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Research Article

Diversity And Distribution Of Macroinvertebrates In Relation To Water Quality Parameters In Selected Ponds Of Kanyakumari District

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ABSTRACT

The relationship between macroinvertebrates and water quality parameters play an important role in assessment and investigation of water quality in any aquatic ecosystem. The globe is currently facing problems with water quality in freshwater ecosystems due to severe and rising water contamination in both developed and developing nations. Since the physico-chemical quality may change often, linking this with aquatic macroinvertebrates may be a useful tool for assessment of water quality in an aquatic ecosystem because of their great diversity and long term survival .This research paper presents a study of relationship of water quality parameters with macroinvertebrate communities present in Vembanoor, Putheri and Parvathipuram Ponds of Kanyakumari District during Pre Monsoon, SW Monsoon and NE Monsoon periods of 2020 and 2021. The macroinvertebrates were examined in the laboratory with the support of experts from the Centre for Marine Science & Technology at Rajakkamangalam. The water quality was evaluated using physico-chemical analysis using standard procedures. The relationship were found out by correlation studies. From the results obtained some of the water quality parameters were found to have positive and strong correlation with the macroinvertebrate community.

Keywords: Macroinvertebrates, Water Quality Parameters, Correlation Vembanoor Pond, Putheri Pond, Parvathipuram Pond.

INTRODUCTION

Aquatic macroinvertebrates constitute an important component of secondary production within freshwater ecosystems. They are therefore expected to vary consistently in relation to the intensity of disturbance in an ecosystem (Dalu *et al.,* 2017). They are good bioindicators because they continuously dwell in water and they respond to every change they encounter in their environment, such as pollution (Santhosh and Ashadevi, 2017). Different taxa of macroinvertebrates respond differently to environmental stressors and are therefore considered as good bioindicators(Rasifudi *et al.*, 2018). Sampling water quality on its own to assess river and estuary health gives us a good idea as to what contaminants are present in the waterway at the time of sampling. Investigation of the macroinvertebrate communities can give us a better understanding of the overall impacts on the environment. A healthy waterway will have a large number of different types of macroinvertebrates present with no one type dominating the system. A polluted waterway will have only a few different types of macroinvertebrates present, often in large numbers. Information on macroinvertebrates is important for a long-term analysis of changes in water quality. However, the observations also indicated using macroinvertebrates as useful tools for evaluating the environmental monitoring and ecological health of freshwater ecosystems.

DESCRIPTION OF THE STUDY AREA

Kanyakumari district has a varied topography with sea on three sides. Geologically, the landmass of the district is much younger, after which numerous transgression, as well as regression of sea, had shaped the western coast of the district. In Kanyakumari district, there exist 2,123 major ponds. Among them, 1,105 ponds have reached their full capacities and 538 ponds have attained 75% of their capacities. Ponds are frequently manmade or expanded beyond their original depths and bounds by anthropogenic causes. Vembanoor wetland has an average depth of 12-13 m (Priyatharsini et al., 2016).
Vembanoor is a small Village/hamlet in Rajakkamangalam Block in Kanyakumari District of Tamil Nadu State, India.It is located 8 km towards west from District headquarters Nagercoil, 4km from Rajakkamangalam, 736 km from State capital Chennai.Parvathipuram pond is located on NH 66 about five km from Nagercoil and 60 km from Thiruvananthapuram (Fig1). Putheri Pond receives water from a canal outlet of PechiparaiDam meant for irrigation. Much local agricultural runoff is also received by this Pond .

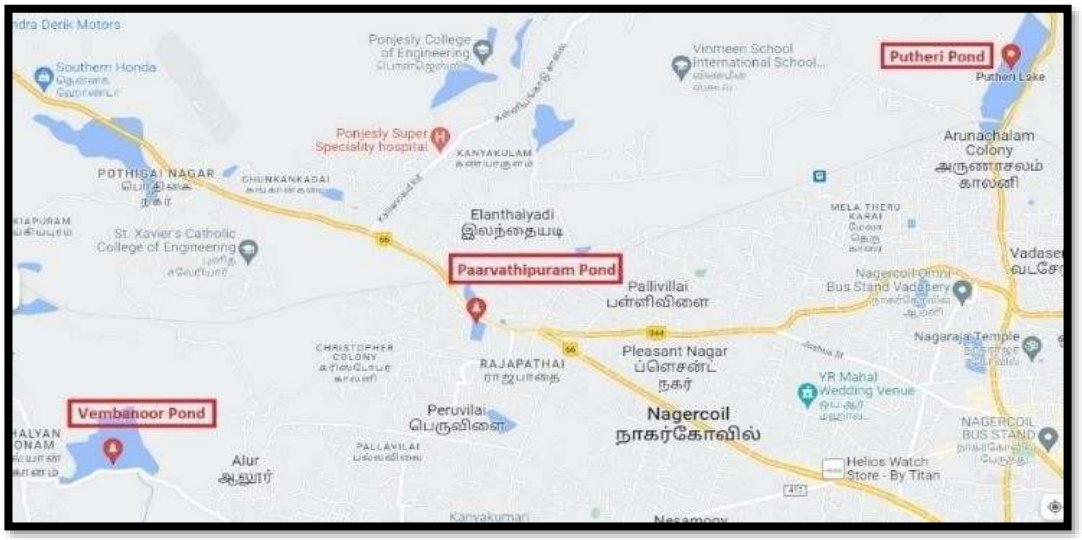

Fig Location Map showing the study areas of selected ponds

MATERIALS AND METHODS

COLLECTION OF MACROINVERTEBRATE SAMPLES :

The collection of macroinvertebrates was done on the same day of sampling water for water quality parameters. This investigation was carried out from all selected water bodies of Vembanoor, Putheri and Parvathipuram from January 2020 to December 2021 to analyze the water quality in Pre Monsoon, SW Monsoon and NE Monsoon seasons. A D-shaped dip net with nylon netting and 500pm mesh was used to collect open water macrofauna. Collected organisms are removed from the D-shaped dip-net and the net is washed into a sieve to collect macroinvertebrates attached to the netting. The sample was sieved through a sieve (0.5 mm mesh) to eliminate the excess debris. Organisms are sorted from the detritus and stored in 70% ethyl alcohol. The collected samples are examined under a dissection or stereozoom microscope (10X and above) and identified.Samples can be assigned to a family or genus using taxonomic keys for that particular group.

COLLECTION OF WATER SAMPLES:

Water samples were collected at seasonal intervals in all selected water bodies for a period of two years to analyses the physico-chemical and biological parameters of water like pH, conductivity ,dissolved oxygen etc. The sampling was done in the first month of every season in early hours of the day around 8am to 10am for a period of two years from the selected ponds during January 2020 to December 2021. Water samples were collected in clean, non reactive white plastic bottles of two litres capacity without any air bubbles. The bottles were labelled with date, time and name of the sampling site with the help of permanent marker. The collected samples were brought to the laboratory and stored at 4°C for detailed physico-chemical analysis. Twenty two water quality parameters were analysed.

RESULT AND DISCUSSION

In the present investigation, a total of 34 macroinvertebrate families have been collected from different sites of selected water bodies of Vembanoor ,Putheri and Parvathipuram Ponds of Kanyakumari District. These macroinvertebrates were included in different orders namely Arhynchopdellida, Oligochaetae,

Tubificida, Ephemeroptera, Odonata, Hemiptera, Diptera, Coleoptera, Plecoptera, Trichoptera ,Decapoda, Hymenoptera,Venerida, Architaenioglossa and Hygrophila. Those macroinvertebrates belonged to three phyla namely Annelida, Arthropoda and Mollusca.

Macroinvertebrates of an aquatic ecosystem play an important role in maintaining the various levels of the interface between community and environment. The physico-chemical quality of water affects the abundance of these macroinvertebrates and thus may serve as biological indicators of water pollution. There were some organisms which are tolerant to the poor water quality conditions, while as some were act as pollution sensitive and others are intermediates.

In the present investigation, Vembanoor Pond showed a differential diversity and abundance of macroinvertebrates in different seasons during 2020 and 2021. (Table.1). In Pre Monsoon period of 2020 and 2021, Gerridae and Culicidae were showing more contribution in abundance respectively. While in SW monsoon season Oligochaeta and Palemonidae adds the maximum abundance but in NE monsoon season both Culicidae and Gyrinidae, has shown the high density. In all the seasons the pollution tolerant macroinvertebrate species belonging to family Hirudinidae, Tubificidae and Naididae are found in least numbers. The result specified the presence of less number of pollution indicators which showed the water is not much polluted. These species of macroinvertebrates act as bioindicators of water quality in Vembanoor pond.

In the experimental period from January 2020 to December 2021 during the three different seasons, Pre monsoon, SW Monsoon and NE Monsoon ,Putheri Pond, showed the diversity and least abundance of macroinvertebrates (Table.2). The family Hirudinidae showed maximum abundance in all the three seasons. This shows the polluted condition of water. Also the presence of family Tubificidae and Naididae which are totally absent in other two ponds, indicate the tolerant species which are bioindicators of water quality. The percentage family richness and number of individual varies with the total numbers in each strata.

In the current investigation ,during the experimental period of 2020 and 2021,Parvathipuram Pond showed diversity and the highest abundance of family Baetidae in Pre Monsoon periods.(Table.3).During SW Monsoon periods Gerridae and Belostomidae showed highest abundance in 2020 and Baetidae contributed its abundance in 2021.In NE Monsoon season of 2020 Nepidae and Hydrometridae are found in abundance and the family Oligochaeta was found in highest numbers in 2021.Percentage of families and individuals depends upon the total numbers in respective strata.

Table1.Abundance of Macroinvertebrates during different seasons in Vembanoor Pond

Seasons	**2020**			**2021**		
Family	**PM**	**SW**	**NE**	**PM**	**SW**	**NE**
Hirundinidae	8	3	1	3	2	2
Oligochaeta	17	19	21	21	8	10
Tubificidae	0	0	0	0	0	0
Naididae	0	0	0	0	0	0
Baetidae	19	4	12	15	9	16
Gyrinidae	0	0	0	17	2	18
Caenagrionidae	18	0	12	21	3	9
Libellulidae	0	0	0	3	2	4
Platycnemididae	10	0	13	13	0	10
Cordulidae	0	0	0	6	3	4
Anisoptera	28	3	0	14	0	10
Corixidae	22	3	11	19	9	13
Gerridae	30	9	16	12	2	10
Nepidae	30	7	13	10	7	7
Belostomatidae	18	6	12	22	10	9
Hydrometridae	21	7	21	11	3	10
Culicidae	25	9	23	30	10	10
Chironomidae	0	0	0	13	3	13
Dytiscidae	11	0	1	10	3	11
Neoptera	16	2	10	13	10	0
Rhyachophilidae	15	10	14	19	2	0
Palaemonidae	30	7	8	5	13	4
Notonectidae	19	3	18	21	0	10
Corbiculidae	19	0	0	14	3	12
Ampullaridae	23	0	2	10	5	15
Lymnaeidae	29	13	12	21	4	5
Planorbidae	0	0	0	5	0	0
Total	**408**	**105**	**220**	**348**	**113**	**212**

Table.2 Abundance of Macroinvertebrates during different seasons inPutheri Pond

Seasons	2020			2021		
Family	PM	SW	NE	PM	SW	NE
Hirundinidae	13	6	10	8	8	2
Oligochaeta	2	3	1	2	2	1
Tubificidae	3	4	0	6	1	0
Naididae	3	2	0	2	2	2
Baetidae	4	0	2	0	2	1
Gyrinidae	0	0	0	1	1	1
Caenagrionidae	3	0	2	1	0	0
Libellulidae	0	1	0	2	1	0
Platycnemididae	1	1	2	0	0	0
Cordulidae	2	0	1	0	0	1
Anisoptera	1	1	0	0	2	1
Corixidae	5	1	3	1	2	1
Gerridae	1	2	1	2	0	2
Nepidae	8	6	2	3	1	1
Belostomatidae	2	0	0	1	2	2
Hydrometridae	0	1	1	0	1	1
Culicidae	0	3	0	2	0	4
Chironomidae	0	0	0	3	2	1
Dytiscidae	0	0	0	1	1	1
Neoptera	2	0	0	1	0	1
Rhyachophilidae	0	0	1	0	0	2
Palaemonidae	7	0	2	0	0	0
Notonectidae	7	1	4	7	1	1
Corbiculidae	0	0	1	1	0	2
Ampullaridae	2	0	0	7	1	0
Lymnaeidae	4	1	3	5	1	2
Planorbidae	0	0	0	3	0	0
Total	70	33	36	59	28	30

Table.3. Abundance of Macroinvertebrates during different seasons in Parvathipuram Pond

Seasons	2020			2021		
Family	PM	SW	NE	PM	SW	NE
Hirundinidae	4	2	2	4	2	1
Oligochaeta	13	5	8	9	12	13
Tubificidae	0	0	1	0	0	0
Naididae	0	0	0	0	0	0
Baetidae	23	20	13	23	13	10
Gyrinidae	0	0	0	12	5	5
Caenagrionidae	12	4	3	7	5	3
Libellulidae	18	4	5	8	3	7
Platycnemididae	10	2	10	8	1	2
Cordulidae	4	11	1	8	1	5
Anisoptera	10	8	7	16	12	8
Corixidae	11	20	12	20	3	3
Gerridae	21	24	15	12	9	11
Nepidae	10	10	16	13	10	7
Belostomatidae	21	24	15	12	9	11
Hydrometridae	10	10	16	13	10	7
Culicidae	15	14	12	11	11	12
Chironomidae	0	0	0	10	10	6
Dytiscidae	20	5	5	16	7	9
Neoptera	17	2	2	13	11	2
Rhyachophilidae	14	10	10	7	8	7
Palaemonidae	14	12	5	12	7	8
Notonectidae	16	12	4	5	8	7
Corbiculidae	17	0	10	11	5	3

Ampullaridae	12	2	7	14	6	0
Lymnaeidae	10	1	12	15	12	11
Planorbidae	2	0	0	0	1	2
Total	**301**	**191**	**179**	**255**	**174**	**144**

Table.4.Correlation matrix showing relationship between physico -chemical parameters and some macroinvertebrate families during the Pre Monsoon period of2020

	Turbidity	TDS	EC	Alkalinity	DO	COD	Hirundinidae	Oligochaeta	Gerridae	Nepidae	Culicidae	Ampullaridae	Lymnaeidae
Turbidity	1.000												
TDS	-0.971	1.000											
EC	-0.999	0.979	1.000										
Alkalinity	-1.000	0.967	0.999	1.000									
DO	-0.318	0.536	0.353	0.303	1.000								
COD	0.300	-0.062	-0.265	-0.315	0.809	1.000							
Hirundinidae	-0.554	0.738	0.585	0.541	0.965	0.627	1.000						
Oligochaeta	0.988	-0.996	-0.993	-0.985	-0.461	0.148	-0.677	1.000					
Gerridae	0.977	-1.000	-0.984	-0.973	-0.513	0.089	-0.720	0.998	1.000				
Nepidae	0.897	-0.765	-0.880	-0.904	0.133	0.690	-0.130	0.818	0.782	1.000			
Culicidae	0.993	-0.992	-0.997	-0.991	-0.425	0.189	-0.646	0.999	0.995	0.841	1.000		
Ampullarida	1.000	-0.964	-0.998	-1.000	-0.292	0.326	-0.531	0.983	0.971	0.909	0.990	1.000	
Lymnaeidae	0.952	-0.851	-0.940	-0.957	-0.013	0.577	-0.274	0.893	0.865	0.989	0.911	0.960	1.000

The present study describes that the physico-chemical parameters moderately influence the occurrence of macroinvertebrates in selected ponds of Vembanoor, Putheri and Parvathipuram Ponds of Kanyakumari District.

Relationship between the Physico-chemical Parameters and the macroinvertebrate families of Vembanoor, Putheri and Parvathipuram Pond during the Pre Monsoon season of 2020 were recorded. The correlation values greater than 0.95 were alone taken into consideration. Macroinvertebrates belonging to family Oligochaeta, Gerridae, Culicidae and Lymnaeidae showed a strong and positive correlation with turbidity. These families increase in numbers as turbidity of waterincreases and vice versa. Hirudinidae showed strong positive correlation with DO (Table.4).

Table .5. Correlation matrix showing relationship between physic-chemical parameters and some macroinvertebrate families during the SW Monsoon period of 2020

	Turbidity	TDS	EC	Alkalinity	DO	COD	Hirundinidae	Oligochaeta	Gerridae	Nepidae	Culicidae	Ampullaridae	Lymnaeidae
Turbidity	1.000												
TDS	-0.971	1.000											
EC	-0.999	0.979 1.000											
Alkalinity	-1.000	0.967		0.999									
DO	-0.318	0.536	0.353	0.303	1.000								
COD	0.300	-0.062	-0.265	-0.315	0.809	1.000							
Hirundinidae	-0.554	0.738	0.585	0.541	0.965	0.627	1.000						
Oligochaeta	0.988	-0.996	-0.993	-0.985	-0.461	0.148	-0.677	1.000					
Gerridae	0.977	-1.000	-0.984	-0.973	-0.513	0.089	-0.720	0.998 1.000					
Nepidae	0.897	-0.765	-0.880	-0.904	0.133	0.690	-0.130	0.818	0.782	1.000			
Culicidae	0.993	-0.992	-0.997	-0.991	-0.425	0.189	-0.646	0.999		0.841	1.000		
Ampullarida	1.000 0.952	-0.964	-0.998	-1.000	-0.292	0.326	-0.531	 0.995 0.983 0.971		0.909	0.990 1 .000		
Lymnaeidae		-0.851	-0.940	-0.957	-0.013	0.577	-0.274	0.893	0.865	0.989	0.911	0.960 1.000	

The correlation matrix between the physicochemical parameters and the macroinvebrates in the SW Monsoon period of 2020 showed a weak relationship. The above Table showed there is no relationship between the both parameters during this season. The correlation values greater than
0.95 were alone taken into consideration for this discussion. This proves that the change in the physicochemical properties of water does not create any drastic changes in the number of organisms in this

SW Monsoon season (Table.5).

Table.6. Correlation matrix showing relationship between physic-chemical Parameters and some macroinvertebratefamilies during the NE Monsoon period of 2020

	Turbidity	*TDS*	*EC*	*Alkalinity*	*DO*	*COD*	*Hirundinidae*	*Oligochaeta*	*Gerridae*	*Nepidae*	*Culicidae*	*Ampullaridae*	*Lymnaeidae*
Turbidity	1.000												
TDS	-0.971	1.000											
EC	-0.999	0.979	1.000										
Alkalinity	-1.000	0.967	0.999	1.000									
DO	-0.318	0.536	0.353	0.303	1.000								
COD	0.300	-0.062	-0.265	-0.315	0.809	1.000							
Hirundinidae	-0.554	0.738	0.585	0.541	0.965	0.627	1.000						
Oligochaeta	0.988	-0.996	-0.993	-0.985	-0.461	0.148	-0.677	1.000					
Gerridae	0.977	-1.000	-0.984	-0.973	-0.513	0.089	-0.720	0.998	1.000				
Nepidae	0.897	-0.765	-0.880	-0.904	0.133	0.690	-0.130	0.818	0.782	1.000			
Culicidae	0.993	-0.992	-0.997	-0.991	-0.425	0.189	-0.646	0.999	0.995	0.841	1.000		
Ampullarida	1.000	-0.964	-0.998	-1.000	-0.292	0.326	-0.531	0.983	0.971	0.909	0.990	1.000	
Lymnaeidae	0.952	-0.851	-0.940	-0.957	-0.013	0.577	-0.274	0.893	0.865	0.989	0.911	0.960	1.000

The correlation values in the NE Monsoon period of 2020 showed a positive and strong relationship with turbidity. The family Ampullaridae showed a strong and positive correlation with turbidity. The values above 0.95 are alone taken into consideration(Table.6).

Table.7. Correlation matrix showing relationship between physic- chemical parameters and some macroinvertebrate families during the Pre Monsoon period of2021

	Turbidity	TDS	EC	Alkalinity	DO	COD	Hirundinidae	Oligochaeta	Gerridae	Nepidae	Culicidae	Ampullaridae	Lymnaeidae
Turbidity	1.000												
TDS	-0.971	1.000											
EC	-0.999	0.979	1.000										
Alkalinity	-1.000	0.967	0.999	1.000									
DO	-0.318	0.536	0.353	0.303	1.000								
COD	0.300	-0.062	-0.265	-0.315	0.809	1.000							
Hirundinidae	-0.554	0.738	0.585	0.541	0.965	0.627	1.000						
Oligochaeta	0.988	-0.996	-0.993	-0.985	-0.461	0.148	-0.677	1.000					
Gerridae	0.977	-1.000	-0.984	-0.973	-0.513	0.089	-0.720	0.998	1.000				
Nepidae	0.897	-0.765	-0.880	-0.904	0.133	0.690	-0.130	0.818	0.782	1.000			
Culicidae	0.993	-0.992	-0.997	-0.991	-0.425	0.189	-0.646	0.999	0.995	0.841	1.000		
Ampullarida	1.000	-0.964	-0.998	-1.000	-0.292	0.326	-0.531	0.983	0.971	0.909	0.990	1.000	
Lymnaeidae	0.952	-0.851	-0.940	-0.957	-0.013	0.577	-0.274	0.893	0.865	0.989	0.911	0.960	1.000

Correlation matrix of water quality parameters and macroinvertebrates in the Pre Monsoon period of 2021 showed a strong relationship with a few parameters .The values above 0.95 are alone taken for discussion. The family Hirudinidae showed a strong correlation with EC .Ampullaridae showed a positive and strong relationship with DO. These values indicated that the increase in EC values made marked deviations in the abundance of macroinvertebrates belonging to this family. Likewise the increase in DO content during this season altered the number of macroinvertebrate during this season(Table.7).

Table.8. Correlation matrix showing relationship between physico chemical parameters and some macroinvertebrate families during the SW Monsoon periodof 2021

	Turbidity	*TDS*	*EC*	*Alkalinity*	*DO*	*COD*	*Hirundinidae*	*Oligochaeta*	*Gerridae*	*Nepidae*	*Culicidae*	*Ampullaridae*	*Lymnaeidae*
Turbidity	1.000												
TDS	-0.971	1.000											
EC	-0.999	0.979	1.000										
Alkalinity	-1.000	0.967	0.999	1.000									
DO	-0.318	0.536	0.353	0.303	1.000								
COD	0.300	-0.062	-0.265	-0.315	0.809	1.000							
Hirundinidae	-0.554	0.738	0.585	0.541	0.965	0.627	1.000						
Oligochaeta	0.988	-0.996	-0.993	-0.985	-0.461	0.148	-0.677	1.000					
Gerridae	0.977	-1.000	-0.984	-0.973	-0.513	0.089	-0.720	0.998	1.000				

Nepidae	0.897	-0.765	-0.880	-0.904	0.133	0.690	-0.130	0.818	0.782	1.000			
Culicidae	0.993	-0.992	-0.997	-0.991	-0.425	0.189	-0.646	0.999	0.995	0.841	1.000		
Ampullarida	1.000	-0.964	-0.998	-1.000	-0.292	0.326	-0.531	0.983	0.971	0.909	0.990	1.000	
Lymnaeidae	0.952	-0.851	-0.940	-0.957	-0.013	0.577	-0.274	0.893	0.865	0.989	0.911	0.960	1.000

Correlation matrix during the SW Monsoon period of 2021 between the physicochemical parameters and macroinvertebrates in selected Ponds of Kanyakumari District showed marked changes in some of the families .Hirudinidae showed a strong correlation with DO. The macroinvertebrates belonging to family Gyrinidae, Gerridae, Nepidae and Lymnaeidae showed a positive correlation with COD values.The values above
0.95 are alone taken into consideration (Table.8).

Table.9. Correlation matrix showing relationship between physico chemicalparameters and some macroinvertebrate families during the NE Monsoon period of 2021

	Turbidity	*TDS*	*EC*	*Alkalinity*	*DO*	*COD*	*Hirundinidae*	*Oligochaeta*	*Gerridae*	*Nepidae*	*Culicidae*	*Ampullaridae*	*Lymnaeidae*
Turbidity	1.000												
TDS	-0.971	1.000											
EC	-0.999	0.979	1.000										
Alkalinity	-1.000	0.967	0.999	1.000									
DO	-0.318	0.536	0.353	0.303	1.000								
COD	0.300	-0.062	-0.265	-0.315	0.809	1.000							
Hirundinidae	-0.554	0.738	0.585	0.541	0.965	0.627	1.000						
Oligochaeta	0.988	-0.996	-0.993	-0.985	-0.461	0.148	-0.677	1.000					
Gerridae	0.977	-1.000	-0.984	-0.973	-0.513	0.089	-0.720	0.998	1.000				
Nepidae	0.897	-0.765	-0.880	-0.904	0.133	0.690	-0.130	0.818	0.782	1.000			
Culicidae	0.993	-0.992	-0.997	-0.991	-0.425	0.189	-0.646	0.999	0.995	0.841	1.000		
Ampullarida	1.000	-0.964	-0.998	-1.000	-0.292	0.326	-0.531	0.983	0.971	0.909	0.990	1.000	
Lymnaeidae	0.952	-0.851	-0.940	-0.957	-0.013	0.577	-0.274	0.893	0.865	0.989	0.911	0.960	1.000

The relationship between the physico-chemical parameters and macroinvertebrates showed in NE Monsoon season of 2021 varied from the other seasons. The macroinvetebrates belonging to oligochaeta, Culicidae and Lymnaeidae showed a strong and positive relationship with TDS. The changes in TDS of water increases the density of macroinvertebrates belonging to the above families(Table.9)

Specifically, in the present investigation it was found that environmental factors play a crucial role in shaping macroinvertebrate community within the study area. The results of this study showed the macroinvertebrate community composition had known changes with the physicochemical parameters and season. There was also a significant relationship between density of macroinvertebrate and sampling sites. According to the results of Rai et al ., 2019 macroinvertebrates are good indicators of water quality which responds to a wide variety of physical, chemical, and biological parameters. The results recorded in the present study showed some of the water quality parameters often cause marked deviations in the diversity and distribution of macroinvertebrates. Usually in the lower strata the organisms are found in lesser numbers. The studies made by Mophin K and Murugesan in 2014 acknowledged the same results. Some of the water quality parameters which altered the distribution of macroinvertebrates are Turbidity, DO, EC and TDS .These parameters are often interrelated. The change in turbidity usually make changes in the density of macroinvertebrate families. This may vary according to seasons. The seasonal changes mainly occurs due to rainfall. Other than that the surface run-off from near by areas due to domestic activites bring in substances that are found in dissolved condition which increases the turbidity. This can be illustrated with the work of Smith R .F and Lamp in 2008. When the turbidity increases automatically there will be a alteration in the dissolved oxygen content which changes the number of macroinvertebrates. The macroinvertebrates which can survive in low oxygen content will multiply and increase in number and vice versa. The other water quality parameters work along with these basic changes caused by these water quality parameters.
The composition, abundance and distribution of macroinvertebrates were influenced by physico-chemical characteristics of water. They are interrelated with water chemistry and the evident rising of richness and abundance of macroinvertebrates in a tune with levels of organic pollution. In this study it was observed that the dominant taxa was Hirudinidae in Putheri pond was a pollution tolerant species. The study of Azrina et al in 2006 proved the abundances of macroinvertebrates, the degree of community assemblages and the presence or absence of dominant taxa reflected pollution levels of freshwater ecosystems making the

macroinvertebrates as good indicators.
In the present investigation, the number of families was found to be least in the lower strata. As the depth of water body increases the dissolved oxygen content also decreases . The reports revealed that DO shows an inverse relationship with free CO2 due to photosynthetic and respiration of the aquatic biota. Studies of Mermillod-Blondin et. al., in the year 2000 also mentioned the density of macroinvertebrates decreases with an increase in water depth.

CONCLUSION

The physico-chemical parameters prevailing in freshwater ponds influence the macroinvertebrate diversity and distribution. It plays a crucial role for assessing the ecological health of ponds in Kanyakumari District. Due to the seasonal variations there occurs a difference in the values of the physico-chemical parameters. This automatically causes changes in the diversity and distribution of macroinvertebrates. Alteration in number of species can be observed. Such studies provide insights into habitat suitability, ecological interactions, and potential impacts of environmental changes on aquatic ecosystems. From the results recorded in various studies and from the present studyit was proved that using macroinvertebrates and their indices as useful tools for evaluating the environmental monitoring and ecological health of freshwater ecosystems.

REFERENCES

1. Azrina, M Z Yap, C K Rahim Ismail, A Ismail, A and Tan, S G 2006 ‘ Anthropogenic impactson the distribution and biodiversity ofbenthic macroinvertebrates and water quality of the Langat River, Peninsular Malaysia’ Ecotoxicol. Environ. Saf.vol. 64, no.3,pp. 337–347.
2. Balachandran. C., Anbalagan. S. and Dinakaran. S., 2012, Influence of environmental parameters on the aquatic insect assemblages in meghamalai hills, south india, LifeScience leaflets 9:72-81 .
3. Esakkimuthu1 K, K. P. Vinod Kumar2 • P. Ponram Assessment of water-polluting sources by multivariate statistical methods in Putheri Lake, Kanyakumari, Tamil Nadu, India [08120 27.100N 77250 54.700E] Sustain. Water Resour. Manag. (2015) 1:349–353.
4. Florian Mermillod-Blondin, Magali Gérino, Valérie Degrange, 2002 ‘Functional Diversity among 3 Detritivorous Hyporheic Invertebrates: An Experimental Study in Microcosms’, Journal of the North American Benthological Society, vol.21, no.1, pp.132-149.
5. James L Carter Vincent H Rush,Macroinvertebrates as Biotic Indicators of Environmental QualityIn book: Methods in Stream Ecology (pp.293-318),2017.
6. Jelanie L. Superada and Annielyn D. Tampus Macroinvertebrates as Indicators of Water Quality in Three Estuary Sites in Iligan City, Philippines , Journal of Multidisciplinary Studies Vol. 4 No. 1, pp. 50-85, 2015.
7. Mophin K and Murugesan A.G 2014’ Assessment of River Water Quality Using macroinvertebrate Organisms as Pollution Indicators of Tamirabarani River Basin Tamil Nadu, India’, International Journal of Environmental Protection, vol. 4, no.1 ,pp. 1-14.
8. Rai, A. , Shah, D. , Shah, R. , & Milner, C. 2019,. ‘Influence of environmental parameters on benthic macroinvertebrate assemblages in the headwaters of Bagmati river, Kathmandu valley, Nepal.’ *Banko Janakari*, vol.29,no.1, pp.53–61.
9. Raphahlelo, M E Addo-Bediako A & W. J. Luus-Powe ,2022, ‘Distribution and diversity of benthic macroinvertebrates in the Mohlapitsi River, SouthAfrica’, Journal of Fresh Water Ecology,vol.37,no.1,pp.145-160.
10. Santhosh, S.K. and Ashadevi, R. (2017) Biomonitoring as a Strategy for Ecosystem Health—A Case Study at the Upper Reaches of Vamanapuram River, Kerala. International Journal of Science and Research, 6, 750-754.
11. Tatenda Dalu , Ross N. Cuthbert , Mathapelo J. Methi , Farai Dondofema , Lenin . Chari , Ryan
12. J. Wasserman, 2022,’ Drivers of aquatic macroinvertebrate communities in a Ramsar declared wetland system’, pp.818
13. Yong Zhang,Beixin Wang,Minghua Han,Lizhu Wang Relationships between the Seasonal Variations of Macroinvertebrates, and Land Uses for Biomonitoring in the Xitiaoxi River Watershed, International Review of Hydrobiology . First 2012.