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Original Research Paper

Study of Algae from Freshwater Reservoirs of Warangal (A.P), India

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ABSTRACT

A total of 105 algal members were reported from two freshwater reservoirs of Warangal (A.P.) including phytoplanktonic and euplanktonic algae belonging to 71 genera, in which 21 Cyanophyceae, 28 Chlorophyceae, 18 Bacillariophyceae and 4 Euglenophyceae genera were identified. Waddepally reservoir was observed with 67 species followed by Bhadrakali reservoir with 83 species of algae under investigation. This is a first report of freshwater algae from Warangal, as the previous reports were related to only Cyanophyceae from paddy fields and wet soil samples.

INTRODUCTION

Freshwater is an essential resource for life, and is a habitat for much of the Earth's biodiversity. It also influences Earth's climate (Naiman et al. 1995, Palmer et al. 1997). The major habitats of freshwater include the lotic bodies (rivers and streams), lentic bodies (ponds and lakes), groundwater zones, and of ecotonal water bodies where two aquatic habitats meet (e.g., hyporheic zones, wetlands, marshes, estuaries) (Palmer et al. 1997). The aquatic environment supporting hydrophytic vegetation is endowed with luxuriant growth of algae. Considerable work has been done in India about systematic survey, distribution, periodicity and ecology of algae in different habitats (Panday 1973, Kumar et al. 1974, Prasad & Saxena 1980). Studies on the phytoplankton diversity of Indian ponds in relation to their environmental condition have been made by Das & Srivastava (1956), Zafar (1964), Munawar (1970), and Jafari & Gunale (2006). An attempt has been made in the present study to survey the algal flora of Bhadrakali and Waddepally reservoirs, which were constructed during the period of 12 Century by Kakatiya king, and both the reservoirs under study are useful for drinking purpose and also as tourist places. The present investigation on algae was carried out in these two reservoirs during the period between September 2007 and August 2009.

MATERIALS AND METHODS

Warangal lies between the latitude of 17°19' and 18°36' north and longitudes of 78°48' and 80°43' east. The area around the city is studied with scattered hills, rain bed tanks and small ponds. The soil of the city comprises of sandy loams with patches of shallow black cotton soils and at places medium and deep cotton soil. As the city is located at considerable distance from the sea coast, its climate generally tends to the dry and without much fluctuations in temperature. It gets quite warm during the summer (March, April, and May) and continues to be so in the rest of the year except during December and January when the temperature drops considerably during night time. The mean daily maximum and minimum temperatures have been recorded as 43°C and 14.2°C, respectively. The rainfall is moderate, which starts in the month of June and ends in September with south- west monsoon.

The phytoplanktonic forms were collected by plankton net No. 20 silk bolting cloth. Samples for quantitative and qualitative analysis of phytoplankton were collected in 1-litre capacity. Pyrex glass bottles with 1mL Lugol's solution were kept prior to the filling of the bottle by reservoir water from below the surface. For sedimentation of plankton material the bottle was kept undisturbed in the dark for 48 hrs at room temperature. After that the overlying water from the bottle was decanted and the final volume was adjusted between 10 and 15mL. The latter method was usually used to compare whether there was any demerit of using the other method. No significant difference was observed. After collection, the phytoplankton material was transferred to glass bottles, and preserved permanently in Transeau's solution. The composition of the preservative is as follows:

Distilled water	60 mL or 6 parts
Absolute alcohol	30 mL or 3 parts
Formaldehyde	10 mL or 1 part

To each l00 mL of the above solution 5mL of glycerin was added to prevent the materials from becoming brittle (Transeau 1951).

Mounting fluid: Ten percent glycerin solution in distilled

water was used as mounting fluid for the preparation of temporary and semi permanent slides for microscopic study. cotton blue and lacto phenol were used with mounting fluid as stains, which facilitated a clean view of the materials under the microscope. The quantitative enumerations of the phytoplankton were carried out with the help of a Sedgwick Rafter counting cell and by drop method.

The counting cell was filled with water to test for any leakage and it was emptied and dried properly. The vials containing the concentrate were shaken properly and 1mL of concentrated sample taken in to the Sedgwick Rafter counting cell. The organisms thus counted, were expressed as units/litre (units/L) of the sample. Seasonal variation and abundance of the dominant algal genera and the groups of phytoplankton were noted.

The abundance of phytoplankton groups was calculated according to the following formula (Welch 1948).

$$N = \frac{(AX\ l00)C}{L}$$

Where, N = Number of phytoplanktons per liter of original water, A = Average number of phytoplankton in all counts in the counting cells, C = Volume of original concentrate in ml, L = Volume of water passed through the net.

Phytoplanktons were identified by using standard key books (Patrick & Reimer 1966, Suxena & Venkateshwarlu 1968, Philipose 1967, Desikachary 1959 and Prescott 1951).

RESULTS AND DISCUSSION

A total of 105 forms of euplanktonic and phytoplanktonic algae belonging to 71 genera were recorded from the sampling reservoirs during the period of study. Communities of phytoplankton were constituted of 4 classes. Out of the total taxa encountered 21 belonged to Bacillariophyceae, 45 to Chlorophyceae, 31 to Cyanophyceae and 8 to Euglenophyceae (Table 1). Phytoplankton community of Waddepally reservoir was constituted of 11 belonging to Bacillariophyceae, 24 to Chlorophyceae, 14 to Cyanophyceae and 4 to Euglenophyceae. Highest number of individual was represented by Bacillariophyceae (1209700), followed by Chlorophyceae (1191086), Cyanophyceae (496348) and Euglenophyceae (48605). A total of 67 forms of phytoplanktons were recorded from Waddepally reservoir during the study period. The phytoplankton community in Bhadrakali reservoir had 15 belonging to Bacillariophyceae, 24 to Chlorophyceae, 18 to Cyanophyceae and 3 to Euglenophyceae. Highest number of individuals were represented by Cyanophyceae (638153), followed by Bacillariophyceae (601761), Chlorophyceae (339879) and Euglenophyceae (67997). A total of 83 forms of phytoplanktons were recorded from the reservoir (Tables 2, 3, 4, 5).

The phytoplankton abundance monthly variations were studied and recorded in Figs. 1, 2, 3 and 4. Interestingly, algal species do not follow any predictable trend for their variations in the two reservoirs. Counting of algal periodicity of both planktonic and benthic algae of the four groups (Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae) has been done with the help of Sedgwick-Rafter cell for the two reservoirs from September 2007 to August 2009.

Fig. 1 shows the seasonal abundance of various algal populations during the period of 2007-2008 of Waddepally reservoir. The Bacillariophyceae population ranged from 118-450 × 10^3 cells/L. They were maximum in April (450 × 10^3cells/L) and minimum in October (118 × 10^3cells/L). The Chlorophyceae population ranged from 88-300 × 10^3cells/L. It was maximum in September (300 × 10^3cells/L) and minimum in April (88 × 10^3cells/L). The Cyanophyceae members ranged from 89-260 × 10^3cells/L. They were maximum in monsoon (September) (260 × 10^3cells/L) and minimum in March (89 × 10^3cells/L). The Euglenophyceae population ranged from 22-94 × 10^3cells/L. They were found maximum in November 94 × 10^3cells/L, and minimum in the month of March, 22 × 10^3cells/L.

Fig. 2 indicates the seasonal abundance variations of various algal populations during the period of 2008-2009 of Waddepally reservoir. The Bacillariophyceae populations ranged from 180-360 × 10^3 cells/L. The minimum population was found in July 180 × 10^3cells/L, and maximum in April 360 × 10^3cells/L. The Chlorophyceae members ranged from 84-330 × 10^3cells/L. The maximum population was observed in November 330 × 10^3cells/L, and the minimum in the month of May 84 × 10^3cells/L. The Cyanophyceae population ranged from 54-208 × 10^3cells/L. The maximum members were found in the month of December 208 × 10^3cells/L, and the minimum in the month of May 54 × 10^3cells/L. The Euglenophyceae populations varied from 14-68 × 10^3cells/L. The maximum population was recorded in the month of November 68 × 10^3cells/L and least in the month of March 14 × 10^3cells/L.

Fig. 3 shows the seasonal abundance of various algal groups during the year 2007-2008 from Bhadrakali reservoir. The Bacillariophyceae members ranged from 154-340 × 10^3cells/L. The minimum population was found in October (154 × 10^3cells/L), and maximum in April (340 × 10^3 cells/L). The Chlorophyceae population ranged from 33-236 × 10^3cells/L. The maximum population was observed in October (236 × 10^3cells/L), and minimum in June (33 × 10^3cells/L). The Cyanophyceae members ranged from 198-

458 × 10^3cells/L. The maximum was observed in April (458 × 10^3cells/L) and the minimum in the month of September (198 × 10^3cells/L). The Euglenophyceae ranged from 12-94 × 10^3cells/L. It was maximum in November (94 × 10^3cells/L), and minimum in April (12 × 10^3cells/L). However, the Euglenophyceae members were not observed in the months of May and June.

Fig. 4 shows the seasonal variation of the phytoplanktons during the period of 2008-2009 of Bhadrakali reservoir. The Bacillariophyceae members ranged from 161-328 × 10^3 cells/L. The minimum numbers of diatoms were found in the month of September (161 × 10^3cells/L), and maximum in May (328 × 10^3cells/L). The Chlorophyceae population ranged from 66-290 × 10^3cells/L. It was found maximum in August (290 × 10^3cells/L), and minimum in the month of May (66 × 10^3cells/L). The Cyanophyceae population ranged from 207-468 × 10^3cells/L under the investigation. The largest count of cells was found in the month of March (468 × 10^3cells/L) and least in July (207 × 10^3cells/L). The members of Euglenophyceae ranged from 8-49 × 10^3cells/L. The minimum count of cells was observed in May (8 × 10^3cells/L) and maximum in January (49 × 10^3cells/L). However, in the month of June the Euglenophyceae members were not found. The total percentage of phytoplankton (PP) community of the reservoirs has also been shown in pie diagrams (Figs. 5 & 6). It shows that total percentage of phytoplanktons was 86.85% and others are 13.15% in Waddepally reservoir, and at Bhadrakali reservoir the total phytoplankton was 90.75% with 9.25% as others.

Bacillariophyceae: Among the recorded genera of diatoms only a few (*Actinastrum* sp., *Amphora* sp., *Diatoma* sp., *Gomphonema* sp., *Navicula exigna, Nitzchia* sp., *Pinnularia* sp., *Tabellaria* sp.) were found to be well adapted to the concerned habitats, while others showed irregular mode of appearance. Throughout the period of study, Waddepally reservoir showed the highest abundance of diatoms (1209700 cells/L) followed by Bhadrakali reservoir (601761 cells/L). *Amphipleura pellucida, Cymbella sturbergii, C. hustedii, Diopleneis* sp., *Fragilaria* sp., *Fragilaria crotononensis, Frustulia* sp., *Mastoglosia* sp., *Navicula cryptocephala* and *Synedra* sp. were only reported from Bhadrakali reservoir, while *Bacillaria paradoxa, Cocconeis* sp. and *Gyrosigma* sp. were found only in Waddepally reservoir. Large peaks of diatom population were usually reported in summer months (Figs.1 & 2) but smaller peaks were also observed in monsoon and winter months. Among the recorded genus of diatom species diversity was exhibited by the genus *Cymbella* (4 sps.), *Fragilaria* sp. and *Navicula* (3 sps.) respectively (Table 4).

Chlorophyceae: The generic diversity of Chlorophycean members was maximum during the period of study in both the reservoirs (Table 4). *Ankistrodesmus falcatus, Bulbochaete* sp., *Chara vulgaris, Chlorella vulgaris, Cladophora glomarata, Cladophora crispata, Cosmarium botrytis, Euastrum verrucosum, Mougeotia* sp., *Oedogonium borisianum, Oocystis gigas, Pediastrum duplex, Rhizoclonium hieroglyphicum, Scenedesmus denticulatus, S. dimorphus, S. obliquus, Spirogyra acanthospora, S. formosa, Stigeoclonium* sp., *Tetraedron quadratum, Ulothrix sp., Zygnema czurde and Zygnemopsis* sp. were recorded as the major dominant genera in the sampling reservoirs. Apart from these *Closterium ehrenbergii, Cosmarium laeve, C. phaseolus, C. javanicum, Hydrodictyon reticulatum, Nitella* sp., *Pandorina* sp., *Pediastrum ovatum, Sirogonium phacosporum* and *Tetraedron gracile* were the important dominant genera of Bhadrakali reservoir, while *Closterium tumidum, Cl. porrectum, Cosmarium auriculatum, C. granatum, Microspora* sp., *Oedogonium grande, Pithophora varia, Protococcus* sp., *Scenedesmus qudricauda, Spirogyra discoida, Staurastrum pinnatum* and *Zygnema areolatum* were found in Waddepally reservoir. Throughout the period of study Waddepally reservoir showed the highest recorded abundance (1191086 cells/L) of green algae, followed by BR (339879 cells/L). *Cosmarium* was the genus which exhibited the maximum (6 species) diversity followed by *Scenedesmus* (4 species), *Spirogyra* (3 species) and *Closterium* (3 species) (Table 4). Throughout the sampling period, peaks of green algae were recorded in monsoon months and lower abundance in summer months (Figs. 1, 2, 3, 4).

Cyanophyceae: Throughout the period of study sharp peaks of Cyanophycean members were exhibited in summer months (Figs. 3 & 4). Out of 21 genera, few of them were found to be the dominant in both the reservoirs; these are *Anabaena iyengarii, Aphanocapsa littorales, Arthrospira* sp., *Gloeocapsa atrata, Gloeotrichia natans, Microcystis aeruginosa, Nostoc sphaerium, Oscillatoria formosa, O. tenuis, Phormidium molle, Synechococcus* sp., *Trichodesmium* sp. *and Lyngbya ceylanica.* Blooms of Cyanophycean algae were recorded during the summer season. Blooms in Bhadrakali reservoir were formed by *Merismopedia glauca, Phormidium molle,* while blooms of *Microcysties aeruginosa* and *Lyngbya ceylanica* were reported from Waddepally reservoir. During the period of study Bhadrakali reservoir showed highest abundance (638153 cells/L) of blue-green algae, followed by Waddepally reservoir (496348 cells/L). *Anabaena variabilis, A. vagincola, Aphanocapsa montana, Aphanothece pallida, Aphanozomenon* sp., *Calothrix membranaceae, Gloeotrichia pisam, Merismopedia glauca, Microcystis flos-aquae, Nostoc linchia, Oscillatoria limosa, Rivularia* sp., *Spirulina*

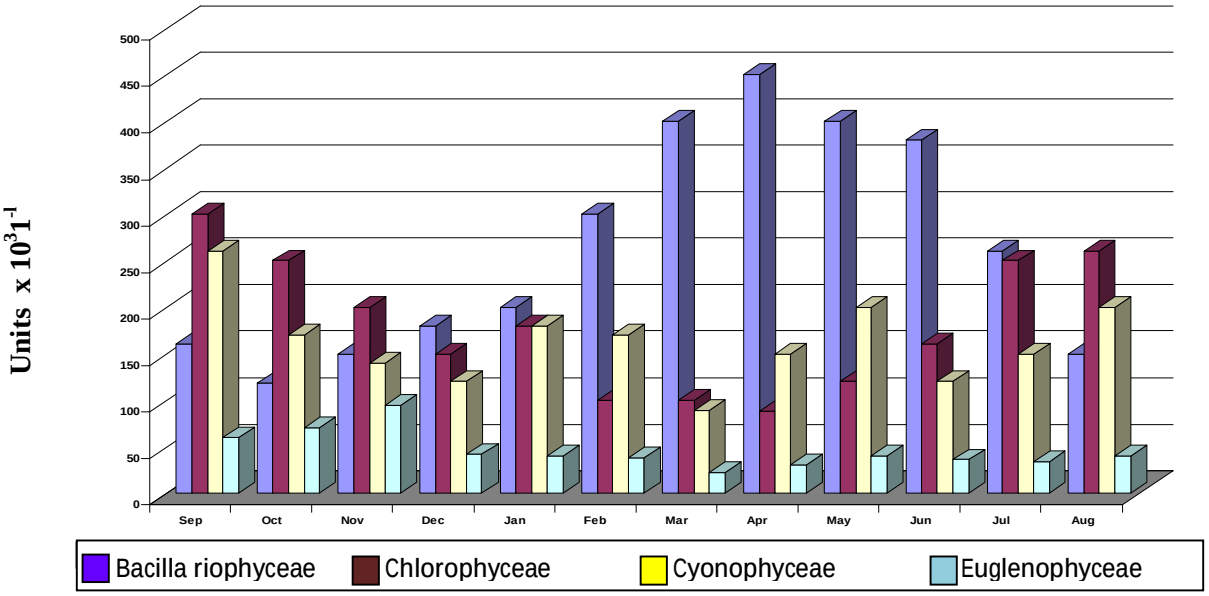

Fig. 1: Monthly variation of phytoplankton of Waddepally reservoir (2007-2008).

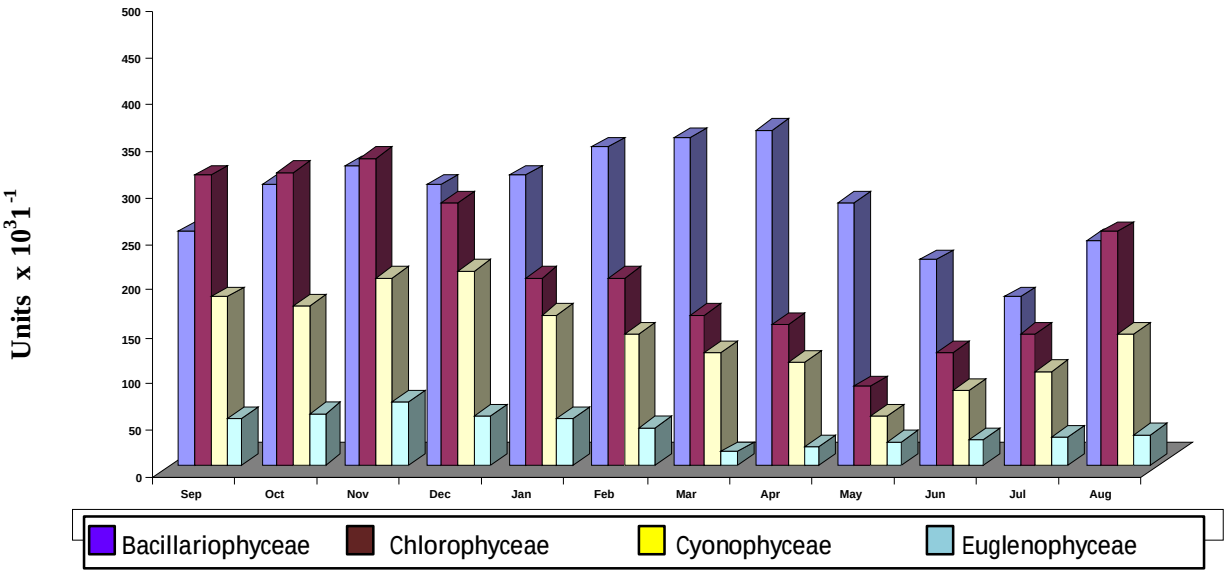

Fig. 2: Monthly variation of phytoplankton of Waddepally reservoir (2008-2009).

laxissima, Lyngbya majuscule were only reported from Bhadrakali reservoir, while *Anabaenopsis* sp., *Chroococcus minulus, Hydrococcus* sp. and *Oscillatoria rubescens* were reported from the Waddepally reservoir. Among the observed members of Cyanophyceae maximum species diversity was exhibited by *Oscillatoria* (4 sps.) followed by *Anabaena* (3 species) (Table 4).

Euglenophyceae: The recorded genera in Euglenophyceae (*Euglena candata, Phacus ranula* and *Trachelomonas curta*) were found to be well adapted to the concerned habitats under study. Others showed irregular mode of appearance. The Bhadrakali reservoir showed the maximum abundance (67997 cells/L) of Euglenophyceae members followed by Waddepally reservoir (48605 cells/L). *Euglena acus, E. viridis, Phacus ranula* and *Trachelomonas* sp. were reported only from Bhadrakali reservoir, while *Phacus* sp. and *Menoidium* sp. were found only in Waddepally reservoir. Large peaks of Euglenoid population were reported in win-

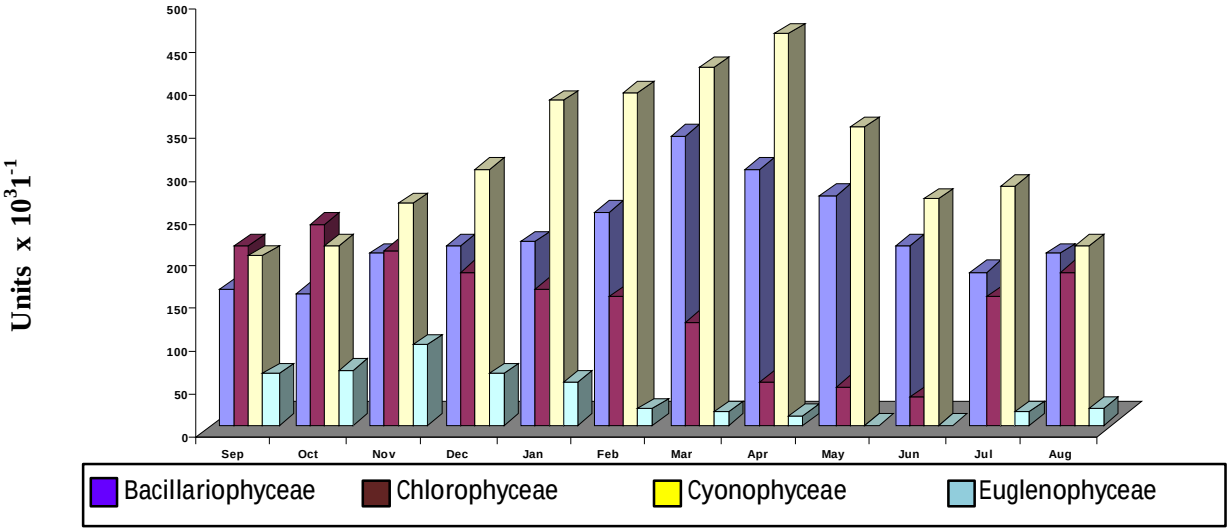

Fig. 3: Monthly variation of phytoplankton of Bhadrakali reservoir (2007-2008).

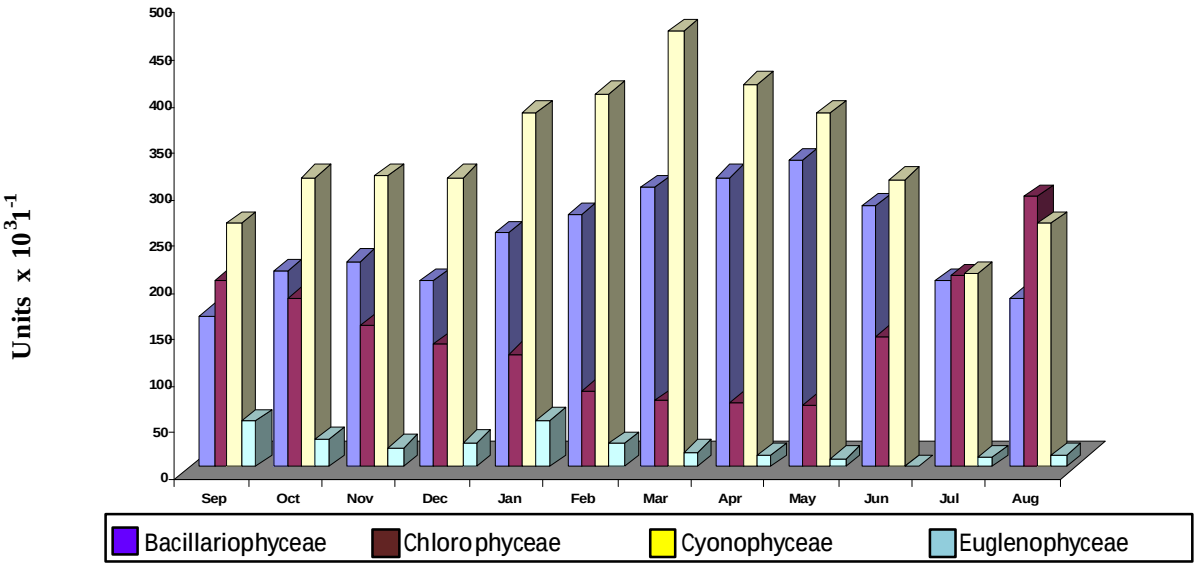

Fig. 4: Monthly variation of phytoplankton of Waddepally reservoir (2008-2009).

ter months, while small peaks were found in summer months. *Euglena* was the genus, which exhibited species diversity with 3 species followed by *Phacus* (2 sps.) (Table 4).

In the reservoir of Waddepally, the phytoplankton community represents the presence of 41.06% of Bacillariophyceae, 40.43% of Chlorophyceae, 16.84% of Cyanophyceae and 1.65% of Euglenophyceae. The Bacillariophyceae members were dominant over other members (Fig. 7). Phytoplankton community of Bhadrakali reservoir represents the presence of 38.72% of Cyanophyceae, 36.51% of Bacillariophyceae, 20.62% of Chlorophyceae and 4.12% of Euglenophyceae. In this reservoir Cyanophyceae members were found to be dominant over other members (Fig. 8).

The phytoplankton members comprised of 53 genera of which 11 belonged to Bacillariophyceae, 24 to Chlorophyceae, 14 to Cyanophyceae and 4 to Euglenophyceae. Highest number of individuals was represented by diatoms (1209700) followed by green algae (1191086), blue-greens (496348) and the members of Euglenophyceae (48605). A total of 67 forms of phytoplanktons were recorded. The to-

Table 1: List of Phytoplankton genera found in the lakes under study (in each class genera arranged alphabetically).

Sl. No.		Waddepally Reservoir (WR)	Bhadrakali Reservoir (BR)
Bacillariophyceae (21 forms) 18 genera			
1.	*Actinastrum* sp.	+	+
2.	*Amphipleura pellucida*	-	+
3.	*Amphora* sp.	+	+
4.	*Bacillaria paradosa*	+	-
5.	*Cocconeis* sp.	+	-
6.	*Cymbella sturbergii*	-	+
7.	*C. hustedii*	-	+
8.	*Diatoma* sp.	+	+
9.	*Dioploneis* sp.	-	+
10.	*Fragilaria* sp.	-	+
11.	*Fragilaria crotononensis*	-	+
12.	*Frustulia* sp.	-	+
13.	*Gomphonema* sp.	+	+
14.	*Gyrosigma* sp.	+	-
15.	*Mastoglosia* sp.	-	+
16.	*Navicula exigna*	+	+
17.	*N. cryptocephala*	-	+
18.	*Nitzchia* sp.	+	+
19.	*Pinnularia* sp.	+	+
20.	*Synedra* sp.	-	+
21.	*Tabellaria* sp.	+	+
Euglenophyceae (8 forms) 4 genera			
1.	*Euglena acus*	-	+
2.	*E. viridis*	-	+
3.	*E. caudata*	+	+
4.	*Phacus* sp.	+	-
5.	*P. ranula*	-	+
6.	*Trachelomonas* sp.	-	+
7.	*T. curta*	+	+
8.	*Menoidium* sp.	+	-
Cyanophyceae (31 forms) 21 genera			
1.	*Anabaena iyengarii*	+	+
2.	*A. variabilis*	-	+
3.	*A. vagincola*	-	+
4.	*Anabaenopsis* sp.	+	-
5.	*Aphanocapsa montana*	-	+
6.	*A. litorales*	+	+
7.	*Aphanothece pallida*	-	+
8.	*Aphanozomenon* sp.	-	+
9.	*Arthrospira* sp.	+	+
10.	*Chroococcus minutus*	+	-
11.	*Calothrix membranacea*	-	+
12.	*Gloeocapsa atrata*	+	+
13.	*Gloeotrichia natans*	+	+
14.	*Gloeotrichia pisam*	-	+
15.	*Hydrococcus* sp.	+	-
16.	*Merismopedia glauca*	-	+
17.	*Microcystis aeruginosa*	+	+
18.	*M. flos-aquae*	-	+
19.	*Nostoc linchia*	-	+
20.	*N. sphaerium*	+	+
21.	*Oscillatoria formosa*	+	+
22.	*O. tenuis*	+	+
23.	*O. limosa*	-	-
24.	*O. rubescens*	+	-
25.	*Rivularia* sp.	-	+
26.	*Phormidium molle*	+	+
27.	*Spirulina laxissima*	-	+
28.	*Synechococcus* sp.	+	+
29.	*Trichodesmium* sp.	+	+
30.	*Lyngbya ceylanica*	+	+
31.	*L. majuscule*	-	+
Chlorophyceae (45 forms) 28 genera			
1.	*Ankistrodesmus falcatus*	+	+
2.	*Bulbochaete* sp.	+	+
3.	*Chara vulgaris*	+	+
4.	*Chlorella vulgaris*	+	+
5.	*Closterium ehrenbergii*	-	+
6.	*Cl. tumidum*	+	-
7.	*Cl. porrectum*	+	-
8.	*Cladophora glomarata*	+	+
9.	*Cl. crispata*	+	+
10.	*Cosmarium botrytis*	+	+
11.	*C. auriculatum*	+	-
12.	*C. granatum*	+	-
13.	*C. laeve*	-	+
14.	*C. phaseolus*	-	+
15.	*C. javanicum*	-	+
16.	*Euastrum verrucosum*	+	+
17.	*Hydrodictyon reticulatum*	-	+
18.	*Microspora* sp.	+	-
19.	*Mougeotia* sp.	+	+
20.	*Nitella* sp.	-	+
21.	*Oedogonium borisianum*	+	+
22.	*O. grande*	+	-
23.	*Oocystis gigas*	+	+
24.	*Pandorina* sp.	-	+
25.	*Pediastrum duplex*	+	+
26.	*P. ovatum*	-	+
27.	*Pithophora varia*	+	-
28.	*Protococcus* sp.	+	-
29.	*Rhizoclonium hieroglyphicum*	+	+
30.	*Scenedesmus denticulatus*	+	+
31.	*S. quadricauda*	+	-
32.	*S. dimorphus*	+	+
33.	*S. obliquus*	+	+
34.	*Sirogonium phacosporum*	-	+
35.	*Spirogyra acanthospora*	+	+
36.	*S. discoidea*	+	-
37.	*S. formosa*	+	+
38.	*Stigeoclonium* sp.	+	+
39.	*Staurastrum pinnatum*	+	-
40.	*Tetraedron gracile*	-	+
41.	*T. quadratum*	+	+
42.	*Ulothrix* sp.	+	+
43.	*Zygnema czurde*	+	+
44.	*Z. areolatum*	+	-
45.	*Zygnemopsis* sp.	+	+

Table cont...

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tal percentage of phytoplankton community was 86.85% with 13.15% of others. The seasonal abundance of the Waddepally reservoir has shown two most prominent blue greens, *Microcystis aeruginosa, Lyngbya ceylanica,* two diatoms, *Pinnularia* sp., *Actinastrum* sp. and green alga, *Scenedesmus*

Table 2: Seasonal abundance of Cyanophyceae members of the two reservoirs (units/L).

		Winter	Summer	Monsoon
Waddepally	Sep2007-Aug2008	76172	212231	62344
Reservoir	Sep2008-Aug2009	56732	34313	54556
Bhadrakali	Sep2007-Aug2008	101352	213847	55831
Reservoir	Sep2008-Aug2009	88900	113242	64981

Table 3: Seasonal abundance of Bacillariophyceae members of the two reservoirs (units/L).

		Winter	Summer	Monsoon
Waddepally	Sep2007-Aug2008	204432	261823	145123
Reservoir	Sep2008-Aug 2009	391561	167420	223341
Bhadrakali	Sep2007-Aug2008	103242	142231	108244
Reservoir	Sep2008-Aug 2009	113252	72431	62361

Table 4: Seasonal abundance of Chlorophyceae members of the two reservoirs (units/L).

		Winter	Summer	Monsoon
Waddepally	Sep2007-Aug2008	150212	50891	391761
Reservoir	Sep2008-Aug 2009	154163	40843	403216
Bhadrakali	Sep2007-Aug2008	64432	51483	49891
Reservoir	Sep2008-Aug 2009	66208	49384	58481

Table 5: Seasonal abundance of Euglenophyceae members of the two reservoirs (units/L).

		Winter	Summer	Monsoon
Waddepally	Sep2007-Aug2008	6634	2384	1143
Reservoir	Sep2008-Aug 2009	32432	3671	2341
Bhadrakali	Sep2007-Aug2008	19931	8991	14321
Reservoir	Sep2008-Aug 2009	4981	2432	17341

obliquus. The compound index of Nygaard algal indices has shown the results in which they varied from 0.6 to 5.8 with the average of 3.75 under investigation. The phytoplankton members comprised of 60 genera of which 15 belonged to Bacillariophyceae, 24 to Chlorophyceae, 18 to Cyanophyceae and 3 to Eugleno-phyceae. Highest number of individuals was represented by Cyanophyceae (638153), followed by diatoms (601761), green algae (339879) and Euglenophyceae (67997). A total of 84 forms of phytoplanktons were recorded. The total percentage of phytoplanktons was 90.75% with others as 9.25%. The seasonal abundance of the prominent phytoplanktons of Bhadrakali reservoir has shown two diatoms, *Synedra* sp. and *Cymbella hustedii,* two blue greens, *Merismopedia glauca, Phormidium molle* and a member of green algae, *Cladophora glomarata*. The Nygaard compound index showed the range of variation from 1.9 to 6.6 with the average value of 4.16 during the study period.

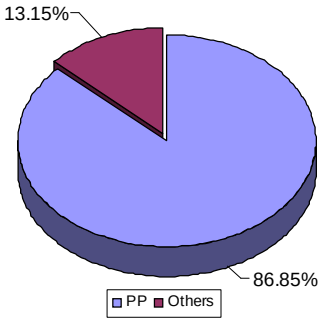

Fig. 5: Waddepally reservoir: Percentage of phytoplankton and others.

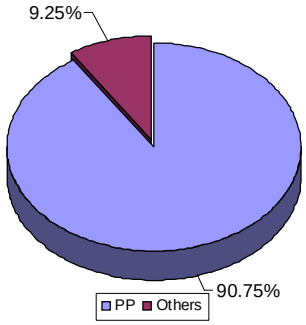

Fig. 6: Bhadrakali reservoir: Percentage of phytoplankton and others.

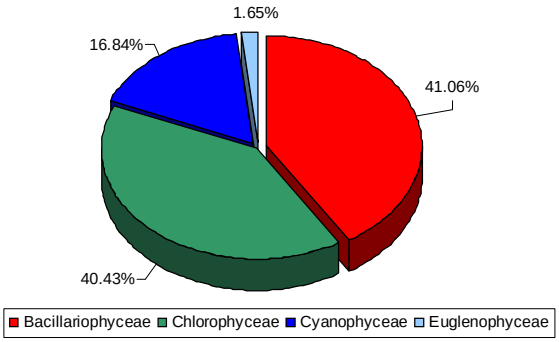

Fig. 7: Waddepally reservoir: Percentage of different groups of phytoplankton.

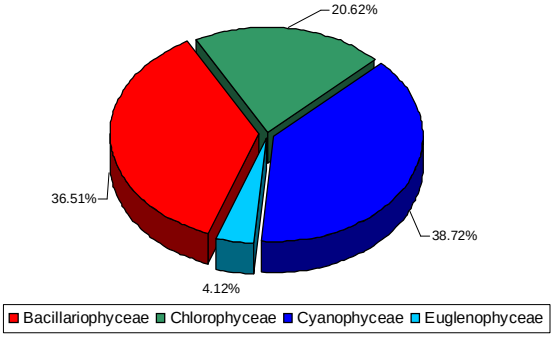

Fig. 8: Bhadrakali reservoir: Percentage of different groups of phytoplankton.

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