

“STUDIES ON PHYTOPLANKTON DIVERSITY OF DHANEGAON RESERVIOR, DHANEGAON, DIST. OSMANABAD, MAHARASHTRA”

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PHYTOPLANKTON—Phytoplankton are generally microscopic they impart green color of the water, phytoplankton may exceed rooted plants in food production per unit area, many of such forms possess other adaptations to aid floating, while turbulence and upward current movements of water keep phytoplankton near surface where photosynthesis is most effective. According to the size of phytoplankton are classified as ultraplankton, Nannoplankton, microplankton macroplankton. Phytoplankton gives number kinds and occurrence of algae in a habitat the planktonic population may vary qualitative and quantitatively depending on depth of water bodies, site, time, season, source of water, its organic and inorganic contents, geological, biological and climatic factors respectively.

Study Area—Dhanegaon reservoir is one of the major irrigation projects in Marathwada. Its construction was completed in 1980. However, recently it has started utilizing for drinking water supply to Latur, Ambejogai, Kaij and Kallamb. The reservoir is situated near village Dhanegaon in taluka Kallamb Dist. Osmanabad. It is 60 km away from Latur. It is situated in the Altitude 641.87 Mtrs. above sea level, Latitude 1825 to 1855 North and Longitude 7515 to 7615 East. The catchment area about 2371 Km.

MATERIALS AND METHODS—For present

investigation three sampling stations were selected viz. spot 'A' is located near the water pump to supply of Latur city, spot 'B' is around 6 Km. away from spot 'A' and spot 'C' is 7 Km. away from spot B. It is located near drinking water supply pump of Kaij. The monthly sample collection for phytoplankton analysis was done once in a month from the reservoir for the period of two years June 2003- May 2005 at selected three spots. The samples were collected from the surface water by filtering 50 liter of water through plankton net. Collection of phytoplankton concentration was made and preserved in 4% formalin solution. The qualitative and quantitative analysis of phytoplankton was done with the help of Sedgwick-Rafter Cell method by using following formula.

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

Where n = Number of plankton in 1 ml.

c = Volume of concentrate

V = Volume of sample in Liter (It represented to total volume filtered)

The identification of phytoplankton done by referring standard text Adoni *et. al* (1985) and Desikachary (1959). The results were expressed as organisms per liter.

Table No. 1 Monthly variation of Phytoplankton count in number/lit (2003-2004)

Spot	Component	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
A	Chlorophyceae	120	145	135	140	240	245	237	228	180	160	170	200
	Cynophyceae	160	170	160	150	190	205	215	180	215	210	210	205
	Bacillariophyceae	290	280	295	285	260	265	257	248	250	260	265	245
	Euglenophyceae	105	110	112	103	137	143	140	130	90	87	88	85
	TOTAL	387	715	702	678	827	858	849	786	735	717	733	735
B	Chlorophyceae	130	145	130	135	300	290	310	280	140	130	150	180
	Cynophyceae	140	135	145	140	157	160	150	163	170	180	185	145
	Bacillariophyceae	280	285	277	268	238	240	242	230	175	180	175	170
	Euglenophyceae	80	85	75	80	118	120	122	110	65	60	70	55
	TOTAL	630	650	627	623	813	810	824	783	550	550	420	550

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C	Chlorophyceae	200	220	218	212	340	337	345	328	290	300	295	295
	Cynophyceae	108	115	120	117	135	139	134	142	150	160	152	158
	Bacillariophyceae	245	255	260	260	215	219	216	220	235	238	237	240
	Euglenophyceae	90	95	95	100	150	155	160	155	90	72	60	68
TOTAL		643	690	693	489	840	850	855	845	765	770	530	761

Table No. 2 Monthly variation of Phytoplankton count in number / lit (2004-2005)

Spot	Component	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
A	Chlorophyceae	110	120	118	115	238	260	272	250	190	200	185	205
	Cynophyceae	175	180	177	178	180	190	215	198	240	230	235	235
	Bacillariophyceae	310	325	310	315	175	177	180	178	225	210	220	205
	Euglenophyceae	75	76	80	79	110	108	122	120	65	50	55	50
TOTAL		670	701	682	687	703	735	789	743	730	680	695	695
B	Chlorophyceae	110	120	118	112	315	320	315	310	175	177	180	178
	Cynophyceae	150	162	168	140	130	140	135	150	215	195	200	250
	Bacillariophyceae	295	282	310	293	170	180	175	175	120	130	140	150
	Euglenophyceae	90	102	95	93	145	140	145	130	75	70	85	80
TOTAL		645	666	691	638	760	780	770	765	585	572	605	658
C	Chlorophyceae	178	182	190	170	350	360	345	365	285	175	270	280
	Cynophyceae	112	117	120	111	150	160	145	165	200	190	185	205
	Bacillariophyceae	275	282	280	273	205	220	215	220	180	170	180	170
	Euglenophyceae	114	112	118	106	132	135	140	133	98	92	100	90
TOTAL		679	693	708	660	837	875	845	883	733	627	735	745

Table No. 3 Seasonal variation of Phytoplankton count org. / liter (2003-2004)

Spot	Phytoplankton	Monsoon	Winter	Summer
A	Chlorophyceae	540	950	710
	Cynophyceae	640	790	850
	Bacillariophyceae	1150	1030	1020
	Euglenophyceae	430	550	350
B	Chlorophyceae	540	1180	600
	Cynophyceae	560	630	680
	Bacillariophyceae	1110	950	700
	Euglenophyceae	320	470	250
C	Chlorophyceae	850	1350	1180
	Cynophyceae	460	550	620
	Bacillariophyceae	1020	870	950
	Euglenophyceae	380	620	290

Table No. 4 Seasonal variation of Phytoplankton count org. / liter (2004-2005).

Spot	Phytoplankton	Monsoon	Winter	Summer
A	Chlorophyceae	460	1020	780
	Cynophyceae	710	780	440
	Bacillariophyceae	1260	710	860
	Euglenophyceae	310	460	220
B	Chlorophyceae	460	1260	710
	Cynophyceae	620	540	860
	Bacillariophyceae	1180	700	540
	Euglenophyceae	380	560	310
C	Chlorophyceae	720	1420	1110
	Cynophyceae	460	620	780
	Bacillariophyceae	1110	860	700
	Euglenophyceae	450	540	380

RESULTS AND DISCUSSION-Monthly variation of phytoplankton species is represented in table no. 1 & 2 and graphically represented in figure no. 1 & 2. The season wise analysis is shown in table no. 3 & 4 and graphically represented in figure no. 3 & 4. The total number of phytoplankton population varied from 387 to 849/lit at Spot A, 623 to 824/lit at Spot B and 489-855/lit at Spot C in 2003-2004. While in 2004-2005 it was in the range of 670 to 789/lit at Spot A, 605 to 780/lit at Spot B and 660 to 883 to Spot C. Total 65 phytoplankton species belonging to 4 different groups viz. Chlorophyceae, Cynophyceae, Bacillariophyceae and Englenophyceae represented phytoplankton diversity in the Dhanegaon reservoir. The maximum phytoplankton population was during winter and minimum during rainy season in two years.

Among the phytoplankton members of Bacillariophyceae was dominant at Spot A, chlorophyceae at Spot B and C in the year 2004-05. While in the year of 2003-04 was Bacillariophyceae was dominant at Spot A, Chlorophyceae at Spot B & C. The phytoplankton population at the three spots followed more or less same trends in the two years study.

The similar trend of the phytoplankton diversity was also recorded by Sakhare and Joshi (2002) in Yeldari reservoir. During the present study Chlorophyceae were represented 20 species, Cynophyceae were represented 15 species, Bacillariophyceae were represented 24 species, Englenophyceae was represented 06 species in Dhanegaon reservoir. Kumawat and Jawale (2003) recorded 59 genera of phytoplankton from a fish pond at Anjale, Maharashtra.

Similar studies carried out by Sakhare and Joshi (2002) in Yeldari reservoir, Bahura (2001) on highly eutrophic temple tank situated near Bikaner, Rajasthan, Sirsat et. al (2004) recorded 24 genera at Dharmapuri in Beed district, Pawar et. al (2006) recorded 85 species of phytoplankton from four lentic water bodies in and around Davangarere city, Karnataka.

Chlorophyceae:-The monthly variation and total number of chlorophyceae varied from 120 to 245/lit at spot A, 130 to 310/lit at spot B and 200 to 345/lit at spot C during the year 2003-04. While in 2004-05 it was 110 to 272/lit at spot A, 110 to 320/lit at spot B and 170 to 385/lit at spot C. In the present investigation the seasonal numerical density of chlorophyceae ranged from 540 to 950/lit.at spot A, 540 to 1180/lit. at

spot B and 850 to 1350 /lit. at spot C in 2003-2004. While in 2004-5005 it was in the range of 460 to 1020/ lit. at spot A, 460 to 1260/lit. at spot B and 720 to 1420 /lit. at spot C. Muragan and Angelo Ivnday Samy (1996) recorded 25 species of phytoplankton in lake and 19 species in Himayatsagar lake, Hyderabad. Suresh, et. al (2005) reported 18 species in Chilar pond Davanjgere Dist. Karnataka. In the present investigation the members of chlorophyceae were observed during the period of investigation, but maximum number was observed in winter season and minimum in monsoon season.

The maximum and minimum number of chlorophyceae is due to higher transparency and low temperature. The following members of chlorophyceae were identified during the investigation viz., *Volvox carteri*, *Volvox aureus*, *Ulothrix zonata*, *Hydrodictyon reticulatum*, *Coelastrum microporum*, *Netrium digitus*, *Closteridium*, *Closterium acerosum*, *Closterium actum*, *Cosmarium depresum*, *Cosmarium reniformes*, *Pondorina morum*, *Spirogyra purvula*, *Spirogyra condensate*, *Ulithrix gonata*, *Oedogonium patalum*, *Chlamydomona confetra*, *Ankistrodesmus falcatus*, *Tetradon minimum*, *Tetradon maticum*.The chlorophyceae or green algae from greenish scum on the surface of quiet of stagnant water or grow firmly attached to the submerged rocks, pieces of wood and other object in water.

The highest population due to high temperature, low nitrate and bright sunshine is favorable for growing green algae in water body.

Cynophyceae-The cynophyceae are widely spread in the aquatic environment. The species exist either as a unicellular individual or chains or filaments called as the green algae. The species are generally found on rocks or soil forming a blackish crust when dried out. Fritsch (1907) has stressed more on the significance of bright sunshine than temperature in the production of blue green algae.

The monthly variation and total number of cynophyceae varied from 150 to 215/lit at spot A, 135 to 185/lit at spot B and 108 to 160/lit at spot C in 2003-04. While in 2004-05 it was 175 to 240/lit at spot A, 130 to 250 at spot B and 111 to 205 at spot C. In the present investigation the seasonal numerical density of cynophyceae ranged from 640 to 790 /lit.at spot A, 560 to 680 /lit. at spot B and 460 to 550 /lit. at spot C in 2003-2004. While in 2004-5005 it was in the range of 710 to 940 /lit. at spot A, 540 to 860 /lit. at spot B and

460 to 780 /lit. at spot C. Shastri Yogesh *et al.*, (1999) recorded 10 species of cynophyceae in Malegaon tank. Pawar *et. al* (2006) reported that 10 species in Sirur Dam Water Mukhed, Suresh *et. al* (2005) recorded 9 species in Chilur pond near Honnali, Meshram & Dhande (2000) recorded the 8 species in Wadal lake Amravati.

In the present investigation the cynophyceae were observed minimum in monsoon and maximum in summer season. The following members of cynophyceae were identified during the investigation viz., *Chroococcus* sp., *Oscillatoria Formosa*, *O. rivularia*, *O. tenuis*, *O. annae*, *O. fereani*, *O. proboscidea*, *Nostoc linekia*, *N. muscorum*, *Phormidium bohneri*, *P. tenue*, *Anabaena beckii*, *A. roscana*, *Microcystis aeruginosa*, *Chlorococcus minutus*.

Bacillariophyceae:- Bacillariophyceae are characterized by silicified cell walls and can be both colonial and unicellular. The group is mainly divided into centric diatoms having radial symmetry and the pinnate diatoms which exhibited bilateral symmetry. The cell wall of diatoms consists of two lid like valve one of which fits within the other. The valves of the pinnate diatoms exhibit various areas of cell thickening and dilations. In some species a slit, termed raphe, transverse allor part of the cell wall, in other a depression in the avail areas of the cell was termed as psendoraphe is found.

Vegetative reproduction by cell division is the most common mode of multiplication. Sexual reproduction occurs only when the cells reach a minimum critical size and correct environmental conditions, which may include combinations of light, temperature, nutrients, trace metals, organic growth factors etc. The water quality in terms levels of organic matter, dissolved oxygen, pH and other physical factors play an important role in the ecological distribution of Bacillariophyceae (Sabata and Nayar, 1987).

In the present investigation the seasonal numerical density of Bacillariophyceae ranged from 1020 to 1150 /lit. at spot A, 700 to 1110 /lit. at spot B and 870 to 1020 /lit. at spot C in 2003-2004. While in 2004-2005 it was in the range of 710 to 1260 /lit. at spot A, 540 to 1180 /lit. at spot B and 700 to 1110 /lit. at spot C. The monthly variation and total number of Bacillariophyceae varied from 245 to 295/lit at spot A, 170 to 285/lit at spot B and 215 to 260/lit at spot C in 2003-04. While in 2004-05 it was 175 to 325/lit at spot

A, 120 to 310 at spot B and 170 to 282 at spot C. Suresh *et. al* (2005) recorded 21 species of Bacillariophyceae in Chilur pond, Honnali, Choudhary and Zaman (2006) recorded 13 species of bacillariophyceae in Utriarlarial habitat. Similar observation is made by Subbamma (1992), Subbamma D. V. (1994) and Pawar *et. al* (2006).

In the present investigation the members of bacillariophyceae were minimum in summer season and maximum in monsoon season. The following species of bacillariophyceae were identified during the investigation. *Navicula radiosus*, *N. gracilis*, *N. accomoda*, *N. rodtellata*, *N. desestriata*, *N. viridula*, *Cyclotella meneghiniana*, *C. operaculata*, *C. comata*, *C. stelligera*, *Tabellaria*, *Diatoma hiemale var.*, *D. elongatum*, *D. vulgare* B *Fragilaria crotonesis*, *Pinnularia viridis*, *Gomphonema vibrio*, *G. olivaceum*, *Fragilaria*, *Xanthidium*, *Euastrum*, *Cymbella var.*, *Cocconeis hyppotheca*, *Syndra*.

Englenophyceae:- Englenoid algae (Englenophyceae) are relatively large and diverse. Few species are truly planktonic. Almost all euglenoids are unicellular. They lack a distinct cell wall and possess one, two or three flagella that arise from an invagination in the cell membrane. Reproduction occurs by longitudinal division of the motile cell. Nutrition is supplemented by the uptake of dissolved organic compounds. Ammonia and dissolved organic nitrogen compounds are the dominant sources of nitrogen among most euglenoid algae.

Their development occurs most often in season as, strata or lake systems in which concentrations of ammonia and especially dissolved organic matter is high. Englenophyceae were studied on fresh water as reported by pioneering workers like Rao (1995), Zafar (1959), Philopse (1960) and Singh (1960). In the present investigation the seasonal numerical density of Englenophyceae ranged from 350 to 550 /lit. at spot A, 250 to 470 /lit. at spot B and 290 to 620 /lit. at spot C in 2003-2004. While in 2004-2005 it was in the range of 220 to 460 /lit. at spot A, 310 to 560 /lit. at spot B and 380 to 540 /lit. at spot C.

The monthly variation and total number of chlorophyceae varied from 85 to 143/lit at spot A, 55 to 122/lit at spot B and 60 to 160/lit at spot C in the year 2003-04. While in 2004-05 it was 50 to 122/lit at spot A, 70 to 145/lit at spot B and 90 to 140/lit at spot C. In the present investigation the members of englenophyceae were minimum in summer season and maximum in winter season. The following members of

euglenophyceae were identified during the investigation viz., *Euglena granulate*, *E. anabaena*, *E. pisciformis*, *E. viridis*, *E. acus*, *E. stellata* Shastri Yogesh *et. al* (1999) recorded 8 species of Englenophyceae in percolation tank in Malegaon, Sedamkar & Angadi (2003) recorded 7 species of Englenophyceae in two fresh water bodies of Gulbarga, Pawar *et. al* (2006) recorded 5 species of englenophyceae at Sirur dam water, B. Munwar (1972) reported that the high values of carbon dioxide, phosphate and low dissolved oxygen favour the grown englenophyceae. Similar observation is made by

Pandey *et. al* (1993), Sedamkar and Angadi (2003) and Thomas *et. al* (2006). The present work to undertaken for the diversity of phytoplankton viz. chlorophyceae, cynophyceae, Bacirriophyceae, Euglenophyceae in Dhanegaon reservoir. Dhanegaon reservoir is a fresh water body is a rich biodiversity rich, productive, and stabilized ecosystem with recreational and ecological value.

Acknowledgement—The authors are thankful to the Principal Dr. R. L. Kawale, Dr. D. G. Solunke, Head Dept. of Zoology & Fishery Science, Rajarshi Shahu College, Latur for providing the necessary Laboratory facilities.

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