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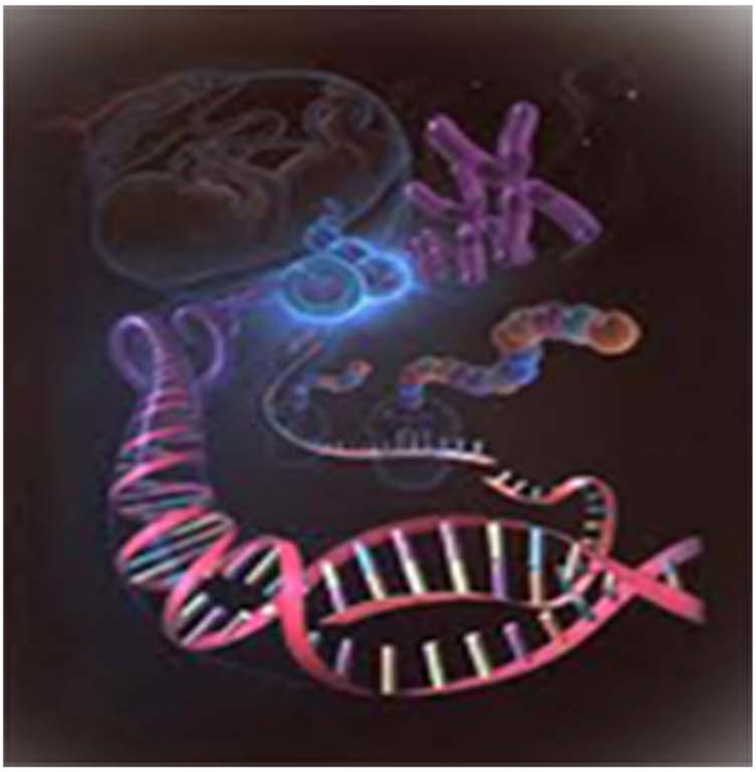

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Research Paper

PHYSICO-CHEMICAL FACTORS INFLUENCED PLANKTON BIODIVERSITY AND FISH ABUNDANCE-A CASE STUDY OF NAGARAM TANK OF WARANGAL, ANDHRA PRADESH

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In the present study an attempt has been made on physico-chemical characteristics and plankton diversity and density of a sub urban perennial water body, located in Nagaram village in Warangal district of Andhra Pradesh.The study was conducted during June 2007 to May 2010. The samples were analyzed at monthly intervals for a period of three years. The results revealed that Transparency, Total solids, Total dissolved solids, and Turbidity was maximum during rainy months. The pH, Conductivity, Hardness, Dissolved Oxygen (DO) and Biological Oxygen Demand (BOD) were higher during summer months. The Chloride concentration was high in the month of January. Phytoplankton was represented with 4 groups of which Chlorophyceae was dominant with 15 species followed by Bacillariophyceae (7), Cyanophyceae (6) and Euglenophyceae (3). A total of 31 species of phytoplankton were recorded with similar distribution. Zooplanktons were represented by four groups' viz. Rotifera, Cladocera, Copepoda and Ostracoda. A total of 39 species of zooplankton were recorded at all the four identified sampling stations of the tank, with similar distribution. In which Rotifers (16) dominated followed by Cladocera (10), Copepoda (08) and Ostracoda (05). The study helps in better understanding for the management of the Nagaram tank for intensive fish culture.

Keywords: Nagaram tank, Physico-chemical factors, Phytoplankton, Zooplankton, Density, Diversity

INTRODUCTION

Water is considered as the elixir of life and is consumed in the greatest quantity throughout the world for drinking, bathing, washing, recreation, irrigation, and aquaculture. Rivers, ponds, lakes and tanks are the major sources of the water. Functional parameters of an ecosystem attributes to the ecological significance and resulting from the interactions between its physical, chemical and biological components. These interactions result in the creation of a variety of niches which are inhabited by various

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organisms thus providing a habitat for plants, animals and micro organisms in an ecosystem and thus determine the tropic dynamics of the aquatic body for its proper fish production. The members of plankton community are important for their role in trophic dynamics and in energy transfer in the aquatic ecosystem. They provide the food for fishes in the fresh water and play a major role in fish production.

Phytoplankton is the pioneer of an aquatic food chain. The productivity of an aquatic environment is directly correlated, with the density of phytoplankton. The physico-chemical factors are directly related with their productions. The phytoplankton is the base of most of the lake food webs and fish production is linked to phytoplankton (Ryder, 1974). Moreover, number and species of phytoplankton serves to determine the quality of water body. It was then the subsequent works were aimed at finding out the causative factors responsible for the growth and sustenance of groups of phytoplankton or zooplankton (Edmondson, 1946; Nygaard, 1949 and 1955; Gossler, 1950; Smith, 1950 and Gerloff *et al.,* 1952). Zooplankton is an integral component of aquatic ecosystem and comprises of microscopic animal life that passively float or swim freely. The principle components of zooplankton in lentic environment are represented by taxonomic group of Rotifera, Cladocera, Copepod and Ostracoda. The study of fresh water fauna specially zooplankton even in a particular area is extensive and complicated phenomenon due to environmental, physical, geographical and chemical variation involving ecological extrinsic and intrinsic factor. Distribution of zooplankton and their variation at different zones of water body is known to be influence by physico-chemical parameters of water.

Fish is a valuable source of protein and occupied a significant position in the socio-economical fabric of South Asian countries. The fishes alone contributing 2,546 species and the fishes of inland water bodies of Indian subcontinent have been subject of study since last century. There is a need to survey fish fauna associated with different fresh water habitats, which will help in planning methods for their production and effective exploitation (Sharma and Nayak, 2001). Considering the importance of inland fishery researchers have studies various aspects of reservoir fisheries. Ray and Paride (1966) studied fisheries of Chilka lake, Sreenivasan (1979) studied fisheries of Sardarsagar. Kanwate and Kulkarni (2006) studied fish and fisheries of Kandhar tank, District Nanded Maharashtra. Many reports were published on reservoir, canal and tank fisheries. Pawar*et al.* (2006) studied fish fauna of Pethwadaj dam, Nanded. Kulkarni *et al.* (2008) studied fish and fisheries of Derala Tank, Dist. Nanded, Maharashtra. Rohankar (2009) studied biodiversity of fishes in Aherilake of Maharashtra. Ravindar (2010) studied biodiversity of fishes in Dharmasagar reservoir, Warangal District, Andhra Pradesh.

MATERIALS AND METHODS

Sampling Program

The studies were carried out 36 months from June 2007 to May 2010 (for three years) during different seasons at four different stations S_1, S_2, S_3 and S_4 of Nagaram tank. The season defined as Rainy (June to September), Winter (October to January) and Summer (February to May). The main aim of present study is to investigate the physico-chemical and biological characteristics of water. Sampling stations were selected at suitable points of the tank and samples were collected from stations at 8.30 am to 10.30 am in the morning hours.

Sampling Procedure

Water samples for physico-chemical analysis were collected from four stations in polythene plastic cans. The parameters like atmospheric temperature, water temperature, pH and conductivity were analyzed with the help of thermometer and water analysis kit developed by El-Products (Model-161-E). Measurement of transparency was done by Sacchidisc. Sample for dissolved oxygen determination was collected in 250 mL capacity BOD bottles and fixed by Winkler's A and B solutions at the station. For the analysis of chemical parameters of the samples were collected in plastic cans and transported to the laboratory, physico-chemical parameters were analyzed with the help of the procedure given in APHA (1985), Kodarkar (1992), Bhalerao (1998) and Khana (2004). For the collection of Phytoplanktons and Zooplanktons, collections were made employing a modified Heron Tranter net with square metallic frame of 0.625 m area. The filtering cone was made up of Nylon bolting silk plankton net (No. 25 mesh size 50 µ) was used for collection of zooplanktons. Collected samples were transferred to labeled vial bottles containing 5% formalin. Quantitative analysis and identification was done on a Sedgwick Rafter Counter cell by taking 1 mL sample. Detailed taxonomic identification was earned out with Tonapi (1980), Needham and Needham (1962), APHA (1985), Kodarkar (1992) and Hosmani (2008).

RESULTS AND DISCUSSION

The ecological studies on Nagaram tank of Warangal district has been investigated to know the physico-chemical and biological parameters which includes diversity and distribution of phytoplankton, zooplankton and fish fauna, period of three years and the tank is discussed with an emphasis on their significance and inter-relationship with fish diversity and also their adverse effect on the enhancement of fish production. The parameters studied were atmospheric (ambient) temperature, water temperature, pH, conductivity, transparency, Total alkalinity, total hardness, total solids, total dissolved solids, dissolved oxygen and free carbondioxide. The biological parameters studied were Phytoplankton, Zooplankton and fishes.

The climate of Warangal district is semi-arid characterized by precipitation during south-west monsoon season (June to September). The data on rainfall of June 2007 to May 2010, it is revealed that the highest rainfall occurred during south-west monsoon season followed by winter season and least rainfall observed during the summer season. The literature revealed that different regions receive variable precipitation and hence meteorological factors governing the physico-chemical properties of the tank which in turn influence planktonic population and all these factors have direct influence on the fish production. The high atmospheric and water temperature was noted in summer and minimum in winter. During the summer season the high water temperature may be due to reduction in water level and high solar radiation and atmospheric temperature. Whereas low temperature in winter may be due to low atmospheric temperature and short day period. Similar patterns of temperature fluctuations have been reported by Nath *et al.* (2007), Siddamallayya and Pratima (2008), Venkatesh *et al.* (2009). Bagade and Belagali (2010) recorded the range of air temperature between 22 °C to 22 °C of some selected lakes around Dharwad, Karnataka. Pawar and Pandarkar (2011) were observed that water temperature and atmospheric temperature were minimum during winter and maximum in summer season.

About the Hydrogen ion concentration (pH) of water, the maximum pH was recorded during month of May (9.00) and minimum in the month of August (7.00) (Tables 1, 2 and 3). The pH range of 6.0 to 9.0 is most suitable for pond fish culture. While pH is more than 9.0 is unsuitable for fish growth (Swingle, 1967). In the present investigation, the minimum pH value is recorded during winter and maximum during summer season. During monsoon high value of pH may be due to high temperature in the tank and minimum during winter season may be due to short day length and decrease in photosynthetic activities. Manjare *et al.* (2010) also reported the maximum pH was recorded in summer and minimum in winter season. Krishnamoorthy and Selva Kumar (2010) recorded the pH values varied from 6.95 to 6.4 in summer, 7.1 to 8.2 in winter and 6.26 to 8.00 in rainy season. The water transparency was estimated, which was at the range of 25.50 to 82.00 cm. The minimum transparency was recorded in the month of August and maximum in month of January. Bhatnagar Chhaya *et al.* (2007) recorded the minimum transparency 70.5 cm in month of August and maximum 155.6 cm in February in Jhamri dam Udaipur, Rajasthan. In the present investigation, the minimum transparency was recorded during rainy season and maximum during winter. The lower values of transparency might be due to turbidity caused by eroded soil and higher values during post-monsoon period may be due to lesser turbulence and decantation of suspended particles. Kadam *et al.* (2007) and Manjare *et al.* (2010) also reported similar observations from different water bodies in Maharashtra.

In the present investigation, the total dissolved solids ranged between 165 mg/L to 635 mg/L. The minimum value recorded in the month of August and maximum in month of September. Choudhari *et al.* (1999) studied water quality of Chatri lake in Amaravati city and noted TDS values in between 40 to 80 mg/L. Total solids ranged between 458 to 940 mg/L. The minimum value was recorded in the month of February and maximum in the month of September. The TDS, total solids were high in rainy followed by summer and comparatively low winter value of TDS, TS may be attributed to low rate of evaporation and settling of silt. The high TDS values in rainy are attributed to leaching of soil and silt carried in the lake by the ingression water lake from the catchments area (Khanna, 1993; Sachindanda Murthy and Yajurvedi, 2004 and Shiddamallayya and Prathima, 2008).

During the study, conductivity fluctuated between 0.113 to 0.420 µmhos/cm. The maximum conductivity was recorded in the month of July and minimum in the month of December (Dutta and Bhagawati, 2007). The maximum conductivity was recorded in rainy and summer season, minimum during winter (Tables 1, 2 and 3). The high values of conductivity could be due to high concentration of ionic constituents present in water bodies. It may be due to entrance of some domestic effluents and other organic materials in tank water. (Fokmare and Musaddiq, 2001).The DO of the water body was ranged between 0.25 to 8.53 mg/L. The minimum value of DO was recorded in the month of May and maximum in the month of July. The values were observed high during rainy and winter as low temperature

Table 1: Yearly Mean Values of Physico-Chemical Parameters During Year 2007-2008

S. No.	Parameters	Station-I			Station-II			Station-III			Station-IV		
		Mean	±	SD	Mean	±	SD	Mean	±	SD	Mean	±	SD
1.	Ambient Temperature	32.53	±	1.99	35.08	±	1.95	37.10	±	1.42	34.26	±	0.32
2.	Water Temperature	24.43	±	2.18	25.10	±	1.70	24.67	±	1.14	24.96	±	0.43
3.	pH	7.99	±	0.35	7.98	±	0.10	8.47	±	0.16	7.36	±	0.14
4.	Transparency	52.08	±	3.99	47.75	±	4.82	49.87	±	3.99	47.87	±	7.84
5.	Total Dissolved Solids	365.50	±	3.49	326.66	±	9.55	327.75	±	4.32	387.66	±	11.02
6.	Total Solids	657.33	±	11.47	654.50	±	32.10	663.25	±	24.92	691.58	±	12.46
7.	Conductivity	0.171	±	0.023	0.276	±	0.001	0.310	±	0.008	0.30	±	0.014
8.	Dissolved Oxygen	5.02	±	0.13	3.80	±	0.07	4.03	±	0.09	2.44	±	0.16
9.	Free CO_2	8.34	±	0.99	8.50	±	3.34	8.50	±	0.08	10.99	±	2.90
10.	Total Alkalinity	125.17	±	0.96	133.42	±	5.23	139.25	±	6.14	148.08	±	0.55
11.	Chlorides	97.33	±	3.88	99.50	±	6.82	113.50	±	2.24	103.25	±	2.40
12.	Total Hardness	186.33	±	16.28	156.83	±	13.71	189.25	±	16.65	218.33	±	17.64
13.	Biological Oxygen Demand	7.90	±	0.89	5.76	±	1.82	7.92	±	1.73	10.36	±	0.27

Table 2: Yearly mean values of Physico-Chemical Parameters During Year 2008-2009

S. No.	Parameters	Station-I			Station-II			Station-III			Station-IV		
		Mean	±	S.D	Mean	±	S.D	Mean	±	S.D	Mean	±	S.D
1.	Ambient Temperature	33.39	±	1.64	35.20	±	1.86	37.40	±	1.62	36.52	±	1.65
2.	Water Temperature	28.59	±	1.54	27.93	±	2.19	29.48	±	1.46	28.29	±	1.61
3.	PH	7.76	±	0.07	7.85	±	0.15	7.86	±	0.09	7.78	±	0.22
4.	Transparency	47.41	±	4.76	44.12	±	4.31	46.75	±	5.04	46.71	±	5.01
5.	Total Dissolved Solids	366.00	±	41.35	320.33	±	7.27	341.25	±	7.08	385.58	±	16.63
6.	Total Solids	653.25	±	27.99	656.83	±	34.44	652.42	±	4.85	682.83	±	13.88
7.	Conductivity	0.17	±	0.025	0.29	±	0.011	0.25	±	0.018	0.32	±	0.010
8	Dissolved Oxygen	5.91	±	0.25	3.62	±	0.01	4.34	±	0.29	3.09	±	0.13
9	Free CO_2	9.59	±	0.74	8.96	±	0.72	10.45	±	0.21	9.63	±	0.39
10	Total Alkalinity	168.42	±	29.92	165.83	±	27.83	183.00	±	31.37	163.50	±	32.93
11	Chlorides	96.42	±	5.19	99.33	±	7.37	96.83	±	6.82	96.16	±	4.50
12	Total Hardness	152.66	±	16.64	155.50	±	18.02	155.92	±	13.96	208.41	±	11.12
13	Biological Oxygen Demand	8.06	±	0.26	5.81	±	0.32	8.34	±	0.15	9.99	±	0.45

Table 3: Yearly Mean Values of Physico-Chemical Parameters During Year 2009-2010

S. No.	Parameters	Station-I			Station-II			Station-III			Station-IV		
		Mean	±	SD	Mean	±	SD	Mean	±	SD	Mean	±	SD
1.	Ambient Temperature	35.06	±	1.37	36.79	±	2.08	37.16	±	0.77	36.37	±	1.39
2.	Water Temperature	27.43	±	1.24	27.94	±	0.96	28.13	±	0.86	28.47	±	0.70
3.	pH	7.72	±	0.15	15.93	±	0.19	7.86	±	0.04	7.81	±	0.03
4.	Transparency	51.25	±	5.04	46.29	±	4.95	46.45	±	4.94	46.58	±	5.36
5.	Total Dissolved Solids	355.25	±	19.79	319.00	±	22.48	339.91	±	6.53	340.41	±	14.06
6.	Total Solids	640.66	±	21.48	680.16	±	46.58	688.52	±	21.71	642.08	±	15.27
7.	Conductivity	0.201	±	0.181	0.27	±	0.012	0.26	±	0.014	0.31	±	0.036
8.	Dissolved Oxygen	5.77	±	0.14	4.70	±	0.10	4.63	±	0.44	3.11	±	0.21
9.	Free CO_2	9.65	±	0.32	10.45	±	0.38	10.15	±	2.95	8.72	±	1.52
10.	Total Alkalinity	150.66	±	24.60	160.66	±	28.13	186.96	±	23.35	290.25	±	14.16
11.	Chlorides	91.08	±	6.50	95.66	±	6.81	97.16	±	6.90	100.00	±	9.45
12.	Total Hardness	150.58	±	24.66	146.50	±	40.52	191.16	±	18.69	160.41	±	30.63
13.	Biological Oxygen Demand	8.24	±	0.11	6.03	±	0.47	8.57	±	0.06	10.28	±	0.26

favored dissolution of DO. Low DO during summer in the present investigation was probably due to two reasons. In summer at high temperature rate of oxidation of organic matter in water increase and oxygen was consumed in the process, secondly at higher temperature the water had a lesser oxygen holding capacity and surplus oxygen was lost to the atmosphere. Many workers (Singh *et al.,* 1993; Mani and Gaikwad 1998 and Prakasham and Joseph, 2000) have discussed the seasonal fluctuations in the DO content of various water bodies in India at length. The value of free CO_2 ranged between 3.82 mg/L to 18.00 mg/L. The minimum free CO_2 was recorded in the month of June and maximum in October (Jain and Seethapati, 1996). The free CO_2 was recorded maximum in summer and minimum in winter. Telkhade *et al.* (2008) reported the maximum CO_2 value in month of March. The present study clearly indicated the fluctuations in free carbondioxide values corresponded directly with changes in the productivity values.

The value of alkalinity ranged from 96 mg/L to 280 mg/L. The maximum alkalinity was noted down during month of January and minimum during September. Similarly, Kumar *et al.* (2007) studied urban pond Telibandha, The total alkalinity was recorded maximum in winter and minimum in rainy season. The present findings are similar with the finding of workers like Kulshrestha *et al.* (1992) and Deshmukh (2001). Total hardness ranged between 98 mg/L to 300 mg/L. The minimum value of hardness was recorded the month of January and maximum in May. The Hardness values were maximum during rainy season, may be due to leaching of rocks in

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catchments area. Minimum during winter may be due to deposition of calcium and magnesium salts. The higher values of chlorides were recorded in summer and lower in rainy. Sarma *et al.* (2007) recorded the range of chlorides was between 13.5-24.0 mgL^{-1}. High chlorides values of in summer could be due to their concentration as a result of evaporative water loss. Lower values in rainy could be attributed to dilution effect and renewal of water mass after summer stagnation. In the present study BOD values were higher during winter season and lower values were observed during summer season. Moderate high BOD values were observed during rainy season. Similar observations were observed by Mishra *et al.* (1999). Jain and Dhanija (2000) have identified BOD as an important parameter in aquatic ecosystems to establish the status of pollution.

In the present study, Phytoplanktons were represented by 4 groups. Amongst which Chlorophyceae was dominant with 15 species followed by *Bacillariophyceae* (7), *Cyanophyceae* (6) and *Euglenophyceae* (3). Total 31 species of phytoplankton was recorded from all the sampling stations of the tank with similar distribution (Table 4). The phytoplankton exhibited a bimodal pattern. One peak of phytoplankton was observed in May and can be summarized as summer peak and second peak was observed in the month of December as winter peak. As per seasonal comparison is concentration, the total number of phytoplankton was low in rainy season and high in summer and winter. Kumar (1990) estimated that the density of phytoplankton is greater during summer, post-monsoon and winter and is lowest in monsoon. Verma *et al.* (2001) and Milind S Hujare (2008) were also reported phytoplankton density in different seasons in order of summer > winter > monsoon.

In the present investigation, zooplanktons were represented by four group's, viz., *Rotifera, Cladocera, Copepoda* and *Ostracoda.* Total 39 species of zooplanktons were recorded from all the stations of the tank, with similar distribution. The present study of zooplankton population abundance showed that *Rotifers* (16) dominated the water body followed by *Cladocera* (10), *Copepoda* (08) and *Ostracoda* (05). Seasonal variation in zooplankton population exhibited bimodal pattern and showed two peaks, one peak during rainy season while other peak was recorded during summer. The seasonal fluctuation of zooplankton population is a well known phenomenon; Welch (1952) mentioned that the fluctuation in zooplankton population is greatly influenced by the variation of temperature along with many other factors. Benarjee *et al.* (2008) studied the climatic influence on zooplanktonic population in historical lake of Warangal, Andhra Pradesh. Manjare *et al.* (2010) worked on zooplankton population in Vadgaen tank, Kolhapur, Maharashtra.

In the present investigation 16 species belonging to Rotifera, *Brachionus* showed its dominance by maximum numbers of species and density. Rotifers were found maximum at all stations during winter and summer (Table 4). Contreras *et al.* (2009) identified 23 species of rotifers and recorded seasonal changes, diversity in Valle de Bravo, Mexico. Manjare *et al.* (2010) have identified 7 species of Rotifers in Vadgaon tank and comprise 40.33% among the zooplankton groups. These observations are also similar with the study. Minimum density was recorded on rainy season maximum during winter and summer. (Choubey Usha, 1991). Among the observed rotifers, *Brachionus falcatus* and *Keratella tropica* were pollution indicator species

Table 4: Seasonal Mean Values of Plankton During Year 2007-2010

S. No.	Parameters	Rainy			Winter			Summer		
		Mean	±	SD	Mean	±	SD	Mean	±	S.D
A)	Phytoplankton	370.75	±	32.29	794.58	±	23.74	730.75	±	16.18
1.	Chlorophyceae	573.58	±	20.14	259.58	±	0.28	704.92	±	42.81
2.	Cyanophyceae	486.50	±	37.10	765.17	±	58.36	726.83	±	10.44
3.	Bacillariophyceae	135.42	±	0.72	285.67	±	4.73	250.25	±	5.27
4.	Euglenophyceae	370.75	±	32.29	794.58	±	23.74	730.75	±	16.18
	Total	1566.25	±	90.25	2105.00	±	87.11	2412.75	±	74.69
B)	Zooplankton									
1.	Rotifera	181.17	±	55.23	801.08	±	8.95	1243.25	±	57.57
2.	Cladocera	527.33	±	117.77	852.17	±	118.26	646.25	±	19.52
3.	Copepoda	667.08	±	64.01	418.67	±	21.98	933.42	±	20.03
4.	Ostracoda	289.83	±	15.18	178.50	±	5.24	644.83	±	113.53
	Total	1665.42	±	252.19	2250.42	±	154.42	3467.75	±	210.66

Table 5: Yearly Mean Values of Plankton Population During Year June 2007 to May 2010

S. No.	Parameters	2007-08			2008-09			2009-10		
		Mean	±	SD	Mean	±	SD	Mean	±	SD
A)	Phytoplankton									
1.	Chlorophyceae	577.16	±	41.21	660.00	±	57.43	658.91	±	18.84
2.	Cyanophyceae	527.58	±	37.17	519.08	±	20.07	491.41	±	15.58
3.	Bacillariophyceae	700.75	±	22.77	643.16	±	25.69	634.58	±	80.66
4.	Englenophyceae	217.58	±	34.61	225.83	±	38.13	227.91	±	39.29
	Total	2023.07	±	135.76	2048.07	±	141.32	2012.81	±	154.38
B)	Zooplankton									
1.	Rotifera	692.33	±	250.05	760.41	±	201.27	772.75	±	168.43
2.	Cladocera	633.58	±	132.64	681.00	±	236.44	711.16	±	226.34
3.	Copepoda	685.00	±	70.74	661.41	±	57.62	672.75	±	60.14
4.	Ostracoda	514.25	±	39.61	501.25	±	77.03	397.66	±	34.61
	Total	2525.16	±	493.04	2604.07	±	572.38	2554.32	±	489.54
	Total Plankton	4548.23	±	628.79	4652.14	±	713.70	4567.13	±	643.92

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and were abundantly found at sampling Station-4, the distribution of these species was typical, abundantly found at polluted station and species of rotifers showed dominance during summer months. These observations are also similar with the present findings of Nagaram tank.

The Cladoceran is represented by 10 species and the population was maximum during winter season followed by summer and least during rainy season. In this season particularly the Chlorophyceae and Bacillariophyceae were also maximum conforming enrich food supply for the growth of Cladocerons (Pawar and Pulle, 2005). Manjare *et al.* (2010) identified 5 species of Cladocerans in Vadgaon tank. Cladocera was observed maximum in July (98.64%) minimum in October (12.95%) and represents 36.49% second dominance of various groups of zooplanktons. During the study period total 8 species of Copepods were identified. Among these most abundant species of copepods were *Cyclops* spp*., Nauplius larvae, Mesocyclops leuckarti* and *Merocyclops hyalimus* (Deshmukh, 2001). The Copepods population of the tank was maximum during summer season followed by rainy season and least during winter season. Singh and Sahay (1979) pointed out maximum Copepod density during February and March in Jalwani pond.

The total 5 species of Ostracods were identified in the present study. *Hemicypris fosculata, Standansia elongata* were more dominant and observed in the entire three years of study period. *Cypris* spp. and *Hetero cypris* spp. were low in their population. The population was maximum during summer season followed by rainy season and lowest during winter season. The present study shows similarities with Deshmukh (2001), Sunkad and Patil (2004); Menzer (2005) and Pandit *et al.* (2007) in occurrence of highest density in summer and lowest in winter. The higher abundance of zooplanktonic fauna was recorded during summer, while lower value during rainy season. This fluctuation of zooplankton is mainly due to environmental changes (Sunkad, 2004; Manzer *et al.,* 2005; Padmanabha and Belagali, 2008). Manjare *et al.* (2010) recorded the order of dominance of various groups of zooplanktons were represented in Vadgaon tank as Rotifera (40.33%) > Cladocera (30.49%) > Ostracoda (12.75%) > Copepoda (10.41%).

Inland fisheries in India have great potential of contributing to the food security of the country. Reservoirs and lakes are the main resources exploited for inland fisheries and understanding of fish faunal diversity is a major aspect for its development and the sustainability management. (Jhingran, 1982 and Vijay Kumar and Paul, 1990). The fish fauna of Nagaram tank consists of 30 species belonging to 13 families. Among the collections 13 species of Cypriniformes, order Siluriformes consists of 7 species, Channiformes consists of 03 species, Perciformes 05 species, Osteoglossiformes 01 and order Atheriniformes consists of one species. The studies on Ichthyofaunal diversity from different fresh water bodies of India have been carried out during the last few decades (RajuTalwar and Jhingran, 1991; Sarkar and Benerjee, 2000; Mishra *et al.,* 2003 and Sharma *et al.,* 2004). Dhankand *et al.* (2008) also reported 29 fish species from Sagar reservoir, Jhabua district of Madhya Pradesh which includes 21 species from order Cypriniformes, 2 species from order Perciformes, and 2 species from order Mastacembliformes. Earlier studies on water quality of some fresh

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water bodies in relation to fish culture were also made by Nooralam *et al.* (2009) and Ramu *et al.* (2009). Pawar and Pandarkar (2011) studied on water quality in relation to pisciculture of Kelewadi lake, Maharashtra.

From the present study, it may be concluded that all the physico-chemical parameters are at nearly permissible limit at all 4 stations. The overall tank is not considered to be more polluted. The tank having rich diversity of flora and fauna. The tank is precious to all aquatic life. Therefore, it is suggested that the immediate measures are necessary to be initiated to avoid further contamination of tank due to anthropological activities. At present the tank water is suitable for fish culturing and irrigation purpose.

CONCLUSION

From the present study, it may be concluded that all the physico-chemical parameters are at nearly permissible limit at all 4 stations. The overall tank is not considered to be more polluted. The tank having rich diversity of flora and fauna. The tank is precious to all aquatic life. Therefore, it is suggested that the immediate measures are necessary to be initiated to avoid further contamination of tank due to anthropological activities. At present the tank water is suitable for fish culturing and irrigation purpose.

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