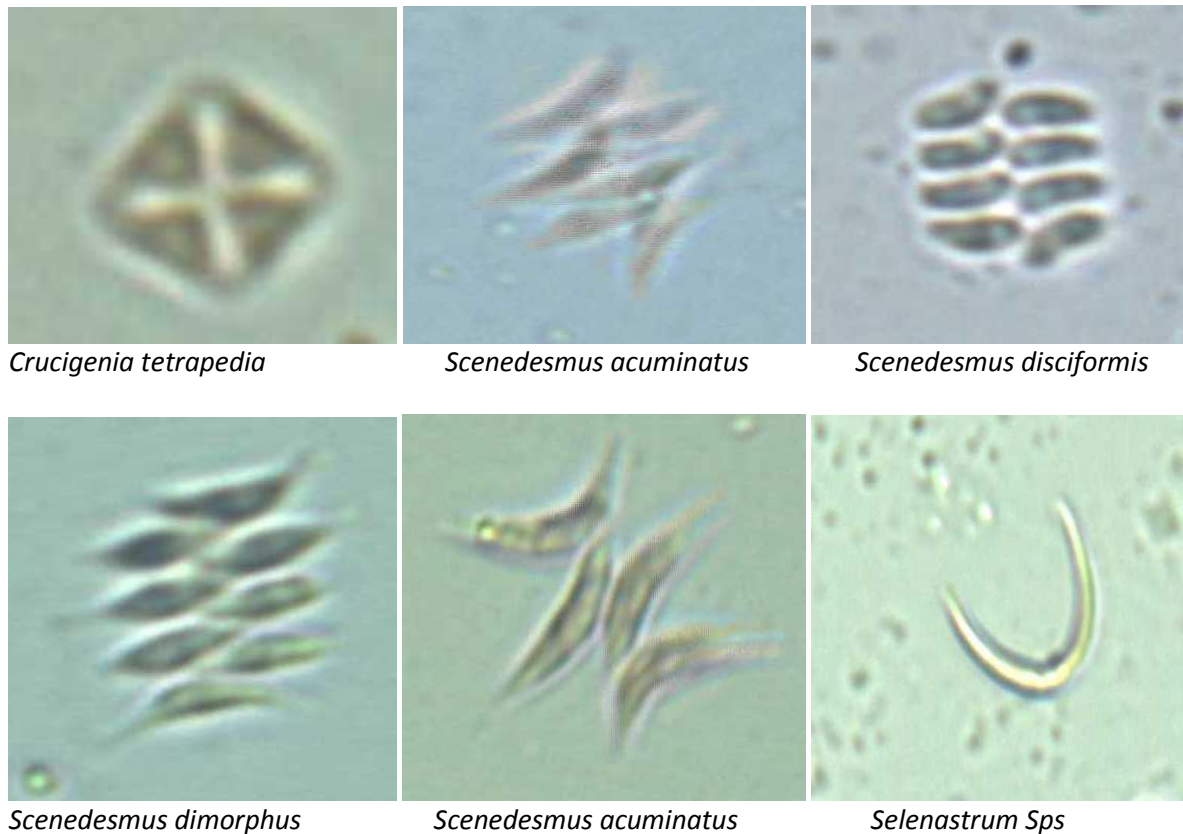


Plate 1: Showing some Important Chlorophyceae members of Shetter Lake in Navalgund, Dharwad district, Karnataka- India

RESULTS AND DISCUSSION

The variations in Physico-chemical parameters of Shetter Lake are presented in Table 1. pH is an important quality parameter which influences the survival and nourishment of biological life. Comparatively maximum pH, DO and

COD values were observed in the month of June and pH, turbidity and BOD values were found low in the month of December in Shetter Lake. Turbidity was high and DO was low in the month of September.

Table 1: Analysis of Physico-chemical parameters in Shetter Lake, Navalgund, Dharwad district, Karnataka-India (May-2012 to April-2013)

PARAMETERS	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC	JAN	FEB	MAR	APR
pH	8.1	8.7	8.3	8.1	7.8	7.7	7.9	7.5	7.9	8.6	8.5	8.4
Temperature °C	29°C	28°C	27°C	31°C	32°C	25°C	22°C	21°C	17°C	21°C	24°C	26°C
EC µs/cm	490	550	540	810	920	990	840	910	1190	1040	2100	2250
Alkalinity mg/L	4.64	5.92	8.8	12	11.6	12.4	13.6	15.08	19.6	15.6	8.0	3.72
Turbidity NTU	176	47	62	170	640	52	4.8	2.0	80	12	16	20
TDS mg/L	254	285	280	426	488	528	443	483	641	556	1159	146
Calcium mg/L	36	45.2	92	180	120	160	146	240	160	120	95	68
Magnesium mg/L	14.72	13.3	11.6	77.76	59.77	129.3	76.3	79.22	102.1	25	13.9	17.5
Total Hardness mg/L	96.6	100	140	320	366	692	460	566	580	226	152	148
Potassium mg/L	2.1	3.3	2.8	4.0	5.2	6.8	4.8	4.0	2.5	2.0	3.6	5.2
Sodium mg/L	70	131	97	176	155.5	161	120	110	38	28	35	42
Total Phosphates mg/L	10	7.1	7.1	4.3	4.3	5.4	5.0	2.7	3.2	2.1	2.7	3.4
Chloride mg/L	195	305	460	780	560	808	570	760	590	290	190	125
Sulphate mg/L	23	22	43	32	34.8	45	119	82	56	44	97	150
Nitrates mg/L	3.0	2.7	5.1	1.8	0.9	5.1	2.6	2.1	2.5	0.9	1.5	2.1
Dissolved Oxygen mg/L	7.0	8.4	6.5	6.5	0.3	5.2	7.0	3.6	3.7	6.7	6.0	5.0
Chemical oxygen demand mg/L	16	121	76.8	80	92.8	64	60	72	80	78	60	43.1
Biological oxygen demand mg/L	7.0	4.7	6.5	6.5	0.3	3.1	6.7	0.0	3.0	2.3	1.8	0.16

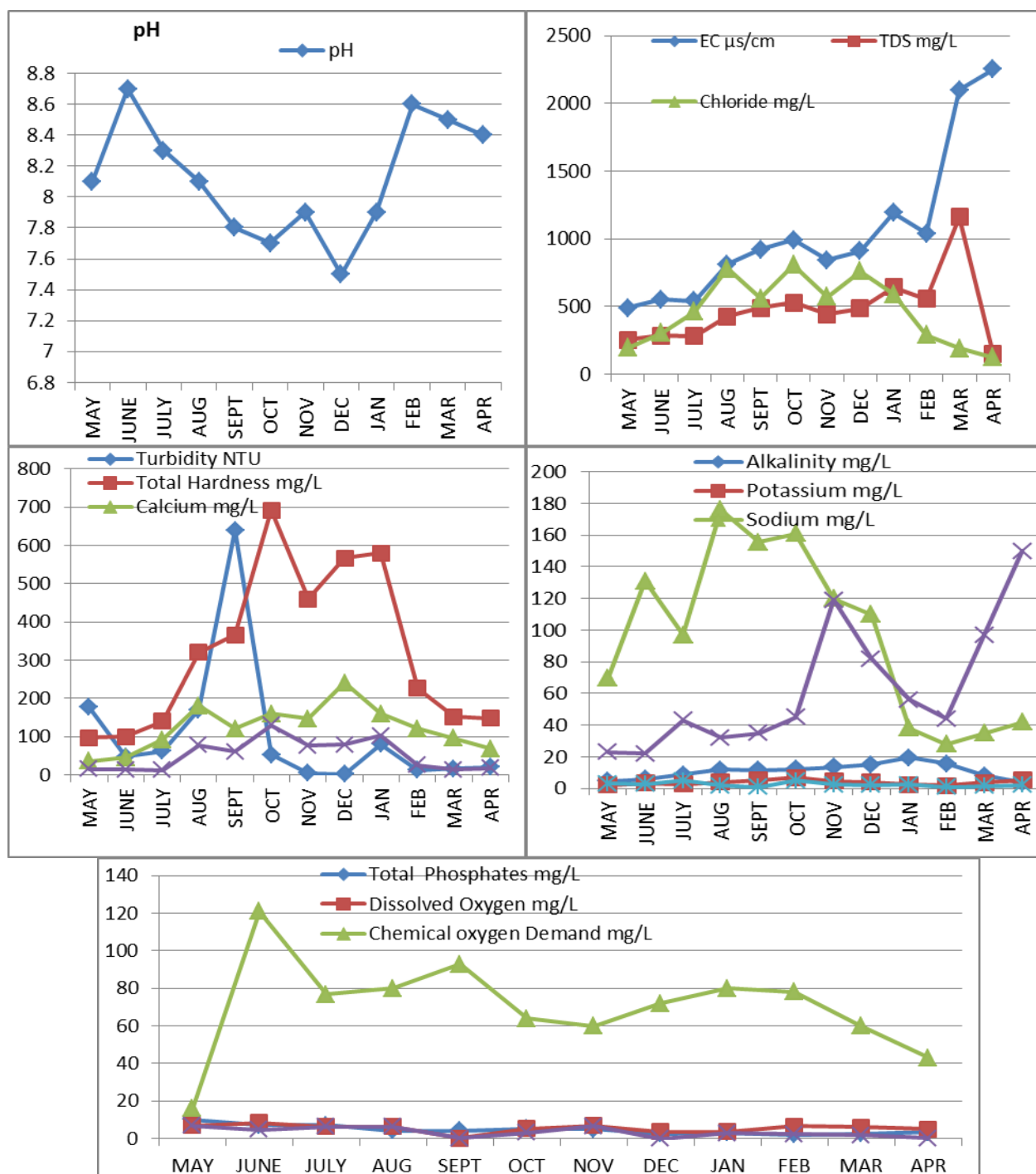
Table 2: Showing the distribution of some important Chlorophyceae members in Shetter Lake, Navalgund in Dharwad district, Karnataka-India

Sr.No	Species
	Chlorophyceae
1	<i>Scenedesmus ecornis</i> (Ehrenberg) Chodat C
2	<i>Scenedesmus arcuatus</i> (Lemmermann) Lemmermann
3	<i>Scenedesmus disciformis</i> (Chodat) Fott & Komarek S
4	<i>Scenedesmus dimorphous</i> (Turpin) Kuetzing S
5	<i>Scenedesmus acuminatus</i> (Lagerheim) Chodat
6	<i>Scenedesmus ellipsoideus</i> Chodat P
7	<i>Selenastrum</i> Sps
8	<i>Crucigenia tetrapedia</i> (KIRCHN.)W.ET G.S.WEST

The water was comparatively warmer in the May and April months as because of the less rain fall and hot sunny days .The temperature fluctuated much during the study period. Electric Conductivity (EC) was varied from the minimum 285µs/cm to

maximum of 2100µs/cm in Shetter Lake. EC and Sulphate values were found high in the month of April and these values were found low in the month of May and June respectively.

Figure 2: Showing the monthly changes in Physico-chemical parameters of Shetter Lake



High concentration of chloride in the water gives an undesirable taste to water. This higher concentration of chloride reduced the algal population in the present work. Chloride was found high in the month of November. TDS, Alkalinity and Chloride were found comparatively low in the month of April. Calcium was found high in the month of December. Total hardness, Potassium and Magnesium were found high in the month of

October. But Total hardness, Calcium and COD were found minimum in the month of May. In fact in the present study, variable temperature, pH, alkalinity and nutrient content in Shetter Lake played a vital role in the distribution of Phytoplanktons in different seasons. It has been well documented that the variation in water temperature can be correlated with seasonal variation.

High values of total Alkalinity may be attributed to the increase in organic decomposition during which carbon dioxide is liberated. This reacts to form bicarbonate thereby increasing total alkalinity in summer (Mahadev and Hosamani 2010). Total alkalinity is due to salts of weak acids and bicarbonates. The highly alkaline water is not potable. In the present study alkalinity was increased in the month of January. The Total dissolved solids indicate the general nature of water quality (Venkataramaiah 2011). Total dissolved solids (TDS) were found high in value in the month of March during the study. They reduced the algal population. Chloride concentration is the most useful parameter for evaluating the atmospheric input to sub-surface water (Shiva Kumar 2009).

Chemical oxygen demand is the amount of oxygen required for oxidation of organic constituents with strong oxidizing agent (acidified potassium dichromate). Thus it is used as measure of organic equivalent of the organic matter present in the sample. It showed the organic load pollution in the Lake. The values obtained in the present study were not acceptable according to drinking water quality standards (WHO, 1990). Sodium, Potassium, Nitrates and Total phosphates were found low in the month of February. Magnesium was found low in the month of July. Sodium was found maximum in the month of August. Nitrates were found high in the month of October and July. Total phosphates and BOD values were found high in the month of May. Similar findings were reported by Pulle and Khan 2003; Kumar and Hosmani 2006; Mahadev *et al.* 2010. Dissolved Oxygen content and BOD in Shetter Lake fluctuated less during the few months of present study and have less effect in changing the phytoplankton habitat.

Sreenivasan *et al.* (1966) have observed that the peaks of phytoplankton occurred at different period in different years. Therefore only temperature was not responsible for the fluctuation in numbers but high pH, alkalinity, carbon dioxide and nutrients are also responsible

for their organic production. Margalef (1964, 1968) suggested that phytoplankton population is rich in fertile water. Phosphorus is another factor that deviated considerably in the Lake waters. Chrost (1991) and Olson (1991) are of the opinion that phosphates are common inside cells but can be excreted outside the cell or be associated with the exterior cell surface. Phosphatase enzymes cleave dissolved organic phosphorous to liberate phosphate. Excretion of extracellular phosphates increases when phosphorous becomes scarce. The ubiquitous nature of these compounds in lakes leads to rapid turnover of many organic phosphorus compounds leading to high amounts of phosphorus in Lake (Ashtekar 1980; Tarar and Bodkhe 1998; Rath and Adhikary 2005).

Dissolved oxygen, Phosphate, Nitrate and pH are the most significant parameters operating in this water body. High alkaline nature of water decreased the number of Chlorophyceae members during June, February and March. The seasonal variation in total Phytoplankton number was due to various factors such as temperature, intensity of light, bicarbonates, nitrates, phosphates and organic matter. In the present study, Chlorophyceae members were found dominant over the other members during the whole year (Table.2). Calcium deficiency may be an important factor, which influenced the abundance of Chlorophyceae members. The values of Physico-chemical parameters which were found in the Lake always deviated from the drinking water quality standards. Therefore it can be revealed that the water of the Lake is not fit for consumption according to drinking water quality standards (WHO, 1990).

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