

# A COMPARATIVE STUDY ON PHYSICO-CHEMICAL CHARACTERISTICS OF MARINE WATER ONSHORE AND OFFSHORE AT KULASEKARANPATTINAM, THOOTHUKUDI DISTRICT, INDIA.

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## ABSTRACT

In the present study, efforts have been made to analyze selected physico-chemical characteristics of the water bodies of Kulasekaranpattinam, Thoothukudi District, Tamil Nadu, India. The comparative analytical study of both onshore and offshore was conducted for three Months. The study area is geographically located between latitude 8°4'N and longitude 78°06'8" E. It is a very good tourist place. In the Kulasekaranpattinam village there are about 12,010 populations are dwelling. This small fishing village is known for its fishery resources. The fishes were transported to Udangudi and its surrounding area. Physico-chemical characteristics of seawater were assessed through the standard protocol suggested by APHA (2005). Statistical analysis such as single factor ANOVA is performed to the data set to know the relationship among the studied parameters. All the physico-chemical parameters were not showed any significant variations among the parameters within the sites as well as between the sites. pH and nitrate were elevated in the onshore, while the parameters such as turbidity, salinity and phosphate were elevated in the offshore. The study showed the present status of the physico chemical parameters, which is very useful to evaluate the health of the coastal system and also to take regular monitoring to save the coastal environment.

**Keywords:** Physico-chemical parameters; onshore; offshore and Kulasekaranpattinam.

## INTRODUCTION:

Water is one of the prime constituent that supports human's life as well as aquatic life. Better quality of water can be described by its physical, chemical and biological characteristics Manjare et al (2010). Physical and chemical properties of water immensely influence the uses of a water body for the distribution and richness of biota Unanam and Akpan (2006) and also influence both vertical and horizontal migration of aquatic organisms. If affects their distribution, diversity and feeding Imam and Balarabe (2012). The open ocean is more stable compared to the near shore waters, where the interaction with the terrestrial zone is more effective in bringing about variations in different physico-chemical parameters Poonam and Rahul (2012). The inshore areas usually get disturbed with more critical water pollution problems than offshore Rao et al (2007). At present, near shore water is in various stage of degradation as they are increasingly exploited by human for food, recreation, transport and other needs. Therefore an attempt has been made to provide an account of physico chemical parameters study exclusively carried out on marine water onshore and offshore at kulasekaranpattinam.

## OBJECTIVES OF THE STUDY:

The main objectives of this current study are;

- ❖ To assess the physico-chemical parameters of the marine water at kulasekaranpattinam.
- ❖ To determine the standard deviation.

❖

To calculate the analysis of

variance.

## METHODOLOGY

### STUDY AREA

The study area is geographically located in the southern part of Thoothukudi district lying between latitude 8°4'N and longitude 78°06'8" E in Tamil Nadu, India (Figure-1). Kulasekaranpattinam was an ancient port dating to the 1<sup>st</sup> centuries of the Christian era and was contemporaneous to the existence of Kollam, Cheranport, and another Pandyan port. Kollam served the pandyas on the West coast while kulasekaranpattinam served them on the east coast connecting them to Ceylon and the pearl fisheries in the Gulf of Mannar facing the Thoothukudi coast. It is a very good tourist place in Tamil Nadu. Kulasekaranpattinam the name is derived from Pandyan ruler Maravarman Kulasekara Pandiyan I. In this coastal village a famous festival known as Dasara which

is celebrated with pomp at the Mutharaman temple in a grand scale every year during October. This temple is nearly 300 years old. Folk artistes from all over the state converge here to participate in the 10days Dasara festival. The village is located along the Kulasekaranpattinam in the east coast of south Tamil Nadu. This small fishing village in Thoothukudi district is known for its fishery resources. Kulasekaranpattinam coast connects the Tiruchendur coast which is in the north east and Manapadu coast which is in the south east, further it drains into the Bay of Bengal. There is an estuary namely Karumeni which confluence between Manapadu coast and Kulasekaranpattinam coast.

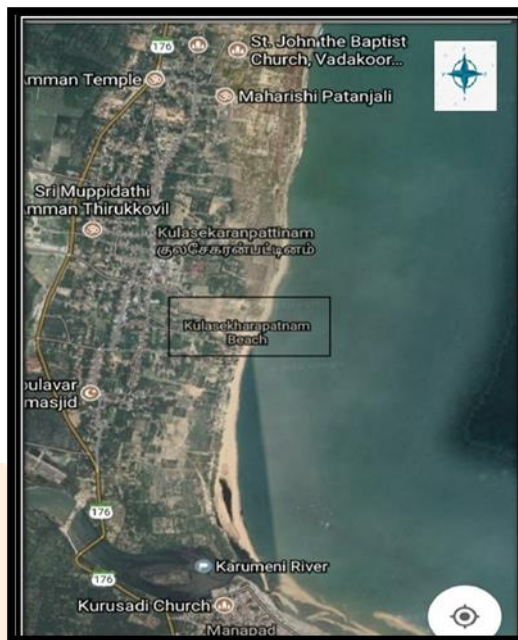


Figure-1. Satellite map showing the location of kulasekaranpattinam Coastal area.

**SAMPLE COLLECTION**

Water samples were collected form onshore and offshore periodically of three months during January 2018 to March 2018(Figure-2 & 3). Sampling was usually carried out between the hours of 6.00 A.M to 8.00 A.M. The onshore was located farther from the seashore coast of about 2m. The average depth of the onshore is 0.5m. The offshore was situated far away from the coastline of about 15Km. The average depth of the offshore is 25m. Water samples were collected in 1 litre high density polyethylene plastic vials pre-treated with 4M HNO<sub>3</sub> and properly rinsed with de-ionized water followed by doubly distilled water before use. After the collection they were immediately kept in ice box and transported to the laboratory for determining the physical and chemical parameters.

Physico- chemical characteristics of seawater were assessed through the standard protocol suggested by APHA (2005). The P<sup>H</sup> was measured by using HACH portable P<sup>H</sup> meter. Turbidity was estimated by Turbidimeter. Salinity was estimated by digital Refractometer. Inorganic Phosphate and Nitrate was analyzed by UV Spectrophotometer.



process of collection of onshore water samples



Figure-2. The process of collection of offshore water samples

## STATISTICAL ANALYSIS

The results for the physico-chemical analysis, mentioned above, are represented by the Mean (Mean  $\pm$  SD). Significance of onshore and offshore variations was compared by using single factor ANOVA between various physico-chemical parameters of Kulasekaranpattinam. All Statistical analysis were carried out using Microsoft excel version 2007.

## RESULTS AND DISCUSSIONS

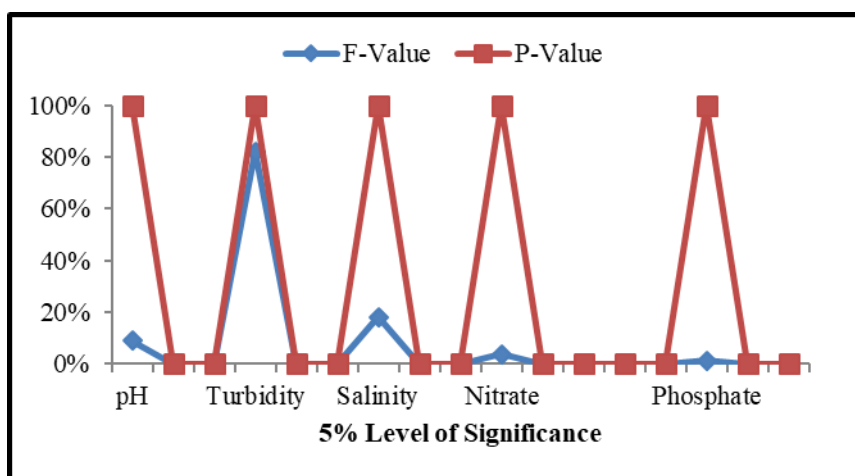
## pH

Onshore site pH was varied from  $7.1 \pm 0.492$  to  $7.5 \pm 0.397$ . The higher mean concentrations were recorded as  $7.5 \pm 0.397$  during March 2018 and lower mean concentrations were recorded as  $7.1 \pm 0.492$  during January 2018. Offshore site was varied from  $7.1 \pm 0.266$  to  $7.4 \pm 0.549$ . The higher mean concentration was recorded as  $7.4 \pm 0.549$  during March 2018 (Table-1) and lower mean concentration was recorded as  $7.1 \pm 0.266$  during January 2018.

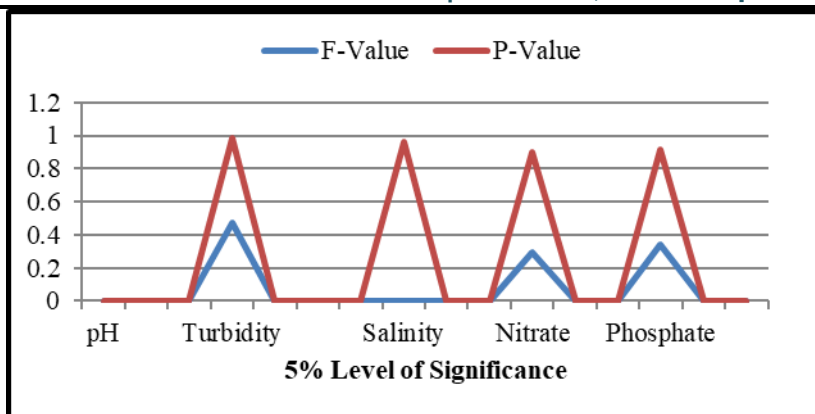
**Table:1 Monthly Variations in Physico – Chemical Characteristics of Onshore water from Kulasekaranpattinam coast.**

S.NO	Parameters	January	February	March
1	pH	$7.1 \pm 0.492$	$7.15 \pm 0.386$	$7.5 \pm 0.25$
2	Turbidity (NTU)	$0.2 \pm 0.158$	$0.4 \pm 0.207$	$0.3 \pm 0.311$
3	Salinity (g/l)	$23.45 \pm 2.854$	$22 \pm 1.245$	$18.813 \pm 2.205$
4	Nitrate (mg/l)	$33 \pm 4.969$	$30 \pm 3.768$	$20 \pm 2.774$
5	Phosphate (mg/l)	$0.81 \pm 0.241$	$0.1 \pm 0.027$	$0.13 \pm 0.031$

In the one way analysis of variance the seawater of pH exhibited no significant variation (ANOVA:  $F=0.078$ ;  $P=0.786$ ) ( $P>0.05$ ) during the study period represented in the figure 4 & figure 5 at both onshore and offshore.



**Figure- 4 One way analysis showing the parameters between and within the sites in onshore during January 2018**



**Figure- 5 One way analysis showing the parameters between and within the sites in offshore during January 2018**

During the investigation on comparing both the onshore and offshore the highest pH concentration has been observed during the month of March in the onshore. The highest pH concentration reported in the onshore indicated the presence of organic acid, biological processes (Photosynthesis and respiration) and physical processes (turbulence and aeration), which can alter concentration of dissolved carbon dioxide that affect pH level in the seawater. Similar literature was available by Sunday Akinde and Omokaro Obire (2011).

### TURBIDITY

Onshore turbidity was varied from  $0.2 \pm 0.158$  NTU to  $0.4 \pm 0.207$  NTU. The higher mean concentration was recorded as  $0.4 \pm 0.207$  NTU during February 2018 and lower mean concentration was recorded as  $0.2 \pm 0.158$  NTU during January 2018.

**Table: 2 Monthly Variations in Physico- Chemical characteristics of Offshore water from Kulasekaranpattinam coast.**

S.NO	Parameters	January	February	March
1	pH	$7.1 \pm 0.266$	$7.10 \pm 0.46$	$7.4 \pm 0.35$
2	Turbidity (NTU)	$0.2 \pm 0.158$	$0.2 \pm 0.223$	$0.5 \pm 0.223$
3	Salinity (g/l)	$29.45 \pm 4.510$	$28.324 \pm 1.472$	$24.00 \pm 2.429$
4	Nitrate (mg/l)	$30 \pm 3.962$	$30 \pm 3.962$	$26 \pm 2.302$
5	Phosphate (mg/l)	$0.97 \pm 0.152$	$0.65 \pm 0.134$	$0.56 \pm 0.141$

Offshore site was varied from  $0.2 \pm 0.158$  NTU to  $0.5 \pm 0.325$  NTU. The higher mean concentration was recorded as  $0.5 \pm 0.325$  NTU during March 2018 (Table-2) and lower mean concentration was recorded as  $0.2 \pm 0.158$  NTU during January 2018. There is no statistically significant difference (ANOVA:  $F=0.875$ ;  $P=0.376$ ) ( $P>0.05$ ) in turbidity at any of the sampling sites (Figure-6 & 7).

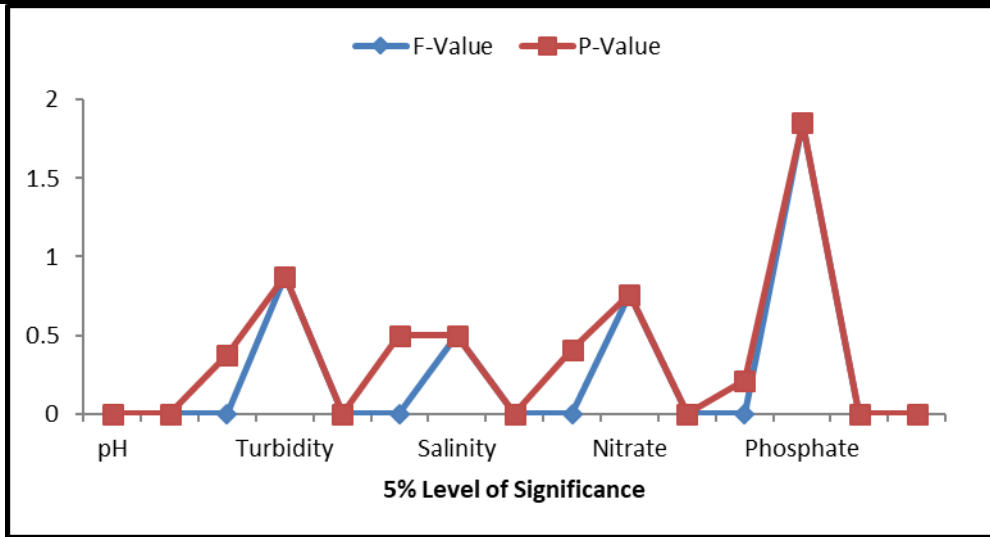


Figure- 6 One way analysis showing the Parameters between and within the sites in onshore during February 2018

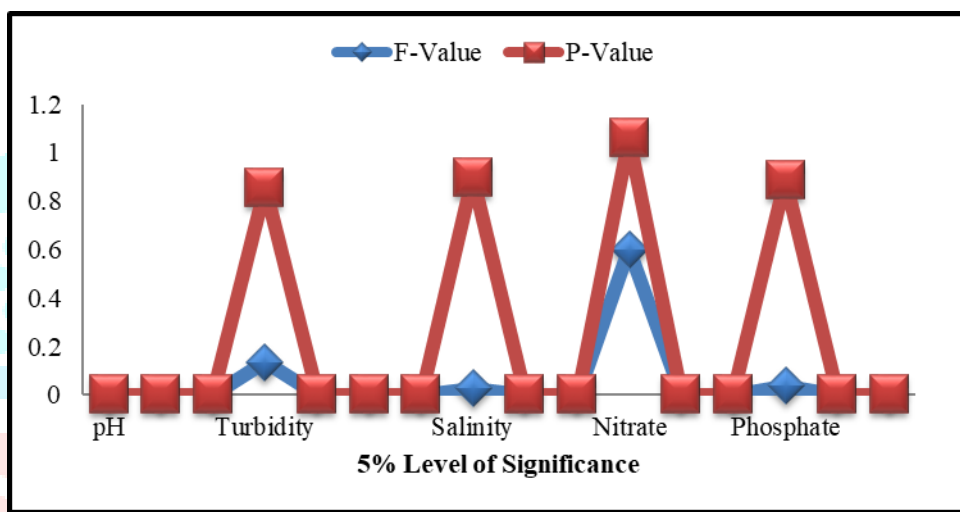


Figure- 7 One way analysis showing the Parameters between and within the sites in offshore during February 2018

Presence of high turbidity in the offshore indicated the presence of colloidal particles arising from high riverine sediment loads adversely affect, the coastal area, by increasing water turbidity when reduces the light penetration, the primary production, then the secondary and tertiary biological production, including fish and the sedimentation. Similarly reported by Ajibare Adefemi Olatayo (2014).

**SALINITY**

Onshore salinity was varied from  $18.813 \pm 2.205$  g/l to  $23.45 \pm 2.854$  g/l. The higher mean concentration was recorded as  $23.45 \pm 2.854$  g/l during January 2018 and lower mean concentration was recorded as  $18.813 \pm 2.205$  g/l during March 2018. Offshore was varied from  $24.00 \pm 2.429$  g/l to  $29.45 \pm 4.510$  g/l. The higher mean concentration was recorded as  $29.45 \pm 4.510$  g/l during January 2018 and lower mean concentration was recorded as  $24.00 \pm 2.429$  g/l during March 2018.

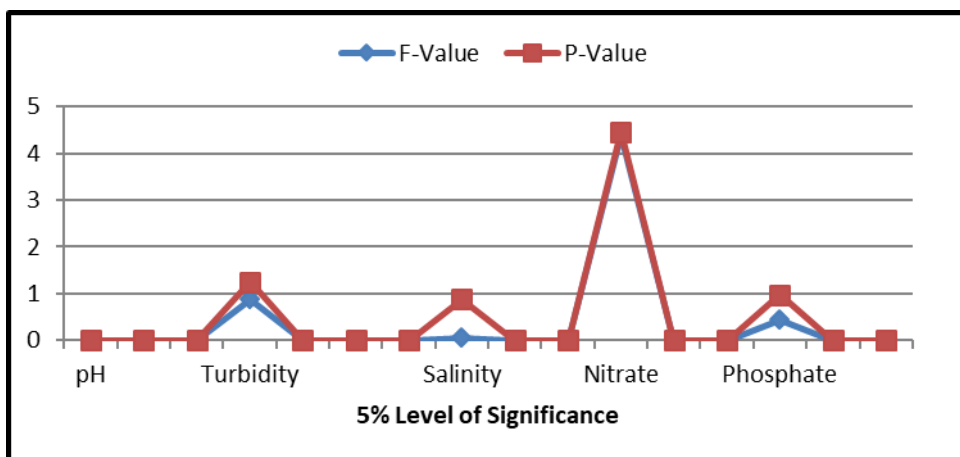


Figure-8 One way analysis showing the parameters between and within the sites in onshore during March 2018

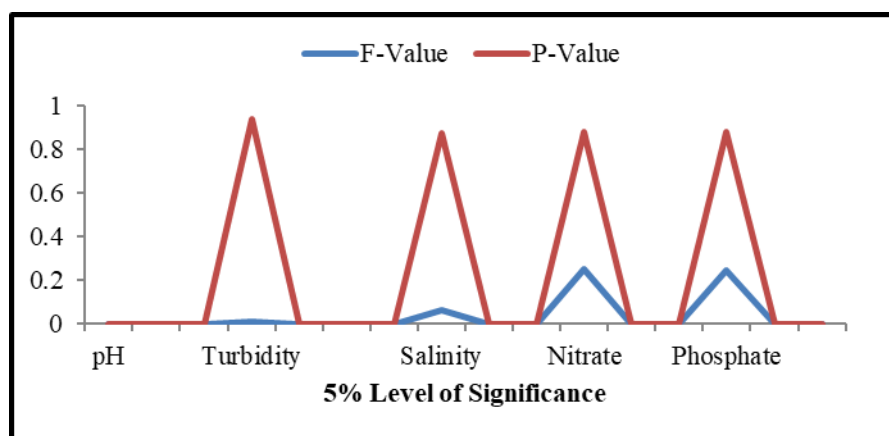


Figure-9 One way analysis showing the parameters between and within the sites in offshore during March 2018

Salinity is considerably higher during January in the offshore while comparing with the onshore. Salinity levels did not show any statistically significant variations (ANOVA:  $F=0.051$ ;  $P=0.826$ ) ( $P>0.05$ ) in any of the sampling sites (Figure-8 & 9). The recorded higher values could be attributed higher rate of evaporation and also due to neritic water dominance. Observations just like to present study were reportable earlier by Palpandi (2011) in Vellar estuary. Available literatures were made by Balasubramanian and Kannan, (2005); Sridhar et al (2006).

#### NITRATE

Onshore Nitrate was varied from  $20 \pm 2.774$  mg/l to  $33 \pm 4.969$  mg/l. The higher mean concentration was recorded as  $33 \pm 4.969$  mg/l during January 2018 and lower mean concentration was recorded as  $20 \pm 2.774$  mg/l during March 2018. Offshore Nitrate was varied from  $26 \pm 2.302$  mg/l to  $30 \pm 3.962$  mg/l. The higher mean concentration was recorded as  $30 \pm 3.962$  mg/l during January 2018 and lower mean concentration was recorded as  $26 \pm 2.302$  mg/l during March 2018.

There is no significant difference in Nitrate at any sampling sites (ANOVA:  $F=0.297$ ;  $P=0.600$ ) ( $P>0.05$ ). Similar observations were made by Bolarinwa Josef Bamidele (2016) in Coastal water. During the study period the higher value of nitrate may be due to enrichment of terogenous deposit of mineralization through evaporation and organic decomposition from the high freshwater inflow. Available literature as observed by Janet et al (1987).

#### PHOSPHATE

Onshore site Phosphate was varied from  $0.1 \pm 0.027$  mg/l to  $0.81 \pm 0.241$  mg/l. The higher mean concentration was recorded as  $0.81 \pm 0.241$  mg/l during January 2018 and lower mean concentration was recorded as  $0.1 \pm 0.027$  mg/l during February 2018.

Offshore Phosphate was varied from  $0.56 \pm 0.141$  mg/l to  $0.97 \pm 0.152$  mg/l. The higher mean concentration was recorded as  $0.97 \pm 0.152$  mg/l during January 2018 and lower mean concentration was recorded as  $0.56 \pm 0.141$  mg/l during March 2018.

There is no statistically significant variation in phosphate (ANOVA:  $F=0.343$ ;  $P=0.573$ ) ( $P>0.05$ ) at any sampling sites. Similar observations were made by Chui Wei Bong and Choon Weng Lee (2008). Higher phosphate value was observed during January in the offshore might have resulted from the regeneration of phosphate from the bottom mud and subsequent release of the same in water column by turbulence and mixing caused by heavy winds. Observations just like to present study as reportable earlier by Rajasegar (2003) in Tuticorin seawater.

#### CONCLUSION

The present study indicated the physico-chemical status of the coastal at Kulasekaranpattinam. In general when compared with the onshore and offshore seawater was good and it maintains stable and healthy aquatic ecosystem. However, in both the onshore and offshore, the physico- chemical parameters were not very much variable. The fluctuations in physico-chemical parameters influence the natural activity and efficiency of marine organism.

#### RECOMMENDATIONS

- ❖ Enforcement of environmental laws and obeisance of maritime law of the sea should be taken more seriously in the coastal maritime.
- ❖ More funds should be channeled to researches based on physico-chemical analysis, biomass estimated and surveillance survey.
- ❖ Training and sensitization of fisher folks on responsible fisheries and basic record-keeping habits should be conducted at regular intervals.

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