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ZOOPLANKTON DIVERSITY OF DNYANGANGA RESERVOIR NEAR KHAMGAON, MAHARASHTRA

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Abstract: Study on zooplankton diversity of Dnyanganga Reservoir in Botha forest of Buldana district was carried out during 2008-09. The zooplankton study reveals that the Copepods are major in occurrence, 3079 in number (32.28%); Cladocera are 2323(24.36%); Rotifers in 2976(31.20%); and Ostracods are 1158 in number (12.14%). The lake exhibited high magnitude in winter season and the low during summer. The less number of genera might be attributed to low nutrients in the reservoir which consequently resulted in less productivity or might be due to depletion of important factors such as dissolved oxygen and PH. The reduction in the number of species may also due to predation and variation in the pH of water which is always associated with the species composition of zooplankton inhibiting among them .In winter, it is biotic interaction operating through feeding pressure rather than water quality seems to affect the zooplankton diversity and density particularly the stocked fish species play an important role in harvesting species of copepoda and Cladocera, thereby reducing their predatory pressure on other groups. The Rotifera and particle feeder Cladocera were higher in winter and can be linked to favorable temperature and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus matter .Total 26 types of genera were recorded which indicates variable nature of productivity the Dnyanganga Reservoir .

Key words: Biodiversity, Dnyanganga, Khamgaon, Microfauna, Seasonal Variations.

INTRODUCTION :

Khamgaon is one of the oldest known cities for business, urbanization and industrialization in the central India since British Regime and it is the vast growing city of Buldana district. It is situated 2040'59.880"N latitudinal and 7634'0.120"E longitudinal, 50 km away from Akola on Mumbai-Kolkatta highway no.6. Routinely, it observed that everyone spending more time in collecting buckets of water not in hot summers but in winters and even also in rains too. At present, there are about eight large medium to small water projects around Khamgaon in the area of 30 km. Some of which are Januna Tank, Lanjur Small Project, Botha Small Project, Dnyanganga Medium Project, Pen Takli, Khadakpurna, Jigaon (projected) etc. But unfortunately, some these projects are either neglected or mismanaged. As a result, people of Khamgaon and around do not have sufficient water for drinking, agriculture and industrial purposes.

Limnology plays an important role in decision making process for problems like dam pollution control and aquaculture practices (Muley and and Gaikwad, 1999; Jakher and Rawat, 2003.) Since, the ages, rivers and dams throughout the world have played significant role in the development of mankind and civilization. In India natural water resources has a system of rivers and their tributaries covering a length of 27,359 km .The five rivers of the Punjab plains, The Ganga, Yamuna, Godavari, Krishna and Brahmaputra have continued to sustain man throughout history (Sinha, et al., 1986). The quality of water resources is usually described accordingly to its physical-chemical and biological or bacteriological characteristics. Assessment of water resource and quality of the water bodies is an important aspect for the development of the region, because it is the sum of water supply of domestic, industrial, agricultural and aquaculture practices (Jain and Seethapathi., 1996; Jakher and Rawat., 2003)

MATERIALS AND METHODS

The research work consists of study of water bodies around Khamgaon. It mainly includes i) Januna Lake ii) Botha Dam iii) Dnyanganga Dam and iv) Lanjur Lake. During survey of all the water bodies five sampling stations designated as site I, II, III, IV at corners and Vth in the core middle of the water body were established. The water samples are collected from the study spots on a monthly basis with help of local fishermen. The survey was started on 1st April 2008 and completed on 31st March 2009.The samples are well mixed and stored in two litre plastic cans. Sample collection was usually completed during morning hours between 6.00 am to 9.00 am every month for further analysis. The water temperature, water transparency, dissolved oxygen and hydrogen ion concentration (pH), were estimated on the spot at the time of sampling while other parameters and microfauna study were carried out in the laboratory. Standard methods as prescribed Trivedy and Goel (1986), Saxena (1990), APHA (1992) and Kodarkar et.al, (1998), were followed for examination of various physical and chemical parameters of water.

RESULTS AND DISCUSSION

Table No. 1. Monthly diversity of Zooplankton Population (no. of individuals/L) of Dnyanganga Reservoir during April 2008 to March 2009

Name of Group	Genera	Site	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	TOTAL
Copepoda	*Mesocyclop*	I	-	-	3	-	14	16	11	13	16	15	-	6	**94**
		II	6	-	-	1	-	-	-	-	-	-	-	11	**18**
		III	2	11	4	2	12	14	-	12	14	16	13	-	**100**
		IV	-	-	-	12	16	13	-	-	-	-	6	4	**51**
		V	-	3	-	-	11	23	-	14	-	20	-	3	**74**
	Argulus	I	4	9	3	11	-	6	20	21	28	-	2	1	**105**
		II	3	-	6	4	4	-	1	2	12	24	9	-	**65**
		III	5	6	5	-	-	16	3	-	-	-	6	5	**46**
		IV	-	7	-	13	18	-	-	15	22	34	4	1	**114**
		V	9	-	4	2	20	12	-	26	36	-	-	-	**109**
	Acartiella	I	3	5	2	-	12	16	2	16	-	-	3	7	**66**
		II	-	6	-	1	13	22	-	-	32	16	-	-	**90**
		III	4	-	4	7	-	-	10	9	21	30	2	1	**88**
		IV	12	6	3	-	4	6	13	12	-	-	3	1	**60**
		V	13	16	-	13	6	5	3	2	26	18	-	-	**102**
	Microcyclopus	I	-	11	9	4	12	-	-	-	-	17	3	6	**62**
		II	16	-	13	-	-	6	9	1	-	-	4	2	**51**
		III	20	9	-	20	2	3	-	-	24	22	-	3	**103**
		IV	-	-	3	-	20	20	24	-	-	-	4	-	**71**
		V	1	9	-	16	-	-	2	14	23	19	3	4	**91**
	Cyclopus	I	-	-	2	3	11	18	-	14	-	-	-	1	**49**
		II	-	5	-	4	21	20	24	21	19	18	4	3	**139**
		III	10	-	4	-	-	22	14	-	-	-	-	-	**50**
		IV	4	6	6	5	24	-	-	18	22	20	1	-	**106**
		V	-	-	2	-	-	13	17	-	-	24	3	4	**63**
	Dioptomus	I	-	6	3	3	20	-	-	19	10	16	-	1	**78**
		II	3	6	-	-	1	13	14	15	8	7	1	1	**69**
		III	-	-	1	3	22	24	-	12	16	-	9	-	**87**
		IV	9	11	2	5	-	-	20	-	20	9	-	1	**77**
		V	-	6	-	-	11	11	20	13	14	13	3	2	**93**
	Phyllodiaptomus	I	9	-	-	6	-	16	-	19	-	-	1	-	**51**
		II	3	11	5	-	13	-	26	16	12	26	1	2	**115**
		III	-	-	-	-	25	-	-	30	-	-	1	1	**57**
		IV	2	12	13	9	-	-	19	28	20	18	-	-	**121**
		V	-	-	-	6	22	28	24	-	-	-	2	1-	**82**
	Nauplius	I	21	-	13	11	-	-	-	-	22	23	1	-	**91**
		II	6	3	9	3	13	26	-	26	-	-	-	5	**91**
		III	3	4	-	4	-	-	-	19	-	24	6	-	**60**
		IV	-	1	2	-	-	13	-	-	-	-	3	-	**19**
		V	-	-	2	3	-	-	-	16	-	-	-	-	**21**
	TOTAL		**168**	**169**	**123**	**171**	**347**	**382**	**276**	**423**	**417**	**429**	**98**	**76**	**3079**
Cladocera	*Alona*	I	3	4	6	1	9	12	-	16	18	-	9	4	**82**
		II	-	-	-	-	-	-	14	1	-	-	-	-	**15**
		III	5	4	3	2	1	28	-	24	-	20	8	2	**97**
		IV	-	3	4	-	-	-	26	-	22	-	1	-	**56**
		V	3	-	-	12	10	20	-	-	32	-	-	6	**83**
	Microthrix	I	2	10	11	5	6	30	18	12	15	36	7	-	**152**
		II	-	1	-	3	9	-	20	-	34	-	-	3	**70**
		III	9	-	5	-	-	14	-	19	-	16	5	6	**74**
		IV	2	-	4	1	2	9	10	169	19	-	-	-	**216**
		V	-	8	-	-	-	16	-	-	9	-	-	10	**43**
	Moina	I	6	7	4	5	8	-	13	-	-	-	11	-	**54**
		II	-	-	-	-	-	25	3	10	27	1	-	9	**75**
		III	2	-	3	-	-	20	-	-	-	10	10	-	**45**
		IV	1	9	-	6	-	21	2	25	22	-	4	12	**102**
		V	11	9	10	-	7	-	-	-	-	18	-	14	**69**
	Ceriodaphnia	I	-	-	-	12	1	20	14	-	20	1	2	13	**83**
		II	11	13	16	-	-	10	-	16	30	24	1	7	**128**
		III	4	10	12	11	13	-	14	-	-	18	-	-	**82**
		IV	5	1	-	-	-	13	11	-	-	-	4	-	**34**
		V	-	20	11	-	7	16	-	10	9	30	-	3	**106**
	Chydorus	I	-	-	1	8	-	-	19	24	30	-	-	-	**82**
		II	6	-	9	-	-	11	16	22	-	34	2	5	**105**
		III	2	-	-	-	-	-	22	1	16	-	1	11	**53**
		IV	9	1	1	8	-	20	-	-	-	-	-	9	**48**
		V	-	-	8	2	6	-	26	20	11	-	8	12	**93**
	Daphnia	I	3	1	-	5	-	13	-	-	-	10	1	-	**33**
		II	6	9	2	5	-	20	18	-	14	-	-	16	**90**
		III	1	-	-	4	-	13	-	16	3	-	10	-	**47**
		IV	2	9	1	1	-	-	25	2	-	12	2	4	**58**
		V	2	3	-	-	4	-	-	-	13	-	6	20	**48**
	TOTAL		**95**	**122**	**111**	**91**	**83**	**331**	**271**	**387**	**344**	**230**	**92**	**166**	**2323**
Rotifera	*Brachionus*	I	-	-	4	5	3	20	21	11	16	24	26	-	**130**
		II	6	-	-	-	-	-	-	-	-	13	1	20	**40**
		III	6	10	9	1	-	-	22	20	24	5	-	19	**116**
		IV	-	7	5	-	2	-	-	10	-	26	18	8	**76**
		V	1	8	-	-	-	1	-	-	9	-	-	-	**19**
	Asplancha	I	-	-	13	-	-	3	1	1	-	14	12	13	**57**
		II	1	4	-	22	13	2	4	-	5	-	19	-	**70**
		III	-	-	-	-	-	-	-	5	-	5	7	13	**30**
		IV	2	3	16	-	-	4	-	6	-	16	18	-	**65**
		V	-	-	7	8	9	-	8	4	2	11	25	11	**85**
	Anuropsis	I	-	-	5	-	-	-	-	3	-	-	16	9	**33**
		II	-	4	6	-	-	-	9	1	-	7	8	6	**41**
		III	-	1	2	4	-	-	-	6	34	32	1	3	**83**
		IV	7	3	-	-	-	24	-	-	30	-	-	-	**64**
		V	-	-	3	4	22	-	26	-	13	-	12	2	**82**
	Philadena	I	6	-	5	-	-	-	14	28	36	-	11	1	**101**
		II	-	9	-	6	-	-	-	-	16	-	4	4	**39**
		III	-	-	4	-	-	22	19	30	-	13	7	-	**95**
		IV	8	7	-	5	26	24	-	3	14	22	6	3	**118**
		V	-	-	6	-	28	22	13	-	-	20	13	7	**109**
	Rotatoria	I	16	-	-	-	-	-	-	-	30	-	8	-	**54**
		II	2	2	3	-	30	16	32	34	-	24	-	-	**143**
		III	-	9	-	-	-	30	-	-	36	-	9	5	**89**
		IV	14	-	1	2	25	20	13	19	28	-	26	6	**154**
		V	-	12	-	-	-	-	-	20	-	-	-	4	**36**
	Rotaria	I	4	5	18	-	3	5	16	-	30	12	14	-	**107**
		II	-	-	-	-	5	4	-	14	-	-	-	4	**27**
		III	20	-	26	-	-	3	5	-	33	11	1	-	**99**
		IV	-	12	-	20	6	-	10	10	-	3	-	9	**70**
		V	25	16	19	-	-	2	-	1	1	10	13	-	**87**
	Keratella	I	13	-	-	23	5	-	7	8	-	-	3	8	**67**
		II	-	-	18	3	-	-	6	-	9	6	2	6	**50**
		III	1	21	21	-	-	5	-	-	-	-	19	9	**76**
		IV	-	16	-	-	8	-	4	3	2	-	4	-	**37**
		V	1	-	16	6	-	9	1	-	-	-	9	-	**42**
	Testudinella	I	20	2	-	-	4	-	3	4	16	9	5	1	**64**
		II	3	-	22	9	-	-	-	-	-	6	-	-	**40**
		III	-	-	24	-	-	22	20	20	18	6	9	-	**119**
		IV	-	-	-	26	10	-	20	-	10	7	10	2	**85**
		V	-	-	-	8	14	18	24	-	-	7	1	5	**77**
	TOTAL		**156**	**151**	**253**	**152**	**213**	**256**	**298**	**261**	**412**	**309**	**337**	**178**	**2976**
Ostracoda	*Cypris*	I	-	-	-	-	-	14	10	10	5	4	3	3	**49**
		II	9	4	-	13	12	-	12	-	14	-	-	2	**66**
		III	7	-	-	8	-	20	-	-	-	-	-	16	**51**
		IV	2	3	16	-	6	-	5	7	18	8	9	1	**75**
		V	-	-	-	16	22	19	-	9	-	-	-	-	**66**
	Stenocypris	I	4	1	16	13	21	-	1	-	32	1	20	2	**111**
		II	-	5	-	2	12	24	-	24	1	9	5	3	**85**
		III	3	1	20	-	30	-	26	-	1	-	-	-	**81**
		IV	-	7	-	13	14	5	-	-	-	3	2	-	**44**
		V	6	-	2	-	3	4	8	-	4	-	1	4	**32**
	Strandesia	I	-	8	-	1	9	-	7	5	-	12	9	1	**52**
		II	7	-	-	1	-	8	-	-	-	-	8	-	**24**
		III	4	9	7	-	5	10	6	-	3	10	5	7	**66**
		IV	-	-	3	6	1	-	-	7	-	12	1	-	**30**
		V	8	-	-	9	-	23	-	1	4	-	1	18	**64**
	Cyprinotus	I	-	-	6	-	1	-	5	10	-	13	11	13	**59**
		II	9	3	-	30	10	1	-	-	-	-	-	-	**53**
		III	-	2	20	20	-	-	-	-	11	-	15	1	**69**
		IV	-	-	-	-	8	-	-	-	-	-	20	16	**44**
		V	1	-	4	5	7	-	-	-	-	11	9	-	**37**
	TOTAL		**60**	**43**	**94**	**137**	**161**	**128**	**80**	**73**	**93**	**83**	**135**	**71**	**1158**

Table 2. :- Summary zooplankton study of the Dnyanganga Reservoir showing types, total number and percentage of zooplanktons during 2008-09.

Group	Type of Genera Recorded	Total no. of individuals/l	Percentage
Copepoda	8	3079	32.28
Cladocera	6	2323	24.36
Rotifera	8	2976	31.20
Ostracoda	4	1158	12.14
Total	26	9536	99.98

Zooplankton Study: In the study period (Table 1,2) zooplankton population of the Dnyanganga Project shows high magnitude during winter season and the low magnitude during summer. The densities of zooplankton were observed to vary between 18 organisms / l in the month of May to 169 organisms /l during December. The data further revealed that the density of Zooplankton were recorded in between 461 organisms/ l / year (site III) to 1137 organisms / l / year.

Observations revealed that minimum number of genera of this population at site I were observed to 6 during the month of August, at site II the minimum of April, at site III the3minimum number of genera was 3 during the month of May. The minimum density of zooplankton population (organisms /l) at I, II, and III site was 32, 31 and 18 was recorded in the month of August, April and may respectively. The maximum number of zooplankton population (organisms / l) at site I were observed to be 169 during the month of December at site II it was observed to be 189 during the month of November and at site III it was 59 during the month of February.

The result indicates that the maximum number of genera occurred during winter season summer and monsoon season as reported by Sabor and Altaff (1995) and Kumar (2001). The less number of genera might be attributed to the less nutrients in the reservoir which consequently result in less productivity or might be due to depletion of important factors such as dissolved oxygen and PH.

The reduction in the number of species may also due to predation, variation in the PH of water is always associated with the species composition of zooplankton inhibiting among them (Jhingran 1982).In winter, it is biotic interaction operating through feeding pressure rather than water quality seems to affect the zooplankton diversity and density particularly the stocked fish species play an important role in harvesting species of copepoda and Cladocera, thereby reducing their predatory pressure on other groups . The Rotifera and particle feeder Cladocera were higher in winter can be linked to favorable temperature and availability of abundant food in the form of bacteria, nanoplankton and suspended detritus (Edmondson 1965; Baker 1979).

Ostracodes: The water temperature and the availability of food might be affecting the Ostracod population. The decrease in the population during winter and summer may be due to the feeding pressure of stocked fishes. The monthly average and total number of Ostracoda varied from 2 to 18/l at S3. Tonapi (1980) has reported higher population of Ostracodes during monsoon due to abundance of fine detritus during this period.

Rotifers: Rotifers play an important role as grazers, suspension feeders and predators within the zooplankton community. The difference in periodicity and population density of different rotifer species can be analyzed by considering the nutritional ecology and biotic interactions. Rotifer species exhibit marked differences in their tolerance and biological parameters. Such changes are dramatic and sudden in the ecosystems. The monthly average and total number of individual rotifers varied from 4 to 17/l at S1, 5 to 15/l at S2and 6 to 14 /l at 83. High rotifer population indicates pollution from organic matter due to direct entry of untreated domestic sewage from the catchment area (Arora 1967). Rao (1982) has reported less effect of abiotic factors on the abundance and fertility of pelagic roifers. Lal and Karthikeyan (1993) observed that population of rotifers was high in polluted zone in the river Ganga at Bhagalpur, Bihar. Chandrasekhar (1996) observed that in summer and monsoon, the factors like water temperature, turbidity, transparency and dissolved oxygen (DO) play an important role in controlling the diversity and density of rotifers.

Copepoda: Nene (1985) had recorded copepoda as the zooplankton community to occupy second position in Masundra Lake, Thane, Maharashtra. In the present study monthly average and total number of individual copepods varied from 2 to 14 /l at S1, 2 to 13 /l at S2 and 2 to 10 /l at S3. The waters with copepoda abundance are regarded to be at a lower trophic stage than those with rotifer abundance (Yousuf 1988). Sharma and Hussain (2001) have reported low copepod population during summer season. The quantitative dominance of copepoda is also reported by Sharma and Hussain (2001). Somani and Pejaver (2004) have reported the highest diversity and density of copepods among zooplankton in Masunda Lake, Thane, Maharashtra.
Cladocera: Most of the Cladocera species are primary consumers and feed on microscopic algae and the fine particulate matter in the detritus thus influencing cycling of matter and energy in benthic food chain of a lake ecosystem. The factors like water temperature dissolved oxygen; turbidity and transparency play an important role in controlling the diversity and density of Cladocera. The monthly average and total number of individual cladocerans varied from 1 to 16 per litre at S1, 2 to 15 per litre at S2 and S3.

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REFERENCES

I.APHA 1992, Standard methods for the examination of water and waste-water, 18th Edn. APHA, Washington DC, USA.

II.Baker RL1979, Specific Status of Keratella cochlearis (Gosse) and K. earlinare Ahlstrom
III.(Rotifera: Brachionidae), Morphological and Ecological Considerations, Canadian. J. Zool 57 (9):1719-1722.
IV.Battish SK 1992, Freshwater Zooplankton of India, Oxford and IBH Publishing Co. New Delhi.
V.Chandrasekhar SVA 1997, Macro-benthic fauna of Lake Hussainsagar, Hyderabad with reference to Molluscs and Chironomid larvae. Rec. Zool. Survey. India.96: 1-5.
VI.Datta Munshi J and Datta Munshi JS 1995, Fundamentals of Freshwater Biology, Narendra Publishing House, New Delhi.
VII.Das SR 2003, Diversity and Density of Macrozoobenthos of South 24-Parganas district, East Bengal, J. Aqua. Biol. 18(1), 41-Canada. 28: 1699-1714.
VIII.Das SM 1978, High pollution in Lake Nainital, U.P. as evidenced by biological indicator, Science and Culture. 44: 236-237.
IX.Edmondson WT 1959, Freshwater Biology 2/c Pp. 1248. John Wiley and Sons. Inc. New York.
X.Edmondson WT 1965, Reproductive rate of planktonic rotifers as related to food and temperature. Ecol. Manoir., 35 : 61-111.
XI.Jain,CK and Seethapathi,PV 1996, Limnological studies of Kay Amkula lake. Indian J.Environ.Protection. 16:561 - 568.
XII.Jakher,GR and Rawat M 2003, Studies on physicochemical parameters of tropical, Jodbpur, J.Aqua.Biol., 18 (2), 2003:79-83.
XIII.Jhingran VG 1982, Fish and fisheries of India, Hindustan Publishing Corporation, New Delhi : 268- 269.
XIV.Krishnamoorthy KN 1966, Preliminary studies on the bottom Macrofauna of the Tungabhadra reservoir. Proc. Ind. Acad. Sci. B. 63: 96-103.
XV.Kodarkar MS 1992, Methodology for Water Analysis, physico – chemical, biological and micro biological, Indian Association of Aquatic Biologists, Hyderabad, Publ. 2: 50.
XVI.Kumar.K.S 2001, Studies on the fresh water copepods and cladocerans of Dharmapuri Dist. Tamil Nadu. Aqua ,Biol., 16 (1 and 2) :5-10.
XVII. Michael RG 1973, A guide to the study of Freshwater Organisms, J. Madurai, Suppl. 1 : 2336.
XVIII. Muley,DVand Gaikwad PT 1999, Limnological studies of Shiroli reservoir-A case study of Fresh water ecosystem of India. Ed. K.Vijay Kumar, Daya Pub.House,Delhi, pp.l09-132.
XIX.Patel and Bhadane VV 2004, Comparative Account of Planktonic Diversity of Nallah pond at Amalner, Dist. (Maharashtra) India, J. of Aqua. Biol.3, 33-36.
XX.Rao IS 1982, Ecology of the Manjira Reservoir, Sangareddy, Andhra Pradesh. Ph. D. Thesis, Osmania University, Hyderabad: 294.
XXI.Saboor A and Altaf K 1995, Qualitative and Quantitative Analysis of zooplankton population of tropical pond during summer and rainy season.J.Eco.Biol.,7(4):269-275.
XXII.Safiullah A 2001, Biochemical and Nutritional evaluation and culture of freshwater live food organisms Aqua-hatcheries, Ph.D. Thesis , P.G. Research Department of Zoology, university of Chennai.
XXIII.Sharma BK and Michael RG 1980, Synopsis of the taxonomic studies on Rotifera , Hydrobiologia, 144: 269 - 275.
XXIV.Sharma BK.and Michael RG 1987, Review of taxonomic studies on freshwater Cladocera from India with remarks biogeography. Hydrobiologia, 145 : 29-53.
XXV.Sinha AK1986, Water Quality Assessment of Ganga Water at Dalmau India on Kartika Purnima.1985. Bulletin Environ.Sci.3:3-6.
XXVI.Verma PK and Datta Munshi 1987, Plankton Community Structure of Badua Reservoir of Bhagalpur (Bihar). Trop. Ecol. 28:200-207.
XXVII.Yousuf AR; Balhi MH and Quadri MY 1986, Limnological Features of a forest lake of Kashmir. J. Zool. Soc. India, 58(1-2):29-42.