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ZOOPLANKTON DIVERSITY FROM GANGAPUR DAM, NASHIK, MAHARASHTRA

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ABSTRACT

Planktons play vital role in the energy transmission at secondary level in any aquatic ecosystem. Planktons are indicators of pollution. Zooplankton diversity along with physic-chemical factors like temperature, pH, EC, Turbidity, TDS, DO, BOD and COD was studied from Gangapur Dam, Nashik, Maharashtra. Present investigation has recorded 40 species of Rotifera, 10 species of Copepodes, 14 species of Cladocera and 8 species of Ostracoda. It is observed that throughout the year Rotifer community dominates followed by cladocera, Copepoda and ostracopoda respectively. Total count of Zooplanktons per liter was recorded highest in the month of May. Physico-chemical parameters along with rainfall show peculiar effect on zooplankton diversity. Along with rainfall quality of runoff influx mainly affects the zooplankton diversity in an aquatic ecosystem.

Keywords: Zooplanktons, Bio-indicators, Gangapur Dam

INTRODUCTION:

Godavari is the longest river of Peninsular India that flows through Nashik district. Gangapur Dam is an earthfill dam on the Godavari river near Nashik in Maharashtra. The dam is one of the oldest dam in Maharashtra that provides drinking water to the Nahshik population. It is located at 20.0260565°N latitude and 73.6671498°E longitude. The dam covers the catchment area of 357.4 km^2. Water level in the dam depends mainly on the rainfall. Basically this dam was constructed for the purpose of irrigation.

South-west monsoon season starts from

June to September. Except monsoon season the climate of Nashik District is generally dry throughout the year. October and November constitute the post-monsoon season. Winter season begins from December to February which is followed by summer season from March to May. According to Koppen climate classification the city has a semi-arid climate with 42.5°C maximum summer temperature, 5.0°C minimum winter temperature, 43% to 62% relative humidity and 500 mm to 3400 mm normal annual rainfall in the district.

Nashik city is one of the fastest growing industrial city in Maharashtra. Earlier Nashik was famous for its cold climate but now a day's temperature increase, air and water pollution are the main penalties of urbanization and fast growing industrialization. Agricultural activities like recurrent tilling, chemical fertilizers and pesticides that passed to the aquatic ecosystem along with agricultural runoff and flow in the reservoir along with domestic sewage also add up in the water pollution.

Planktons forms the basic level of food chain. They are microscopic group of organisms including both plants and animals (Sommer, 1994). According to Keller *et al*., 2008, planktons are important bio-indicators of water quality. They play significant role in biogeochemical cycles like methanogenesis remineralization, nitrification, denitrification and carbon cycle. Planktons play major role in the food chain of many aquatic animals. Planktons are the source of life for most of aquatic organism especially in their larval stages. Many fish species depend on it as a food source after absorbance of yolk sac. It has been professed from long time back that Planktons are the major resource of nourishment for fish larvae. Planktons play vital role in the energy transmission at secondary level in any aquatic ecosystem.

Zooplanktons community include Rotifera, Copepoda, Cladocera and Ostracoda. The relative abundance of each other is influential over community structure, which depends upon the relative range of tolerance towards changing seasonal physic-chemical properties of water as well as relative abundance of resource available. Planktons feeding on same resource in a homogenous environment cannot co-exist because of competitive exclusion (Hutchinson 1961). Planktons are bioindicators of the pollution. Abundance of *Rotaria* and *Asplanchuna* in water is indicator of water pollution (Gholap, 2014). Few members of rotifer when present in abundant number is indication of eutrophication of lakes, they are *Brachionus forficula, Brachionus nilsoni*, and *Trichocerca*

sp (Azma Hanim Ismail *et al*, 2016). In a study of lake Parque Atalaia in America, Rotifera diversity was markedly low during dry season under the influence of pollution of water by inlet of domestic sewage (Neves *et al*., 2003).

MATERIALS AND METHODS:

For the current review, water tests were gathered from four unique destinations of Gangapur dam haphazardly. The water samples were gathered by norms and method for assessment of water and waste water American Public Health Association (APHA-1989) and seventeenth version of Beuro of Indian standard strategies for Sampling and Test (Physical and Chemical) for water and waste water (BIS-3025) as a manual for examination.

Temperature and pH of water was recorded at the time of sample collection. Temperature is measured with help of glass thermometer. Temperature is recorded after two hours of sunrise concurrently with water sample collection. Test water collection time is retained unchanged throughout the year. Other physico-chemical parameters like turbidity, TDS (Total Dissolved Solids), OD, BOD etc. were analysed in the laboratory as per procedure mentioned in USGS manual and EPA government manuals (USGS Manual and eps.gov) (epa.gov manual). Zooplanktons were gathered with 80 cross section size net and 50

liters of water was sifted through net. The water samples containing planktons were carefully transferred to the bottle and brought to the laboratory without disturbance. Samples were collected twice in a month from all four stations of dam, for period of 12 months from January 2020 to December 2020. The samples were collected during morning hours. Planktons were observed under a light microscope and identified by using standard Key, other literature (APHA, 1998; Dhanpati 2000, Permak 1989).

RESULTS AND DISCUSSION:

Water temperature was observed highest in May and least in December **(Table 1)**. Turbidity and Electric conductivity (EC) increases with the accumulation of rainfall in rainy season. Therefore both of these parameters are more in month of August and March which correlates with maxima of rainfall **(Table 1)**. pH diminishes with expansion of downpour water rainstorm yet despite the fact that it never reach under 7 or acidic level that is the vacillation is inside the range of fundamental pH. During summer season at hotter temperature the pH is high **(Table 1)**. Turbidity increases in the rainy season showing peak in month of August **(Table 1)**. Dissolved Oxygen (DO) follows the example of consolidated impact of temperature and precipitation. Dissolved oxygen decreases

in summer season while the monsoon rain enhances concentration of DO in water **(Table 1)**. Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) however follow a similar example yet too low upsides of BOD over COD demonstrates the degree of natural contamination in the supply from homegrown sewage, human mediation and that too in summer season when amount of water in repository was relatively less **(Table 1)**.

Among zooplanktons Rotifera, Copepoda, Cladocera and Ostracoda are recorded from the study area. In summer season especially in the month of May all the zooplanktons counted highest in number that is organisms per litter. In winter season that is in December organisms count is less **(Table 2)**. Zooplankton count lowered with the arrival of rainfall in the month of June due to influx of rainwater. The quantity of rainfall and the quality of inlet water through agriculture runoff along with temperature are the important factors that directly or indirectly govern all other abiotic factors considered here like total TDS, pH of water and BOD and COD. In summer season Rotifera, Copepoda, Cladocera and Ostracoda predominate in terms of quantity and diversity than other seasons.

Rotifera dominates the zooplankton community. 40 species of Rotifera are recorded from collected water samples **(Table 3)**. *Brachinus* species dominate among the Rotifera. Among zooplanktons 10 species of Copepodes **(Table 3)**, 14 Cladocera **(Table 3)**, and 08 species of Ostracoda **(Table 3)**, are recorded from the collected samples. It has been observed that rotifera dominated the community throughout the year pursued by Ostracoda, Copepoda and least is Cladocera. Growth rate of inhabitants may be highest in summer season especially in the month of May which follow high temperature and count is lowest in winter season during November and December. Thus temperature is the significant physical factors that rule the population either directly by affecting the population growth rate or indirectly by affecting other physic-chemical parameters. Along with rainfall quality of runoff influx mainly affects the zooplankton diversity in an aquatic ecosystem.

Rotaria and *Asplanchuna* were found relatively abundant in collected water sample which is indicator of water pollution. Eutrophication indicators *Brachionus forficula, Brachionus nilsoni*, and *Trichocerca* sp are also recorded from the collected water examples.

Table 1: Physico-chemical Parameters of water samples from Gangapur Dam, Nashik:

Month	Temperature	pH	EC	Turbidity	TDS	DO	BOD	COD
January	23	7.9	461.44	7.7	335	4.04	4.47	36.59
February	20	7.8	488.17	8.9	354	4.50	3.82	31.35
March	26	7.6	552.88	9.3	400	4.72	8.30	67.68
April	27	7.9	541.78	8.5	392	4.32	5.02	41.09
May	32	7.5	482.62	8.3	349	3.90	4.86	39.72
June	29	7.7	579.21	9.6	420	5.38	3.58	29.35
July	28	7.1	633.72	12.6	459	6.01	3.02	24.79
August	23	7.1	769.26	15.6	558	7.53	2.31	19.04
September	26	7.3	729.10	15.0	528	7.15	1.15	9.62
October	22	7.5	695.07	13.6	504	6.66	1.39	11.59
November	21	7.6	646.28	11.7	468	5.75	2.23	18.40
December	19	7.8	538.50	11.3	364	4.97	2.93	24.02

Table 2: Total Count of Zooplanktons recorded from the water samples of Gangapur Dam (Organisms / Lit.):

Month	Rotifera	Copepoda	Cladocera	Ostracoda
January	103	42	37	36
February	123	47	42	30
March	136	41	55	31
April	142	62	79	42
May	158	89	62	58
June	153	70	52	47
July	139	59	32	38
August	111	45	49	21
September	116	64	56	36
October	121	63	55	40
November	133	51	45	41
December	106	49	43	40

Table 3: List of Zooplanktons observed from the water samples of Gangapur Dam, Nashik

List of Rotifers			
Asplanchna sp.	*Brachionus angularis*	*Brachionus ureceolaris*	*Brachionus calyciflorus*
Brachionus diversicornis	*Brachionus folculus*	*Brachionus falcatus*	*Brancionous calciflorus*
Brachionus quadridentatus	*Brachionus caudatus*	*Brachionus forficula*	*Cephalodella exigna*
Colurella adriatica	*Cephalodella forficula*	*Dicranophorus dolerus*	*Euchlanis dilatata*
Epiphanes clovulata	*Filinia longiseta*	*Filinia opoliensis*	*Keratella tropica*
Kertella valga	*Keratella procura*	*Keratella cochlearis*	*Lecane bidentata*
Lecane bulla	*lecane depressa*	*Lecane pyriformis*	*Lepadella ovalis*
Lepadella patella	*Monostyella sp.*	*Notholca acuminata*	*Notomata copeus*
Pseudoharringia similis	*Proales decipiens*	*Rotaria spp*	*Trichocerca tigris*
Tripleuchlanis spp	*Testudinella patina*	*Testudinella sp.*	*Filina spp.*
List of Copepoda			
Cyclops sp.	*Cyclops viridis*	*Diaptamus spp.*	*Eudiaptomus gracilis*
Heliodiaptomus contortus	*Mesocyclop sps*	*Mesocyclops leuckarti*	*Megacyclops sp.*
Nauplius larvae	*Paracyclops fimbriatus*		
List of Cladocera			
Alona guttata Sars	*Bosmina longirostris*	*Biapertura Moina mircura*	*Biapertura affinis (Leydig)*
Cypris Flurcularia	*Ceriodaphnia pulchella Sars*	*Daphnia cucullata Sars*	*Daphnia sp*
Grimaldina brazzai (Richard)	*Ilyocryptus sordidus (Lievin)*	*Macrothrix goeldii (Richard)*	*Macrothrix spinosa (King)*
Scapholeberis kingi Sars	*Trophocyclops*		
List of Ostracoda			
Candocypris spp.	*Candona Centrocypris*	*Cyprides Cyprinotus*	*Cypris spp.*
Darwinula Ilyocypris	*Limnocythere*	*Metacypris*	*Potamocypris*

CONCLUSION:

Present investigation has recorded 40 species of Rotifera, 10 species of Copepodes, 14 species of Cladocera and 8 species of Ostracoda. It is observed that throughout the year Rotifer community dominates followed by cladocera, Copepoda and ostracopoda respectively. Total count of Zooplanktons per liter was recorded highest in the month of May. Physico-chemical parameters along with rainfall show peculiar effect on zooplankton diversity.

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