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Limnology, Planktonic diversity and Ichthyofauna of Sant-Sarover Pond: Mount Abu (Rajasthan), India

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ABSTRACT

Limnological parameter promotes ecological diversity and acts as a major key factor of the water body. The portability of water can be determined by planktonic and fish diversity in that water body. Mount Abu (Arbudanchal) is also referred as a place with abode of Gods as it is sated with devotion of all faith. The research site, Sant-Sarover Pond has a mythological importance among the localised. In the weather cycle of monsoon (2018), the specific status of limnological characteristic, planktonic diversity and ichthyofauna of Sant-Sarover Pond have been studied through top and bottom water samples. The Limnological parameters of Sant-Sarover Pond showed low mean values including hardness (104.83 mg/L) and TDS (142.0 mg/L) with optimum alkaline water (pH 7.12), and alkalinity of (98.50 mg/L) Secchi Depth of 80 cm. The average nitrate and sulphate levels were 28.57 mg/L and 122.28 mg/L, while average dissolved oxygen levels were at 5.45 mg/L, respectively. Based on the results of limnological parameters of water, Sant-Sarover Pond is eutrophic.

Keywords: Limnology, Biodiversity, Lentic, Planktonic, Sant-Sarover, ichthyofauna, Eutrophic

1. INTRODUCTION

Water is an important asset to basic requirement of mankind, also a valued natural resource. Biological production of a water body is always dependent on its physiochemical status. The conservation of the habitat is maintained by the physico-chemical parameters of water with the optimum requirement which ensures water quality of the water body. The variations in physico-chemical parameters, like temperature, dissolved oxygen, COD, BOD,

nitrate, phosphate, TDS, turbidity, etc. of water with different seasons provides a description of countable data of quality impacts of water on ecological biodiversity.

Sharma *et al.* (2011) studied the Limnological Characteristic, Planktonic Diversity and Fishes (Species) in Lake Pichhola, Udaipur, Rajasthan (India). They studied through seasonal surveys in two annual cycles (2005-2006 and 2006-2007) and the result stated that the water remained moderately alkaline (pH 7.5) while electrical conductance (0.3958 mS/cm), TDS (237.5 mg/L), chloride (176 mg/L), hardness (174.33 mg/L), and alkalinity (207.16 mg/L) showed low mean values. Average dissolved oxygen levels were at 5.75 mg/L, while average nitrate and phosphate levels were 3.70 mg/L and 2.79 mg/L, respectively. They also observed a high rate of primary production (302.085 mgc/m/h).

The Pond Ecosystem is comprised of phytoplanktons, zooplanktons, as well as secondary and tertiary consumers, however, the tropic structure of a pond is proportional to its primary productivity. Hence, the present investigation attempted to study of Limnological parameter their relationship, phytoplankton, zooplankton status in Sant-Sarover Pond, Mount-Abu during the period, may help in optimum utilization and conservation of Pond ecosystem.

2. MATERIALS AND METHODS

2. 1. Study area

Sant-Sarover Pond (**Figs. 1, 2**) was chosen for Limnological study. It is located at Delwara “Mount Abu” (Latitude 24.36°N, Longitude 72.43°E) and filled annually by rain water: the extent of pond is 490 meters (approx.) with a depth of 18-22 feet, it is also an important asset to complete the need of water for endemic species in that habitat.



Fig. 1. GIS view of Sant-Sarover Pond.



Fig. 2. Physical view of Sant-Sarover Pond

2. 2. Sampling procedure and laboratory analysis

Water samples were collected from central region during the peak of season of the weather cycle. Water samples were collected in clean and rinsed polyethylene sampling bottles from surface and bottom area of the respective site, and were brought to the research laboratory for limnological analysis.

The important physico-chemical parameters of water, including temperature, water temperature, transparency, color-hazen, turbidity (NTU), pH value, sechhi depth, Total alkalinity (mg/L), Total Hardness (CaCO₃, mg/L), Iron (Fe, mg/L), Chloride (Cl, mg/L), Fluoride (F, mg/L), Total Dissolved Solids mg/L, Calcium (Ca, mg/L), Magnesium (Mg, mg/L), Sulphate (SO₄²⁻ mg/L) Nitrate (NO₃⁻ mg/L), Nitrate-N, Total Alkalinity mg/L, Chemical Oxygen Demand (COD), Biological Oxygen Demand (BOD), were analyzed by the methods, as per IS:3025 and APHA 22nd Edt.

3. RESULT AND DISCUSSION

3. 1. Physico-chemical Analysis

Table 1. Limnological Study of water samples: Sant-Sarover Pond.

S. No	Parameters	Top Water	Bottom Water	Average
1	pH value	7.18	7.06	7.12
2	Water Temperature	31	24.6	27.8
3	Colour, Hazen	0.53	0.64	0.59
4	Turbidity, NTU	0.73	0.82	0.78
5	Dissolved Oxygen	5.1	5.8	5.45

6	Chemical Oxygen Demand (100 mg/L)	7.28	12.8	10.04
7	Biological Oxygen Demand (100 mg/L)	21.83	43.6	32.72
8	Total Alkalinity (mg/L)	92	105	98.5
9	Total Hardness (CaCO ₃) (mg/L)	103.65	106	104.83
10	Total Dissolved Solids (mg/L)	144	140	142
11	Iron (Fe) (mg/L)	0.023	0.021	0.02
12	Fluoride (F) (mg/L)	0.22	0.28	0.25
13	Chloride (Cl) (mg/L)	99.38	108.65	104.02
14	Calcium (Ca) (mg/L)	51.69	48.6	50.15
15	Magnesium (Mg) (mg/L)	17.35	19.8	18.58
16	Sulphate (SO ₄) (mg/L)	121.79	122.77	122.28
17	Nitrate (NO ₃) (mg/L)	29.56	27.57	28.57

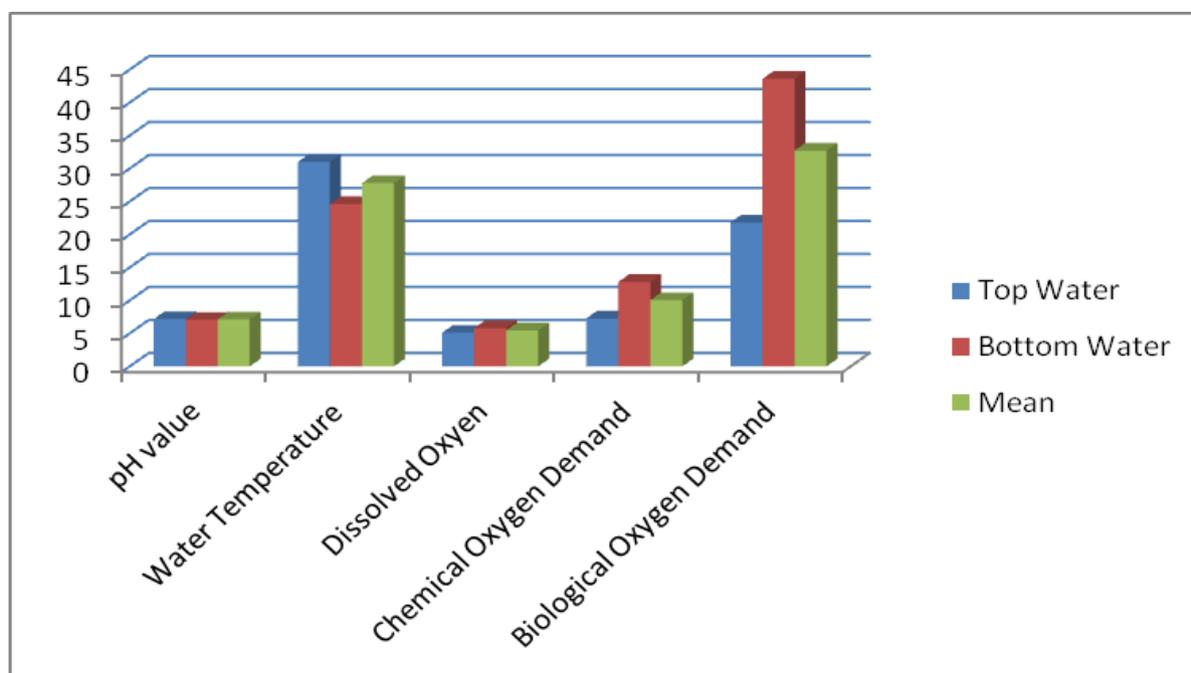


Fig. 3. Graphical Analysis of Limnological parameters: Sant-Sarover Pond.

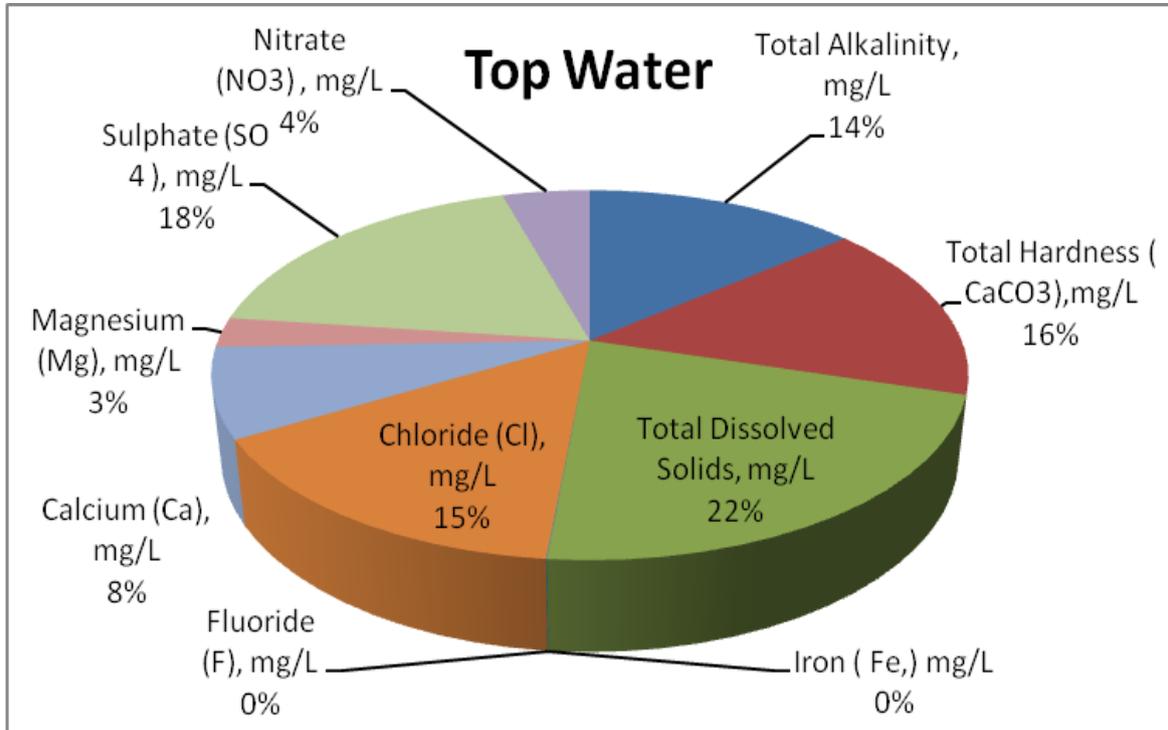


Fig. 4. Pie-Chart Limnological Analysis of Top water: Sant-Sarover Pond.

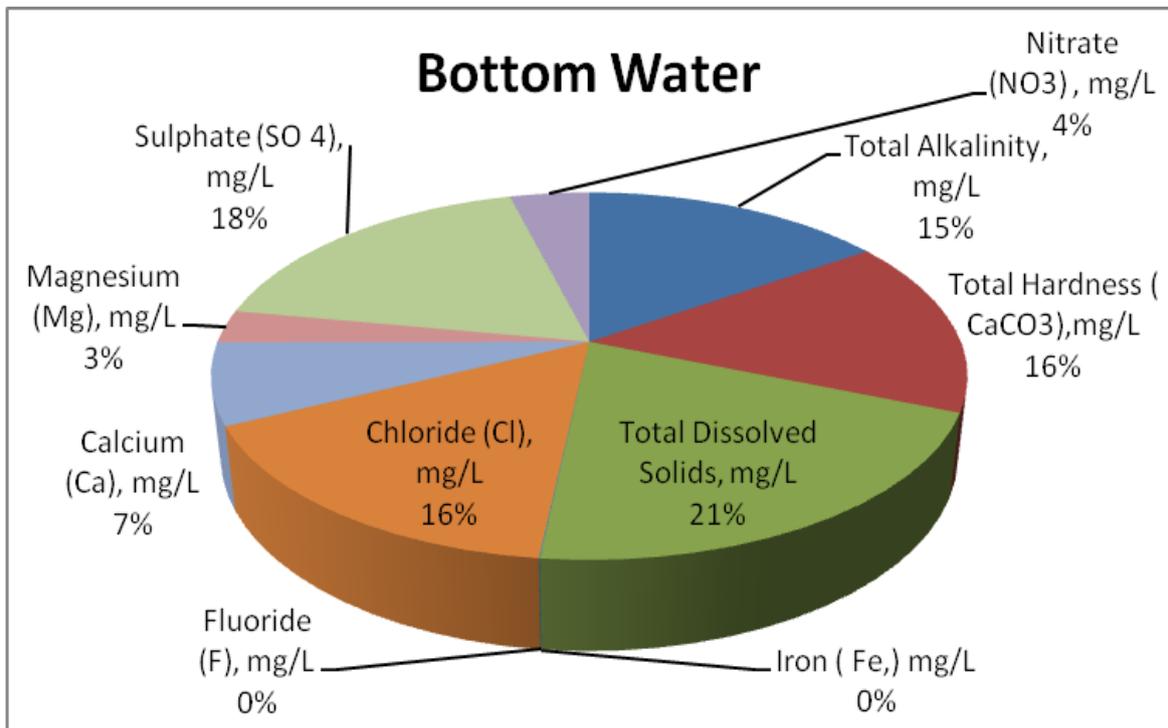


Fig. 5. Pie-Chart Limnological Analysis of Bottom water: Sant-Sarover Pond.

The range of variation and the comparative analysis are given in **Table 1**. The result shows the average pH of water was 7.12, whereas the colour (Hazen) of top water sample varies over top and bottom water samples, with 0.53 at top water, and 0.64 at bottom water. Similarly the turbidity of both, top and bottom water sample shows fluctuation of 0.73 and 0.82 over top and bottom water samples. pH varies between 7.06 to 7.18, as there is not any agriculture area nearby, no pesticide residue was found in water samples.

According to the study, (**Figs. 3 through 5**) Sant-Sarover Pond is characterised by average to low level of total dissolved solids (TDS) 142 mg/L. Similarly, the level of total dissolved solids at bottom surface water was quite low, that was 140 mg/L at deep water compared to top water of 144 mg/L. During the study of total alkalinity, the highest value was 105 mg/L at bottom surface water, whereas 92.0 mg/L in top surface water. Total alkalinity shows a positive relationship with temperature, pH, hardness, TDS, conductivity, chloride, nitrate, phosphate, and silicate.

The average value of total hardness during the study was 103.65 mg/L with upper surface water, and 106.0 mg/L with lower surface water. This increase in total hardness during the period is, may be, due to a high rate of transport of minerals through the rain water. In monsoon season, the highest value of biological oxygen demand (BOD) was observed 43.86 (100 mg/L) in deep water sample. In the present study, the value of fluoride shows similarities by an average value of 0.25 mg/L at both top and deep water surface. The result shows that the average value of chloride, fluoride, sulphate, and nitrate for the top level water sample is lower than the value from bottom level water sample.

Limnological study by Nandan and Aher (2005) at Haranbaree dam (Maharashtra), showed the recorded pollution among various groups using algal communities, such as Navicula, Oscillatoria, and Euglena. Veeresh Kumar and Hosmani (2006) studied the diversity index of algae in fresh water; their observations suggest that the parameters, such as high temperature, pH, and bicarbonates tend oligotrophic lakes to become eutrophic. Ranjan *et al.* (2007) studied seasonal variations in physico-chemical characteristics of Ghariyarwara pond (Nepal) and demonstrated that the variation in physico-chemical characters shows dominance of Chlorophyceae throughout the year. Yogendra and Puttaiah (2007) dealt with the decreases in demand of BOD and COD with increased nitrogen due to nitrification, due to discharge of sewage into the lake, the chloride and sulphate level increase in water. Hence, dissolved oxygen levels in water constantly changed.

Sharma *et al.* (2011) studied the Limnological Characteristic in Lake Pichhola, Udaipur, Rajasthan (India). They studied through seasonal surveys in two annual cycles (2005-2006 and 2006-2007) and the results stated that the water remained moderately alkaline (pH 7.5), while electrical conductance (0.3958 mS/cm), TDS (237.5 mg/L), chloride (176 mg/L), hardness (174.33 mg/L) and alkalinity (207.16 mg/L) showed low mean values. Average dissolved oxygen levels were at 5.75 mg/L, while average nitrate and phosphate levels were 3.70 mg/L and 2.79 mg/L, respectively. Balai *et al.* (2016) studied limnological characteristics of Jaisamand Lake (Rajasthan), India, and report its suitability for aquaculture with the presence of essential nutrients in adequate amount needed for primary producers.

3. 2. Plankton Analysis

For Plankton study, samples were collected from surface water near bank or shore region and bottom mud. For qualitative analysis, the plankton samples were collected by a standard plankton net through pull and drag with uniform speed.

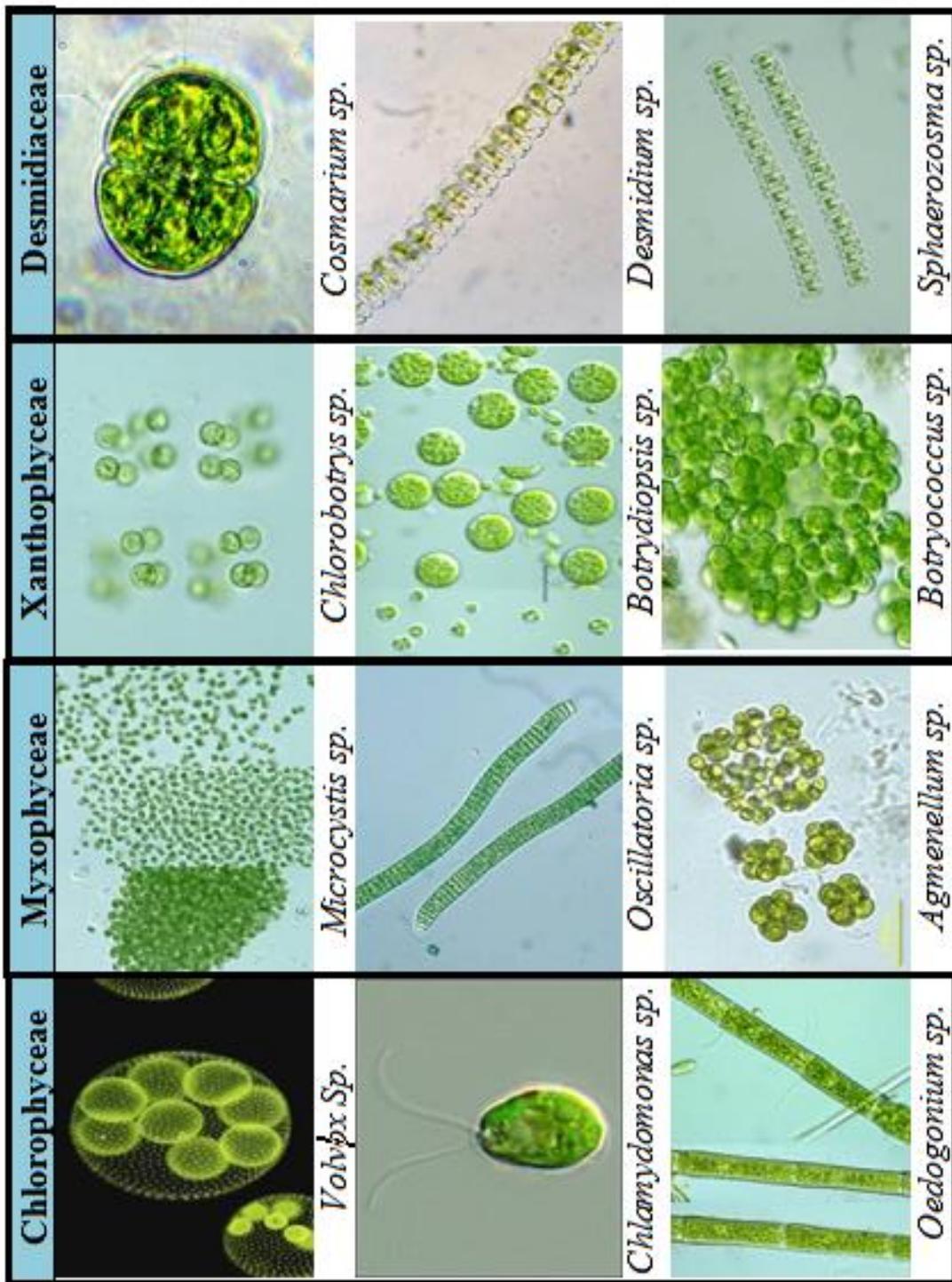


Fig. 6. Phytoplanktons observed during Monsoon 2018

The collected sample was fixed in 70% ethyl alcohol. As shown in **Fig. 7**, about four types of different species of Phytoplanktons were observed in respective site of Sant-Sarover Pond (**Fig. 6**).

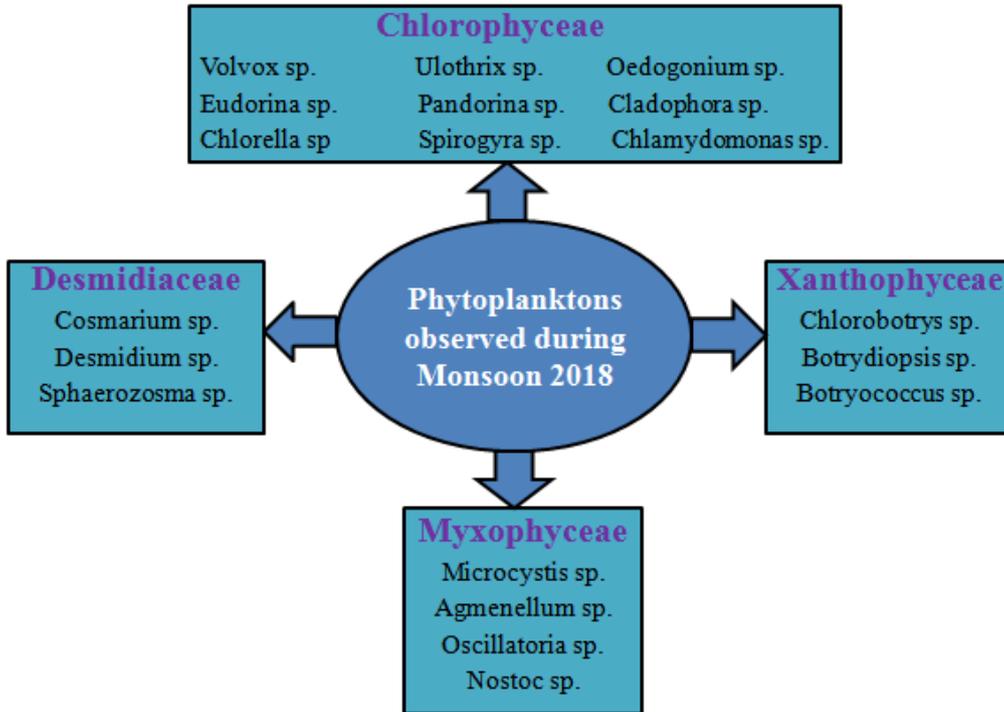


Fig. 7. List of Phytoplanktons observed during Monsoon season 2018.

3. 3. Fish Diversity Analysis



Fig. 8. Fish Diversity in Sant-Sarover Pond

For the study of ichthyofauna, fishes were identified with the help of pond care-taker contractor. Most Common Fishes (**Fig. 8**) in Sant-Sarover Pond are:

Carassius auratus auratus

- (1) Labeo rohita
- (2) Catla catla
- (3) Heteropneustes fossilis
- (4) Labeo gonius
- (5) Puntius sarana sarana
- (6) Aorichthys seenghala
- (7) Gambusia affinis.

4. CONCLUSION

The ecosystem of any place depends on location, fauna and flora there. Biodiversity also play an important role in human welfare, such as food for good health security, social relationship, life and freedom for choice, etc. The present study is relevant to the limnological study, biodiversity of plankton, and fishes (species) in Sant-Sarover Pond. This study explains that Sant-Sarover Pond is in rich biodiversity of plankton, fishes, and need to be conserved in the future.

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