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BIODIVERSITY OF ZOOPLANKTON AT SHIDHESHWAR LAKE, SOLAPUR, MAHARASHTRA, INDIA

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ABSTRACT:

The present investigation has been conducted Shiddheshwar Lake. (popularly known as Shiddheshwar Talav-reservoir) of Solapur,Maharashtra, with special reference to its zooplankton diversity concerning physicochemical characteristics. 105 (One hundred and five) zooplankton species were identified from Shidheshwar Talav which consisted ofRotifera 43 species (41%), Cladocera 25 species (24%), Protozoa 20 species (19%), Copepoda 12 species (11%), and Ostracoda 5 species (5%). The investigation on physicochemical characteristics at four sites revealed its alkaline nature, suitable for aquaculture practices. Significant site variations have been recorded due to the interference Religious, Recreation, fish culture, idol immersion in seclusion (practiced now a day). Among all the zooplankton groups, Rotifera recorded dominance. The maximum diversity of the zooplankton population was recorded atfoursites during the summer season.

KEYWORDS: *Biodiversity, Zooplankton, Shiddheshwar Lake,Sessional Change.*

INTRODUCTION

Zooplankton study is important as it could provide ways to predict the productivityof freshwater aquatic systems (Borgmann et al., 1984; Morgan et al., 1978). In deciphering trophic status and biomonitoring of aquatic habitats, zooplanktons play a vital role (Krishnamurthy et al., 1979). The biodiversity and distribution of zooplankton in the aquatic ecosystem depend mainly on the physicochemical properties of water. Pollution of water bodies by different sources results in a drastic change in zooplankton populations and thereby affects the production potential of the ecosystem (Singh and Mahajan, 1987; Harikrishnan and Azis, 1989). Zooplankton communities are highly sensitive to environmental variation. Hence, they are effective tools in environmental biomonitoring of an aquatic system. Changes in the zooplankton species composition have been used as an indication of increased eutrophication offreshwaters (Wanganeo and Wanganeo, 2006). Some species flourish in highly eutrophic waterswhile others are very sensitive to organic or chemical wastes (El-Enany, 2009). In India, several important contributions on zooplankton and their diversity, density, ecological importance have been made in different parts of the country suchas Subla et al., Das et al., (1996) Dadhich and Saxena (1999); Dhanapathi (2000);Ramachandra et al., (2006); Sharma (2009).,Raina et al., (2009)Rashmi Parkh et al., (2011) Vijaykumar Koli and Madhur Mohan Ranga (2011); Kumar et al.,

(2011). Najeeb et al. (2012)., Shankar, (2012) and Das, (2012).Sharma., (2013) Gayathathri et al., (2014) But, information regarding the zooplankton diversity has not been thoroughly investigated in Maharashtra especially inthe Solapur district. Thus, the present work aimed to assess the biodiversity of zooplankton and their relation to the physicochemical parameters of ShiddheshwarLake. The water from the reservoir uses for Religious, Recreation, fish culture, idol immersion in seclusion in addition to fisheries used fishing practices, and recreation.

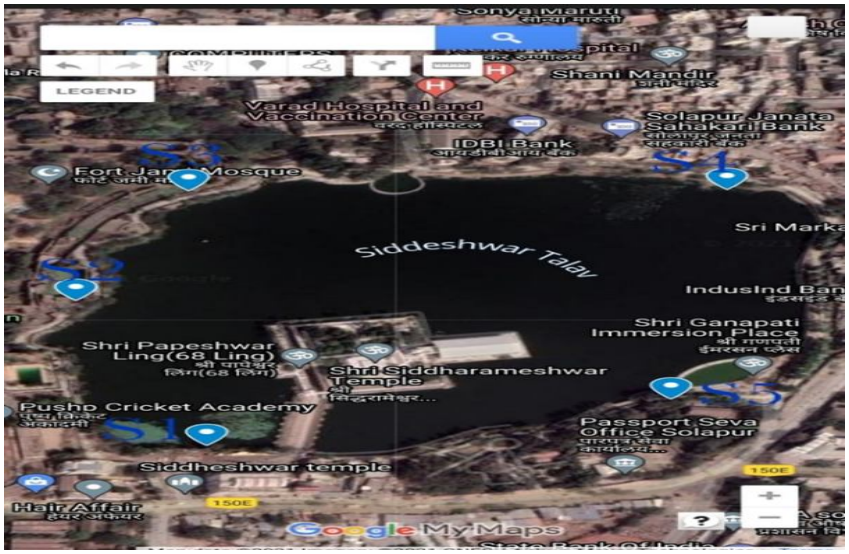

Figure1: Location of Shiddheshwar Lake

MATERIALS AND METHODS:

The survey of zooplanktons was carried out from June 2017 to May 2018 at theShiddheshwar lake.Present work has been conducted on sampling sites of Shidheshwar Lake for the estimation of its zooplankton diversity as well as its physicochemical properties. Water samples were collected between 9.00 am to 11.00 am the data was articulated seasonally as summer, winter and monsoon (post monsoon) period. The Sites were fixed after survey of the lake ecosystem. Sites were designated asSite I-Panch Katta (E) Site II-Bhuakot Fort (W) Site III- Ganpatighat (N) Site IV-Home-maidan (S). The collection samples were analyzed by two parameters like field parameters and general parameters. The field parameters that include color, odder, temperature, pH that need to be analyzed immediately after sample collection. Color testing by visual comparison apparatus. Nessler tube (Matched, 50 ml, tall form., Odder testing Method by qualitative human receptor, Temperature test by mercury thermometer apparatus general parameters that analyzed in the laboratory four sampling stations were selected to the make data useful for analysis. Three sampling stations were selected along the shoreline and one sampling station is located 100-200 meters within the reservoir from the shore. sampling depths ranged between 0.5to20 CMS below the surface, at the selected stations samples bottles (1000ml) were labeled indicating date, station, depth, and time of collection. General metrological conditions like sunshine, sky nature etc. were recorded on every sampling location. The water for zooplanktons were collected by filtering 100 liters of surface water through plankton collecting net of (blotting silk cloth) mesh size No.25µ.and preserved in 4% formaldehyde. Plankton preservation methods: Zooplankton samples were preserved immediately with 4% formaldehyde. Some samples collected for observing live specimens are not preserved in chemicals.

Estimation of Plankton

Ten ml(10ml) of sample is centrifuged for 20 minutes at 1500g. The settled material is used for the examination of planktons' sample is analyzed qualitatively to determine the species composition as well as quantitatively to determine the number of organisms per unit volume. The zooplankton are identified with help of standard keys of Adoni et al. (1985), Pennak (1978 Bhouyain and Asmat (1992). The qualitative and quantitative analysis of the organism is carried out by Sedgwick Rafter cell. As per the standard method APHA (1998). A total of 105 species were recorded. The Rotifer was most dominant group.

Physicochemical Analysis:

Physicochemical analysis of water samples was carried out following the standard methods as described by Adoni (1985) and APHA (2000). For enumeration of zooplankton population surface water samples (100 liters) were filtered with the help of a plankton net made of bolting silk of mesh size of 20 µm and concentrated samples were preserved with 5%formaldehyde solution in 100 ml plastic vials. The concentrated samples were examined under the inverted microscope (Metzer made) and identification of plankton was done following the taxonomic references of Pennak (1978), Victor and Fernando (1979), Michel and Sharma (1988), Edmondson (1992), Battish (1992), Reddy (1994), Sharma (1999) Dhanapathi (2003). Bryant et al. (2008) and Murkher(2011).Shidheshwar Lake (Water Reservoir)

Figure 2: Shiddheshwar Lake &ShiddheshwarTemple.

Shiddheshwar Lake is located in the central part of Solapur city of Maharashtra state it is a manmade lake 138500SQ.MTR Water spread area. The reservoir is located approximately geographically. It lies between Latitude: N17°40´30 & Longitude: E 75°54´28.05 and altitude of 514m MSL. The water from the reservoir uses for Religious, Recreation, fish culture, idol immersion in seclusion in addition to fisheries use. The survey of Indian tropological sheets (1:50000scales) was used to prepare the locality map of the reservoir along with satellite imageries. The Lake type is natural lake+ manmade (Reservoir) It occupies 0.1385 SQ KM. Area {138500SQ. MTR.}. The perimeter is about 1434.42Meters. Regarding hydrology, the source of water(inflow)is rainfall & drain dries out occasionally. The catchment or watershed area in sq.km.is about 8.1187sq.km. However, the nature of the lake is plain. for Religious, Recreation, fish culture, idol immersion in seclusion (practiced nowadays). The sewage is not provided solid waste disposal in lake occurs due to the religious offerings' idol immersion &paraphernalia. The Water Quality Pollution Status of the lake indicates presumably potable water with a fishy odder and blue-green color. Siddheshwar lake as of now is however a mesotrophic lake as regards its pollution status. The aquatic plant is found to be submerged. Emergent& Free-floating algae. The aquatic animals recorded are zooplankton, benthic invertebrates, mollusks, fish, amphibians, reptiles' birds, and mammals. Functions and values of the lake can be titled as usage for Religious, Recreation, fish culture, idol immersion in seclusion (practiced nowadays). Regarding the use of biological resources, it is observed that the weeds &green grasses are used for that chor fodder. Fishing through the tendering system. Function of the lake are groundwater recharge &supports biodiversity & sociocultural aesthetic major problems are reduction in area (shrinkage) & loss of fisheries &eutrophication, where the trust authorities with public initiatives overcome the

problem occasionally. There is an immediate need to monitor the lake for its water quality, Algal bloom &fish culture. The lake has been monitored every year.

Table 1.: Study Area

Sr. No.	Location	Siddheshwar lake (Talav)
1	Year of Establishment	1200 BC.
2	Type	Original Natural Source
3	Constriction Lake Type	Natural Manmade (Reservoir)
4	Modern Title	Urban Lake
5	Longitude	E 75°54′28.05
6	Latitude	N17°40′30 19.4
7	Elevation (m)	of 514m MSL
8	Catchment area	8.1187sq.km.
9	Perimeter	about 1434.42 Meters
10	Water spread area	0.138500 SQ.MTR
11	Maximum Depth(m)	27.5 m
12	Sources of Water	(Inflow)in rainfall &drain it rain water
13	Main use of water	Aquaculture, Recreation.

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Table.2. Physicochemical Characteristics ofShiddheshwarlake (Talav)

Parameter	Site I-(E) Panch Katta		Site II-(W) Bhuikot Fort		Site III-(N) Ganpati Ghat		Site IV-(S) Homemaidan	
	Summer	monsoon	summer	monsoon	Summer	monsoon	Summer	monsoon
Color	Blue - Green	Blue - Green	Blue - Green	Blue - Green	Blue - Green	Blue - Green	Blue - Green	Blue - Green
Odder	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy	Fishy
Air Temp.	33	29	32	28.40	33	27	32	28
Water Temp.	27	23	29.0	25.3	28.6	25	27.2	25.2
Secchi Transparency	40	44	42	46	44	34	44	36.00
Depth(m)	14.8	18.80	1	1	1.2	1.3	1.1	1.2
pH(units)	7.8	7.5	7.2	7.1	8.2	8.5	7	7.3
TDS (ppm)	260	210	320	270	250	200	540	520
Conductivity(s/cm)	340	300	580	540	380	340	780	740
Dissolved Oxygen(mg/l)	10.9	9.8	8.8	7.2	5.4	8.4	4.16	5.70
Total Alkalinity(mg/l)	130	120	136	144	144	156	136	146
Chloride (mg/l)	48	38.6	48.5	60	50.4	44.4	76.96	67.90
Total Hardness(mg/l)	210	206	249	240	274	254	276	260
Ca.Hardness (mg/l)	124	92	132	118	164	146	160	152
Mg. contents(mg/l)	22.84	27.70	29	29.60	26.73	26.24	28.18	26.24
Nitrate(mg/l)	0.33	0.31	0.75	0.67	0.64	0.52	1.67	1.52
Nitrite(mg/l)	0.064	0.03	0.18	022	0.12	0.08	.22	0.24
Orthophosphate(mg/l)	0.22	0.28	0.26	0.22	0.24	0.22	0.34	0.30
Ammonia(mg/l)	0.02	0.01	0.034	0.05	0.034	0.03	0.05	0.03
Sodium(mg/l)	4.4	4.8	6.4	5.2	6.6	4.8	12.2	9.4
Potassium(mg/l)	1.4	1.2	1.4	16.	1.34	1.4	2.34	1.8

Physicochemical Analysis:

Physicochemical characteristics of the Shiddheshwar lake (Talav) were given in Table 2. Significant variations in the physicochemical properties of Shiddheshwar lake (Talav) Four sites have been recorded which is due to the various pollution loads. The temperature of both air and water is an important factor influencing all aquatic flora and fauna and chemical solutes. Nearby Shiddheshwar lake (Talav) air temperature ranged between 26 to 33°C (Table 2). The minimum air temperature was recorded at site-1 during post-monsoon season and maximum at site 3 during the summer period. Water temperature ranged between 23 to 29°C (Table 2). Air temperature recorded higher values as compared to the water temperature which is mainly governed by the local climatic conditions of the aquatic system. Higher air temperature as compared to surface water temperature has also been noticed by Bhatnagar (1982), Wanganeo (1998), Ayoade et al. (2006), and Wanganeo et al. (2011). Transparency values ranged between 34 cm to 80 cm and recorded minimum value at site II and maximum at site 1 during post-monsoon, respectively (Table 2). High transparency at the central Part was due to the higher depth and absence of algal blooms. Comparatively, low transparency at site III was due to the presence of algae, boating activity near Ganpati Ghat which disturbed the mud water interface and increases the turbidity of water. The type and concentration of suspended particles such as silt, clay, fine particles of organic and inorganic matter, soluble organic compounds, plankton, and other microscopic organisms control the transparency of the water (Chapman, 1992). Lee et al. (1981) reported a transparency value of <170 cm as an indicator of the higher trophic status of the water body which was also confirmed by Wanganeo et al. (2011) and Kumar et al. (2010, 2011, 2012). A maximum depth of 15.8 m was recorded at the central site during post-monsoon while other sites are shallow because of their placement in the shallow regions (Table 2) Higher depths control the growth of aquatic vegetation and help to maintain the trophic levels of the water body. pH value in Shiddheshwar Lake (Reservoir) 7 to 8.5 units indicating its alkaline.Physicochemical analysis of water samples was carried out by followings :

Zooplanktons are those microscopic organisms that consume the synthesized food from the autotrophic level and nektons are those who feed on zooplanktons. Largescale freshwater phytoplankton and zooplanktons distribution and their biodiversity are unknown and yet need to be studied.

Ferris and (1985) studied phosphorus relations in Burragorang Lake, New South Wales, and other Southern hemisphere lakes. Finlayson (1980) observed that phosphorus limits the growth of aquatic plants and chloride is an indicator of water pollution. The salty taste of water is due to Sodium, potassium, and calcium ions concentrations 100mg/L. Jhingran (1969) Biological production in any aquatic body gives correlation with its physicochemical status which can be used as faunal resource potential. Geographical variation in environmental factors is the major determinant of large-scale patterns in phytoplankton and zooplankton diversity Ptacnik et al. (2010) Showed that patterns of phytoplankton diversity in Scandinavian lakes are related to regional variation in phosphorus availability. The diversity was low in premonsoon probably due to the shrinkage of the water spread of the reservoir (Thirumala et al.,2011) Environmental status of any water body. The biodiversity of the lake especially in India depends upon monsoon also in the study of fish biodiversity at Bhadra reservoir the species diversity is the peak in post-monsoon with favourable conditions such as sufficient water and ample food resources. The diversity was low in pre monsoon probably due to the shrinkage of the water spread of the reservoir (Thirumala et al., 2011).

Table No. 3 Zooplankton Population Analysis(Organisms /liter)in Shiddheshwar Lake..

Sr.No	Genera &spp.	"SITE- I -panch Katta "		SITE- II- Bhuakot Fort		SITE- III- Ganapati Ghat		SITE- IV- HOMEmaidan	
.Class(Texa)		S	PM	S	PM	S	PM	S	PM
ROTIFERA 1	Asplanchna brightwelli	-	-	+	+	D	+	+	+
2	Asplanchna siebold	+	+	+	-	+	-	-	-
3	Brachionus cacyflorus	-	-	D	-	D	-	D	-
4	Brachionus diversiconis	+	-	-	+	+	D	D	+
5	Brachionus folculus	D	+	-	+	-	+	-	+
6	Brachionus spp.	+	-	D	+	D	D	D	-
7	Calyciflorus spp.	D	+	-	+	D	+	-	+
8	Chydorus ciliates	D	-	+	-	+	-	+	-
9	Daphnia carinata	+	-	D	+	D	_-	D	+
10	Euchlanis dilatata	D	+	-	+	+	-	+	-
11	Filina longiseta	+	-	+	-	-	+	-	+
12	Keatella procurca	-	D	D	+	D	-	D	-
13	Keratilla tropica	-	+	-	+	-	+	+	-
14	Notholca acuninata	+	D	-	-	D	+	-	+
CLADOCERA1	Alona rectigla	D	+		+	+	-	+	D
2	Alona affinis	+	-	D	+	D	+	-	+
3	Bosmina longirostris	D	-	+	-	+	-	+	-
4	Ceriodaphania spp.	+	+	-	+	D	-	+	+
5	Chydrous ovirus	D	-	D	-	+	+	-	+
6	Doaphanosoma.spp.	-	+	-	+	D	-	+	-
7	Moina brachiata	D	-	D	-	+	+	-	+
8	Moina micrura	+	-	+	-	+	-	+	-
COPEPODA1	Cyclop viridis	+	-	+	-	+	+	-	+
2	Diaptomus spp.	D	+	-	+	D	-	D	-
3	Mesocyclops leucarti	+	+	-	+	+	-	+	+
4	Microcyclop varidicans	-	-	+	-	D	+	+	-
5	Paracyclops spp.	+	-	D	-	+	-	D	+
6	Trocyclops	-	-	+	+	-	+	+	-
7	Undinula valgaris	+	+	-	-	D	+	D	+
OSTRACODA1	Candocypris spp.	D	-	+	+	-	+	-	
2	Calyciflorus spp.	+	-	D	-	+	_-	+	-
3	Heterocypris spp.	+	+	-	-	D	+	D	-
4	Paracondona euplictella	D	+	D	_-	-	+	-	+
5	Stenocypris spp.	+	-	D	+	D	-	+	-
PROTOZOA1	Arcella spp.	+	-	+	-	D	+	D	+
2	Brachionus spp.	D	-	-	-	-	+	+	+
3	Ceratium spp.	+	-	-	+	D	-	+	-
4	Diiffuga spp.	-	-	+	+	+	+	-	-
5	Fillnia opliensis	+	-	-	+	D	-	+	+

S-Summer, PM-Post Monsoon, D-Dominant +-Positive.

Table No. 3 BIOLOGICAL ANALYSIS :

A total of 105 Zooplankton species were identified in Shidheshwar Lake .Density of zooplankton population was observed at Site III-(N) Ganpati Ghat which was located near the human habitat.

Religious people dumped garbage at that site also, the site was aquatic vegetation was observed during monsoon to the winter season when the water level is high in the reservoir. After Site III-(N) Ganpati Ghat, Site II-(W) Bhuakot Fort was the most populated followed by Site IV-(S) Home maidan and Site I-(E) Panch Katta. Author reported that the aquatic vegetation supports a greater diversity of planktonic fauna because they offer a larger variety of microhabitats; Wanganeo, (1980); Duggan et al., (1998).Purushothama et al.(2011)Gyathri et al ;(2014) In the present study, a positive impact of temperature on the growth of the zooplankton population has been noticed. The temperature has been considered as one of the primary factors to cause the abundance of zooplankton in freshwaters particularly in shallow waters where the bottom exhibit considerable variations in temperature, especially with the progression of the warm season Das, 1956; Bamforth, 1958; Moitra and Bhattacharya,1965, Tripathi and Tiwari (2006) ; and Ahangar et al., 2012). also reported the highest zooplankton population in the summer season. It was also observed that seasonal occurrence and distribution of zooplankton diversity at different locations of Shidheshwar Lake .is influenced by various physicochemical characteristics which mainly used for aquaculture practices. Hence, the study of the zooplankton population in this water body has great importance as they are also used to estimate the fishery potential of any aquatic body. Also, the occurrence and abundance of zooplankton may be regarded as a major indicator of the entire environmental status of any water body.

RESULT & DISCUSSION

The zooplankton diversity composition from Shidheshwar Lake, District Solapur, Maharashtra, India. Total 105 species of zooplanktons were recorded from Lake including Rotifer 43, Copepod 12and Ostracoda 5 and Protozoa 5 represent species respectively. Rotifera were dominant group among the zooplankton community with 14 species in present investigation are also the similar record of Gayatri et al., (2014), Dede and Deshmukh (2015,) .Similar work carried and similar findings reported by (Sharma.,2013) Zooplanktons are the grazers on the Phytoplankton food base for the carnivorous and omnivorous fishes. Zooplankton diversity reflects the quality of water and they are good indicators of the changes in water quality because they are strongly affected by environmental conditions and respond quickly to changes in water quality. Hence quantitative studies of zooplankton are importance.

CONCLUSIONS:

The diversity of zooplanktonsare maximum in and presence and dominance of zooplankton species play very significant role in the functioning of freshwater ecosystem. In the present investigation, there were 105 species belonging to five taxonomical groups from Zooplankton diversity. The quantity of zooplanktons in water provided significant information about the available sources for supporting life for fishery development. The density of planktons in water body determined stocking rate of fishes because they were the chief sources of the food of fishes as well as development in production of inland fishery.

SIGNIFICANCE:

The zooplanktons species play significant role in freshwater ecosystem. The density of planktons in water body useful to fishery. The information contributed by this investigation will be useful in order to create awareness in the people to prevent further interference and improved aquaculture in near future. Analysis of the primary productivity and its seasonal dynamics in this lake is also useful fishery potential of the reservoir.

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REFERENCES:

- Adhikari S (2003). Fertilization, soil and water quality management in smallscale ponds. Aquaculture Asia, 8(1):11-13.
- Adoni AD (1985). Workbook on limnology.Pratibha Publishers, Sagar: pp.1-126.
- Ahangar I. A.Saksena DN, Mir MF (2010). Seasonal Variation in ZooplanktonCommunity Structure of Anchar lake, Kashmir. Universal Journal of Environmental Research and Technology. 2(4):305-310
- Alikunhi KH (1957).Fish culture in India. Fm. Bull, Indian Coun. Agr. Res., 20:101-144.
- Alma EGM, Mane EG (2004). Rotifera from southeastern Mexico, new records and comments on zoogeography. Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología 75(1):99-120.
- APHA (2005). Standard Method for the Examination of Water and Waste Water. 21st Edn.,Washington DC.
- Ayoade AA,Fagade SO, Adebisi AA (2006). Dynamics of limnological features of two manmade lakes concerning fish production. Afr.J.Biotechnol. 5:1013-1021.
- Bamforth SS (1958) - Ecological studies on the planktonic Protozoa of a small artificial pond. Limnol. Oceanogr. 3:398-412.
- Borgmann D, Shear H, Moore J (1984). Zooplankton and potential fish production in Lake Ontario. Can.] Fish Aqua. Sci.41:13031309.
- Burgis MJ (1974). Revised estimates for the biomass andproduction of zooplankton in Lake George, Uganda. Biology,4:535-541.
- Das Mrinalkumar and BordoloiSabitry Diversity of ornamental fishes in the river island Majuli, Assam" G.J.B.B (Golbal journal of bioscience and Biotechnology) Vol.1(1) 2012:81-84 ISSN2278-9103.
- Dede A. N. and A. L. Deshmukh (2015): Study on Zooplankton Composition and Seasonal Variation in Bhima River near Ramwadi Village, Solapur District (Maharashtra), India: International journal of current microbiology and applied science, vol.4 (3): 297-306.
- .Dhembare, A.J. 2011. Diversity and its indices in zooplankton with hysicochemical properties of Mula Dam WaterAhmednagarMaharashtra India. Eur. J. Exp. Biol., 1(4): 98- 103.
- .Gayathri S., Latha N. and M. Ramachandra Mohan (2014): studies on population dynamics and seasonal abundance of zooplankton community on Doddavoderahallilake,Bangalore: International Journal of Emerging Trends in Engineering and Development, Vol.1(4).
- .Goswami, A.P., Mankodi, P.C. 2012. Study on zooplankton of freshwater reservoir Int.J.Curr. Microbiol.App.Sci (2015) 4(3): 297-306
- Kolegoan Dam OsmanabadDist., Maharashtra, India. J.Exp. Sci., 3(5): 19 22.
- .Jafari, N., Nabavi, S., Akhavan, M. 2011. Ecological investigation of zooplankton abundance in the river Haraz, Northest Iran: impact of environmental variables. Arch. Biol. Sci. Belgrade, 63(3): 785-798.
- .Jayabhaye, U.M. 2010. Studies on zooplankton diversity of river Kayadhu, Near Hingoli City, Hingoli, Dist. Maharashtra. Int. Res. J., 11(12): 47 49.
- .Kapoor P.A(2015):Study on Ecology of zooplankton profusion in Bhoj wetland, India:International scholars journals,Vol.3 (6): 249-260.
- Koli K.B. and D.V. Muley (2012): studied on zooplankton diversity and seasonal variation with special reference to physicochemical parameters in Tulshi reservoir of Kolhapur district (M.S.): India :International scientific research journal, Vol.4(1): 38-46.
- Kulkarni D.A. and S.S.Surwase(2013):Studies on Occurrence, Richness and Composition of Zooplankton in Seena river water at, Mohal, Dist.- Solapur, MS, India:International Research Journal of Biological Sciences,Vol.2(2):25-28.
- 22.Manoharan D., Isaiarasu L., Suresh Kumar R., Mariappan V. (2015): Observations on the occurrence and diversity of zooplankton in the surface water of three tropical ponds at

Thiruparankundram near Madurai,Tamilnadu, India: International Journal of Fauna and Biological Studies, Vol.2(4): 114-119.

- Pennak, R.W. 1978. Freshwater invertebrate of United States, 2nd edn. John Wiley and Son, Newyork. PP: 303.
- Purushothama, R.,Sayeswara,H.A.,Goudar, M.A.,Harishkumar, K. 2011.Physicochemical profile and zooplankton community composition in Brahmana Kalasi Tank, Sagar, Karnataka, India. Ecoscan., 5(3): 99-103.
- Ramakrishna, S. 2014. Zooplankton seasonal abundance in relation to physicochemical feature in Yelahanka Lake, Bangalore. Global J. Res. Anal., 3(6): 218 219.
- Pradhan V.P (2014): Zooplankton diversity in fresh water Wunnalake:Int. J. of Life Sciences, Vol.2 (3): 268-272.
- .Russell, J., Shiel, A., Justin, F., Costelloe, B.T., Julian, R.W., Reid, A.C., Peter Hudson, A., Powling, J. 2006. Zooplankton diversity and assemblage in Aride zone river of lake Eyre Basin, Australia. J. Mar. Freshwater Res., 57: 49 60.
- Sehgal K., Phadake G.G., Chakraborty S.K. and S. V. Reddy(2013): Studies on Zooplankton Diversity in Dimbhe Reservoir, Maharashtra, India:Advances in Applied Science Research, Vol.4(1):417-420
- .Sharma S., Siddique A., Singh K., Chouhan M., Vyas A., Solnki C., Sharma D., Nair S. and T. Sengupta (2010): Population Dynamics and Seasonal Abundance of Zooplankton Community in Narmada River (India):3741 researcher0209, Vol.2 (9): 1-9.
- Tyor, A.K., Chopraand, G., Seema Kumari.2014. Zooplankton diversity in Shallow Lake of Sultanpur National Park, Gurgaon Haryana. Int. J. Appl. Biol. Pharm. Technol., 5(1): 35 -40.
- Vijaykumar Koli and Madhur Mohan Ranga (2011);Physicochemical Status and productivity of Ana Sagar Lake, Ajmer (Rajasthan),India"Universal Journal of Environmental Research and technology E-ISSN 2249-0256 Vol.1(3)2011 pp286-292.