

**RESEARCH ARTICLE****Water Quality Parameters of Thamirabarani Estuary****¹D.Thomma Arockia Gaspar and ²Dr. G. Lakshman.**

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Abstract

The present study, "Water Quality Parameters of Thamirabarani Estuary" was analyzed for consequent years 2011 and 2013. The physico - chemical parameters were analyzed from the water samples of five stations of the estuarine. The parameters such as pH, turbidity, electrical conductivity, total dissolved solids and hardness were analyzed. The range of parameters like Turbidity 0.4 to 0.6 NTU, EC 215 to 98000 mg/l, PH 6.9 to 8.2, TDS 144 to 64600 mg/l and Hardness 59 to 7070 mg/l. All parameters exhibit higher degree in station I & II (Punnaikayal Mouth and Pazhayakayal Mouth) and low level in station V nearby Eral river bridge.

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Introduction

Water is one of the most valuable natural resources on earth, and is essential for every living organism. Human history is tied directly or indirectly to fresh water source such as lakes, rivers and estuaries. Human beings as well as other terrestrial and adequate life forms are sensitive to changes in the quality of the fresh water supply. Changes in properties such as total dissolved solid, pH and dissolved oxygen in particular affect the mortality of aquatic life. The characteristics of both natural weathering process and anthropogenic activities can have a significant impact on water quality. Rain fall tends to dissolve and carry away minerals and contaminants found in the soil and the atmosphere. (Lawrence.b 2010).

People mostly depend on water for agricultural and domestic purposes. But with rapid growing population and urbanization, different activities like unplanned building and encroachment, clearing of riparian vegetation along the river banks, disposal of waste materials in river and unwise mining of construction materials from the rivers are commonly observed in rivers. Human as well as natural phenomena are responsible for bringing disturbances in the river system (Gyawali etal. 2011).

The water quality of river and lakes changes with the seasons and geographic areas, even when there is no pollution present. Water quality guidelines provide basic scientific information about water quality parameters and ecologically relevant toxicological threshold values to protect specific water uses. Important physical and chemical parameters influencing the quality environment are pH, turbidity, ec, tds and hardness. These parameters are the limiting factors for the survival of aquatic organism (flora and fauna). Poor water quality may be caused by low water flow, municipal effluents and industrial discharges (Lawson,EO. 2011).

Materials and methods

Thamirabarani River is one of the most important aquatic resources in southern Tamilnadu especially Tirunelveli and Tuticorin Districts. This river originated from Agastiar Mountain of Western Ghats, and reaches the Bay of Bengal Punnaikayal and Pazhayakayal Estuarine, part of Gulf of Mannar. Study area thamirabarani Estuarine is located between latitude 8.641316N, longitude 78.127298E.

This study was carried out from 2011 to 2013 and surface water samples were collected from five different stations in and around thamirabharani estuary. Five different stations namely Station I Punnaikayal Mouth, Station II Pazhayakayal Mouth, Station III Sernthapoomangalam river area, Station IV Mukkani river bridge area and Station V Eral River bridge area. Station I and Station II are brackish water area and reaming Stations III, IV and V are fresh water area.

Samples were collected during early morning time of Summer, Pre-Monsoon, Monsoon and Post-Monsoon. All parameters were estimated in the laboratory by using standard method as prescribed by WHO.

Results & Discussion

The result of water quality parameters of water samples from five stations in Thamirabarani estuarine are presented in tables

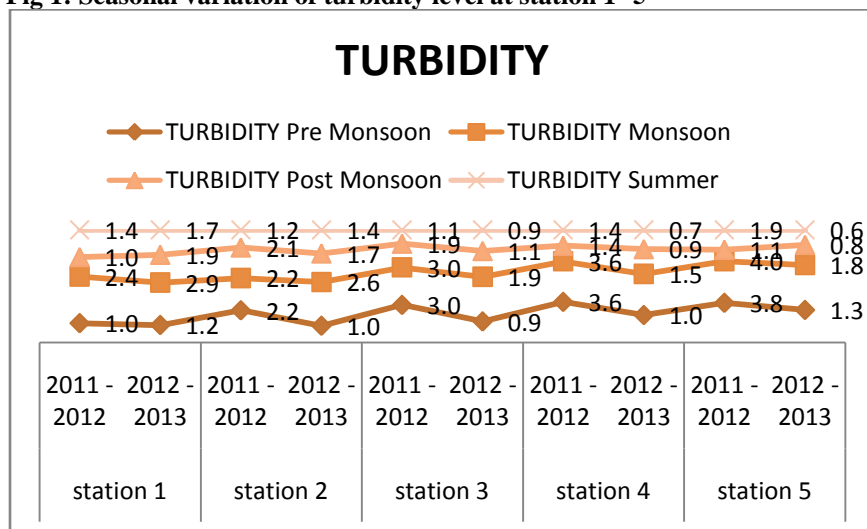
Turbidity

The turbidity is one of the key factors in aquatic habitat. Turbidity occurs due to organic and / or inorganic constituents. It measures water clarity, which allows sunlight to penetrate to a great depth. The main source of turbidity is erosion, living organism and those from human activity. This present study results are given at table and figure 1.

Table 1: Seasonal variation of turbidity level at station 1- 5

Stations	Year	TURBIDITY(NTU)			
		Pre Monsoon	Monsoon	Post Monsoon	Summer
station 1	2011 -2012	1.0	2.4	1.0	1.4
	2012 - 2013	1.2	2.9	1.9	1.7
station 2	2011 -2012	2.2	2.2	2.1	1.2
	2012 - 2013	1.0	2.6	1.7	1.4
station 3	2011 -2012	3.0	3.0	1.9	1.1
	2012 - 2013	0.9	1.9	1.1	0.9
station 4	2011 -2012	3.6	3.6	1.4	1.4
	2012 - 2013	1.0	1.5	0.9	0.7
station 5	2011 -2012	3.8	4.0	1.1	1.9
	2012 - 2013	1.3	1.8	0.8	0.6

Fig 1: Seasonal variation of turbidity level at station 1- 5



Prasanna and Ranjan (2010) have reported, Turbidity value varied from 1.89 to 112.75 NTU. The maximum being at station I in monsoon period and the minimum at station V in the pre-monsoon period at Dhamra

Estuary. In this present study, turbidity of the water fluctuated from 0.6 to 4.0. The maximum value 4.0 was recorded in 2011-2012 monsoon at station V and minimum value 0.6 was recorded in 2012 –2013 summer at station V. During the monsoon time the level of turbidity is very high due to the estuarine received rain water along with industrial waste and manmade waste. In summer, low level of turbidity was observed it may be due to the low level of inflow of fresh water.

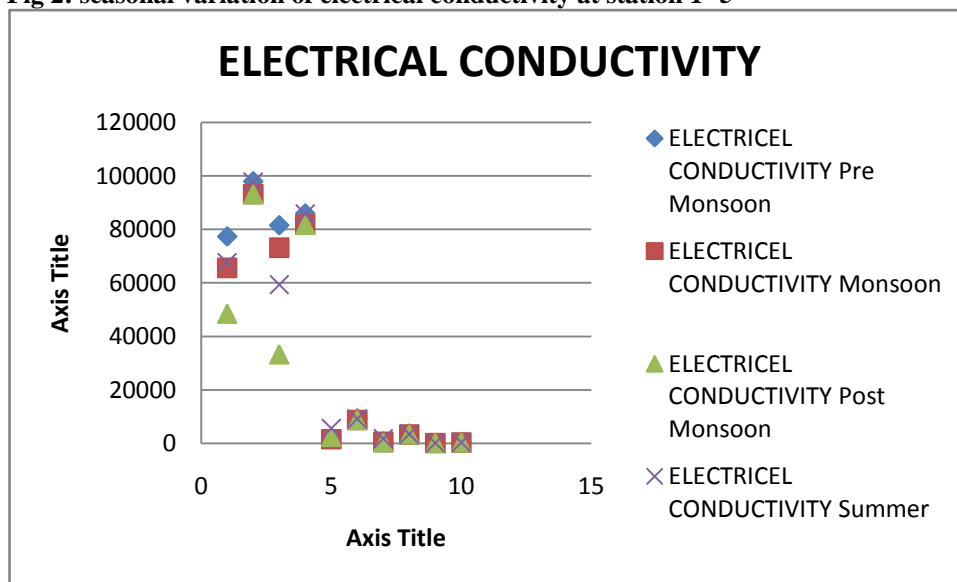
Electrical conductivity

Electrical conductivity is another key factor that determines the quality of water. Electrical Conductivity indicates the presence of ions within the water, usually due to in majority saline water and in part, leaching. It can also indicate industrial discharge, tidal and wind velocity. The results are given in this table and figure 2.

Table 2: Seasonal variation of electrical conductivity at station 1- 5

Stations	Year	ELECTRICEL CONDUCTIVITY (mh.s)			
		Pre Monsoon	Monsoon	Post Monsoon	Summer
station 1	2011 -2012	77400	65600	48500	67600
	2012 - 2013	98000	93100	93100	97755
station 2	2011 -2012	81600	73100	33300	59400
	2012 - 2013	86000	81700	81700	85785
station 3	2011 -2012	1855	1622	2510	5690
	2012 - 2013	9350	8800	8800	9240
station 4	2011 -2012	782	634	420	1880
	2012 - 2013	3680	3400	3400	3570
station 5	2011 -2012	300	244	290	215
	2012 - 2013	440	410	410	431

Fig 2: seasonal variation of electrical conductivity at station 1- 5



Satheeshkumar and Anisa khan 2009 have observed at Pondicherry Mangroves, High EC was recorded during post – monsoon and relatively low value were at all stations during monsoon. In this present study EC ranged from 215 to 98000. The higher value 98000 was obtained on 2012-2013 during Pre-Monsoon at station I and low value 215 was obtained on 2011-2012 during summer at Station V. In pre- monsoon, action of wind velocity and

tidal energy are high. Hence electrical conductivity level may be high in this time. During the summer, EC level very low it may be due to absence of wind velocity.

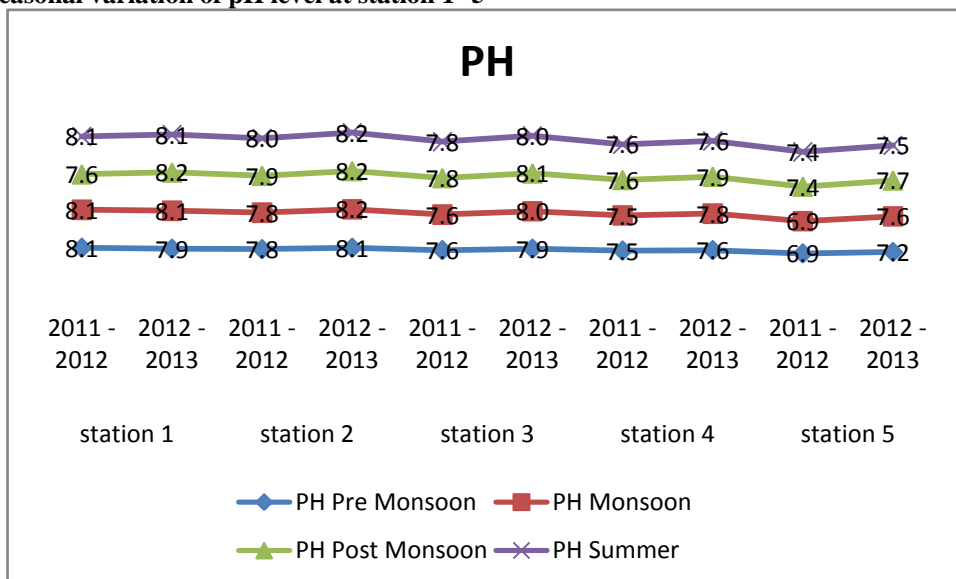
pH

pH is the common and important parameter of any aquatic ecosystem. It also indicates the fertility or potential productivity of water. If the pH value falls in below 4 or above 9 everything is dead. The pH results are given the table and figure 3

Table 3: Seasonal variation of pH level at station 1- 5

Stations	Year	PH			
		Pre Monsoon	Monsoon	Post Monsoon	Summer
station 1	2011 -2012	8.1	8.1	7.6	8.1
	2012 - 2013	7.9	8.1	8.2	8.1
station 2	2011 -2012	7.8	7.8	7.9	8.0
	2012 - 2013	8.1	8.2	8.2	8.2
station 3	2011 -2012	7.6	7.6	7.8	7.8
	2012 - 2013	7.9	8.0	8.1	8.0
station 4	2011 -2012	7.5	7.5	7.6	7.6
	2012 - 2013	7.6	7.8	7.9	7.6
station 5	2011 -2012	6.9	6.9	7.4	7.4
	2012 - 2013	7.2	7.6	7.7	7.5

Fig. 3: seasonal variation of pH level at station 1- 5



Soundarapandian et al 2009 have measured at Uppanar Estuary. He explained, High value of PH during summer was due to the uptake of CO₂ by photosynthesizing organisms. The low PH observed during the month of January to March may be due to the influence of fresh water influx, dilution of sea water, low temperature and organic matter decomposition. In this present study, pH range from 6.9 to 8.2. The highest value 8.2 was recorded in 2012 2013 at all seasons from station I & II and the lowest value 6.9 was recorded I 2011 – 2012 on pre monsoon and monsoon from station I. During summer, pH is very high it could be due to absence of rainfall. High level of pH may be affect the flora and fauna of this ecosystem. During the monsoon, pH is very low due to fresh water floating and heavy rainfall. Low level of pH is ideal for plants and animals.

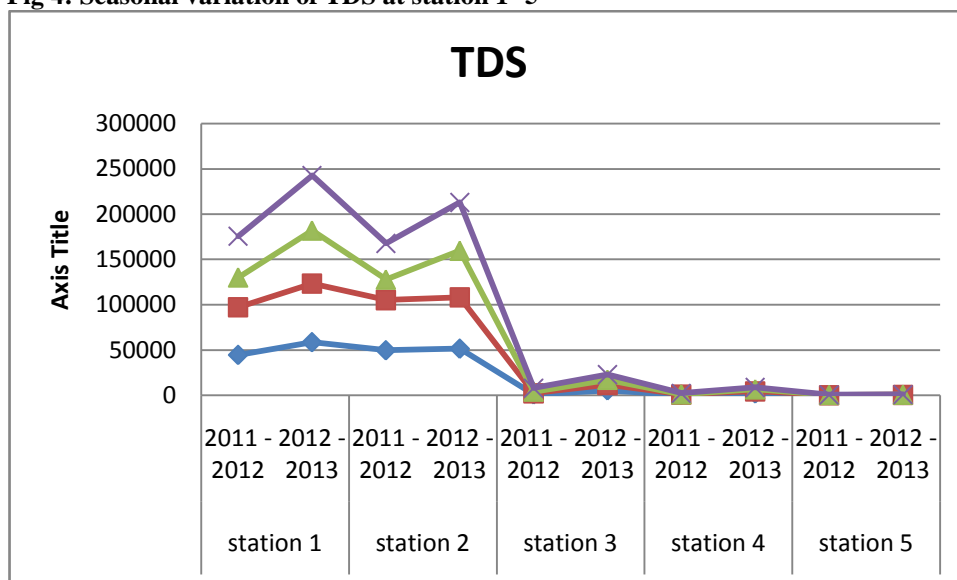
Total Dissolved Solids(TDS)

The total solids measures both dissolved and suspended solids. There are six major types of solids like silts, clay, soil runoff, plankton, industrial waste and sewage. The total dissolved solids (TDS) in water consist of inorganic salts and dissolved materials. In natural waters, salts are chemical compounds of anions such as carbonates, chlorides (Cl₂), sulphates (SO₄), nitrates (NO₃) and cations such as potassium (K), magnesium (Mg), calcium (Ca) and sodium (Na). The results are given in this table and figure 4

Table 4: Seasonal variation of total dissolved solids (tds) at station 1- 5

Stations	Year	TOTAL DISSOLVED SOLIDS(mg/lit)			
		Pre Monsoon	Monsoon	Post Monsoon	Summer
station 1	2011 -2012	44600	52600	32980	45292
	2012 - 2013	58653	64600	58653	60608
station 2	2011 -2012	49700	55480	22640	39798
	2012 - 2013	51471	56700	51471	53187
station 3	2011 -2012	1100	1250	1910	3812
	2012 - 2013	5544	6170	5544	5729
station 4	2011 -2012	430	525	285	1260
	2012 - 2013	2142	2465	2142	2213
station 5	2011 -2012	165	200	195	144
	2012 - 2013	258	290	258	267

Fig 4: Seasonal variation of TDS at station 1- 5



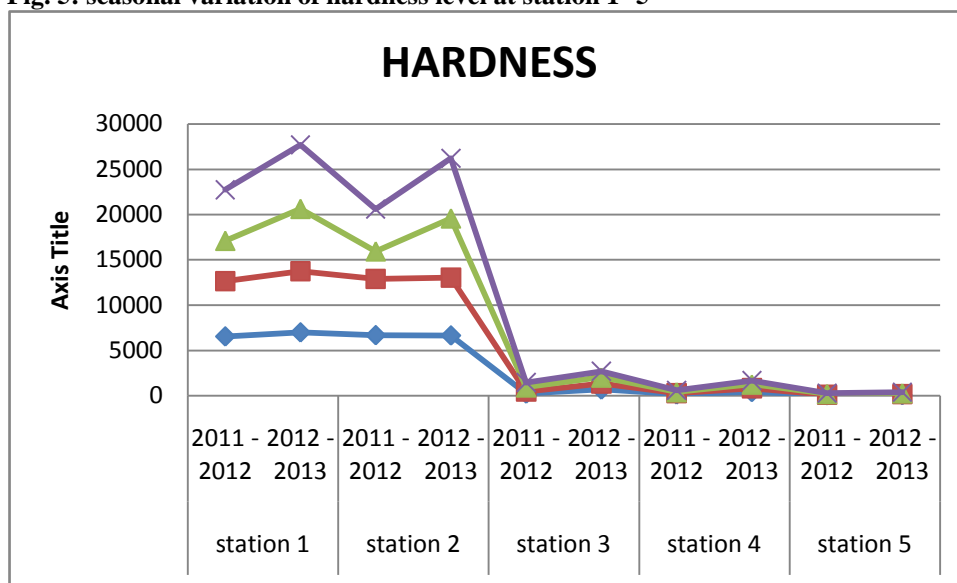
Prasanna and Ranjan 2010 have reported the maximum range of TDS during the month of April and May and the minimum range during January and February at Dhamra Estuary. In this present study, amount of TDS ranges from 144 to 64600. The maximum value 64600 was analyzed from 2012 -2013 during Monsoon at station I and minimum value was analyzed from 2011 – 2012 on summer at station V. During the monsoon, TDS level is very high because of heavy rainfall. In summer, TDS level is very low it may be due to the low inflow of fresh water.

Hardness

Table 5: seasonal variation of hardness at station 1- 5

Stations	Year	HARDNESS(mg/lit)			
		Pre Monsoon	Monsoon	Post Monsoon	Summer
station 1	2011 -2012	6565	6100	4444	5630
	2012 - 2013	7012	6740	6875	7070
station 2	2011 -2012	6706	6210	3028	4670
	2012 - 2013	6670	6390	6518	6648
station 3	2011 -2012	263	221	464	532
	2012 - 2013	707	656	669	683
station 4	2011 -2012	162	148	103	198
	2012 - 2013	434	410	418	427
station 5	2011 -2012	71	59	83	90
	2012 - 2013	101	96	98	100

Fig. 5: seasonal variation of hardness level at station 1- 5



Prasanna and Ranjan 2010 have analyzed at Dhamra Estuary, the hardness ranged from 969.68 to 5655.24mg/l, the highest and lowest were recorded at Station I and Station VI. It might be due to the dissolution of the land derived carbonates and bicarbonates in the water. In this present study, the value of hardness is measured from 59 to 7070. The highest value 7070 was recorded during 2012 – 2013 on summer at station I and lowest value 59 was recorded on 2011 – 2012 during monsoon at station V. During summer, high level of hardness is present in the water because of dry weather and absence of water floating. This hardness may affect the photosynthesis and aquatic ecosystem. In monsoon, hardness is very low due to rainfall and water floating.

Conclusion

Physicochemical parameters affected the primary production in different seasons; The primary production varied from season to season with the load of nutrient in addition to phytoplankton species. The physicochemical characteristics of river water in the study area suggested that Thamirabarani River is contaminated by various effluents. If proper measures are taken for the treatment of sewage before discharge and restrictions are put on various anthropogenic activities upstream, the estuary would remain healthy in the long run.

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