

Assessment of Seasonal and Annual Mean of Physico–Chemical Parameters in Kuduvaier Estuary, Nagapattinum East Coast, Tamil Nadu India

¹G. Vanthana & ²A.S. Paul Ravindran

¹Research Scholar, Department of Zoology, T. B.M.L College, Porayar, Nagapattinum District, Tamil Nadu (India)

²Associate Professor and Head, Department of Zoology, T. B.M.L College, Porayar, Nagapattinum District, Tamil Nadu (India)

ARTICLE DETAILS

Article History

Published Online: 10 December 2018

Keywords

Kuduvaier estuary, Dissolved Oxygen, Temperature

Corresponding Author

Email: vanthana01091975@gmail.com

ABSTRACT

Water is one of the most common and the large precious resources on world. ground water resources have been contaminated by organic, inorganic and biological pollution. Therefore management of aquatic ecosystem in particular has become a main concern in present years. Estuaries constitute a major Interface between land and the ocean and have been regarded as one of the most important aquatic system. Surface water samples were collected from Kuduvaier estuary are during period of 2014 to 2015. The physicochemical parameters such as rain fall, pH, atmospheric and surface temperature, Dissolved oxygen and salinity were assessed different seasons (Pre- Monsoon, Monsoon, Pos- Monsoon and Summer). The physico–chemical changes may have the tendency to accumulate in the various organs of estuarine organisms, especially fish which may in turn enter into the human metabolism through consumption causing serious hazards.

1. Introduction

Water is one of the most common and the large precious resources on world, without which there would be no life on world, pollution is a serious problem as 70% of India's surface water resources and ground water resources have been contaminated by organic, inorganic and biological pollution. Therefore management of aquatic ecosystem in particular has become a main concern in present years. Estuarine and coastal areas are complex and dynamic aquatic environment (Morris *et al.*, 1995). Estuaries constitute a major Interface between land and the ocean and have been regarded as one of the most important aquatic system. The progressing of large buildings (Municipal - waste) In Nagapattinum has become a threat to the health of the Kuduvaier Estuarine and coastal water environment. The sewage from urban area and industrial wastages contributes a constant source of pollutants, whereas the surface runoff is a seasonal phenomenon largely affects by climate in the basin. The urban inputs, agricultural runoff and industrial inputs play a vital role in nutrient cycling, water quality eutrophication, biota abundance and overall food web dynamics in Estuaries and near shore ecosystems, apart from this fishing activities near the estuary also influence the water quality parameters (Blaber *et al.*, 2000) nutrient enters into coastal seas through various modes viz, terrestrial runoff, estuary, effluent discharge etc. the quick alternation in nutrient structure effects the phytoplankton taxonomic composition and in order leads to the eutrophication and algal blooms (Bethoux *et al.*, 2002; Piehler *et al.*, 2004). The water quality depends on both natural processes, such as precipitation erosion, weathering of crystal materials and anthropogenic processes like urbanization, Industrialization, Mining and agricultural activities (Chakrapani *et al.*, 1993). In the present study, physicochemical parameters such as rain fall, pH, atmospheric and surface temperature, Dissolved oxygen and salinity were assessed in Kuduvaier estuary, Nagapattinum east coast, Tamil Nadu, India.

2. Materials and methods

Study area

The water sample was collected from Kuduvaier estuary, Nagapattinum east coast, Nagapattinum district, Tamil Nadu India.

Sample Collection

The sampling has been taken in pre cleaned polyethylene bottles. Plastic bottles of 2 liter capacity were used to collect the samples. The water samples were collected from different seasons (Pre- Monsoon, Monsoon, Pos- Monsoon and Summer) in the year of 2014 - 2015.

Physicochemical analysis

Water and air temperatures were measured using standard mercury filled centigrade thermometer. pH of the water samples were determined by portable pen type electronic pH meter. The pH meter was immersed in the water and pH values were read directly from the digital screen. The Mohr-Knudsen titration procedure and Winkler's method was followed for salinity (Strickland and Parsons, 1972). The Dissolved oxygen was estimated using Winkler's Method (Strickland and Parsons, 1972).

3. Results

Table 1 shows the Seasonal and annual mean of Physico-chemical Parameters in Kuduvaier estuary, Nagapattinum east coast. During the study period, the study area experienced a total rainfall of 986.1mm with a maximum in monsoon while of 4.40mm (November 2014) in summer followed by pre-monsoon (533mm) and pos- monsoon (52.80mm).

The low atmosphere temperature (30.54°C) was recorded during monsoon (November 2014) and high temperature (31.84°C) in summer (May 2015). Surface water temperature varied from 28.42°C (monsoon) to 30.52°C (summer) during the study period.

Salinity in the study area was low (29.30‰) during monsoon whereas high (34.85‰) during summer season of the study period. The present investigation showed minimum values of dissolved oxygen content (5.20ml/l) during summer

and maximum (6.75ml/l) during monsoon seasons of study period. Hydrogen ion concentration (pH) was always towards the alkaline condition in the range of 8.02 to 8.43.

Table 1. Seasonal and annual mean of Physico-chemical Parameters in Kuduvaiyr estuary, Nagapattinum east coast.

Parameters	Pre Monsoon	Monsoon	Post Monsoon	Summer
Annual Rainfall (Mm) 2014-15	533.00±37.31	986.10±69.02	52.80±3.69	4.40±0.30
Atmospheric Temperature (° C) 2014-15	31.40±2.19	30.50±2.13	31.00±2.17	31.84±2.22
Surface water Temperature (° C) 2014-15	28.42±1.98	28.30±1.98	29.70±2.07	30.50±2.13
Salinity(35 ‰) 2014-15	33.20±2.32	29.30±2.05	34.20±2.39	34.85±2.43
Dissolved O ₂ (ml/l) 2014-15	5.42±0.37	6.75±0.47	5.50±0.38	5.20±0.36
pH 2014-15	8.10±0.56	8.20±0.57	8.02±0.56	8.43±0.59

Value expressed as Mean ± SD

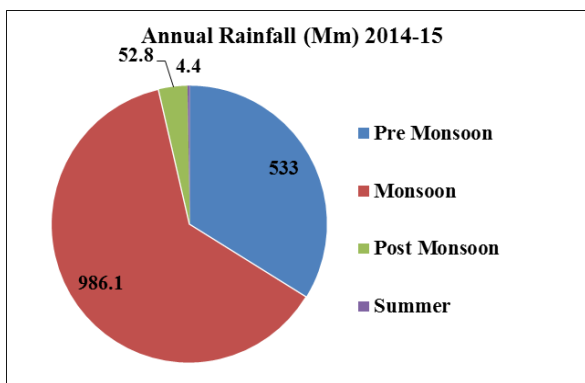


Figure 1. Seasonal Changes in Rainfall during the study period

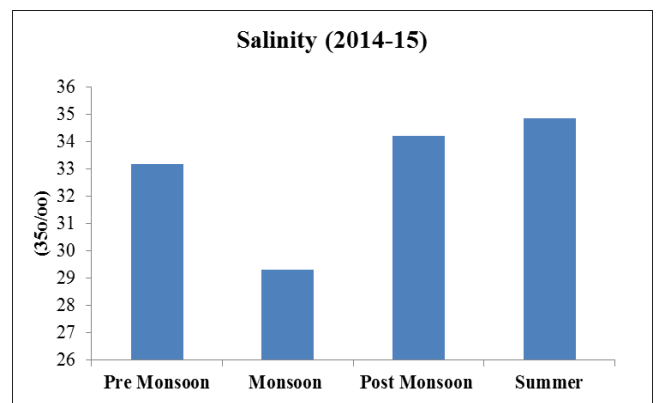


Figure 4. Seasonal Changes in Salinity during the study period

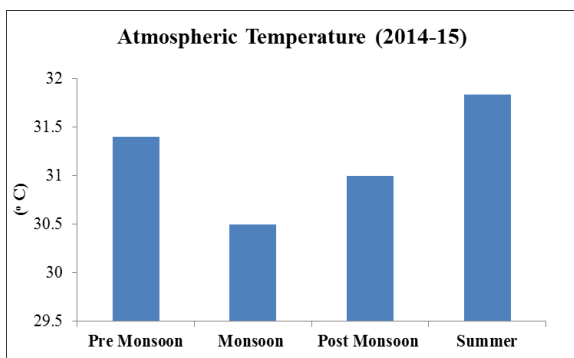


Figure 2. Seasonal Changes in Atmospheric Temperature during the study period

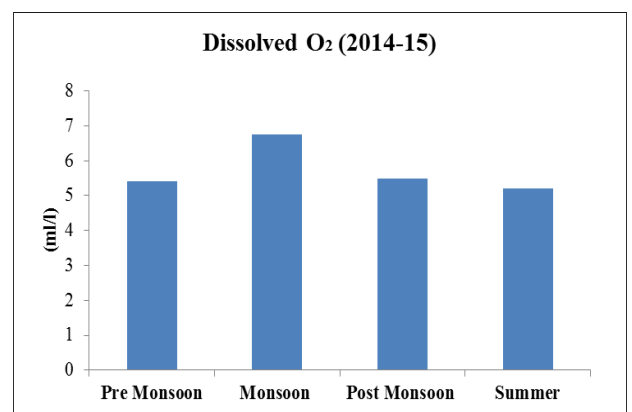


Figure 5. Seasonal Changes in Dissolved oxygen during the study period

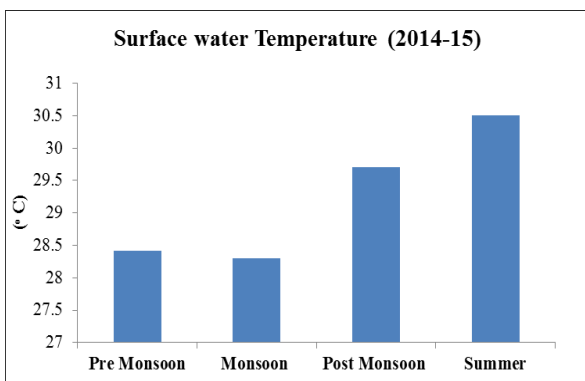


Figure 3. Seasonal Changes in Surface Temperature during the study period

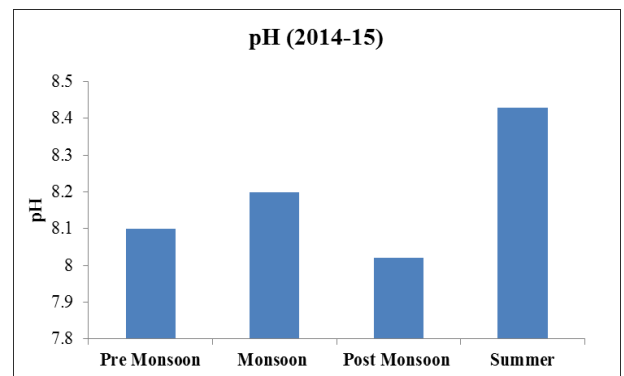


Figure 6. Seasonal Changes in pH during the study period

4. Discussion

The seasonal variation in physico chemical parameters such as rainfall, air and surface water temperature, salinity, dissolved oxygen and pH contents in Kuduvaiyr estuarine waters were recorded for a period of 2014 to June 2015. The surface water temperature largely depends upon the intensity of solar radiation, evaporation, freshwater influx, cooling and mixing due to currents and tidal flow. Surface water temperature also showed a similar trend of monthly variation as that of air temperature and the low atmosphere temperature (30.54°C) was recorded during monsoon (November 2014) and high temperature (31.84°C) in summer (May 2015). The gradual increase in water temperature from post monsoon to summer is directly related to atmospheric conduction and radiation similar finding were reported by (Thangaraj, 1984). During the study period surface water temperature varied from 28.42°C (monsoon) to 30.52°C (summer) during the study period.

A marked seasonal change in salinity was observed throughout the study period. Salinity was low (29.30%) during monsoon whereas high (34.85%) during summer season of the present study. The salinity variation in the exchange of ions and nutrient is because of the tidal flow and low during the monsoon season in the Kuduvaiyr estuary. The present study in the conformity with the earlier reports from velar estuary (Palpandi, 2011; Singbal, 1976; Soundarapandian *et al.*, 2009)

Dissolved oxygen is one of the most important parameters which reflects the physical and biological processes of water. The dissolved oxygen content depends upon the photosynthetic activities, monsoonal floods and the turbulence caused by winds (Nedumaran *et al.*, 2012). In the present study, minimum values of dissolved oxygen content (5.20ml/l) during summer and maximum (6.75ml/l) during monsoon seasons. During study period, the dissolved oxygen concentration was low in monsoon compared to summer season which may perhaps to due to low rainfall recorded

during the period. The trend noticed in the present study is in accordance with the findings of hydrology and heavy metals (Rajasegar, 2003).

The monthly mean values of hydrogen ion concentration of water varied from 7.5 to 8.5. Maximum values of pH were observed in 2014 - 2015. pH was always towards the alkaline condition in the range of 8.02 to 8.43. The minimum values of pH during the environmental changes in the study area may be controlled by the influence of freshwater discharge rainfall and the decomposition of organic matter as started by (Ragothaman and Patil, 1995; Upadhyay, 1998). The photosynthetic activity may cause high pH, because of bicarbonate degradation by carbonic anhydrase associated with photosynthesis (Rajkumar *et al.*, 2009).

5. Conclusion

The seasonal variation in physico-chemical parameters such as rainfall, air and surface water temperature, salinity, dissolved oxygen and pH were monitor in Kuduvaiyr estuarine. A total rainfall of 986.1mm with a maximum in monsoon while of 4.40mm (November 2014) in summer followed by pre-monsoon (533mm) and pos- monsoon (52.80mm). The low atmosphere temperature (30.54°C) was recorded during monsoon (November 2014) and high temperature (31.84°C) in summer (May 2015). Surface water temperature varied from 28.42°C (monsoon) to 30.52°C (summer) during the study period. Salinity in the study area was low (29.30%) during monsoon whereas high (34.85%) during summer season of the study period. The minimum values of dissolved oxygen content (5.20ml/l) during summer and maximum (6.75ml/l) during monsoon seasons of study period. Hydrogen ion concentration (pH) was always towards the alkaline condition in the range of 8.02 to 8.43. The physico-chemical changes may have the tendency to accumulate in the various organs of estuarine organisms, especially fish which may in turn enter into the human metabolism through consumption causing serious hazards.

References

- Bethoux, J.P., Morin, P. and Rviz -Pino, D.P. 2002. Tempova trends in nutrient varios. chemical evidence of Mediterranean ecosystem charges driven by human activity Deep -sea. Res., 49: 2007-2016.
- Blaber, S.J.M., Cyrus, D.P. Albaret Chong ving ching, J.J., Day, J.W., Elliott, M., Fonseea, M.S., Hoss, D.E., Orensanz, J., Potter, I.C. and Silvert, W. 2000. Effects of fishing on the structure and functioning of estuarine and near shore ecosystems. *ICES.J. Marine science*, 57: 590 -602.
- Chakrapani G.J. and Subramanian, V. 1993. "Rate of Erosion and sedimentation in the Mahanadi Rever Basin. *India Journal*, 1694 (90098-T.)
- Morris, A.W., Allen, J.I., Howland, R.J.M. and wood, R.G. 1995. The estuary plume zone: Source or sink for land - derived nutrient discharges? *Estuarine, Coastal and shelf science* 40: 387 -402.
- Nedumaran, T.P., Prumal, R. and Rajaram. 2011. Physical-chemical characteristic features of the Uppanae estuary, south east coast of India. *J Ecotoxicol Environ Monit*, 21(1): 1-11
- Palpandi, P. 2011. Hydrobiology parameters, pollution density and distribution pattern in the gastropod *Nerita dostia* crepidularia Lamarck .1822, from mangroes of Vellar estuary, southeast India. *Int J Biodvers Conserv*, 3(4): 121-130
- Piebler, M.F., Twomey, L.J., Hall, N.S. and pearl, H.W. 2004. Impacts of Inorganic nutrient enrichment on phycoplankton community structure and function in Pamlico sound, MC,USA Estuar. *Coastal Shalt Sci.*, 61: 197-209.
- Ragothaman, G. and patil, T. 1995. Studies on the physico-chemical parameters and phytoplankton of narmada estuary. *Enviromedia*, 14(2): 221-226
- Rajasegar, M. 2003. Physico-chemical characteristics of the Vellar estuary in relation to shrimp farming. *J. Environ. Biol.*, 24, 95-101.
- Rajkumar, M., Perumal, P., Ashok Prabu, V., Vengadeshperumal, N. and Thillai Rajasekar, K. 2009. Phytolankton diversity in Pichavaram mangrove waters from south-east coast of India, *J. Environ Biol*, 30: 489- 498.

11. Singbal, S.Y.S. 1976. Diurnal variation of some physico-chemical factors in the Mandovi estuary of Goa. *Mahasagar*, 9: 27-34.
12. Soundarapandian, P., Preamkumar, T. and Dinakaran, G.K. 2009. Studies on the physico-chemical characteristics and nutrients in the Uppanar estuary of Cuddalore, south east coast of India. *Curr Res J Biol sci.*, 1(3): 102-105.
13. Strickland, J.D.H. and Parsons, T.R. 1972. A practical hand book of seawater analysis. *Fish. Res. Board Can. Bull.*, 167, 185-199.
14. Thangaraj, G.S. 1984. Ecology of the marine zine of Vellar estuary, Ph.D.Thesis, Annamalai University.
15. Upadhyay, S. 1998. Physico- chemical characteristic of the Mahannadi estuarine ecosystem, east coast of India. *Indian J Mar Sci.*, 17:19-23