E-ISSN: 2347-5129
P-ISSN: 2394-0506
(ICV-Poland) Impact Value: 5.62
(GIF) Impact Factor: 0.549
IJFAS 2020; 8(3): 268-272

www.fisheriesjournal.com
Received: 01-03-2020
Accepted: 03-04-2020

Shashank KR
Postgraduate Department of Zoology, JSS College of Arts, Commerce and Science Ooty Road, Mysuru, Karnataka, India

KS Raghunandan
Assistant Professor, Postgraduate Department of Zoology JSS College of Arts, Commerce and Science Ooty Road, Mysuru, Karnataka, India

Corresponding Author:
Dr. KS Raghunandan,
Assistant Professor,
Postgraduate Department of Zoology, JSS College of Arts, Commerce and Science, Ooty road, Mysuru, Karnataka, India
Email: raghundnflash@gmail.com

A Checklist of Zooplanktons recorded at Melukote Ponds, Pandavapura Taluk, Karnataka

Shashank KR and KS Raghunandan

Abstract
Zooplankton species are cosmopolitan in freshwater habitat. Their abundance and composition are of ecological importance, as they are biological indicator sensitive organisms. They acts as main sources of food for many fishes and plays an important element in early detection and monitoring the water pollution. Collection of Zooplanktons was carried out from two different water bodies (Akka and Tangi Pond) using planktonic net of mesh size 25µ. The plankton was fixed using 4% formalin and Lugol's iodine solution. Observations were done under Leica Stereozoom Microscope (LX21M). Identification of Zooplanktons was carried out with an aid of taxonomic keys and scientific literatures. The prepared Checklist revealed total of 28 different species of Zooplanktons, out of which Rotifers are dominated (47.3%) with 15 species followed by Copepods (36.5%), Cladocera (11%) and Ostracods (5.2%) respectively. Thus, this pioneer study will forms a baseline data for further Zooplankton studies in future.

Keywords: Zooplanktons, Rotifera, Occurrence, Melukote, Karnataka

1. Introduction
Ponds are freshwater habitats for aquatic plants and animals which play a key role in maintaining regional biodiversity. In aquatic ecosystem, Zooplanktons are drifting, living organisms in water particularly the pelagic and littoral zones in rivers, lakes and ponds [1]. They are heterotrophic planktons, ranging from microscopic, unicellular or multicellular forms with few microns to millimetre and large species [2, 3]. They play an important role as they are largely consumed by fishes and other higher organisms [4]. The diversity and density of Zooplankton is determined by fluctuating Physico-chemical conditions [5, 6] in each and every water bodies of the world, which are associated with every lake or pond with unique kind of species that fluctuate monthly [7]. These are the group of species whose function or population status can reveal the degree of ecosystem or environmental integrity [8,9] influencing all functional aspect of aquatic ecosystem such as food chain, food webs, energy flow and cycling of matter [10, 11]. Few Zooplanktons act as *"Bioindicators"* that can be used to monitor health of an environment including aquatic ecosystem [12, 13]. These are divided into different groups such as Rotifera, Cladocera, Copepods, Ostracods and Protozoa, including their larval forms [14]. The Zooplankton communities respond to a wide variety of disturbances including nutrient loading acidification and fish densities [15, 16]. The occurrence and abundance of Zooplankton depends on its productivity, which in turn is influenced by abiotic factors and the level of nutrients in the water [17, 18]. Human intervention, different microbial abundance, water quality, nutrient supply, climatic variations are the main factors that determine the trophic status of the lake [19, 20]. As a result, change in their abundance and species diversity or community composition can provide important indications of environmental change or disturbance [21].
Research on Zooplankton has attracted the attention of several researchers throughout the world, as they occupy a central position in sustaining the food web component of various aquatic ecosystems. Thus, the study on Zooplankton is very useful tool for the assessment of biotic potential [22] and contributes to overall estimation of basic nature and general economic potential of water body. Number of research studies had been carried out on Zooplankton composition and its influence due to ecological conditions in various parts of India [23-30] in general and Karnataka is not an exception. However, Zooplankton reports are replete as per the Melukote area is concerned. Hence, a pioneer attempt has been made to prepare a checklist of Zooplankton from Melukote Akka and Tangi Ponds at Pandavapura Taluk, Mandya district, Karnataka.

2. Materials and Methods

2.1 Study Area

The study was carried out at Melukote (12^0 41^1 to 12^0 43^1 N Latitude and 76^0 39^1 to 76^0 41^1 E Longitude) at 1,127msl located in Pandavapura taluk, Mandya district, Karnataka. The Temperatures range from 17° to 38°C and the mean annual rainfall is 621 mm. It is also one of the sacred places and home to Sri Cheluvanaryana Swamy Temple in southern India, surrounded by many shrines and ponds. Among them Akka and Tangi Pond (Fig. 1) were selected for the present study.

2.1.1 Zooplankton Sampling

The pond water samples were collected during period of October, 2019 to February, 2020. The samples were collected in the morning time from 7am to 9am in the monthly twice intervals following standard methods [31] by using a plankton net having a mesh size of 25microns. Then the samples were filtered and placed in Tarson (100 ml) container, subsequently fixed in 4% Formalin and Lugol's iodine solution and stored in cool and dark place till analysis. A drop of water was taken on the glass slide and observed under Leica Stereozoom Microscope (LX21M). Further, the specimens were identified based on morphological and taxonomic key characters [32-34].

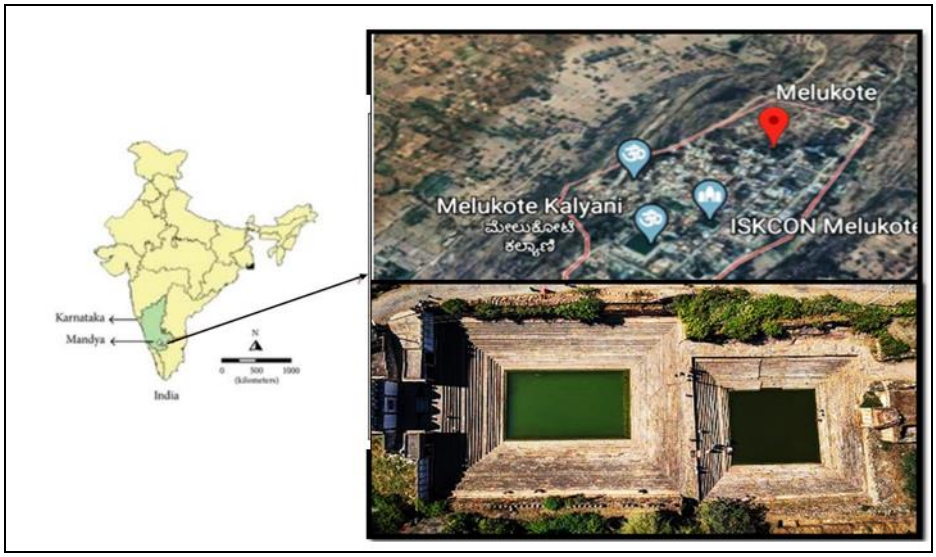

Fig 1: Map showing the study area of Melukote, Pandavapura Taluk, Karnataka

3. Results and Discussion

The prepared Checklist on Zooplankton at Melukote, Pandavapura Taluk, Karnataka revealed a total of 28 different species of Zooplanktons belonging to 4 groups, 5 Classes, 7 Orders and 12 Families (Table 1). Zooplanktons are intermediate link between phytoplankton and fish, which are the secondary producers in the aquatic environment. They are good indicators of changes in water quality, because they are strongly affected by environmental conditions and responds quickly to change in environmental quality. Rotifers are the microscopic, soft bodied, aquatic, multicellular invertebrates which are the indicators of aquatic health [35- 37]. Thus, in the present study the taxonomic dominance of rotifers were reported which agrees with several researchers, [38-41] who reported the same from water bodies of different regions. The Cladocerans ("Water flea") which prefers to live in deep water and constitute a major item of food for fish. They hold a key role in food chain and energy transformations [42, 43]. The Cladoceran population is dependent due to favourable temperature and availability of food, the factors like temperature, turbidity and transparency play an important role in controlling their diversity and density [44-47]. The similar observations on Cladocera are witnessed from the study area. The Copepods occur in all types of water bodies, which serves as food to several fishes and play a major role in ecological pyramids. During the present investigation, copepods were documented from the study area ponds too which is an important element amongst the Zooplankton groups. The Ostracods are bivalve structures, they occur in all kinds of freshwater and marine environments too. The abundance of these provides a good food for aquatic organisms in general including at Melukote Ponds. In the present investigation 3 species of ostracods were recorded. The month wise occurrence of Zooplankton species varied significantly amongst Akka and Tangi Ponds as shown in Table 2. Figure 2 represents, amongst the recorded Zooplankton species from both the ponds from the study area, Rotifers were dominated (47.3%) representing 15 species followed by Copepods (36.5%), Cladocera (11%) and Ostracods (5.2%) respectively.

4. Conclusion

Thus, this pioneer study forms a baseline data for further Zooplankton studies. It also warranted on the continuous monitoring of these water bodies to know the future impact of climate change on distribution of Zooplanktons, which can help to identify the sensitive and sentinel species to formulate the effective conservation strategies in future.

5. Acknowledgement

Authors are thankful to The Chief Executive Officer and Temple Trustees, Sri Cheluvanarayana Swamy Temple, Melukote for the permission to carry out research work. Sincere thanks to Prof. B. V. Sambashivaiah, CEO and Prof. Mahadevappa, Principal, JSSCACS for their support. Thanks are also due to Dr. M. Ramyashree, HOD, PG Dept. of Zoology, JSSCACS for encouragment and Dr. B. S. Nijagal, Assistant Professor, PG Dept. of Zoology, JSSCACS for his comments and suggestions while preparing the manuscript.

Table 1: Checklist of Zooplanktons at Melukote Ponds, Pandavapura Taluk, Karnataka (2019 – 20)

S. No.	Zooplankton Groups	Class	Order	Family	Scientific name	No. of Species
1.	Rotifera	Monogonata (Remane, 1933)	Ploima (Remane, 1933)	Brachionidae (Ehrenberg, 1838)	*Brachionus calyciflorus* (Pallas, 1776)	10 species
					Brachionus caudatus (Barrois and Daday, 1894)	
					Brachionus diversicornis (Daday, 1883)	
					Brachionus donneri (Brehm, 1851)	
					Brachionus falcatus (Zacharias, 1898)	
					Brachionus manjavacas (Hudson and Gosse, 1886)	
					Brachionus Pterodinoides (Rousselet,1913)	
					Brachionus quadridentatus (Hennann,1783)	
					Keratella cochlearis (Gosse, 1851)	
					Keratella tropica (Apstein, 1907)	
			Eurotatoria (De Ridder, 1957	Notammatidae	*Eosphora anthadis* (Harring & Myers,1922)	1 species
				Trichocercidae (Remane, 1933)	*Trichocerca capucina* (Wierzejski & Zacharias, 1893)	1 species
				Lecanidae (Remane, 1933)	*Lacana phapi* (Nitzsch, 1827)	2 species
					Lecane vasishi (Nitzsch, 1827)	
		Bdelloidea (Hudson,1884)	Bdelloida	Philodinidae (Bryce, 1910)	*Rotoria flaviceps* (Pallas, 1766)	1 species
2.	Copepoda	Maxillopoda (Dahl, 1956)	Cyclopoida (Burmeister,1834)	Diaptomidae (Baird, 1850)	*Heliodiaptomus viduus* (Gurney, 1916)	1 Species
				Cyclopoidae (Dana, 1853)	*Mesocyclops leuckarti* (Claus,1857)	5 species
					Cyclops strenus (Fisher 1951)	
					Microcyclops varicans (Sars,1863)	
					Mesocyclops hyalinus (Rehberg,1880)	
					Thermocyclops hyalinus (Rehberg, 1880)	
			Calanoida (Sars, 1903)	Pseudodiaptomidae (Sars,1903)	*Pseudodiaptomus speciosus* (Dang, 1967)	2 species
				Acartiidae (Sars, 1900)	*Acartiella sinensis* (Shen and Lee, 1963)	
3.	Cladocera	Crustacea	Cladocera (Latreille, 1829)	Sididae (Baird, 1850)	*Bosmina longirostris* (O.F.Muller, 1785)	2 species
					Diaphanasoma sarsi (Richard, 1894)	
				Moinidae (Goulden, 1968)	*Moina micrura* (Kurz, 1874)	1 species
4.	Ostracoda	Crustacea	Podocopida (Sars, 1866)	Cyprididae (Baird, 1845)	*Cyprinotus nudus* (Brady, 1885)	2 species
					Strandesia elongata (Stuhlmann, 1888)	
Total	4 Groups	5 Classes	7 Orders	12 Families	28 Species	

Table 2: Monthwise occurrence of Zooplanktons at Melukote Ponds, Pandavapura Taluk, Karnataka (2019 – 20)

S. No.	Zooplanktons	Akka Pond					Tangi Pond				
		2019			2020		2019			2020	
		Oct	Nov	Dec	Jan	Feb	Oct	Nov	Dec	Jan	Feb
1	*Brachionus calyciflorus*	+	-	+	-	+	-	-	+	+	+
2	*Brachionus caudatus*	+	+	-	+	+	+	+	-	-	+
3	*Brachionus diversicornis*	+	-	+	+	-	+	-	+	+	+
4	*Brachionus donneri*	-	+	+	+	+	+	-	-	+	+
5	*Brachionus falcatus*	-	+	+	+	+	+	+	+	-	+
6	*Brachionus manjavacas*	+	+	-	-	+	+	-	+	+	-
7	*Brachionus Pterodinoides*	-	+	+	+	-	-	-	+	+	-
8	*Brachionus quadridentatus*	+	-	+	+	-	+	+	+	-	+
9	*Keratella cochlearis*	+	+	+	-	+	-	+	+	+	-
10	*Keratella tropica*	+	-	+	+	-	+	-	+	-	+
11	*Eosphora anthadis*	+	-	+	+	+	+	-	+	+	-
12	*Trichocerca capucina*	-	+	-	-	+	-	+	+	-	-
13	*Lacana phapi*	+	-	+	-	-	+	+	-	-	+
14	*Lecane vasishi*	-	+	-	-	+	-	-	-	-	-
15	*Rotoria flaviceps*	+	-	+	+	-	-	-	+	+	-
16	*Mesocyclops leuckarti*	+	-	+	+	+	+	+	+	-	+
17	*Cyclops strenus*	+	+	-	+	-	+	-	-	+	-
18	*Microcyclops varicans*	-	+	+	+	+	+	+	+	-	-
19	*Mesocyclops hyalinus*	+	+	+	-	-	+	+	+	-	+
20	*Thermocyclops hyalinus*	-	-	+	+	-	-	-	-	-	-
21	*Heliodiaptomus viduus*	-	-	+	+	+	-	+	+	+	+
22	*Pseudodiaptomus speciosus*	+	+	+	+	-	+	+	-	+	+
23	*Acartiella sinensis*	+	-	-	-	-	+	-	+	+	+
24	*Bosmina longirostris*	+	-	+	+	+	-	+	+	-	+
25	*Diaphanasoma sarsi*	-	+	+	-	-	-	+	+	-	-
26	*Moina micrura*	+	+	-	-	-	+	-	+	+	+
27	*Cyprinotus nudus*	-	-	+	+	-	-	+	+	+	-
28	*Strandesia elongata*	-	+	+	-	-	-	-	+	+	+

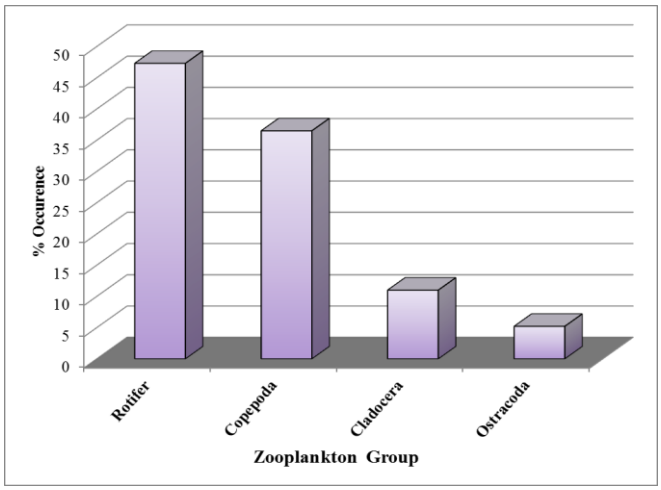

Fig 2: Per cent occurrence of different Zooplankton groups documented at Melukote Ponds, Pandavapura Taluk, Karnataka (2019 – 20)

6. References

1. Fernando CH, Tudorancea C, Mengestou S. Invertebrate Zooplankton predator composition and diversity in tropical lentic waters. In: Intra Zooplankton Predation Springer, Dordrecht. 1990, 13-31.
2. APHA. Standard methods for the examination of water and wastewater. American Public Health Association, Soc. Pub. Washington DC, 1920.
3. Dhargalkar VK, Verlecar XN. Southern Ocean seaweeds: a resource for exploration in food and drugs. Aquaculture. 2009; 287(3, 4):229-42.
4. Canfield TJ, Jones JR. Zooplankton abundance, biomass, and Size-distribution in selected mid-western waterbodies and relation with trophic state. Journal of freshwater ecology. 1996; 11(2):171-81.
5. Padmanabha B, Belagali SL. Diversity indices of rotifers for the assessment of pollution in the lakes of Mysore city, India. Pollution Research. 2007; 26(1):63.
6. Altaff K. Zooplankton diversity of freshwater lakes of Chennai, Tamil Nadu with reference to ecosystem attributes. Int. J. of Life Science. 2019; 7(2):236-248.
7. Sitre SR. Studies on the Seasonal Variation of Freshwater Zooplankton in A Perennial Urban Lake of Nagpur City (MS) India. Lokavishkar International E-Journal. 2012; 1(3):10.
8. Padmanabha B, Belagali SL. Diversity of Rotifers in the Lakes of Mysore City. Wetlands, Biodiversity and Climate Change, 2010.
9. Dhanapathi MVSSS. Taxonomic notes on the rotifers from India (from 1889-2000). Indian Association of Aquatic Biologists, 2000, 10.
10. Sharma BK, Sharma S. Zooplankton diversity of Loktak Lake, Manipur, India. Journal of Threatened Taxa. 2011; 3(5):1745-55.
11. Edmondson WT. Freshwater Biology. Edn. 2, John Wiley & Son. Inc. New York- USA, 1959.
12. Sharma BK, Sharma S. Diversity of Microcrustacea (Crustacea: Branchiopoda) of Loktak Lake, A Ramsar site, Manipur, India. Journal of Threatened Taxa. 2009: 541-8.
13. Sugunan VV. Limnological features in beels: Biotic factors. Bulletin of the Central Inland Capture Fisheries Research Institute, Barrackpore. 1989; 63:128-35.
14. Balamurugan K, Senthil KG, Muthalgi S. Seasonal variations of Physico Chemical parameters from Willington lake, Cuddalore district of Tamil Nadu, India. International Journal of Current Research. 2008; 10(11):75385-75392.
15. Joseph B, Yamakanamardi SM. Monthly changes in the Abundance and Biomass of Zooplankton and Water quality parameters in Kukkarahalli Lake of Mysore, India. Journal of Environmental Biology. 2011; 32(5):551.
16. Yadava YS, Singh RK, Choudhury M, Kolekar V. Limnology and productivity of Dighali beel (Assam). Tropical Ecology. 1987; 28(2):137-46.
17. Jalilzadeh K, Yamakanamardi SM, Altaff A. Physico-chemical parameters of three contrasting lakes of Mysore, Karnataka, India. Journal of Aquatic Biology. 2009; 24(2):90-8.
18. Yousuf AR, Shah GM, Qadri MY. Some limnological aspects of Mirgund wetland. Geobios New Reports. 1986; 5(1):27-30.
19. Kiran BR, Puttaiah ET, Kamath D. Diversity and seasonal fluctuation of zooplankton in fish pond of Bhadra fish farm, Karnataka. Zoos' Print Journal. 2007; 22(12):2935-6.
20. Kumar KS. The fresh water Zooplankton of some lakes in Dharmapuri District Tamilnadu. J. Aqua. Biol. 2001; 16:5-10.
21. Jose R, Sanalkumar MG. Seasonal variations in the zooplankton diversity of River Achencovil. International Journal of Scientific and Research Publications. 2012; 2(11):1-5.
22. Jalilzadeh AK, Yamakanamardi SM, Altaff K. Abundance of zooplankton in three contrasting lakes of Mysore city, Karnataka state, India. In: Proceedings of Taal 2007: The 12th World Lake Conference. 2007: 464:469.
23. Dodson S. Predicting Crustacean Zooplankton species Richness. Limnology and Oceanography. 1992; 37(4):848-56.
24. Edmondson WT. Food as the dominant pathway of methyl mercury uptake by fish. Water Air Soil for regional lake monitoring. Canad. J Fish. and Aqua. Sci. 1965; 58:2222-2232.
25. Purandara BK, Varadarajan N, Jayashree K. Impact of sewage on ground water quality - A case study. Pollution Research. 2003; 22(2):189-97.
26. Rajagopal T, Thangamani A, Sevarkodiyone SP, Sekar M, Archunan G. Zooplankton diversity and physico-chemical conditions in three perennial ponds of Virudhunagar district, Tamilnadu. Journal of Environmental Biology. 2010; 31(3):265-72.
27. Ahmad MU, Khumar F, Anwar S, Siddiqui MS. Preliminary observations on the growth and food of the murrel Channa (*Ophicephalus*) marulius Bloch of the river Kali in north India. Journal of Freshwater Biology. 1990; 2(1):47-50.
28. Balloch D, Davies CE, Jones FH. Biological assessment of water quality in three British rivers: The North Esk (Scotland), the Ivel (England) and the Taf (Wales). Water Pollut. Control, 1976; 75:92-114.
29. Choudhary S, Singh DK. Zooplankton populations of Boosra Lake at Muzaffarpur, Bihar. Environment and Ecology. 1999; 17(2):444-8.
30. Meena K, Dube P. A Critical Review of Zooplankton Studies of Lentic Water Bodies of India. International Journal of Environmental Sciences. 2018; 7(3):79-83.

31. Battish SK. Freshwater zooplankton of India. Oxford & IBH Publishing Company Co. Pvt., Ltd., New Delhi, 1992.
32. Welch PS. Limnological methods. Blakiston Co., Philadelphia, 1948, 381.
33. Hutchinson GE. A treatise on limnology, introduction to lake biology and the limnoplankton. Wiley; 1967, 13.
34. Sharma BK. The Indian species of the genus *Brachionus* (Eurotatoria: Monogononta: Brachionidae). In Biology of Rotifers, Springer, Dordrecht: 1983, 31-39.
35. Segers H. Global diversity of rotifers (Rotifera) in freshwater. In: Freshwater Animal Diversity Assessment, Springer, Dordrecht: 2007, 49-59
36. Contreras JJ, Sarma SS, Merino-Ibarra M, Nandini S. Seasonal changes in the rotifer (Rotifera) diversity from a tropical high altitude reservoir (Valle de Bravo, Mexico). Journal of Environmental Biology. 2009; 30(2):191-5.
37. Shekhar TS, Kiran BR, Puttaiah ET, Shivaraj Y, Mahadevan KM. Phytoplankton as index of water quality with reference to industrial pollution. Journal of Environmental Biology. 2008; 29(2):233.
38. Sharma BK. Rotifer communities of floodplain lakes of the Brahmaputra basin of lower Assam (NE India): biodiversity, distribution and ecology. Hydrobiologia. 2005; 533(1-3):209-221.
39. Khan MA. Observations on Zooplankton Composition, Abundance and Periodicity in two Flood- plain Lakes of the Kashmir Himalayan Valley. Acta hydrochimica et Hydrobiologica. 1987; 15(2):167-74.
40. Sunkad BN, Patil HS. Water quality assessment of Fort lake of Belgaum (Karnataka) with special reference to zooplankton. Journal of Environmental Biology. 2004; 25(1):99-102.
41. Chauhan R. Seasonal fluctuations of zooplankton in Renuka lake, Himachal Pradesh. Uttar Pradesh journal of Zoology. 1993, 17-20.
42. Watkar AM, Barbate MP. Studies on Zooplankton Diversity of River Kolar, Saoner, Dist. Nagpur, Maharashtra. Journal of Life Sciences and Technologies. 2013; 1(1):26- 8.
43. Rajashekhar M, Vijaykumar K, Parveen Z. Zooplankton diversity of three freshwater lakes with relation to trophic status, Gulbarga district, North-East Karnataka, South India. International journal of systems Biology. 2009; 1(2):32.
44. Deepthi S, Yamakanamardi SM. Abundance of Cladoceran Zooplankton in Varuna, Madappa and Giribettethe Lakes of Mysore, Karnataka State, India. International Journal of Science and Environment. 2014; 3(3):885-900.
45. Smitha PG, Byrappa K, Ramaswamy SN. Physico-chemical Characteristics of water samples of Bantwal Taluk, south-western Karnataka, India. Journal of Environmental Biology. 2007; 28(3):591.
46. Sachidanandamurthy KL, Yajurvedi HN. A Study on Physico-chemical parameters of an aquaculture body in Mysore city, Karnataka, India. Journal of Environmental Biology. 2006; 27(4):615.
47. Jeong HG, Kotov AA, Lee W, Jeong R, Cheon S. Diversity of freshwater cladoceran species (Crustacea: Branchiopoda) in South Korea. Journal of Ecology and Environment. 2015; 38(3):361-366.