



Physicochemical Parameters and Zooplankton Diversity in Anicadu Chira, Kerala, India

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Abstract

Ponds are natural water sources that are used by man for various purposes. Zooplankton community constitutes an important component in the faunal composition of the water body. They are sensitive indicators of pollution in comparison with phytoplankton. The present investigation was carried out in Anicadu Chira (pond) situated in Avoly Panchayat, Ernakulam, Kerala. The physico-chemical parameters and zooplankton diversity were studied for a period of one year from April 2014 to March 2015. Totally 28 species of zooplanktons comprising of five orders namely Rotifera (12 species), Cladocera (7 species), Copepod (6 species), Ostracoda (3 species) and Protozoa (1 species) were identified in this perennial pond. Among the Rotifers, *Branchions falcatus* was found abundant. *Daphnia carinata* was predominant among the Cladoceras. Among the Copepods the dominant species was *Diatpamus* and *Cypris* among Ostracoda. Among the Protozoa, only *Vorticella* was observed. The density of zooplankton population was maximum during summer (100 units/ litre) and minimum (8.6 units/litre) during monsoon season due to different environmental conditions of the water bodies. The abundance in zooplankton population was noticed in the following order: Rotifera > Cladocera > Copepoda > Ostracoda > Protozoa.

Keywords: Anicadu chira, physicochemical parameters, zooplankton diversity.

Introduction

Water is the most essential commodity for mankind and is a habitat for a large number of aquatic organisms ranging from microscopic planktons to large aquatic animals. It would be just if it is said study of water is the study of life. Globally, it has been calculated that more than 250 million people are being named with water borne disease every year, ending up with 10 million deaths without age limitation. Now a day due to unplanned urbanization, rapid industrialization and unjustified use of chemical fertilizers in the fields deteriorate water both quantitatively and qualitatively depleting the aquatic fauna¹. Ponds are natural water sources either perennial or non-perennial which is used by man for various purposes. Zooplanktons are one of the most biotic components and are found to be diverse. They are delicate microscopic organisms and they make a beautiful assemblage of minute floating animals. These organisms play a key role in the pelagic food web by controlling phytoplankton production and as a food source for larvae and juvenile fishes².

They influence the functional aspects of aquatic ecosystems such as food chains, food web, energy flow and various cycles involved^{3,4}. The distribution of zooplankton community depends on numerous factors such as change of climatic conditions, physical and chemical parameters and vegetation cover⁵.

Zooplanktons are bio-indicators and help in measuring water pollution status⁶. Present investigation had made an attempt to study the physicochemical parameters and on the distribution and abundance of the zooplankton of Anicadu Chira (perennial pond), Kerala.

Material and Methods

Study area: Anicadu Chira, a perennial pond situated at Avoly Panchayat, Ernakulam district, Kerala located at 9° 58' 8.81" N latitude and 76° 36' 33.86" E longitude was selected for the study. The entire field is about 1 ha (figure-1). The plankton density and physico-chemical parameters were recorded during the period April 2014 to March 2015. Samples were collected from the surface water (0.5 m) during each month in the early hours between 7.00 am to 9.00 am. Concurrently water samples were taken for measuring selected physico-chemical variables. For this purpose water samples were collected in a pre-cleaned polypropylene container. Water quality parameters like air, temperature, pH, DO, BOD, salinity were estimated by adopting the standard methods⁷⁻¹⁰. The plankton samples were collected by filtering 50 litres of water through standard plankton net (77 mesh bolting silk) and the samples were preserved in 5% of formaldehyde solution for proper identification in the laboratory.



Figure-1
Study area of Anicadu Chira, Kerala

The quantitative enumeration was carried out following Sedwick- Rafter counting cells method and identification of various taxa was done by using the taxonomic keys¹¹. Several records portrayed here about zooplankton diversity, abundance, composition and seasonal variances of the different fresh water bodies were extracted¹². Many researchers have studied the zooplanktons of fresh water bodies, both in India and in abroad¹³⁻¹⁵.

Results and Discussion

From the investigation, surface water appeared colourless, odorless and pH showed a range from monsoon (6.5),

Postmonsoon (6.8), premonsoon (7.4) followed by summer (7.6) throughout the study period (table-1). The atmospheric temperature level was recorded from monsoon and post monsoon (28⁰C) to premonsoon and summer (29⁰C). The surface water temperature varies between 29⁰C to 29.63⁰C. In summer season highest temperature was noted and lowest of the monsoon season. High rainfall was observed during the month of June and July. The arrivals of monsoon in June reduced the pH level in water. Temperature is one of the essential environmental factors. It influences the growth and distribution of flora and fauna. Here, the temperature reported was found suitable for the development of planktonic organism¹⁶.

Table-1
Seasonal fluctuation in physico-chemical parameters during April 2014 to March 2015 in Anicadu Chira Kerala

Parameter	Premonsoon 2014			Monsoon 2014			Post monsoon 2014			Summer 2015		
	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar
Air Temp. (°C)	29	29	28	28	28	28	28	28	28	28	29	29
Water Temp. (°C)	29.7	29.6	29	29	29	29	29	29.1	29.3	29.3	29.6	30
pH	7.6	7.6	7.2	6.5	6.5	6.5	6.5	7.0	7.1	7.3	7.4	7.7
Salinity (ppt)	0.39	0.39	0.29	0.27	0.28	0.28	0.30	0.30	0.32	0.38	0.40	0.40
DO (mg/L)	3.8	3.9	5.5	7.5	7.5	7.4	6.5	6.5	6.3	3.6	3.6	3.4
BOD (mg/L)	4.3	4.2	4.0	2.6	2.7	2.8	3.0	3.0	3.0	4.4	4.4	4.8

Salinity did not exhibit much variation and was under 0.5 ppt. To be more specific it was monsoon (0.28 ppt), Postmonsoon (0.31 ppt), premonsoon (0.35 ppt) followed by summer (0.39 ppt). Salinity influences the life of aquatic plants, animals and affects other aspects of water quality too. Heavy rainfall decreases salinity, but drought increases it. Dissolved oxygen (DO) is very important aquatic parameter whose measurement is vital in the context of the culture of any aquatic animal. DO varies from 3.53 mg/L to 7.45 mg/L. DO value was found highest in monsoon and lowest in summer, followed by premonsoon (4.4 mg/L) and post monsoon (6.43 mg/L). BOD was found to be maximum in summer (4.5 mg/L) and the minimum in monsoon (2.7 mg/L). In Kerala due to heavy rainfall and low temperature, a good amount of oxygen is found dissolved in water. BOD found maximum in summer because of high bacterial activity and input of organic load. Dissolved oxygen has an immense relationship with pH value this

statement is borne out by the studies¹⁷.

Seasonal abundance of zooplankton has been followed for a year and investigation results are represented in table-2. Zooplankton population density was maximum during summer (100 units/liter) and minimum (8.76 units/liter) during monsoon season. A sum of 28 genera of zooplankton was identified from the collections during the survey period. Of these 12 belong to rotifers, 7 to cladocera, 6 to copepod, 2 to ostracod and 1 to protozoa (figure-2). The annual periodicity shows rotifer dominantly and constituted (44.86%), cladocera (25.70%), copepod (21.02%), ostracoda (7.00%) and protozoa (1.40%). The zooplankton assemblage in the pond consists primarily of rotifer followed by cladocerans, copepods, ostratracoda and protozoa. The population abundances of zooplankton were noticed in the following order: Rotifera > Cladocera> Copepoda> Ostracoda>Protozoa (table-3).

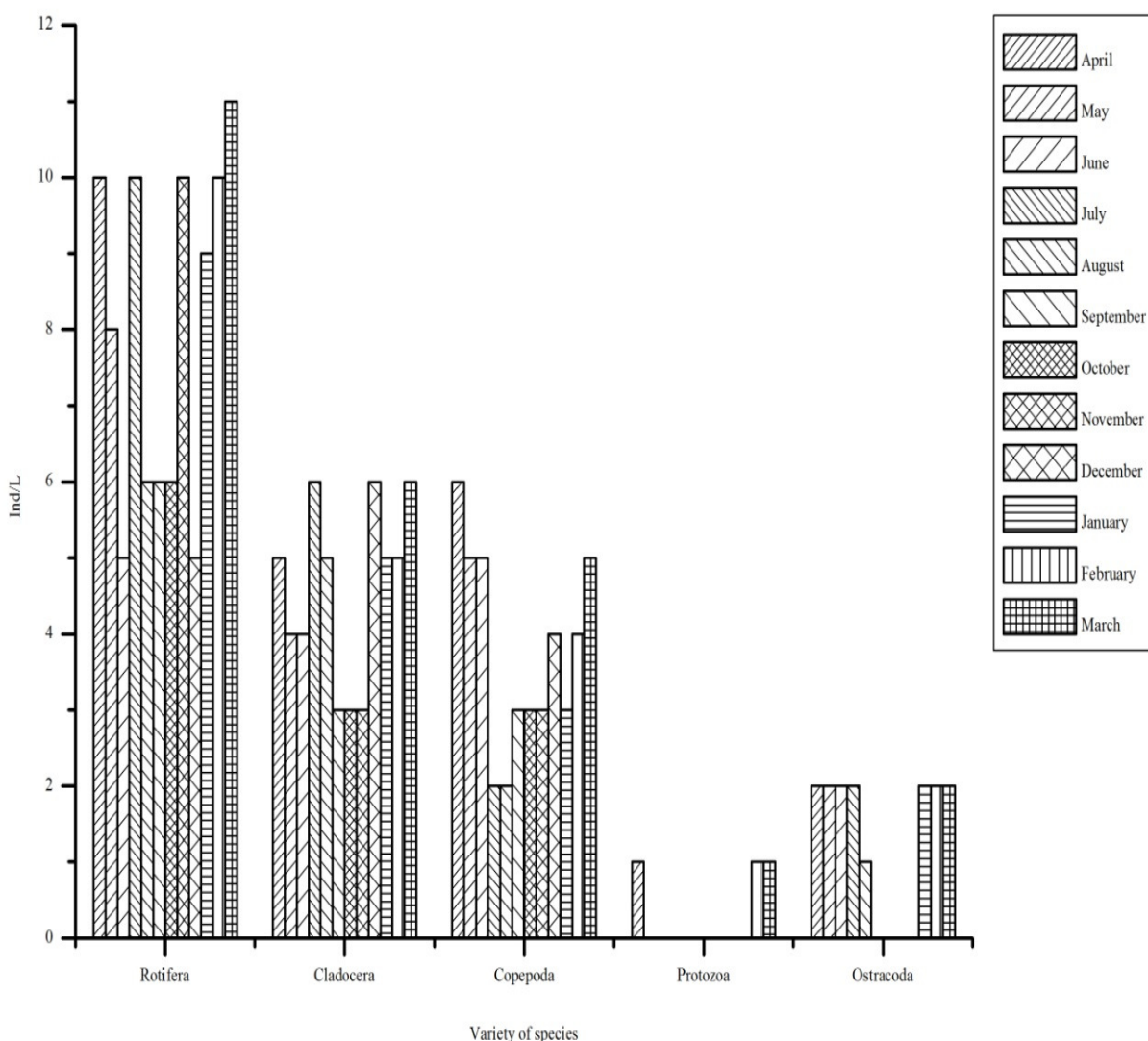


Figure-2
 Monthly Species Variation of Zooplankton Density from April 2014 to March 2015, Anicadu Chira Kerala

Table-2
Monthly and Seasonal Abundance of Zooplankton in Anicadu Chira, April 2014 to March 2015

Genera	Pre-Monsoon			Monsoon			Post-Monsoon			Summer		
	Apr 14	May 14	June 14	July 14	Aug 14	Sep 14	Oct 14	Nov 14	Dec 14	Jan 15	Feb 15	Mar 15
Rotifera												
<i>Brachionus calyciflorus</i>	+	+	-	+	+	+	+	+	-	+	+	+
<i>B. quadridentatus</i>	+	+	-	+	+	+	-	+	-	+	+	+
<i>B. angularis</i>	+	-	-	+	-	-	+	+	-	+	+	+
<i>B. falcatus</i>	+	+	+	+	+	+	-	+	+	+	+	+
<i>Horella brehmi</i>	-	+	+	+	-	-	-	+	+	-	-	+
<i>Keratella tropica</i>	+	+	+	+	-	-	+	+	+	+	+	+
<i>K. cochlearis</i>	-	-	-	+	-	-	-	-	-	+	+	+
<i>Monostyla quadridentatus</i>	+	-	-	+	+	+	+	+	+	+	+	+
<i>Notholca sp.</i>	+	+	-	+	+	+	+	+	-	+	+	+
<i>Lecane lunaris</i>	+	+	+	+	-	-	-	-	+	+	+	+
<i>L. papuana</i>	+	+	+	-	-	-	-	+	+	+	+	+
<i>Trichocera rattus</i>	+	-	-	-	-	+	+	+	+	-	-	-
Cladocera												
<i>Bosmina longirostris</i>	+	+	+	+	-	+	+	+	+	-	-	+
<i>Daphnia carinata</i>	+	-	-	+	+	+	+	+	+	+	+	+
<i>D. similis</i>	-	+	-	+	+	-	-	-	+	-	+	+
<i>Diaphanosoma sp.</i>	+	-	+	-	-	-	-	-	+	+	+	+
<i>Leydigia sp.</i>	-	+	+	+	+	-	-	-	+	+	+	-
<i>Monia brachiata</i>	+	-	-	+	+	+	+	+	-	+	+	+
<i>Moina daphnia</i>	+	+	+	+	+	-	-	-	+	+	-	+
Copepoda												
<i>Heleodiptomus viduus</i>	+	+	+	-	+	-	+	+	+	-	+	+
<i>Mesocyclops hyalinus</i>	+	-	+	+	-	+	-	-	+	-	-	+
<i>Nauplius</i>	+	+	-	+	+	+	+	+	+	+	+	+

Genera	Pre-Monsoon			Monsoon			Post-Monsoon			Summer		
	Apr 14	May 14	June 14	July 14	Aug 14	Sep 14	Oct 14	Nov 14	Dec 14	Jan 15	Feb 15	Mar 15
<i>Tropocyclops sp.</i>	+	+	+	-	-	-	-	-	+	+	+	+
<i>Thermocyclops sp.</i>	+	+	+	-	-	-	+	+	-	+	+	+
<i>T.crassus</i>	+	+	+	-	-	+	-	-	-	-	-	-
Protozoa												
<i>Vorticella sp.</i>	+	-	-	-	-	-	-	-	-	-	+	+
Ostracoda												
<i>Cypris sp.</i>	+	+	+	+	+	-	-	-	-	+	+	+
<i>Stenocypris malcolmsoni</i>	+	+	+	+	-	-	-	-	-	+	+	+

Table-3
Monthly Species Variation of Zooplankton Density from April 2014 to March 2015, Anicadu Chira, Kerala

Genera	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Rotifera	10	8	5	10	6	6	6	10	5	9	10	11
Cladocera	5	4	4	6	5	3	3	3	6	5	5	6
Copepoda	6	5	5	2	2	3	3	3	4	3	4	5
Protoszoa	1	0	0	0	0	0	0	0	0	0	1	1
Ostracoda	2	2	2	2	1	0	0	0	0	2	2	2

Conclusion

The preliminary study in Anicadu Chira (pond) pasteurizes the water quality and the vital zooplanktons in food web which in turn increases the fish yield. The variations in the physicochemical factors were determined by the environment and other anthropogenic inputs. Consciousness has to be created among people in and around villages regarding water contamination and its effects. It is also recommended that all the fresh water ponds should be regularly monitored to preserve and maintain the aquatic ecosystem well balanced, which would benefit the environment - organismal ratio in the future.

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