

**Assessment of physico-chemical analysis of Cauvery River water at selected stations**

Kavitha I<sup>1</sup>, Vijayan P<sup>1\*</sup>, Rajasekara Pandian M<sup>2</sup>

<sup>1</sup>Department of Zoology, Annamalai University, Annamalainagar- 608 002, Tamil Nadu, India.

<sup>2</sup>Department of Zoology, Arignar Anna Government Arts College, Namakkal

\*Correspondence:

Email: [bharanitharan2011@gmail.com](mailto:bharanitharan2011@gmail.com)

## Abstract

The water quality of river Cauvery has been assessed in four areas in Mettur (station 1), Bhavani (station 2), Kumarapalayam (station 3) and Pallipalayam (station 4), in Tamil Nadu, and the industrial effluents and domestic sewage contribute a source of pollution in river water. The water samples are collected and selected sampling station to station (S1, S2, S3 and S4) which are previously chosen by pollution control authorities and a comparison between the previous year's results to the present day study carried out in 2019 is made. The high toxic effluent load due to industrial activities, domestic sewage and anthropogenic in the sampling locations viz., S1, S2, S3 and S4 sampling stations are found to be high due to human activities. Chemical parameters vary from S1, S2, S3 and S4 depending upon quality and quantity of effluents and sewage water quality with regard to  $p^H$ , Dissolved oxygen, TDS chloride, sulphate, ammonical nitrogen, calcium, magnesium, COD have been analyzed. In the research, causes of Cauvery river pollution, locate point and non-point source of pollution for the study area and suggest possible remedial measures to reduce the river pollution.

**Keywords:** Cauvery River, Water pollution, Water quality, Physical parameters, Chemical parameters

## Introduction

Aquatic ecosystem monitoring has been carried out in India based on either chemical or biological analysis. The chemical approach is useful in order to determine the levels of nutrients, metals, pesticides. Water quality is a major economic and environmental issue in developing countries. The water quality from the river has a considerable importance for the reason that their water resources are generally used for multiple matters such as drinking, domestic and residential water supplies agriculture<sup>1,2</sup>. Rivers due to their role in carrying of the municipal and industrial

waste water and run off from agricultural land in their drainage basins is among the most vulnerable water bodies to pollution <sup>3</sup>.

The Cauvery river is one of the scared river of southern India as the source of water for an extensive irrigation system and hydroelectric power. The river receive huge amount of industrial effluents <sup>4</sup>. The Cauvery river flows depends on seasonal rains, which has been observed to be low besides industrial effluents has domestic and agricultural runoff are also freely allowed to mix with the river water consequently the quality of water in the Cauvery river has to be monitored and assessed periodically. Water is one of the most common and the large precious resources have been contaminated by organic in organic and biological pollution <sup>5</sup>. The river receives untreated industrial, domestic and municipal sewage from illegal discharges and by anthropogenic activities. The discharge from dyeing units, sugar mills are majorly contributing to high BOD levels in the Cauvery river <sup>6</sup>.

In the current research, the assessment of physico-chemical characteristics into Cauvery river is basin following in the study areas. Further, the research helps to understand how the river is getting polluted, and its possible control of pollution.

## **Material and Methods**

### **Study area**

The water samples were collected from three different sampling stations. During the January to December 2019. The water samples were collected with the help of a glass samples which consisted of a glass bottle and a cork tired to a lid.

Station 1 - Mettur (Free from Pollution)

Station 2 - Bhavani (Less Polluted)

Station 3 - Pallipalayam (Polluted)

#### Station 4 - Kumarapalayam(Highly Polluted)

The Sampling station could be considered as source point.

#### Collection of water sample

Sample were protected from direct sunlight and immediately transported to the laboratory of the Department of Zoology, Annamalai University. The samples were collected for a period of one year from January to December 2020 in the Cauvery river. The pH was measured using electrical digital pH meter. Temperature was measured using a mercury thermometer. TDS was estimated by Gravy metric method <sup>5</sup>. Dissolved oxygen was estimated by modified winkler's method. Sulphate was determined by standard method <sup>7</sup>. Cholride was estimated by Argentometric method <sup>8</sup>. Ammonical nitrogen was estimated by adopting the method described by American public health association. Calcium and magnesium were estimated by EDTA. COD was analyzed by standard method <sup>9</sup>.

#### Results and Discussion

The pH is the measure of the intensity of acidity or alkalinity and measures the concentration of hydrogen ions. Natural water has pH values between 6.5-8.5. The pH is classed has one of the most important parameter water quality. The normal drinking water Ph range mentioned in WHO and NDWQS guide lines is between 6.8 and 8.5. The comparable results, the pH meter used to determine the pH and temperature, DO, silicate <sup>2</sup>. The Cauvery river still in the purest water quality condition, and showed the water quality of the Cauvery river have become pollute and near to pollute <sup>10</sup>. Maximum PH values are recorded in station 3 (8.28). The minimum Value (6.7) is observed during september 2019 temperature is a critical water quality and environmental parameter because it contribute the kinds and types of aquatic life regulates

maximum DO concentration of water and influences the rate of chemical and biological reaction. The Water temperature place and important role is influencing the occurrence and abundance of phytoplankton seasonal changes in different seasons which varied from 19°C to 34.7. Palatability, Viscosity, Solubility, Odors and Chemical Reactions are influenced by temperature. Thereby the sedimentation chlorination processes and (BOD) are temperature depended.

Chloride ions Cl<sup>-</sup> in drinking water do not cause any harmful effects on public health, but high concentration can cause an unpleasant salty taste for the most people. Higher chloride value was found during the present study at station 3 and 4 it may be due to Industrial effluent influence higher values like ca, mg shown by the station 3 and 4 samples may be due to mixing of industrial plant a effluent with this water (Table 1 to 4).

**Table 1**

**PHYSICO-CHEMICAL ANALYSIS OF CAUVERY RIVER WATER AT SELECTED STATIONS AT JANUARY TO MARCH 2019**

Parameters	January 2019 Sampling Stations				February 2019 Sampling Stations				March 2019 Sampling Stations			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
pH	8.4	7.5	6.2	7.6	8.5	7.9	7.7	7.7	8.10	8.26	7.57	6.99
Temperature	19	21	23.1	26.3	27.4	23.4	35.5	26.4	19.32	21.41	267.8	27.2
TDS mg/L	224	324	292	416	300	312	254	524	304	296	428	428
Chloride mg/L	30	54	30	40	34	38	34	34	42	38	82	79
Sulphate mg/L	4.4	10	4.4	10	3	7	34	15	18	18	11	53
D.O mg/L	8.1	8.1	7.3	6.7	7.3	7.5	15	5.6	8.40	7.50	4.50	1.7
Ammonia-N, mg/L	2.2	1.68	1.7	3	1	1	5.6	3	1	2	3	8.2
Calcium mg/l	30	46	36	90	34	42	43	43	29	35	52	32
Magnesium mg/L	18	23	29	24	19	16	22	22	23	17	19	32
COD mg/L	16	16	16	48	16	16	32	32	16	16	24	19

Sulphate is a substance that occurs naturally in drinking water health concerns regarding sulphate in drinking water have been raised because of reports that diarrhea may be associated

with the ingestion of water containing high levels of sulphate. Sulphate plays a key role in the sulphur cycle. In the present study amount of chloride and sulphate were varied during different

**Table 2**

**PHYSICO-CHEMICAL ANALYSIS OF CAUVERY RIVER WATER AT SELECTED STATIONS AT APRIL TO JUNE 2019**

Parameters	April 2019 Sampling Stations				May 2019 Sampling Stations				June 2019 Sampling Stations			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
pH	7.7	7.89	7.8	7.9	7.71	7.98	7.42	7.88	7.94	8.02	8.28	8.1
Temperature	27.3	28.06	29.4	31.1	27.1	29.4	34.7	33.2	22.06	24.1	28.8	27.9
TDS mg/L	276	284	364	364	304	340	382	340	336	360	430	382
Chloride mg/L	34	33	65	65	40.0	50	71.0	53	48	64	112	61
Sulphate mg/L	22	6	18	18	19	12	16	6	18	16	10	6
D.O mg/L	5.20	7.70	6.80	6.80	4.20	7.50	5.20	6.20	5.10	5.20	8.0	7.8
Ammonia-N, mg/L	1	2	3	3	1.1	1	1.7	1.6	1.1	1.68	1.6	1.2
Calcium mg/l	27	34	20	21	24	34	31	26	38	38	32	22
Magnesium mg/L	22	17	23	33	22	17	16	19	20	17	18	21
COD mg/L	24	16	24	25	16.0	16	23	5.20	16	16	39	16

**Table 3**

**PHYSICO-CHEMICAL ANALYSIS OF CAUVERY RIVER WATER AT SELECTED STATIONS AT JULY TO SEPTEMBER 2019**

Parameters	July 2019 Sampling Stations				August 2019 Sampling Stations				September 2019 Sampling Stations			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
pH	7.54	8.33	7.45	7.9	7.21	7.51	6.93	7.8	6.6	6.7	7.2	6.9
Temperature	23.8	25.8	25.4	27.8	22.1	24.8	24.3	27.8	23.1	25.4	26.9	27.6
TDS mg/L	328	804	368	368	168.0	236	220.0	200	148.0	280	192	248
Chloride mg/L	58	215	76	68	12.0	56	34.0	35	26.0	29	27.0	46
Sulphate mg/L	10	19	16	2.8	7.0	8.8	15.0	7.3	7.3	22	4.4	4.84
D.O mg/L	7.00	4.80	5.40	5.2	6.80	5.90	7.10	7.1	6.1	5.2	6.0	5.2
Ammonia-N, mg/L	0.6	3.36	2.2	2.8	0.6	1.12	1.1	1.12	1.1	1.12	1.1	1.68
Calcium mg/l	27	40.1	24	24	46.0	66	52.0	44	35.0	88	26.0	46
Magnesium mg/L	23	37	26	34	28.0	34	40.0	32	34.0	80	76.0	32
COD mg/L	16	24	6.40	5.2	8.0	16	16.0	8	8.0	16	16.0	24

seasons in the river cauvery. Dissolved oxygen content is one of the most important factors in stream health its deficiency directly affects the ecosystem of a river due to bio accumulation and bio magnifications. Dissolved oxygen plays a major role in water quality determination. The introduction of oxygen demanding materials either organic or inorganic into a river causes

**Table 4**

**PHYSICO-CHEMICAL ANALYSIS OF CAUVERY RIVER WATER AT SELECTED STATIONS AT OCTOBER TO DECEMBER 2019**

Parameters	October 2019 Sampling Stations				November 2019 Sampling Stations				December 2019 Sampling Stations			
	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
pH	8.1	7.4	7.5	7.21	7.1	7.4	7.5	7.2	8.1	7.7	7.9	7.8
Temperature	22.7	24.8	25.8	26.5	22.4	24.5	25.3	26	22	24	24.9	25
TDS mg/L	176	280	172	164	220	172	182	340	248	376	292	264
Chloride mg/L	24	25	22	22	31	21	39	60	50	30	54	36
Sulphate mg/L	27	47	28	27	14	19	15	17	11	22	23	17
D.O mg/L	6.2	6.4	6.6	6.8	6.5	6.2	6.6	6.4	6.0	7.3	7.0	6.8
Ammonia-N, mg/L	1.1	1.12	0.6	0.56	1	1	1	1	1	0.6	1	1
Calcium mg/l	50	36	52	50	66	50	76	80	56	128	84	64
Magnesium mg/L	36	58	32	34	54	48	44	72	72	104	62	64
COD mg/L	16	16	16	16	16	8	16	16	16	16	15	16

depletion of the dissolved oxygen to water this process a threat to fish and other higher forms of aquatic life. There exists to better general indicator of water quality level that DO<sup>11</sup>. The physico-chemical and microbiological parameters of water from a part of the Cauvery river in Pallipalayam region. The levels for these parameters are higher than their acceptable limits, and the decreased levels of beneficial microbial populations in the river water samples are an indication that the river is encumbered with large quantities of xenobiotic compounds<sup>12</sup>.

In this study showed higher Ammonical N in station 4 (summer) this increase could be attributed to the industrial plant discharging and agricultural runoff mix into the river but low values recorded in the Winter seasons (0.6). Calcium the highest calcium values were observed

during the present study in station 2. A consolidated reported of all the physicochemical parameters studied showed values for these to be significantly higher than their standard limits on account of pollution of the river water by industrials activities<sup>13,14,15</sup>.

A higher concentration of magnesium is due to the continuous addition of a fluent contamination. Magnesium occurs in all kinds of natural waters with calcium sewage and industrial effluents are important contribution of magnesium. High concentration of magnesium can import unpleasant taste to water. Total Dissolved Solids (TDS) describes the amount of inorganic salts of calcium, magnesium, sodium etc and small proportion of organic matter present in the water. The river water of the study area was not polluted in respect to physicochemical assessment, but bacteriological studied attributed river water was not fit for drinking purposes due to higher coliforms counts, which require continuous monitoring and treatment process if the water is to be used for drinking purpose<sup>16</sup>. The present studies carried out from January 2019 to December 2019 on river Cauvery revealed that due to urbanization and rapid industrialization of this area river water is deteriorated.

### **Conclusion**

In kumarapalayam taluk there are 135 numbers of Dyeing and Bleaching industry or in Operation. Some of the unauthorized textile Dyeing and bleaching units identified in Kumarapalayam and Pallipalayam in above units discharge theirer untreated Effluent into the municipal drain along with the domestic sewage reached the river cauvery do station 4 is highly polluted then the other stations.



## Acknowledgment

This study was supported by the authors are grateful to the Professor and Head, Department of Zoology, Annamalai University, Annamalainagar for the laboratory facilities provided.

## Reference

1. Yoganathan K, Ganesh P, Tamizhazhagan V.. Impact of organic and conventional (chemical) fertilization on soil quality and its seasonal variation. *Int J Zool Appl Bioscie* 2017;2:348-355.
2. Vijayan P, Senthilmurugan S, Pugazhendy K, Tamizhazhagan V. Analysis of physicochemical parameters water samples from Cauvery River in Thanjavur district, Tamil Nadu. *Int J Biol Res* 2018;3:223-227.
3. Wang P, Wang Z, Wu Z, Zhou Q, Yang D. Effect of hypochlorite cleaning on the physiochemical characteristics of polyvinylidene fluoride membranes. *Chem Engineer J* 2010;162:1050-1056.
4. Tamizhazhagan V, Pugazhendy K, Sakthidasan V, Revathi K, Baranitharan M. Investigation of microbial count in the soil and earthworm gut (*Eudrilus Eugeniae*). *Innovar J Agricult Scie* 2016;4:7-9.
5. Tamizhazhagan V, Pugazhendy K. The toxicity effect of Monocrotophos 36% Ec on the Hematology, *Labeo rohita* (Hamilton, 1882). *Int J Curr Pharmaceu Res* 2015;4:92-95.
6. Sakala BT, Sampath Kumar MC. Assessment of physico-chemical characteristics of selected study area of Cauvery basin. *Int J Late Trend Engineer Technol* 2019;15:51-54.
7. Trivedy RK, Goel PK. Chemical and biological methods for water pollution studies environmental publications India, 1986.

8. APHA. Standard methods for the examination of waters and wastewater analysis. 21th Edn. Washington. D.C, 2005.
9. APHA. Standard Methods for the examination of water and wastewater. 20<sup>th</sup>ed. American public health association, Washington, DC, 1998.
10. Shiva Kumar D, Srikantaswamy S, Jagadish K. An overview on assessment of Cauvery river water quality. Int J Innov Res Scie Technol 2014;1:13-18.
11. Huge Ellis J. Stochastic water quality optimization using imbedded chance constraints. Water Resour Res 1987;123:2227-2238.
12. Vijayalakshmi G, Ramadas V, Nellaiah H. Evaluation of physico - chemical parameters and microbiological populations of Cauvery river water in the Pallipalayam region of Tamilnadu, India. Int J Res Engineer Technol 2013;2:305-312.
13. WHO. Guidelines for drinking water quality, Health Criteria and other supporting information, Geneva; WHO 1990;2.
14. Raja PA, Muhindhar Amarnath, Elangovan Palanivel M. Evaluation of physical and chemical parameters of river Kaveri, Tiruchirappalli, Tamil Nadu, India. J Environ Biol 2008;29:765-768.
15. Hema S, Subramani T, Elango L. GIS Study on Vulnerability Assessment of Water Quality in a Part of Cauvery River. Int J Environ Scie 2010;1:1-17.
16. Venkatesharaju K, Ravikumar P, Somashekar RK, Prakash KL. Physico-chemical and bacteriological investigation on the river Cauvery of Kollegal stretch in Karnataka. Kathmandu University J Scie Engineer Technol 2010;6:50-59.