International Journal of
Life Sciences
International Peer Reviewed Open Access Refereed Journal

Special Issue A 12: March 2018:247-253
UGC Approved Journal No 48951

Original Article Open Access

Diversity of Zooplanktons in Janala Lake, Mul, Maharashtra (India)

Borkar KR[1] and Deshmukh GD[2]

Departmen. of Zoology, N.H. College, Bramhapuri, Dist-Chandrapur, Maharashtra, India
Department of Zoology, RMG College, Nagbhid, Dist-Chandrapur, Maharashtra, India
Email – kirankapgate14@gmail.com

Manuscript details:

Available online on http://www.ijlsci.in

ISSN: 2320-964X (Online)
ISSN: 2320-7817 (Print)

Editor: Dr. Arvind Chavhan

Cite this article as:
Borkar KR and Deshmukh GD (2018) Diversity of Zooplanktons in Janala Lake, Mul, Maharashtra (India), *Int. J. of. Life Sciences*, Special Issue, A12: 247-253.

ABSTRACT

Zooplanktons play a very crucial role in the trophic dynamics and energy transfer in aquatic ecosystem. Their abundance increases in eutrophic water. They are also sensitive to pollution and many species are recognized as indicators of pollution. It is an integral component of an aquatic ecosystem. The study site Janala Lake is located near Mul, situated between 20^0,07·N and 79^0 ,67· E. Water samples were collected once in month from the selected sampling sites of Janala lake to analyze the diversity of zooplanktons for the period of 24 months i.e. from January 2011 to December 2012. Zooplankton belonged to Rotifera, cladocera, copepod and ostracoda and both the lakes, the two years average showed the following sequence of their abundance. Janala Lake = Rotifera > Copepoda > Cladocera > Ostracoda. In the present investigation, total zooplankton was recorded maximum during summer and minimum during monsoon.

Key words: Zooplankton, Rotifera, Copepoda, Cladocera, Ostracoda

INTRODUCTION

Fresh water ecology emphasizes mainly the study of relationship between organisms and the fresh water environment. Study of all aspects (physical, chemical, geological and biological) of fresh water is termed as Limnology (George, 1997). Lakes are characterized by distinct biotic and abiotic environment. Lakes maintain ecological balance of flora and fauna and their interrelationship regulate surrounding climate and recharge ground water, but unfortunately, they are dying. The lakes are getting polluted due to inflow of domestic effluents, apart from pollution, resulting from washing of clothes, Vehicles, Cattle, immersion of Idols during certain festivals etc. All these activities are deteriorating the quality of the water in the lake resulting in the accumulation of the toxic chemicals and other sludge leading to ecological imbalance.

Zooplanktons play a very crucial role in the trophic dynamics and energy transfer in aquatic ecosystem. Their abundance increases in eutrophic water. They are also sensitive to pollution and many species are recognized as indicators of pollution. It is an integral component of an aquatic ecosystem. Investigation on seasonal change in zooplankton diversity has been undertaken by various workers (Ganapati, 1943; George, 1997; Edmondson, 1995; Dhanpati, et al, 2000; Narasimha *et al*, 2001; Padmanabhan and Bolagali, 2008; Jorge et al, 2009; Dahegaonkar et al., 2012; Parveen and Mola, 2013; Vasant et al, 2013; Khalokar, 2014 ; Kadam et al. 2014, Pradhan, 2014; Dekate and Baviskar, 2016, Kar and Kar, 2016).

Present study site, Janala lake is about 8 km away from the town and is surrounded by forest and little away from human habitation and therefore is still oligotrophic in nature. Therefore input of organic load due to domestic pollutants is less. Although many reports are available on the limnological profiles of lentic ecosystems from other district in Maharashtra, no attempts have been made to record the zooplankton diversity.

MATERIAL AND METHODS

The study site Janala Lake is located near Mul. Mul town is in the Chandrapur district of eastern part of Maharashtra and is situated between 20^0,07,N and 79^0 ,67, E. It is constructed by the minor irrigation department of the Maharashtra state and is about 8 km from Mul town near Janala Village, with a area of 26.62 hectare. Water samples were collected in polythene bottles (two litters capacity) once in month from the selected sampling sites of Janala lake to analyze the diversity of zooplanktons for the period of 24 months i.e. from January 2011 to December 2012.

For qualitative analysis, the samples were collected with the help of plankton net. Sweeps were made in all directions in the littoral zones. For the collection from open water, net was thrown to some distance from peripheral zone to the centre avoiding the macrophytes and solid floating material. Collected plankton was transferred to enamel tray, inside of the net was carefully washed so as to collect any sticking plankters. Zooplankton was preserved in 4% formalin and were observed and photographed by the Labomed make Digi 2 Pro camera attached to trinocular microscope. Detailed taxanomical identification was carried out by using the keys from Edmondson (1959); A.P.H.A. (1991), Tonapi, (1980) and Dhanapathi, (2000).

RESULTS AND DISCUSSION

The relative data of Zooplanktons of Janala lake is given in the table 1 and 2 selected zooplantons. The Zooplanktons comprises Rotifera, Cladocera, Ostracoda and Copepoda. Total 2331 ind/ltr Zooplankters were recorded in 2011 and 2222 ind/ltr during 2012. Rotifers were recorded as 1552 ind/ltr during 2011 and as 1504 ind/ltr during 2012. It contributed 66.5% during 2011 and 67.6% during 2012 of the total zooplankton. Fig. 1 shows graphical representation of zooplanktons during summer, monsoon and winter seasons in study period.

Fig.1 to Fig. 3 shows graphical represention of seasonal abundance of different groups of zooplankton. The zooplankters were recorded with maximum of 1179 ind/ltr during the summer of 2011 and minimum of 509 ind/ltr during the monsoon season of 2012. Rotifera was recorded with maximum of 812 ind/ltr during summer season of 2011 and minimum of 343 ind/ltr during the winter season of 2012. It contributed maximum of 52% in summer, followed in monsoon by 25% and in winter by 23% during 2011. During 2012 they were again dominant during summer by contributing 53% followed by monsoon 24% and 23% in winter. Cladocera recorded maximum of 162 ind/ltr during summer season of the year 2011 and minimum 71 ind/ltr during monsoon season of 2012. It contributed maximum of 48% in summer followed in winter with 28% and 24% in monsoon. During 2012, they were again dominant during summer by contributing 49% followed by winter with 28% and 23% in monsoon. Ostracoda recorded maximum of 29 ind/ltr during summer season of 2011 and minimum of 12 ind/ltr during monsson season of 2011 and 2012. Seasonally, Ostracoda was dominant in summer with 47% followed by 33% in winter and 20% in monsoon. During 2012, they were again dominant during summer by contributing 45% followed by winter 33% and 22% in monsoon. Seasonally, Copepoda was recorded maximum of 176 ind/ltr during the summer season of 2011 and minimum of 59 ind/ltr during monsoon season of 2012. It has shown highest percentage i.e. 46% in summer followed by 36% in winter and 18% during monsoon of 2011. During 2012, it has recorded maximum with 47% during summer, followed by 36% in winter and 17% in monsoon. Fig. 4. Shows, some of the zooplanktons in Janala lake.

Table 1 : Monthly Variations in Zooplankton in JANALA Lake during 2011

	Zooplankton / Month	J	F	M	A	M	J	J	A	S	O	N	D	Tot
A	**ROTIFERA**													
	Family: Brachionidae													
1	*Brachionus diversicornis*	5	3	11	8	8	7	3	1	1	0	5	10	62
2	*B. calyciflorus*	31	55	89	100	75	72	64	48	35	22	15	1	607
3	*B. falcatus*	82	85	99	115	83	80	35	12	5	28	55	68	747
4	*Keratella tropica*	11	17	6	0	0	0	0	0	0	0	0	0	34
	Family: Trichocercidae													
5	*Trichocerca longiseta*	0	3	8	20	24	6	3	3	4	9	7	0	87
	Family: Asplanchnidae													
6	*Asplanchna spp.*	0	1	2	0	0	1	2	0	0	0	6	3	15
	TOTAL	129	164	215	243	190	166	107	64	45	59	88	82	1552
B	**CLADOCERA**													
	Family: Sididae													
7	*Diaphanosoma sarsi*	0	0	0	0	3	2	0	0	0	0	0	0	5
	Family : Daphnidae													
8	*Ceriodaphnia cornuta*	0	0	3	2	2	0	0	0	0	0	0	0	7
9	*C. quadrangula*	0	0	0	1	0	0	0	0	1	1	0	0	3
	Family: Moinidae													
10	*Moina micrura*	0	0	0	0	10	7	1	0	0	0	3	0	21
	Family: Bosminidae													
11	*Bosmina longirostris*	25	29	30	40	39	29	20	10	6	20	18	24	290
	Family: Chydoridae													
12	*Chydorus sphaericus*	0	1	2	0	0	1	3	0	0	0	0	1	8
	TOTAL	25	30	35	43	54	39	24	10	7	21	21	25	334
	OSTRACODA													
1	*Cypris sp.*	9	13	2	3	11	8	2	2	0	0	1	10	61
	COPEPODA													
1	*Mesocyclop sp.*	12	10	5	0	0	0	0	0	5	5	3	7	47
2	*Eucyclop sp.*	7	11	21	13	7	3	2	0	0	3	3	2	72
3	*Cyclop sp.*	14	0	0	0	4	0	1	0	1	9	15	19	63

Table 2 : Monthly Variations in Zooplankton in JANALA Lake during 2012

	Zooplankton / Month	**J**	**F**	**M**	**A**	**M**	**J**	**J**	**A**	**S**	**O**	**N**	**D**	**Total**
A	**ROTIFERA**													
	Family: Brachionidae													
1	*Brachionus diversicornis*	4	2	10	7	7	6	2	1	1	0	4	9	53
2	*B. calyciflorus*	30	54	88	99	74	71	63	46	34	20	14	0	593
3	*B. falcatus*	81	84	98	113	82	79	34	11	4	28	54	67	735
4	*Keratella tropica*	10	16	5	0	0	0	0	0	0	0	0	0	31
	Family: Trichocercidae													
5	*Trichocerca longiseta*	0	2	7	19	23	6	2	2	3	9	6	0	79
	Family: Asplanchnidae													
6	*Asplanchna sp.*	0	1	2	0	1	1	1	0	0	0	5	2	13
	TOTAL	125	159	210	238	187	163	102	60	42	57	83	78	1504
B	**CLADOCERA**													
	Family: Sididae													
7	*Diaphanosoma sarsi*	0	0	0	0	2	1	0	0	0	0	1	0	4
	Family : Daphnidae													
8	*Ceriodaphnia cornuta*	0	0	2	3	2	0	0	0	1	0	1	1	10
	C. quadrangula	0	0	0	1	2	0	0	0	0	1	1	0	5
	Family: Moinidae													
9	*Moina micrura*	0	0	0	0	9	6	0	0	0	0	2	0	17
	Family: Bosminidae													
10	*Bosmina longirostris*	24	27	29	39	38	28	19	9	5	18	16	22	274
	Family: Chydoridae													
11	*Chydorus sphaericus*	0	1	1	0	0	0	2	0	0	0	0	1	5
	TOTAL	24	28	32	43	53	35	21	9	6	19	21	24	315
	OSTRACODA													
1	*Cypris sp.*	8	12	1	2	10	8	2	2	0	0	1	9	55
	COPEPODA													
1	*Mesocyclop sp.*	11	9	4	0	0	0	0	0	4	4	2	6	40
2	*Eucyclop sp.*	6	10	20	12	6	2	1	0	0	2	2	1	62
3	*Cyclop sp.*	13	0	0	0	3	0	0	0	0	8	14	18	56
4	*Diaptomus sp*.	2	7	8	19	67	25	17	3	7	20	9	6	190
	TOTAL	32	26	32	31	76	27	18	3	11	34	27	31	348

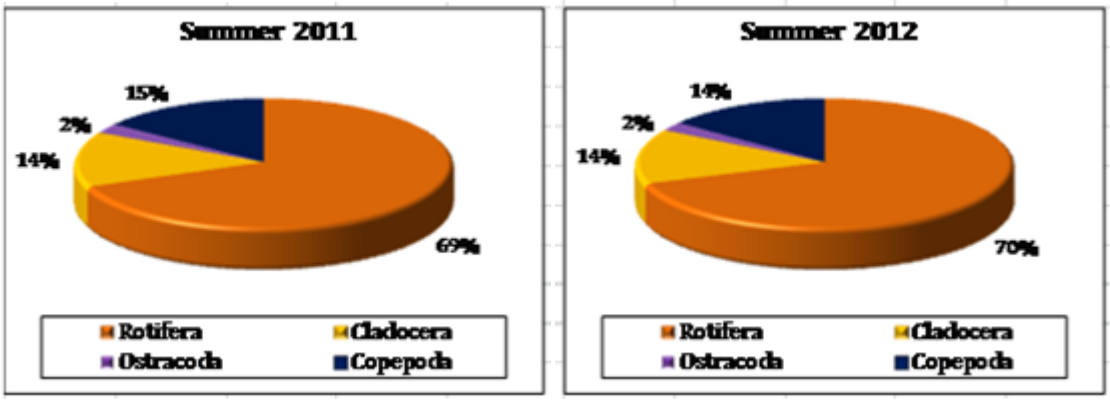

Fig. 1 Seasonal Distribution of Zooplankton during Summer in Janala Lake

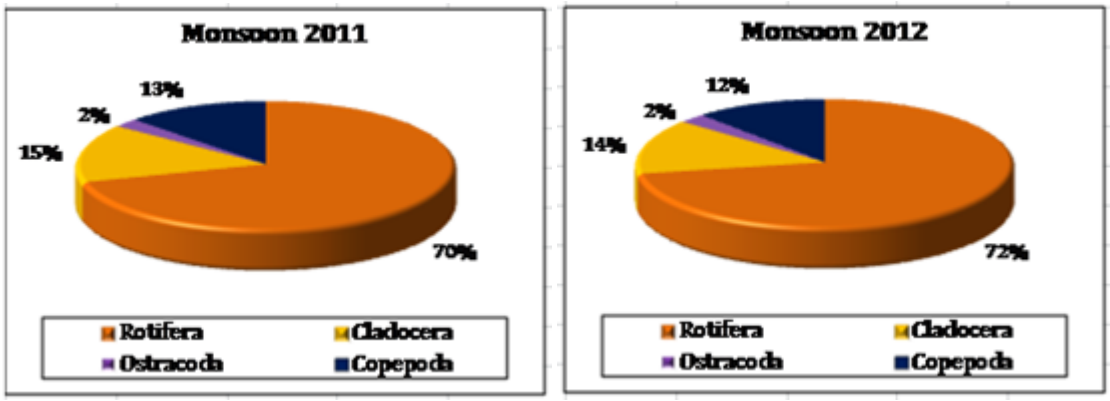

Fig. 2: Seasonal Distribution of Zooplankton during Mansoon in Janala Lake

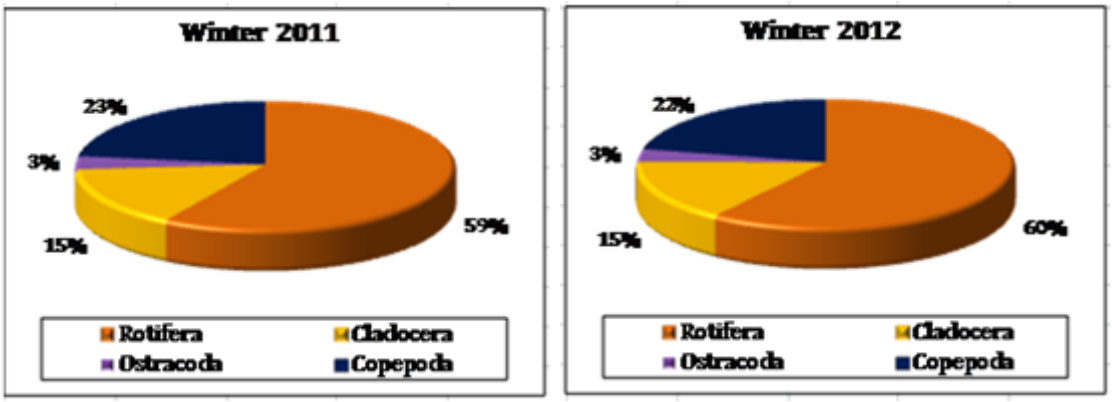

Fig. 3: Seasonal Distribution of Zooplankton during Winter in Janala Lake

DISCUSSION

Zooplankton diversity is one of the most important ecological parameters in water quality assessment. The zooplankton study has been a fascinating subject for a long time. Water bodies rich in phytoplankton are also rich in zooplankton diversity and biomass. Vijaykumar (1999) stated that in an aquatic ecosystem, zooplanktons play an important role not only in converting plant food into animal food but also provide an important food source for other higher organisms including fish. The zooplankton consisted of Rotifers, Cladoceran, Copepods and Ostracods in Janala lake. The quantitative relationship amongst different groups of zooplankton in Janala lake it was Rotifera > Copepoda > Cladocera >Ostracoda during both the years of study. Seasonal fluctuations of zooplanktons in Janala lake during the study period shows that, rotiferans dominated the plankton population under study, while the others groups were encountered with the moderate numbers.

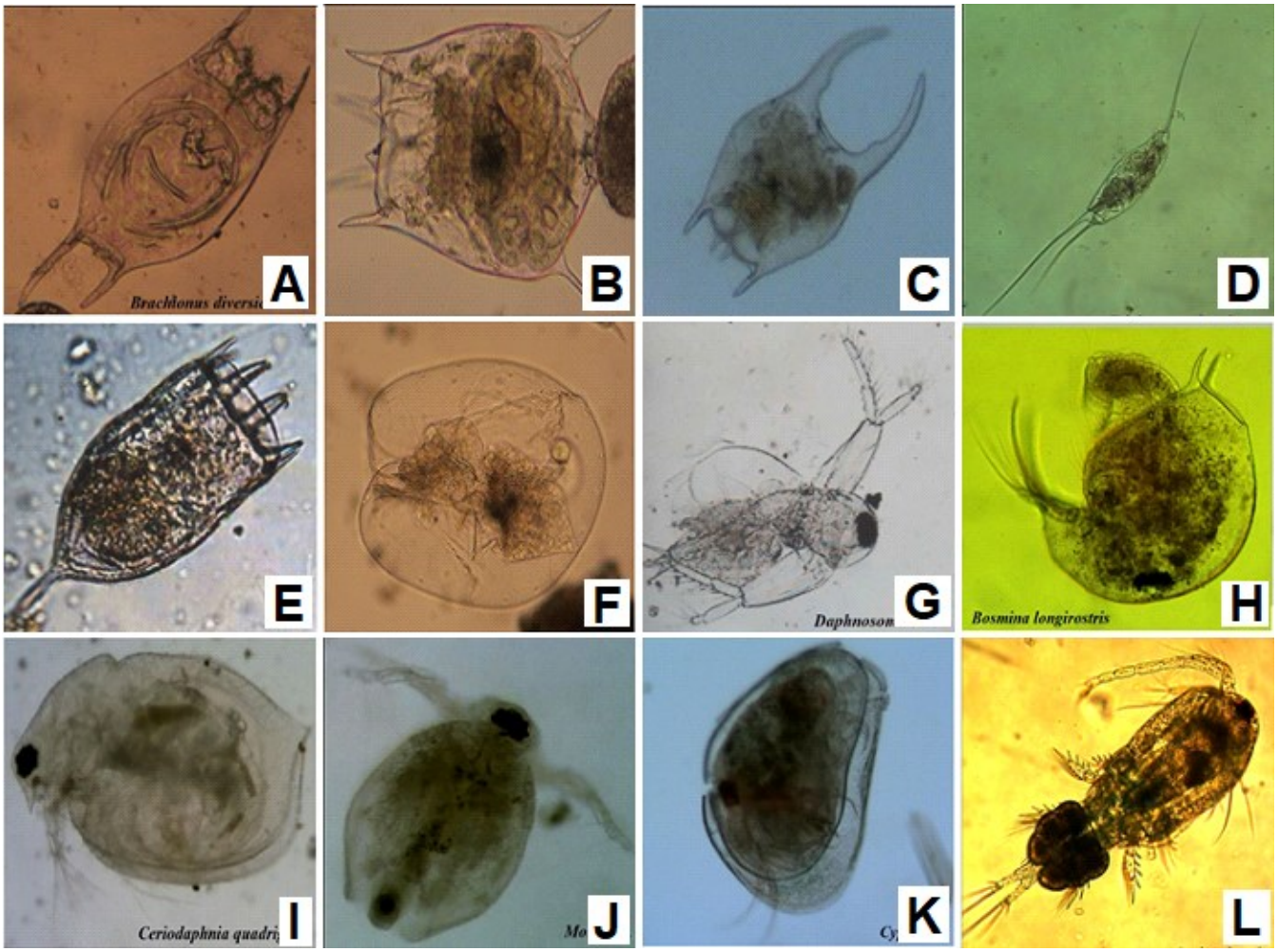

Fig. 4: Zooplankton Species Janala Lake : A: *Brachionus diversicornis,* **B:** *Brachionus calyciflorus,* **C:** *B. falcatus,* **D:** *Trichocerca longiseta,* **E:** *Keratella tropica,* **F:** *Asplanchna sp.,* **G:** *Diaphanosoma sarsi,* **H:** *Diaphanosoma sarsi,* **I:** *Bosmina longirostris,* **J:** *Ceriodaphni quadrangular,* **K:** *Moina sp,.* **L:** *Cypris sp.,* **M:** *Cyclop* Female

High density of Rotifers during summer might be due to high temperature which is suitable for their growth, reproduction and development and availability of nutrients due to bacterial decomposition. But high density of Rotifers during monsoon season may be attributed to high temperature and availability of rich nutrients during June-July months, while low density of zooplanktons during winter season coincides with substantial decrease in temperature in the lakes during winter season. In the present investigation, *Brachionus sp.* is very common in both the two lakes under study. Jorge et. al. (2009) and Parveen and Mola (2013) reported enormous growth of Rotifers in lakes and reservoirs indicating eutrophic conditions. In the present study also Mul lake shows the higher numbers of Rotifers throughout the study period indicating its eutrophic nature. Dahegaonkar, *et al.*, (2012) noticed that the Rotifers are very common in Indian waters and their occurrence in eutrophic water bodies. Bhandarkar et. al. (2008) reported the seven Brachionus species and mainly *B. falcatus* was most dominant species in Kalikar pond, Bramhapuri.

Summer maxima of ostracoda in Janala lake may be attributed to higher water temperature, decrease in water level, and increased availability of its food. Similar result was reported by Padmanabhan *et. al*. (2008) in Dalvoi lake, Mysore. Ostracode play an important role in transferring the energy from producers to the consumers and they occupy an intermediate position in aquatic food web by being live food for fishes. The diversity, abundance and seasonal fluctuations of ostracods have direct link with water quality (Padmanabhan and Belagali, 2008; Parveen and Mola, 2013).

The copepod diversity was represented by four species and found more in number during summer in Janala lake, during both the years, 2011 and 2012 respectively. However, minimum number was recorded during monsoon season in Mul lake and Janala lake in both the years. Padmanabhan and Belagali, 2008, observed that the Cyclops are sensitive to pollution and increased with an increase in nutrients and is in agreement with our observation.

In the present investigation, total zooplankton was recorded maximum during summer and minimum during monsoon.

CONCLUSIONS

In the present investigation, Janala lake were investigated for the limnological profiles, for two years i.e. from January 2011 to December 2012. Zooplankton belonged to Rotifera, cladocera, copepod and ostracoda and both the lakes, the two year average showed the following sequence of their abundance. Janala Lake = Rotifera > Copepoda > Cladocera > Ostracoda. In the present investigation, total zooplankton was recorded maximum during summer and minimum during monsoon.

Conflicts of interest: The authors stated that no conflicts of interest.

REFERENCES

Adoni AD (1985) Workbook on Limnology, *Pratibha Publishers,*, India.

APHA (1991) standard methods for the examination of Water and Waste Water, *American public Health association,* Inc. New York. 18th Ed.

Bhandarkar WR, Bhandarkar SV and Murkute VB (2008) Observations on species diversity of *Brachionus* (Rotifera) from Kalikar pond, Bramhapuri, Dist. Chandrapur, Maharashtra. *J. Aqua. Bio.* 23 (1) : 4-7 pp

Dahegaonkar NR, Telkhade PM and Bhandarkar WR (2012) Studies on water quality of river Wardha at Ballarshah near Chandrapur (M. S.), India, *Bionano Frontier,* VOL. 5 (2 - I)

Dekate HM and Baviskar RN (2016) Diversity and Ecology of Zooplankton in Mumbri creek of South Konkan, Maharashtra, India *International J. of Life Sciences*, 4 (2): 310-313.

Dhanpathi MVSSS and Rama Sarma DV (2000) Further studies on the Rotifers from A.P.,India, Incluing a new species. *J. Aqua. Biol.,* Vol. 15 (1 & 2) : 6-15 pp.

Edmondson NT (1995) Reproductive rates of planktonic rotifers related to food temperature in *Nature Ecol*., Vol.5 : 61-68 pp.

Ganapathi SV (1943) An ecological study of a garden pond containing abundant zooplankton. *Proc. Indian Acad. Sci., Bombay*, 17: 41-58 pp.

George JP (1997) Aquatic ecosystem: structure, degradation, strategies for management in: Recent advances in ecobiological research, M.P. (Ed). *A.P.H. Publication house*, New Delhi, 603

Jorge JC, Sarma SSS, Ibarra MM and Nandini S (2009) Seasonal changes in the rotifer (Rotifera) diversity from a tropical high altitude reservoir (Valle de Bravo, Mexico). *J.Env. Biol*. 30(2) : 191-195 pp.

Kadam CP, Dandolia HS, Kausik S, Saksena DN and Shrotriy VP (2014) Biodiversity of Zooplankton in Pillowa Reservoir District Morena Madhya Pradesh, India, *Int. J. of Life Sciences*, 2(3): 263-267.

Kar S and Kar D (2016) Zooplankton Diversity of a freshwater Pond in a Cachar district of Assam, India, *International J. of Life Sciences*, 4(1): 125-128.

Khalokar SP (2014) Study of Zooplakton Population In Shahanur Reservoir With Reference to Fishery Activity, International Journal of Life Sciences, 2 (1): 90-92.

Narasimha Rao P and Jaya Raju PB (2001) Limnological investigations and diversity of plankton on sewage-fed fish culture pond at Nambur near Guntur, A.P. India. *J. Aqua. Biol.*,Vol.16 (1 &2), 2001: 11-14 pp.

Padmanabhan B and Belagali SL (2008) Ostracods as indicators of pollution in the lakes of Mysore. *J. Environ. Biol.* Vol. 29 (3) : 415-418 pp.

Parveen Saltanat and Hesham R Abdel Mola (2013) Comparison of physicochemical parameters and zooplankton diversity in two perennial ponds at Aligarh, India. *J.of Envn. Biol.,* Vol 34, 709-716.

Pradhan VP (2014) *Zooplankton diversity in fresh water Wunna lake. Int. J. of Life Sciences*, 2(3): 268-272.

Sharma Jayashree, Mandloi and Pathak Era (2007) : Planktonic diversity in a lentic water body at Jabalpur (M.P.). *NSL-2007* : 258-261 pp.

Somani VU and Pejaver MK (2003) Rotifer diversity in Lake Masunda ,Thane (M.S.). *J. Aqua. Biol.,* Vol. 18(1): 23-27 pp.

Sunkad BN and Patil HS (2004) Water quality assessment of fort lake of Belgaum (Karnataka) with special reference to zooplankton. *J.Environ. Biol*. Vol.25(1) : 99-102 pp.

Tonapi GT (1980) Fresh Water Animals of India, an ecological approach, *Oxford and IBH publishing Co. New Delhi.*

Vasanth Kumar B, Roopa SV and Gangadhar BK (2013) A study on Zooplankton diversity and abundance in mangroves of Kali Estuary, Karwar, West coast of India, Int. J. of Life Sciences, 1(4): 297-302.

Vijaykumar K, Holkar Devendra and Kaur, Kuldeep (1999) Limnological Studies on Chandrampalli reservoir, Gulbarga. Freshwater ecosystem of India by *Vijaykumar, K.,Daya publ.,Delhi.,*: 59-108 pp.