VOLUME 8 (SPECIAL ISSUE) 2022

ISSN 2454-3055

Manuscripts under Special issue are published with the Theme
"Modern Perspectives of Biological Sciences"

Guest Editor: Dr. S. Mohanasundaram
Assistant Guest Editor: Dr. S.S. Syed Abuthahir

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 8, Special Issue, 254-258 (2022)

International Journal of Zoological Investigations
Contents available at Journals Home Page: www.ijzi.net
Editor-in-Chief: Prof. Ajai Kumar Srivastav
Published by: Saran Publications, Gorakhpur, India

ISSN: 2454-3055

Assessment of Seasonal Variation (2020 to 2021) in Physico-Chemical Parameters of Nandalar Estuary in East Coast of Tamil Nadu, India

Anusiya R. and Sukumaran M.*

P.G. and Research Department of Zoology, Rajah Serfoji Govt. College (Autonomous) (Affiliated to Bharathidasan University), Thanjavur 613 005 Tamil Nadu, India

**Corresponding Author*

Received: 20th August, 2022; **Accepted:** 27th October, 2022; **Published online:** 10th November, 2022

https://doi.org/10.33745/ijzi.2022.v08i0s.030

Abstract: Estuaries are defined as the areas between rivers and the ocean that have unique ecological characteristics, a wealth of flora and fauna, and are essential to both biodiversity and hydrological processes. Aquatic ecosystems depend on their biological traits as well as their physical and chemical qualities. The objective of the current study was to identify seasonal variations in the physico-chemical parameters of Tamil Nadu's Nandalar Estuary. The physico-chemical characteristics of the Nandalar Estuary were recorded which have an impact on the estuarine environment. Future analyses of the ecological, biological, and cultural elements of estuarine species as well as the allowable limit of fisheries and aquatic life would benefit from preliminary data on the physico-chemical parameters in this Nandalar estuary area.

Keywords: Nandalar estuary, Physico-chemical analysis, Estuaries ecology

Citation: Anusiya R. and Sukumaran M.: Assessment of seasonal variation (2020 to 2021) in physico-chemical parameters of Nandalar estuary in east coast of Tamil Nadu, India.
Intern. J. Zool. Invest. 8(Special Issue): 254-258, 2022.

https://doi.org/10.33745/ijzi.2022.v08i0s.030

Introduction

Ecotoxicology studies the harmful effects of physical and chemical agents on living things, particularly on populations and communities that are part of specific ecosystems. Urbanization and industrialization pose a severe danger to coastal habitats, particularly estuaries. Estuaries are known for their high biological productivity, which supports a wide variety of creatures during their whole life cycle or as larvae. As a result of several pollutants, including metals, persistent organic pollutants, pesticides, and hydrocarbons, these delicate ecosystems are continually under pressure. Although heavy metals are naturally occurring components of the environment, their concentrations have been found to be rising in many coastal areas (Fred, 2019).

The physico-chemical and biological properties of an aquatic ecosystem determine its health, which may aid in its conservation and management. Estuarine and coastal habitats are intricate and dynamic (Surekha and Anjali, 2014). Numerous physical and chemical reactions occur when river water and marine water meet, and these processes may have an impact on the water's quality. Surface water quality is an extremely delicate subject. Both anthropogenic influences, such as urban, industrial, and agricultural activity, as well as natural processes include precipitation inputs, erosion, and weathering of crustal elements (Prasanna and Ranjan, 2010).

About 15% of India's entire coastline, or 1076 km, is made up of the coasts of Tamil Nadu and Puducherry. Here, there is a variety of distinctive coastal environments. These include mangrove forests, mudflats and salt marshes, backwaters and streams, tropical dry evergreen forests, coral reefs, seagrass beds, and oyster reefs in addition to sandy beaches and dunes (Nagarajan *et al.*, 2002; Amudha *et al*., 2017). In this investigation physico-chemical analysis of the Nandalar estuary on Tamil Nadu's east coast has been conducted.

Materials and Methods

Location of sample Collection:

The Kaveri (Cauvery) branch of the river, which is located near Tharangambadi, in the district of Nagapattinam, in the state of Tamil Nadu, is where the Nandalar Estuary water sample was taken (EIS, 2015) (Fig. 1). Water samples were taken fortnightly over the study period (2020–2021), and the data were gathered seasonally to understand the seasonal influence. Pre-monsoon (March to May), monsoon (June to September), and post-monsoon (October to December) periods were the three separate seasons. Five distinct locations on each site were used to gather samples, which were then combined to create an integrated sample. The pH of the water was determined immediately.

Physiochemical characteristics:

The techniques utilized to analyze various physicochemical characteristics were the same as those described in Standard Methods for the Examination of Water (APHA, 1967, 1980; APHA-AWWA-WPCF, 1976); Golterman *et al*. (1978); National Environmental Engineering Research Institute (NEERI, 1986) and Water Quality Assessments (1996).

Results and Discussion

Estuaries are an essential component of marine ecosystems and are crucial to both the hydrological processes in coastal areas as well as biodiversity. Estuaries are created when components from the land are transported to the ocean and weather, changing the physico-chemical properties of the water (Behera and Padhy, 2012). For a period of one year from 2020 to 2021, seasonal fluctuations in meteorological and physico-chemical parameters, including pH, DO, Ammonium, Nitrate, BOD, Sodium, Chloride, Sulphate, and Fluoride content in Nandalar Estuary waters, were noted. The data are shown in Table 1.

The pH of the Nandalar Estuary ranged from 8.53 to 8.95, indicating that the water is slightly alkaline. While monsoon pH was 8.61, pH varied with the seasons, being lowest in the post-monsoon season (8.53) and highest in the pre-monsoon (8.95). The DO (mg/l) ranged from 5.22 to 5.22, with the post-monsoon season having the lowest value (5.22) and the monsoon season having the highest value (5.93). The pre-monsoon pH was 5.71, and both the pH and DO values fell within the Fisheries and aquatic life standard. Pre-monsoon pH levels were often somewhat higher than post-monsoon levels, while post-monsoon levels were generally lower. Santhanam and Perumal (2003) in the Vellar estuary and Soundarapandian *et al.* (2009) in the Uppanar backwaters discovered a similar seasonal trend. According to Upadhaya (1998), the influence of freshwater discharge, rainfall, and the breakdown of organic matter may regulate the research area's

Fig. 1: Study area of Nandalar estuary (EIS, 2015).

Table 1: Physico-chemical analysis of Nandalar estuary water of east coast of Tamil Nadu (2020-2021)

Parameters	Season			*Fisheries and aquatic life Std.
	Pre-monsoon	Monsoon	Post-monsoon	
pH	8. 95	8.61	8.53	6.0-9.0
DO (mg/L)	5.71	5.93	5.22	4.0-6.0
Ammonium (mg/L)	0.37	0.46	0.41	0.5
Nitrate (mg/L)	39.41	35.17	32.19	40
BOD (mg/L O_2)	1.98	2.95	2.11	3
Sodium (mg/L)	114.23	95.74	126.19	120
Chloride (mg/L)	319.75	253.88	286.17	300
Sulphate (mg/L)	93.21	87.55	81.31	100
Fluoride (mg/L)	0.69	0.65	0.71	0.75

* Maximum allowable concentrations of selected water quality variables for Fisheries and aquatic life uses

minimum pH values throughout the monsoon season.

The presence of more fresh water during the monsoon, which has a higher solubility and lower salinity, may have contributed to the study area's high levels of dissolved oxygen during that time. The Vellar Estuary (Nedumaran *et al*., 2001), the Point Calimere coastal water (Damotharan *et al*., 2010) and the Muttukadu backwaters have been reported to possess similar DO values (Prema and Subramanian, 2003). The greatest BOD levels were recorded during the monsoon season (2.95); comparable findings were reported by Vasanthi and Sukumaran (2017) in the Muthupet estuary and Muthukumaravel *et al*. (2012) in the Karaikal estuary.

According to Behera and Padhy (2012), a higher productivity, decomposition, and denitrification process occurred during the pre-monsoon and post-monsoon periods, which may

explain why the lower value was observed during the pre-monsoon period and the higher value in the monsoon period. Our study recorded that the Nandalar Estuary had a lowest value (0.37 mg/l) of ammonia during the pre-monsoon and a highest value (0.46 mg/l) during monsoon.

The addition of nitrate to estuary water is caused by river water that transports nitrogen from anthropogenic inputs such as industrial effluents and organic wastes from the catchment area. Nitrate levels during the study period (2020 to 2021) ranged from 32.19 mg/l to 39.41 mg/l. (Das *et al*., 1977). Vasanthi and Sukumaran (2017) recorded similar observations. Fluoride has an acceptable level of 0.65 to 0.71 mg/l according to Fisheries and Aquatic Life, whereas sulphate has a permissible limit of 81.31 to 93.21 mg/l and is highest during the pre-monsoon season (March to May) and lowest during the post-monsoon season (October to December).

The lowest sodium level (95.74 mg/l) was found during the monsoon season, and the highest sodium content (126.19 mg/l) was found during the post-monsoon season. High salinity and low value during the monsoon season may be due to rain and river water flow (Gadhia *et al*., 2012). Chauhan *et al*. (2008) reported findings similar to this study. Chloride concentrations ranged from 26.0 mg/l to 34.7 mg/l. Monsoon season has the lowest value (253.88 mg/l), and pre-monsoon season has the highest value (319.75 mg/l). Bhaware *et al*. (2013) reported the seasonal fluctuations in physico-chemical parameters in the water of the Bhatye Estuary which showed the lowest levels of chloride in the months of August and March.

In this study monitoring of physico-chemical characteristics and changes in parameters were evaluated at east coast of Nandalar Estuary. According to Bhaware *et al*. (2013) one of the key variables that affects physico-chemical parameters, the distribution, and the richness of biota in the coastal and estuarine ecosystem is pH variation. Future analyses of the ecology, biodiversity, and cultural facets of the species from the estuary might benefit from preliminary data on the physico-chemical parameters in this Nandalar estuary area.

References

Amudha P, Vanitha V, Bharathi NP, Jayalakshmi M and Mohanasundaram S. (2017) Phytochemical analysis and in vitro antioxidant screening of sea grass-*Enhalus acoroides*. Int J Res Pharm Sci. 8(2): 251-258.

APHA. (1967) Standard methods for the examination of water and waste water including sediments and sluge, 12th edn., APHA Washington, D.C.

APHA. (1980) Standard methods for the examination of water and waste water APHA, AWWA, WPCF, 15th edn., Washington D.C.

APHA-AWWA-WPCF. (1976) Standard method for the examination of water and waste water. American Public Health Association, New York.

Behera PK and Padhy SN. (2012) Physico-chemical studies on water quality characteristics of Bahuda Estuary, Bay of Bengal. Nature Environ Pollut Technol. 11(1): 117-120.

Bhaware B, Rodríguez MA and Kurhe A. (2013) Study of seasonal variations in physico-chemical parameters and nutrients in water of Bhatye estuary, Ratnagiri central, West coast of India. Int J Environ Sci. 3(5): 1671.

Chauhan R and Ramanathan AL. (2008) Evaluation of water quality of Bhitarkanika mangrove ecosystem, Orissa, east coast of India. Indian J Mar Sci. 37(2): 153-158.

Damotharan P. (2010). Seasonal variation of physico-chemical characteristics in point Calimere waters (South East Coast of India). Middle East J Sci Res. 6(4): 333-339.

Das J, Das SN and Sahoo RK. (1997) Semidiurnal variation of some physico-chemical parameters in the Mahanadi estuary, East Coast of India. Indian J Mar Sci. 26: 323-326.

EIS (Environmental Information System) (2015) Hosted by Centre of Advanced Study in Marine Biology, Faculty of Marine Sciences, Annamalai University, Sponsored by Ministry of Environment, Forest and Climate Change, Govt. of India.

Fred AO. (2019) A 50-year review on heavy metal pollution in the environment: bivalves as bio-monitors. Afr J Environ Sci Technol. 13: 220-227.

Gadhia M, Surana R and Ansari E. (2012) Seasonal variations in physico-chemical characterstics of Tapi Estuary in Hazira Industrial Area. Our Nature 10:

249-257.

Golterman HL. (1969) Methods for chemical analysis of freshwater (International Biological Programme. IBP handbook), Blackwell Scientific, Oxford..

Muthukumaravel K, Vasanthi N, Sivakami R, Kandasami D and Sukumaran N. (2012. Physico-chemical characteristics of Arasalar estuary Karaikal Southeast Coast of India. Int J Inst Pharm Life Sci. 2(3): 84-94.

Nagarajan VM, Yuvan M, Srinivasan R, Satagopan NR, Asokan A and Anooja A. (2022) Status of important coastal habitats of North Tamil Nadu: Diversity, current threats and approaches for conservation. Regional Stud Mar Sci. 49: 102106.

Nedumaran T, Ashok Prabu V and Perumal P. (2001) Ecology of phytoplankton of Vellar estuary, southeast coast of India. Seaweed Res Tiln. 23(1,2): 157-162.

NEERI. (1986) Manual on Water and Waste Water Analysis, NEERI Publication, Nagpur.

Prasanna MB and Ranjan PC. (2010) Physico chemical properties of water collected from Dhamra estuary. Int J Environ Sci. 1(3): 334-342.

Prema M and Subramanian B. (2003) Hydrobiological parameters of Muttukadu backwater of Bay of Bengal. Indian Hydrobiol. 6(1, 2): 95-100.

Santhanam P and Perumal P. (2003) Diversity of zooplankton in Parangipettai coastal waters, South east coast of India. J Mar Ass India 45(2): 144-151.

Soundarapandian P, Preamkumar T and Dinakaran GK. (2009) Studies on the phyisco-chemical characteristics and nutrients in the Uppanar estuary of Cuddalore, south east coast of India. Curr Res J Biol Sci. 1(3): 102-105.

Surekha ND and Anjali BS. (2014) Physico-chemical characteristics of estuarine water bodies from Sindhudurg district of Maharashtra. Indian J Appl Res. 4(9): 45-47.

Upadhaya S. (1998) Physico-chemical characteristics of the Mahanadi estuarine ecosystem, east coast of India. Indian J Mar Sci. 17: 19-23.

Vasanthi P and Sukumaran M. (2017) Physicochemical analysis of coastal water of east coast of Tamil Nadu (Muthupet estuary). Int J Zool Stud. 2(5): 15-21.

Water Quality Assessments (1996) A Guide to Use of Biota, Sediments and Water in Environmental Monitoring- Second Edition, UNESCO/WHO/UNEP.