



Study on Inter-relation between Zooplankton and physico-chemical parameter of Yaldari Dam, Parbhani (M.S.), India

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ABSTRACT

The inert- relation between Physico-chemical parameters and Zooplankton diversity of Yaldari Dam Parbhani (M.S.) study during the Jan 2019 to Dec 2019. The distribution and diversity of zooplankton in aquatic ecosystem depends mainly on the physico-chemical properties of water. Zooplankton have been considered as ecological importance organisms. The zooplankton community in Yeldari Dam is comprised of rotifer, Cladocera, Copepoda and Ostracoda. Total 34 species and 29 genera of zooplankton obtained in this study, out of that number of species rotifer are 18, Cladocera 8, Copepods 5 and 3 Otracodes are found during study period. A percentage comparison among the various zooplankton species reveals that the rotifers were the dominant group forming 52.94% of the zooplankton followed by cladocerans are 23.52 %, copepods representing 14.7% each. This was followed by Ostracoda representing 8.82% of the total zooplankton. Thus, each group of zooplankters preferred to reach their peak in different months of the year.

Keyword: Zooplankton, Physico-chemical, Yaldari Dam.

INTRODUCTION

The environment, a complex of so many things encompassing an organism that interact not only with organism but also among themselves. Environmental biology is extension of ecological approach, which stresses the study of environment for welfare of man and his comfort. Different climatic zones are formed bases on annual temperature range, mean annual rain fall and on the base of altitude. In temperate regions, lakes often become thermally stratified during summer and again in winter, owing differential heating and cooling. Epilimnion i.e. the upper warmer part of lake isolated from the hypolimnion i.e. colder warmer water by a thermocline zone that acts as barrier to exchange of material. "Blooms" of phytoplankton often follow seasonal rejuvenations of ecosystem.

Environment of water bodies mainly depends upon the climatic conditions occurs annually like temperature fluctuation, rainfall, physico-chemical properties, biological conditions and adverse effects decided condition of water. The living organisms and their non-living environment are inter-related, interact separately and with each other. Any unit in which there is interaction between organism and between two materials is called ecosystem. Ecosystem is the functional unit of ecology and represent highest level of ecological interaction which is energy based (Prasad, 2000).

The "Biotic community" and non-living environment function together called as an ecosystem. Ecology is the basic division of biology and also an integral part of any and all taxonomic division. It is consider in terms of the concept of several biotic level of organization as Community, population organism, organ, cell and gene. The major ecosystem of the world deals with easily recognized types, with emphasis on geographical and biological differences that underlie the remarkable diversity of life on earth. Fresh water eco-system are characterized as having running water (lotic) and still water (lentic). The fresh water stream (springs creeks, rivulets, brooks etc.) and rivers are lotic zone but pools, ponds, some swamps bogs, lakes, etc are lentic ecosystem.

MATERIAL AND METHODS

The Yeldari dam which is located 15 km distances away from Jintur city in the Yeldari village (rural area) at the GPS latitude N 190 43' 12.4" Latitude N 190 43' 12.4" Longitude E 760 43' 55". Yeldari dam is fresh water body built on Purna River which is sub Basin of Godavari River. This dam has spread on large agricultural area there are so many villages were came under the this dam during construction i.e. Kinhi, Kawatha, Amberwadi, Bamni, Wazar and Sawangi, Sonsawangi and Belkhi The present study has been undertaken 1st time on Yeldari dam to know the climatic changes as per the sites and species richness.

Plankton sample will be collected from four different sampling sites, collected plankton sample analyzed in to the laboratory of P. G. and Research Department of Zoology R. A. College Washim. All collected sample will be analyzed by following the methods suggested in APHA (1998) and Dhanpathi (2000).

RESULT AND DISCUSSION

Inter-relation between the Plankton with physico-chemical parameters of Yaldari Dam dist. Parbhani was given below.

Physico-chemical Properties of the Yaldari Dam Water:

The study of Yaldari Dam was undertaken from January 2019 to December 2019 and the water quality studies consisted solely of the recording of selected physico-chemical parameters and their interpretation (Table 1). The Dam water was recorded having temperature highest in Jun i.e 29.75 °C and lowest in December i.e. 18.25 °C, pH ranging from 8.1 to 7.23, Electrical conductivity (EC) ranges from 377.5 µmho/cm in Jun and lowest was 215 µmho/cm in month of December, Turbidity ranges from 9.14 NTU to 5.2 NTU both the range are in same month as EC, Total dissolved solid ranges from 375.36 mg/l to 228.83 mg/l, the various chemical parameters like dissolved oxygen (DO) ranging from 7.70 in the month of January to 3.9 mg/l in October, the free carbon dioxide was observed in the water sample hence the observed total alkalinity by carbonate ranges from 56.5 mg/l to 22 mg/l and bicarbonate was ranges from 163 mg/l to 98.13 mg/l, the alkalinity highest was observed in the month of February while lowest was in the month of August. Total hardness ranges from 300.5 mg/l to 141.5 mg/l, while the calcium and magnesium hardness of dam water are observed in permissible limit, Chloride of dam water was ranges from 140.73 mg/l to 68.34 mg/l salinity of dam water is also calculated on the basis of chlorinity, Nitrogen compounds like ammonia, highest was observed 0.78 mg/l to 0.03 mg/l in trace amount during the summer season, while the ammonia converted in to the various other parameters like Nitrite and Nitrate, the highest was observed in the month of August and lowest was in February it ranges from 8.32 mg/l to 0.01 mg/l. The phosphate content of the water body was maximum during August that was 2.11 mg/l and lowest was 0.17 mg/l in month of January, Sulphate ranges from 7.375 mg/l to 3.23 mg/l, Silicates ranges from 9.35 mg/l to 1.60 mg/l. Biological oxygen demand ranges from 2.13 mg/ to 0.35 mg/l highest demand of oxygen was observed in the late winter season, Chemical oxygen demand ranges from 15.48 mg/l to 9.35 mg/l during the same season, Walale and Rathod (2020).

Table 1: Seasonal fluctuations in physico-chemical parameters of water in Yaldari Dam water during the study period Jan to Dec 2019.

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
TEMP °C	23.75	24.5	25.5	25.63	29.5	29.75	27.25	26.75	24.5	22.75	20.5	18.25
pH	7.58	7.7	7.9	8.05	7.9	8.1	7.9	7.68	7.53	8.03	7.38	7.23
EC µmho/cm	371.5	377.5	283.25	277.5	279.25	377.5	371.5	341	335.25	296	272.25	215
Turb. NTU	6.52	7.95	8.2	8.51	8.94	9.14	8.67	8.19	6.82	6.1	5.95	5.2
TDS mg/l	274.32	283.42	249.29	228.83	249.32	375.36	375.33	290.78	262.3	236.03	235.74	231.37
DO mg/l	7.70	6.83	4.45	5.3	5.25	6.35	7.45	6.48	4.75	3.9	5.25	7.4
CO2 mg/l	7.7	6.83	4.45	5.3	5.25	6.35	7.45	6.48	4.75	3.9	5.25	7.4
CO3 mg/l	37.5	56.5	44.5	27.75	32	35.25	27.25	22	23.75	29.75	27	24
HCO3	134.5	131.75	163	98.13	99.9	101.83	114.5	130.5	139.25	127.25	126.75	122.75
TH mg/l	265	300.5	253.25	288.5	229	267.5	200.5	193	186.25	178.5	199.25	141.5
Ca H mg/l	43.4	40.9	41.15	39.06	34.1	26.04	10.84	8.3	8.65	16.33	24.77	35.68
Mg H mg/l	54.82	63.34	51.75	60.62	51.27	58.91	46.28	41.65	43.33	39.57	43.57	25.82
Cl. mg/l	79.76	68.43	90.22	127.48	140.73	103.16	93.56	93.03	78.7	94.15	87.48	73.23
Salinity mg/l	144.00	123.54	162.88	230.14	254.05	186.23	201.64	167.95	142.07	170.04	157.94	132.21
NH ₃ mg/l	0.30	0.06	0.03	0.08	0.78	0.48	0.50	0.53	0.38	0.33	0.0825	0.235
Nitrite mg/l	0.21	0.01	0.08	0.03	0.40	0.43	0.24	0.41	0.23	0.11475	0.14	0.48575
Nitrate mg/l	2.16	2.47	3.18	5.59	7.75	7.67	5.75	8.32	4.97	4.08	4.5	3.52
Phosphate mg/l	0.17	0.26	0.28	0.42	0.51	0.61	1.13	2.11	1.01	0.82	0.65	0.36
Sulphate mg/l	5.00	3.55	4.50	5.23	5.15	4.75	3.23	4.13	3.60	6.4	7.375	4.875
Silicates mg/l	1.60	2.25	4.28	4.18	6.35	5.05	5.93	6.55	8.65	6.0025	9.35	6.125
BOD mg/l	2.03	2.13	1.33	1.06	0.53	0.35	1.93	0.79	0.61	0.6	0.47	0.52
COD mg/l	9.35	11.79	12.05	13.33	14.34	13.5	14.88	12.9	13.73	14.98	14.73	15.48

Table No. 2: Zooplankton Diversity of Yaldari dam Parbhani (M.S.)

Zooplankton	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ro/ml	10.25	7.25	1.25	1.75	0.75	2	1.75	3.25	2.5	7.75	7.5	5
CL/ml	6.25	4	3.75	4.75	3.75	4.75	5	5.25	3.25	5.5	6.25	5
Cop/ml	3.5	3.5	2	5	5	4.75	5.25	6.25	5	9.25	10	4.25
OS/ml	1	1	1.25	2.5	1.75	0.5	0.25	0.75	0.25	0.75	0.5	0.75

The zooplankton community in Yeldari Dam is comprised of rotifer, Cladocera, Copepoda and Ostracoda. Total 34 species and 29 genera of zooplankton obtained in this study, out of that number of species rotifer are 18, Cladocera 8, Copepods 5 and 3 Otracodes are found during study period, Rathod and Walale (2022).

During study periods the mean Rotifer diversity ranges from 0.75 ± 0.5 to 10.25 ± 1.2583 in 2019 In rotifer total 6 genera are recorded including 18 species. Rotifera species were recorded more in winter season than monsoon and summer. Maximum number of rotifer found in the month of January in both the years and minimum in may. Rotifers are chiefly fresh water forms and presence of rotifer in

abundance is indicate suitable condition for their survival. Dhanapati (2000) In rotifera species *Keratella sp.* and *Brachionus sp.* were abundant reported by Kedar and *et al.*, (2008) in abundance in Rishi Lake, Karnja In various water bodies of Central India Kaushik and Sexena (1995) have also reported genus *Brachionus* in abundance. Occurance of genus *keratella* with *Brachionus* indicate nutrient rich status of water body. According to Goel and Charan (1991) *K. tropica* and *Brachionus Calyciflorus* are the pollution tolerant species and indicate accumulation of organic matter and theses species reported dominant in polluted fresh water lake of Kolhapur.

Quantitative analysis of Cladocera during the 2019 it was 3.25 ± 0.5 to 6.25 ± 1.2583 Cladocera were found more in summer than mansoon and winter. Number of cladocera was more in January, minimum in the month of September in 2019. Gadekar and *et al.*, (2014) also found that Cladocera were minimum in Monsoon but they recorded that maximum cladocera found in winter. In present study due to favorable temperature and availability of food like suspended detritus, bacteria and nanoplakton the abundancy of Cladocera increases. Similar result recorded by Raut and *et al.*, (2012) they found Cladocera dominated in summer season over other zooplankton. In monsoon season the physico-chemical factor like dissolved oxygen, temperature, turbidity, transparency also play an important role to controlling the density and diversity of Cladocera. (Edmonson, 1965; Baker 1979). Among cladocera *Alona sp.* and *Moina* were most abundant.

During the study year the mean Copepods rages from 3.5 ± 0.5774 to 10 ± 3.6515 in 2019. It shows the fluctuation all over the year but maximum number of copepods was found in November in both years and less number found in January in 2019. Number of Copepods recorded 5 species in 6 genera. Contraversial result obtained by Pradhan (2014) that they found dominancy of Copepods in summer month during study period. *Calanoid (diaptomus sp.)*, *Eucyclopes sp.*, *microcyclopes sp.* and Presence of Diatomus and cyclopes also observed by Pawar and Pulle (2005) in Pethwadaj dam Nanded. The Cladoceran are primary consumers which feed on algae and fine particulates thus it influence the energy of food chain and cycling matter in the dentritus. Sitare, (2013).

Ostacodes during the 2019 it was ranges from 0.5 ± 0.57735 to 1.75 ± 0.9574 . The highest ostrcodes were observed during the month of April that is summer season while the lowest was observed in winter season that is month of November in both years. In ostracodes *Paracondona euplectella* and *Cyclocypris sp.* were abundant. The highest density of ostracoda found in summer by Sontakke and Mokashe (2014) in Kagzipura Lake. Water level decreases in summer and metabolic activities of biotic component increases. This result found by them and Jayebhaye (2010) worked on river kayadhu, near Hingoli city, Hingoli district, Maharashtra and study on perennial tank in Warangal district, A.P. As compared to other zooplankton population Ostrcoda shows minimum population, similar observation are got by Lahane and Jaybhaye (2013) according to them Ostracoda population are less due to the feeding pressure of fishes and Ostracoda are small Crustaceans having bivalve carapace enclosing the laterally compressed body.

CONCLUSION

An aquatic ecosystem consists of various kind of living organisms like phytoplankton, zooplankton, aquatic plants, Sponges, cnidarians, fishes, amphibians etc. These living organisms depends on physico-chemical Parameters for their food, distribution, density. The phytoplankton and zooplankton give response to temperature, pH, DO, BOD, COD, salinity, carbon dioxide, transparency, hardness and minerals Distribution and density of zooplankton is affected by temperature. Zooplanktons are important component of food chain. The fish larvae and some adult fishes feeds on zooplankton. The movement and distribution of fishes is affected by water temperature. Similarly, alkalinity ranges from 83-107 ppm are proper for growth and reproduction. The amount of DO, CO₂ affect life of aquatic organisms. So, the physico-chemical parameters in relation to zooplankton plays important role in fishery management and fish culture in lakes, ponds and other water bodies. The present investigation on the zooplankton composition, seasonal variation in the diversity and distribution of zooplankton in Yaldari dam Parbhani District (M.S.), India is helpful to investigate the status of this Dam. In all 34 species of zooplankton were identified from Yaldari dam during the course of study of two years. All four groups of zooplankton were recorded

throughout the study period. The number was highest during winter and lowest during summer except ostracoda. Ostracoda is maximum in summer to the study area. The study indicates that temperature plays an important role in the distribution of zooplankton in a fresh water habitat. The abundance of zooplankton from this Yaldari Dam followed a sequence as under: Rotifera > Cladocera > Copepoda > Ostracoda.

Conflict of interest: The authors declare that they have no conflict of interest.

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