Pollution Studies in the Chengannur Segment of River Pampa Based on Physical Parameters.

Rohini Krishna M V[*] and M G Sanal Kumar[**]

[*]Vizhinjam Research Centre of CMFRI,,Thiruvananthapuram, ,Kerala, India
[**]P.G. & Research Department of Zoology, N S S College, Pandalam, Kerala, India.

Abstract- Pampa River is the third longest river in the South Indian state of Kerala. The river is one of the most stressed rivers in Kerala .Water quality of Chengannur segment of Pampa River was determined based on Physical parameters such as TDS,Turbidity,Temperature and Conductivity followed by water quality index. Three study sites were selected. Mean with standard deviation were taken. Two way ANOVA was conducted. The water quality index (WqI) was calculated. The quality index was84 forTDS and 98 forTurbidity during premonsoon and summer . The study shows that water in the Chengannur segment of Pampa river is of moderate quality.

Index Terms- Pamba river,TDS ,Temperature ,Conductivity,Turbidity

I. INTRODUCTION

River Pamba originates at Pulachimalai hill in the Peerumedu plateau I of the Western Ghats at an altitude of 1650MSL and flows through Ranni, Ayoor, Pathanamthitta, Thiruvalla, Chengannur, Kuttanad and Ambalappuzha taluks. Most part of the river is flowing through Pathanamthitta and Alappuzha District, both are densely populated and the river is depended for various domestic and agricultural purposes. Studies on pollution of water had always been dealt with respect to the impacts on public health and hence discharge of industrial waste has to be monitored frequently.

Physical parameters such as temperature have their functional roles to determine the type of organisms and their existence in a particular segment of the river. Any change in the structural, physical or chemical characteristics of a river can be considered as indication of increased perturbation either due to anthropogenic interventions or natural damages to the system. Alterations in nutrients in water will also determine the abundance and depletion of different organisms including benthic macro invertebrates and micro flora

Riverine ecology has to be properly studied and dealt with, in term of physical and chemical aspects to find out whether potable water is available to the surrounding inhabitants who solely rely upon river water for domestic purposes. Urbanization, industrialization and unscientific exploitation of water for agricultural activities can cause a river to diminish its quality and will transform to a mere garbage dumping area. A sharp change in these parameters can be seen from the origin to the mouth of a river and hence aquatic biota has shown a severe diversity fluctuation throughout .

There are few studies conducted in river Pamba. The river is one of the stressed rivers in Kerala due to uncontrolled sand mining, pilgrimage, encroachment, reclamation etc. Therefore, it is interesting to study the physical parameters in the water of river Pamba

II. METHODOLOGY

2.1 STUDY AREA

The study area was Chengannur Segment of River Pamba. It is located at latitude 9^0 19' 29.07' N and longitude 76^0 27' 54.31' E with an elevation of 6 Ft above mean sea level.Three study sites were selected in this segment. They were Mundankavu, Parumala and Veeyapuram.

2.3 Collection and Transportation of Sample

Monthly samples were collected from these study sites during Post monsoon (October, November and December 2011) and summer (January, February and April, 2012) seasons. Three samples were taken from each site with an average distance of 500 meters. Samples were collected in pre-sterilized containers and transported to the laboratory in iceboxes within shortest possible time to avoid erroneous data variation due to physical and bacteriological change.

2.3Physical analysis of Samples

In the laboratory Total dissolved solids (TDS) and conductivity was measured using a water quality analyzer. Temperature was measured in the site itself using a thermometer. Turbidity was measured using a sechii disc in the site itself.

2.4 Statistical analysis

Mean and standard deviation for each parameters were determined from the three samples using Microsoft excel software. Two way Analysis of variance (ANOVA) was conducted to determine any significant difference in the value of each parameter between samples and between sites using SPSS package 11.00.

2.5 Water quality index

The overall water quality index of Chengannur segment was calculated season wise using National Sanitation Foundation (NSF) water quality index calculator (NSF,2010)

III. RESULTS

3.1 TOTAL DISSOLVED SOLIDS– TDS (mg/L)

The average TDS level in Mundankavu was 24.24 and 24.41, 23.38 and 22.98 for Parumala and for 26.01 and 22.48 for Veeyapuram (Table 1 and figure 1). The average value between sites was 24.5 for postmonsoon and 23.9 for summer .The average value between seasons were 24.3 mundankavu ,23.18 at Parumala and 24.24 at Veeyapuram.

Table1. TDS (mg/L) in samples from different sites during postmonsoon and summer

Sites	postmonsoon	summer	Mean ± S.D
Mundankavu	24.24	24.41	24.3+0.12
Parumala	23.38	22.98	23.18+0.28
Veeyapuram	26.013	22.48	24.24+2.49
Mean ± S.D	24.5+1.34	23.9+1.0	

Figure 1. TDS (mg/L) in samples from different sites during post monsoon and summer

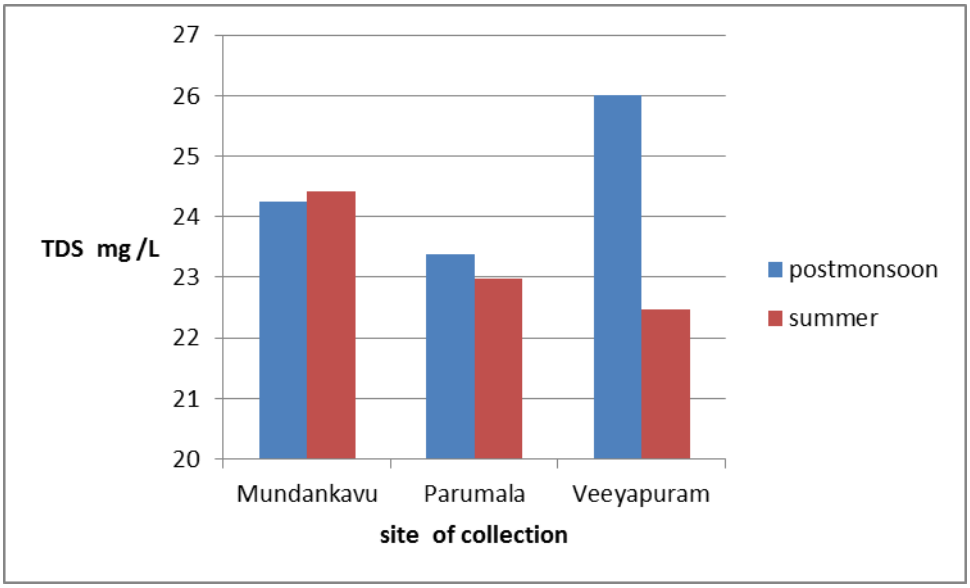

Figure 1. TDS (mg/L) in samples from different sites during post monsoon and summer

Two way ANOVA showed less difference in the TDS between sites (P=0.4116 P>0.05) and significant difference observed between samples (P=1.187, P<0.05) (Table 2).

TABLE 2. Anova showing the significance of variation in TDS in summer and postmonsoon

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1.636406	2	0.818203	0.411626	0.708403	19
Columns	2.360028	1	2.360028	1.187296	0.389665	18.51282
Error	3.975466	2	1.987733			

Total	7.971901	5				

3.2 TURBIDITY (M)

The average Turbidity level in Mundankavu was 0.4, 0.4 and 0.36 for Parumala and 0.6 and 0.33 for Veeyapuram (Table 3 and figure 2). The average value between sites was 0.46 for postmonsoon and 0.36 for summer .The average value between seasons were 0.4 for mundankavu ,0.38 at Parumala and 0.46 at Veeyapuram

Table3. Turbidity (M) in samples from different sites during postmonsoon and summer

Sites	postmonsoon	summer	Mean ± S.D
Mundankavu	0.4	0.4	0.4+0
Parumala	0.4	0.36	0.38+0.02
Veeyapuram	0.6	0.33	0.465+0.19
Mean ± S.D	0.46+0.115	0.36+0.035	

Figure2 . Turbidity (M) in samples from different sites during postmonsoon and summer

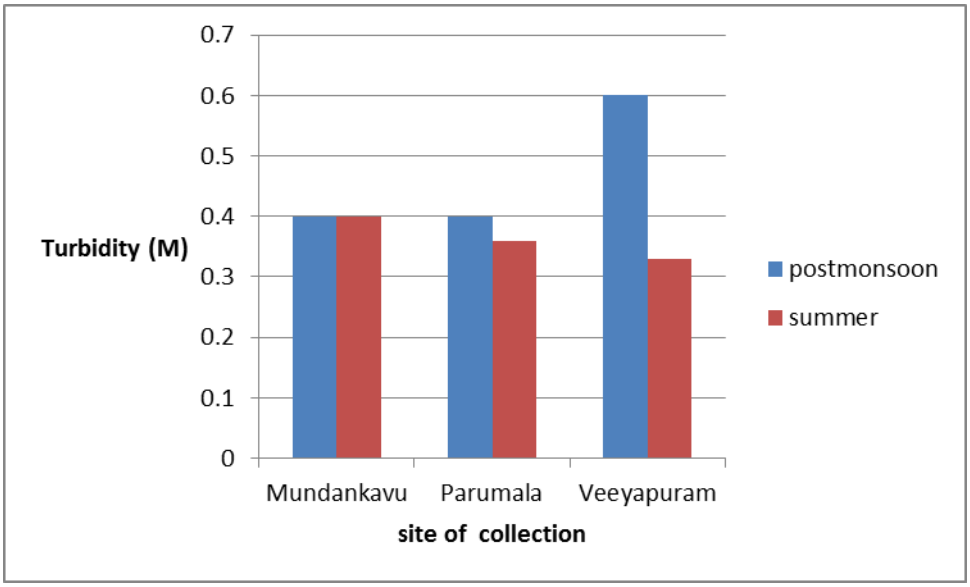

Figure2 . Turbidity (M) in samples from different sites during postmonsoon and summer

Two way ANOVA showed less difference in the Turbidity between sites (P=0.372, P>0.05) and significant difference observed between samples (P=1.508, P<0.05) (Table 4).

TABLE 4. Anova showing the significance of variation in Turbidity in summer and postmonsoon

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	0.0079	2	0.00395	0.372057	0.728833	19
Columns	0.016017	1	0.016017	1.508634	0.344273	18.51282
Error	0.021233	2	0.010617			

Total	0.04515	5				

3.3 TEMPERATURE (^{0}C)

The average temperature level for Mundankavu was 24.53 and 27, 25.66 and 26.63 for Parumala and 24.53 and 26.73 for Veeyapuram (Table 5 and figure 3). The average value between sites was 24.9 for postmonsoon and 26.73 for summer .The average value between seasons were 25.76 for mundankavu ,26.14 at Parumala and 25.6 at Veeyapuram

Table5. Temperature(^{0}C) in samples from different sites during postmonsoon and summer

Sites	postmonsoon	summer	Mean ± S.D
Mundankavu	24.53	27	25.76±1.74
Parumala	25.66	26.63	26.14±0.68
Veeyapuram	24.53	26.73	25.6±1.55
Mean ± S.D	24.9±0.65	26.7±0.19	

Figure3 . Temperature (^{0}C) in samples from different sites during postmonsoon and summer

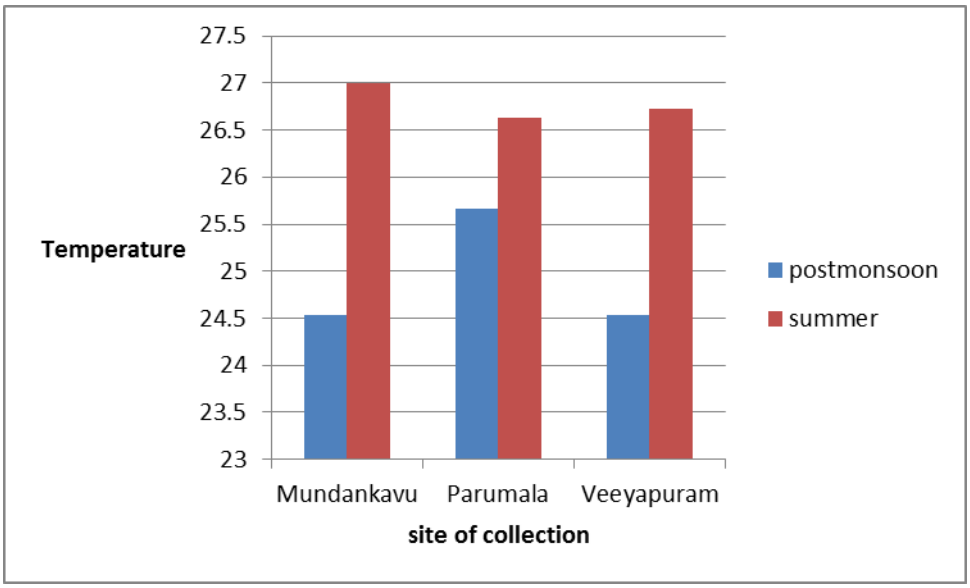

Figure3 . Temperature (^{0}C) in samples from different sites during postmonsoon and summer

Two way ANOVA showed less difference in the Temperature between sites (P=0.446, P>0.05) and significant difference observed between samples (P=16.585, P<0.05) (Table 2).

TABLE 5. Anova showing the significance of variation in Temperature in summer and postmonsoon

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	0.285233	2	0.142617	0.446165	0.691484	19
Columns	5.3016	1	5.3016	16.58564	0.055336	18.51282

Error	0.6393	2	0.31965			
Total	6.226133	5				

3.4 CONDUCTIVITY (mS)

The average Conductivity level in Mundankavu was 36.3 and 30.31, 36.4 and 30.89 for Parumala and for 37.17 and 31.42 for Veeyapuram (Table 7 and figure 4). The average value between sites was 36.6 for postmonsoon and 30.8 for summer .The average value between seasons were 33.3 mundankavu ,33.64 at Parumala and 34.2 at Veeyapuram.

Table7. Conductivity (mS) in samples from different sites during postmonsoon and summer

Sites	postmonsoon	summer	Mean ± S.D
Mundankavu	36.3	30.31	33.3±4.23
Parumala	36.4	30.89	33.64±3.89
Veeyapuram	37.17	31.42	34.2±4.06
Mean ± S.D	36.6±0.47	30.8±0.55	

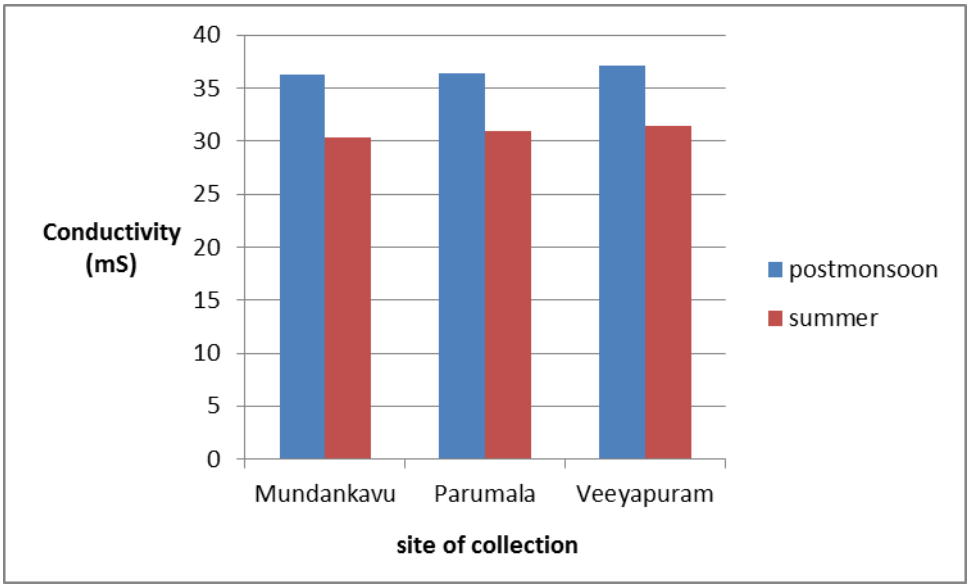

Figure 4. Conductivity (mS) in samples from different sites during postmonsoon and summer

Two way ANOVA showed less difference in the Conductivity betwen sites (P=17.57, P>0.05) and significant difference observed between samples (P=1722.0, P<0.05) (Table 8).

TABLE 8. Anova showing the significance of variation in Conductivity in summer and postmonsoon

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Rows	1.012133	2	0.506067	17.57176	0.053845	19
Columns	49.59375	1	49.59375	1722.005	0.00058	18.51282
Error	0.0576	2	0.0288			

Total	50.66348	5				

Table -9 Water quality index of pampa river for post monsoon and summer

Parameters	Quality Index	Weight
Total dissolved solids	84	0.07
Turbidity	98	0.08

IV. DISCUSSION

The TDS of study region showed a slight variation in two different seasons studied. This is due to less drainage during summer.A major difference in turbidity value was noticed in the two season. The more turbidity value during pre-monsoon is due to the inflow of pre-monsoon showers and input of particles from land. (Sanal Kumar, 2011)The difference in the temperature during two season corresponds with difference in the atmospheric temperature.The conductivity is high in pre-monsoon season and low in Summer. The conductivity has a direct relationship with turbidity and TDS. When TDS and turbidity is more there will be corresponding increase in the conductivity also. (Abbasi, 1997)

V. SUMMARY AND CONCLUSIONS

Water quality of Chengannur segment of Pamba river was determined based on physical parameters followed by water quality index. Three study sites were selected in the study segment as Mundankavu, Parumala and Veeyapuram. Three samples were taken from each study site monthly during post monsoon and summer seasons.Physical parameters like Turbidity, TDS, Conductivity and temperature were determined..

Mean with standard deviation was taken for each parameter value. Two way ANOVA was conducted to test whether the samples have variation in values between site and between replicates. Water quality index (WqI) was calculated following NSF method in both seasons.Slight variation in water quality was observed for TDS during postmonsoon and summer. Great variation in water quality parameters were observed for turbidity, temperature & conductivity in two seasons.The water quality index WqI was found to be 98 for turbidity and 84 for TDS during post monsoon and summer. Both these values indicate a moderate water quality level in the Chengannur segment of Pamba river.

REFERENCES

[1] Abbasi, SA. (1997). Wetlands of Kerala,Ecology and Threats.Discover Publishing House , Delhi Vol.3. pp.210.

[2] Agarwal, K.M. et.al. (2002): A Textbook of Environment. Macmillan India Ltd.

[3] APHA, 2005. Standard methods for the examination of water and waste water American public Health Association. 21st ed. Washington DC p. 948

[4] Carins J.D.W. Albough, F. Busey and M.D. Chaney (1968). The sequential comparison Index. A simplified method to estimate Relative Differences in Biological Diversity in Stream Pollution Studies.

[5] Jhingram, A.G (1991).Challenging frontiers in freshwater fisheries of India.In: Aquaric science in India (B.Gopal.V.Asthana Eds.),Indian Associative for Limnology and Oceanography,31-48

[6] Johnson, J. 2009. Diversity, distribution and assemblage of fishes in streams of W.Ghats. Threatened Taxa 1 (10) 507-513

[7] Koshy, M 2010. Water quality aspects of River Pamba. Pollut. Res. 4(2) 31-38

[8] NSF, 2010.National Sanitation Foundation-water quality index Calculator. in: Field manual for water quality monitoring pp.218.

[9] Odum, E.P. (1983). Basic Ecology, Saunders College publishing, Philadelphia, New York, Chicago.

[10] Sanal Kumar, M.G; 2011. Assessment of Physico-chemical and biological quality of Achankovil river. Research Report, KSCSTE, Trivandrum 63 pp

[11] Saxena M.M. (1987): Environmental Analysis, Agro Botanical Publishers, India

[12] Sharma, B.K. and Kaur (1994), Water Pollution, Goel Publishing House, Meerut

[13] Sladeck, V. (1973): System of water quality from the biological point of view. Arch. Hydrobiol. Beih 7:1

[14] Trivedi, P.R. and Goel P.K. (1986): Chemical and biological methods for water pollution studies.

[15] Vass, et. al. (1977): The lakes and reservoirs of Rajastan

AUTHORS

First Author – Rohini Krishna M V, Vizhinjam Research Centre of CMFRI, Thiruvananthapuram, Kerala, India. rohini.krishna09@gmail.com

Second Author – Dr. M.G. Sanal Kumar, Ph.D., Post Graduate and Research Department of Zoology, N.S.S. College, Pandalam, Kerala, India. mgsanalkumar@gmail.com

Correspondence Author – Rohini Krishna M V , rohini.krishna09@gmail.com ,+91 9846277682