



COMPARATIVE ANALYSIS OF PHYSICO-CHEMICAL PROPERTIES OF WATER IN MUTHUPETTAI MANGROVE FOREST AND ECR BEACH CHENNAI, INDIA

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Abstract: Changes in Physical and chemical reactions such as pH, temperature, EC and chemical properties such as Dissolved Oxygen, Organic matter and Silica provide important information on water quality, source (s) of variations and their effects on activities and biodiversity of water. In the present study, the physico-chemical parameters of mangrove water samples and seawater were compared to provide basic information on the chemical characteristics of physico in this study area. The result shows that there is very little impact on water quality pollution and this study can be used to look at Mangrove water quality and seawater quality to maintain aquatic ecosystems and resources. Reconstruction of the physicochemical properties of mangrove water and seawater in cover areas is needed as a future work.

Index Terms - Physicochemical parameters, mangrove water, seawater, basic information, minor pollution

I INTRODUCTION

Water is one of the most important processes in the ecosystem. Physico-chemical and biology characteristics can explain water quality (Priyanka *et al.*, 2009). However, some possible links between these components and importantly will be useful in determining water quality (Manjare *et al.*, 2010). Deal quality guidelines provide basic information regarding water quality parameters and toxicological values to prevent specific water use. Mangroves and marine areas are a complex and dynamic marine environment (Morris *et al.*, 1995). Seawater has become a major problem due to its high rates of social and human development. With the increase in population and commercial industries, mangrove water receives a large amount of pollutants from various sources such as recreation, fish culture and adoption and the transportation of waste products into the river (Prasanna *et al.*, 2010). These conditions have created tremendous pressure on the ecosystem, leading to a decline in water quality and biodiversity, loss of critical habitats (Herrera- Silveira and Morales-Ojeda, 2009). The natural environment of the Mangrove forest serves as a base for light and productive food in tropical and subtropical marine environments (Odum and Heald, 1972). The availability of good quality water is a very important factor in preventing disease and improving health.

The emergence of plume-related declines, environmental pollution, seawater, food and nutrient interactions with other particles in the atmosphere and land into water, is known to occur mainly in seawater (Ho *et al.*, 2009), (Sundarambal *et al.*, 2010). Variations in production in surface water are due to fluxes of nutrients that may have come from both natural and anthropogenic origin and changes in physicochemical water properties that may later change the water quality. Therefore, it can also influence the composition and availability of marine organisms and affect the process of ecosystem processes such as coral habitats and marine ecosystems (Yap *et al.*, 2011), (Sigman and Hain, 2012), (Velsamy *et al.*, 2013). The growth of biomass phytoplankton and marine biodiversity (Sigman and Hain, 2012) is influenced by the biochemical parameter of the sea surface such as DO, temperature, salinity, pH, tube, nutrients and other parameters also important to determine the relationships and factors involved in biogeochemical cycles and an important key for monitoring water quality (Tan *et al.*, 2002), (Shazili *et al.*, 2006), (Fargallah *et al.*, 2009), (Yap *et al.*, 2011). Information on the Physico-chemical properties of the present study sites are limited.

II. RESEARCH METHODOLOGY

2.1: Learning area

For the current project two study sites were selected. Study area I is located in the Muthupettai Mangrove Sea (Plate 1) and study area II is located on East Coast Road (ECR) Beach Chennai (Plate 2).



Plate 1: Muthupettai Mangrove Sea Learning Site I

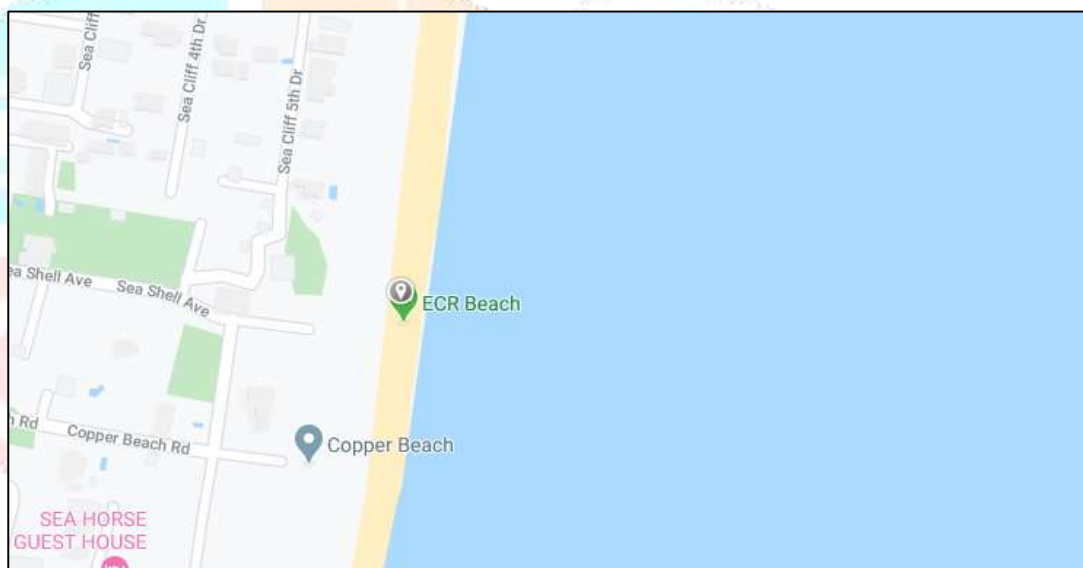


Plate 2: ECR Beach, Chennai - Learning Site II

2.2: Water Sample collection

In this work, two water samples were collected, one from mangrove forest and one from ECR Beach (marine area). Water samples were collected by water sampling at 1 m bottom and transferred to polyethylene bottles, which were already soaked in 5 M HCl for more than three days and rinsed with distilled-deionized water before rinsing.

2.3: Parameter Analysis

The collected samples were taken to the laboratory and kept at 37 for C for further study. The period of study is from November 2018 to April 2019. PH, TDS MG / L, Phosphate PO 4 Mg / L, Nitrogen, DOD MG / L, BOD MG / L, COD MG / L, Potassium. As K mg / l. Atmospheric temperature and water temperature were measured and recorded using on-the-spot thermometers (Velsamy *et al.*, 2013). Salinity was measured using an Etago refractometer (Arumugam and Sugirtha P. Kumar, 2014). The pH value is measured employing a pH meter. Total nitrogen is measured using the Kajaldi method. Potassium was estimated using the tetraphenylborate method. The revised oxygen estimate is measured by the modified Winkler method. In addition to the biochemical oxygenation method, chemical oxygen demand is also measured. Total dissolved solids and phosphates were also measured. Potassium levels were measured for both water samples

2.4: Statistical Analysis

Data obtained were statistically analyzed using one-way ANOVA. An essentialness level of 0.05 shows a 5% danger of inferring that distinctions exist when there is no genuine contrast.

III. RESULTS AND DISCUSSION

3.1: Study area

Learning site 1 have a great cover for Mangrove swimming. These mangroves are a major contributor to the burden of biodiversity. (Plate 1). The total area of Mangrove is 6,803.01 Hectare (Table 1). The marshy land in Muthupet is a major tourist place. This scenic area is endemic to mangrove trees, in an area of 120 square kilometers. The 162 mtrs wooden path has long been designed to benefit visitors to enjoy the mangrove forest. During the rainy season in November-January, large numbers of birds migrate here from all over the world. Eight different species of migratory birds congregate here for long distances. Among the most noteworthy bird species are heron, egret, flamingo, painted pig, pelican, teal and tern. The migration of these birds is a rare sight that adds to the beauty of this region.

Table 1: Details of Learning site I

S.No	Learning site I	
1	Name of Mangrove	Muthupettai
2	River	The Cauvery Delta
3	Place	Muthupet-Thiruvarur District
4	State	Tamil Nadu
5	Coast	East Coast
6	Latitude	10°46'N
7	Longitude	79°51'E
8	Important Landmarks	Point Calimere
9	Total Area of Mangrove	6,803.01 Hectare

The Learning site 2, ECR Beach Chennai is a two-lane highway (now upgraded as a four-lane route) in Tamil Nadu, India, built along the Bay of Bengal coast, connecting Tamil Nadu's state capital Chennai with Cuddalore via Pondicherry (Plate 2). The eastern coastal road to Kanyakumari was extended via Chidambaram, Sirkali, Akkur, Tharangambadi, Karaikal, Nagore, Nagapattinam, Thiruthuraiipoondi, Muthupet, (Table 2). There were numerous studies regarding water quality and pollution status conducted in Muthupettai Mangrove sea and ECR Beach, however the information on Physico-chemical properties of water in these areas are limited.

Table 2: Details of Learning site II

S.No	Learning site II	
1	Name of Beach	ECR
2	Place	Panaiyur, Chennai
3	State	Tamil Nadu
4	Country	India
5	Latitude	12.8920°N
6	Longitude	80.2537°E

3.2: Physico- chemical parameters

General physico-chemical parameters of water such as Temperature, pH, TDS mg / L, Phosphate as Po₄ mg / L, Nitrogen, BOD mg / L, COD mg / L and Potassium as K mg / L was analyzed (Table 1). Marine and Mangrove water samples were collected randomly in an autoclaved container from the MuthuPettai mangrove forest and ECR Beach, Chennai. The Physico chemical parameter was analyzed in water samples. Sample 1 is Mangrove Water and Sample 2 is Marine Water.

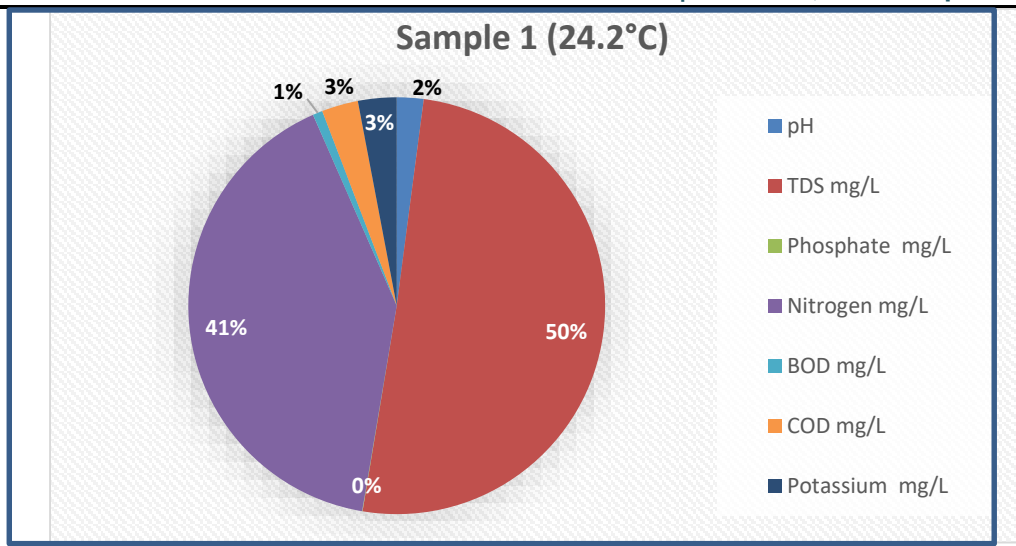


Figure 1: Physico- chemical parameters of Study area I

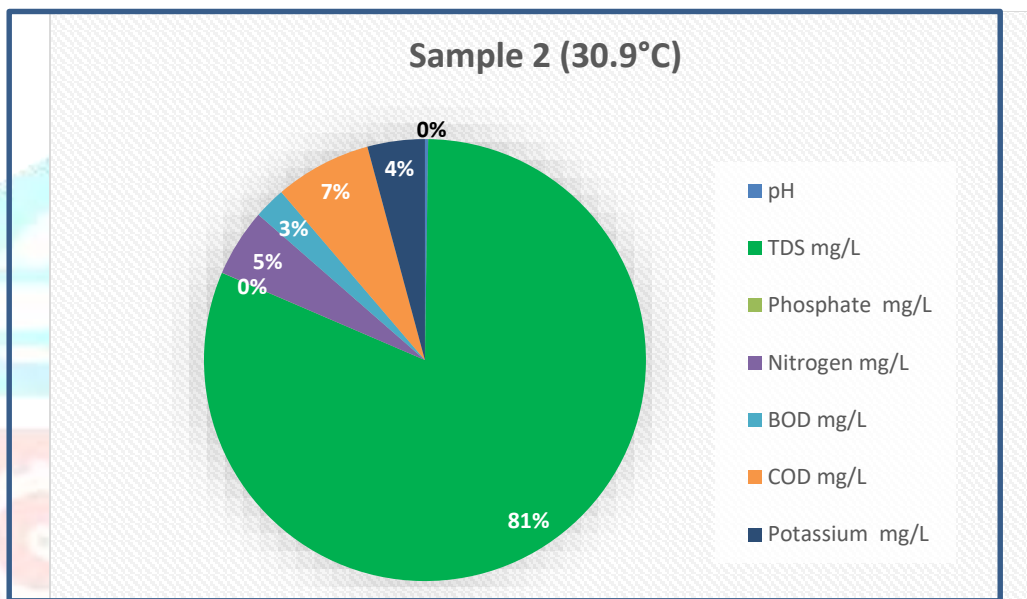


Figure 2: Physico- chemical parameters of Study area II

Table 3: Physico Chemical Parameters of the Water Sample I and II

SI. NO	Parameter	Sample 1 Mangrove	Sample 2 Marine
1	Temperature	24.2°C	30.9°C
2	pH (Hydrogen ion concentration)	7.64	7.93
3	TDS mg/L	186.00	2758.00
4	Phosphate as PO4 mg/L	0.12	0.46
5	Nitrogen (total nitrogen)	150.0	168.0
6	BOD mg/L (Biological oxygen demand)	2.81	78.60
7	COD mg/L (chemical oxygen demand)	10.40	240.00
8	Potassium as K mg/L	11.0	142.50

Temperature (°C): The average distance at which aquatic organisms are used in the tropics is between 8°C and 30°C (Alabaster and Steven Lloyd, 1980). All chemical reactions are regulated by water temperatures and affect fish growth, reproduction and

immunization. Inconsistent temperature changes can be harmful to aquatic organisms. The temperature of the water between the study sites showed little variation (24.2°C - 30.9°C) (Table 3).

pH: pH is very important in determining the quality of water that is harmful. The lower the pH the higher the corrosive water environment. pH was positively correlated with electrical performance and total alkalinity (Gupta *et al.*, 2009). The pH changes in water are governed by the amount of free CO₂, carbon and bicarbonate. These changes are accompanied by changes in other physico chemical factors that also influence water quality. Nearly neutral pH is observed in both areas. The pH value of the water sample 1 and 2 is 7.64 and 7.93 respectively. This result indicates that both samples are neutral. (Boyd and Lichtkoppler, 1979). reported a pH range of 6.09 - 8.45 as suitable for supporting aquatic life including fish. The results indicate that the pH is within the permissible limit for the growth of aquatic organisms.

Dissolved solids (TDS): The total dissolved solids (TDS) is a measure of the aggregate content of all organic and organic matter contained in a liquid, ionized or micro-granular suspension. Some of the most naturally occurring dissolved organic matter comes from weather extremes and the dissolution of rock and soil. The TDS mg / L (Total Non-volatile Solution) of the water sample 1 and 2 is 186.00 and 2758.00. The quality of the water sample 1 is correct and the water quality of sample 2 is not acceptable. The water you receive should exceed the level of TDS that should be present in the water. Water with a TDS level above 1000mg / L is not suitable for use. High levels of TDS in water can lead to many health problems. The presence of potassium, sodium, chlorides increases TDS levels in the water

Phosphate: This is an excellent rating. The yellow color is produced from the action of phosphates and silts on the molybdate ions under acidic conditions. The phosphate level in the water sample 1 is 0.12 and in the case of sample 2 it is 0.46. This exploits rapid growth and consecutive problems.

Nitrogen (Nessler's reagent Spectrophotometry method): Nitrogen is spectacularly measured at radiation of 425 nm by coloring the complex with Nessler's reagent. The reaction conditions are alkaline and cause severe disruption from the hardening of the water. Nitrogen level in sample 1 is 150.0 and sample 2 is 168.0. The acceptable range for total nitrogen is 2mg / L to 6mg / L.

Dissolved Oxygen (DO) (Modified Winkler Method): DO is one of the most important characteristics. Its relation to the water body provides direct and indirect information e.g. bacterial activity, photosynthesis, gene availability, stratation etc. (Premlata Vikal 2009).

Biological Oxygen Demand (BOD): BOD is a form of organic pollutants in water, expressed in mg / L. The amount of dissolved oxygen required for the chemical elimination of organic substances and organic solvents (eg., iron, sulfites) is measured by BOD. BOD tests are usually performed over a period of five days. BOD is the amount of oxygen used by living organisms to decompose this waste. The median contaminated water body has a BOD of 2 to 8 mg / L and the most polluted water body will exceed the BOD of 8 mg / L. The BOD level for sample 1 is 2.81 and for sample 2 it is 78.60. Sample 1 is equally polluted and sample 2 is highly polluted.

Chemical Oxygen Demand (COD): COD is another form of biological pollutant in water defined in mg / L. COD is the amount of oxygen required to cause the chemical emissions of organic matter. The COD level in sample 1 is 10.40 and sample 2 is 240.00. COD is a good indicator of chemical pollutants in water and as a result most of the pollution control concentrates on COD as it also reports reduced substances such as sulfides, sulfites, iron ferrous and organic carbon. Both BOD and COD are important indicators of the environmental health of surface water input. They are widely used in wastewater treatment but are rarely used in water treatment. (Milacron Marketing Co).

Potassium (Tetraphenylborate Method): Potassium is measured by the Tetraphenylborate method. Potassium in the sample combines with sodium tetraphenylborate to form potassium tetraphenylborate, insoluble white solid. The amount of turbidity produced is proportional to the concentration of potassium. Potassium level in sample 1 is 11.0 and sample 2 is 142.50 (Table 3).

IV CONCLUSION

Existing research shows that ECR Beach and the Muthupettai Mangrove Sea have little impact on water pollution and this study can be used to monitor Mangrove water and seawater quality to maintain aquatic ecosystems and resources. Water pollution is actually a major problem as it not only has a negative impact on health and can also have devastating effects on various industries and agriculture. This study also provides basic information on the physico chemical parameters of Mangrove and marine waters which may be useful for the assessment of land-based changes that may occur over time due to climate change and anthropogenic activities.

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- [34] <https://www.google.com/maps/place/ECR+Beach/@12.8917736,80.2514149,17z/data=!3m1!4b1!4m5!3m4!1s0x3a525b6768f3160f:0x5365c199a0caea88!8m2!3d12.8919615!4d80.253651> Location - (12.892213, 80.253636)

