VOLUME 8 ISSUE 2 2022

ISSN 2454-3055

INTERNATIONAL JOURNAL OF ZOOLOGICAL INVESTIGATIONS

Forum for Biological and Environmental Sciences

Published by Saran Publications, India

International Journal of Zoological Investigations Vol. 8, No. 2, 59-63 (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

Physico-chemical Properties of Kottaipattinam Coastal Water, Southeast Coast of India

Karthik M.* and Rajakumar R.

Department of Zoology and Biotechnology, A.V.V.M. Sri Pushpam College (Autonomous) (Affiliated by Bharathidasan University), Poondi 613503, Thanjavur, Tamil Nadu, India

**Corresponding Author*

Received: 7th June, 2022; **Accepted:** 10th July, 2022; **Published online:** 18th July, 2022

https://doi.org/10.33745/ijzi.2022.v08i02.009

Abstract: In the rapid development of marine aquaculture, the water quality of aquatic environments is regarded as a main limiting factor. Physicochemical characteristics of seawater play crucial role for productive marine ecosystem and fisheries activities. In the present study, the physico-chemical parameters such as sea surface temperature, salinity, pH, and dissolved oxygen were studied for a period of 12 months (July 2019– June 2020). Sea surface temperature varied from 25.5 to 32.5 °C. Salinity varied from 28.0 and 37.0 ‰, hydrogen ion concentration ranged between 7.15 and 8.22. Variation in dissolved oxygen content was from 3.86 to 5.85 mg l^{-1}. In the present study the seasonal variations of various factors were studied and interrelationships existing between them discussed.

Keywords: Physicochemical parameter, Kottaipattinam coast, Water analysis

Citation: Karthik M. and Rajakumar R.: Physico-chemical properties of Kottaipattinam coastal water, southeast coast of India. Intern. J. Zool. Invest. 8(2): 59-63, 2022.
https://doi.org/10.33745/ijzi.2022.v08i02.009

Introduction

One of the most crucial substances in the ecosystem is water. Water quality can be described by physicochemical and microbiological parameters (Priyanka *et al.*, 2009). Physical, chemical, and biological features can all be used to characterize water of higher quality. However, there is some link between these metrics, and the significant one may be used to determine water quality (Manjare *et al.*, 2010). Physical parameters play an important role in the biochemistry of the water body. Subtle changes in physical conditions can have profound effects on the water quality of the study system, which may in turn affect the spatial and temporal distribution of nutrients and biological communities. Additionally, changes in physical ocean process can affect weather patterns and climatic variability. Important physical and chemical parameters influencing the aquatic environment are temperature, rainfall, pH, salinity and dissolved oxygen. These parameters are the

limiting factors for the survival of aquatic organisms (flora and fauna) (Lawson, 2011). The 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. It also affects their distribution, diversity and feeding (Imam and Balarabe, 2012). The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physico-chemical parameters and biological characteristics. So, monitoring of these parameters is essential to identify the magnitude and source of any pollution load (Thirupathaiah *et al.*, 2012). Kottaipattnam, is coastal district in the southeast coast of Pudukottai, Tamilnadu, has been an important area for recreational site attraction of many visitors and an increasing number of permanent residents as well as known for its seafood industry. There has been a lot of interest in researching different factors affecting fish growth in relation to physicochemical attributes over the past few decades. However, there is still a lack of information about the physicochemical conditions in this study area. The aim of the study was to provide information regarding physicochemical water parameters of Kottaipattnam to increase our understanding of variation of distribution patterns in this area of study. The contributed scientific data of water quality will help to take proper management to maintain the healthy ecosystem in that coastal area.

Materials and Methods

Study Area:

The Kottaipattinam coast is located on Tamil Nadu's central coast, reaching into the Palk Strait (Lat. 9°57'48.36"–9°57'25.70"N and Long. 79°11'42.35" – 79°11'42.35").79°11'56.33''E) (Fig. 1). It has a tropical climate, and the April to June is the warmest month of the year with temperatures reaching 40 ºC. During the day, the sea in this location seems calm. The majority of the months are with little tidal effect throughout the year, the wave height is less than 0-0.3 m. Furthermore, the inter tidal zones are large and diverse shallow. No substantial riverine outflows are expected. Few minor rivers only flow during the season of rain.

Fishing is done on a bigger scale with the use of wooden dug-out canoes, motorised boats, and trawlers. This stretch of coastline is dominated by the lush growth of sea grasses and seaweeds. Rocks, corals, and other comparable substrates are absent. Aquaculture and agricultural activity are seen everywhere near the coast of Kottaipattinam. Monthly sampling was carried out in the coastal waters of Kottaippattinam for a year from July 2019 (pre-monsoon) to June 2020 (summer).

Collection of Samples:

Investigations on the Kottaipattinam coast Palk Strait, Southeast coast of India was carried out from July 2019 to June 2020. The sampling stations were Kottaipattinam coast. The sea water samples were collected at 1 meter below the water surface through a water sampler and transferred in polyethylene bottles, which were already cleaned by soaking in 5 M HCl for more than three days and washing with distilled-deionized water thoroughly before use.

Water Analysis:

Measurements of temperature (hand-held mercury thermometer), salinity (Refractometer, ATAGO, Japan) and pH (pH Pen, model LI-120, Eutech Instrument, Singapore) were recorded during each sampling event. Dissolved Oxygen (DO) was estimated by using Winkler's method (Strickland, J.D.H., Parsons).

Results and Discussion

This short time series data may allow us to understand the effects of short time variations in the biological and physico-chemical conditions on the eutrophication in the coastal waters, southeast coast of India. Hence, the present study investigated the seasonal change in primary production in the southeast coast of India with

Fig. 1: The sample collection at Kottaippattinam coastal waters.

respect to the prevailing hydrographical environment through planned systematic new data collections.

Temperature is the significant factor which regulates the biochemical activities in the aquatic environment. Temperature ranged from 25.5 to 32.5 °C and the minimum was recorded during monsoon 25.5 °C and maximum was during summer 32.5 °C (Fig. 2). The surface water temperature usually is influenced by the intensity of solar radiation, evaporation, fresh water influx and cooling and mixed up with ebb and flow from the adjoining neritic waters (Ravanaiah *et al.,* 2010; Dhinamala *et al*., 2015).

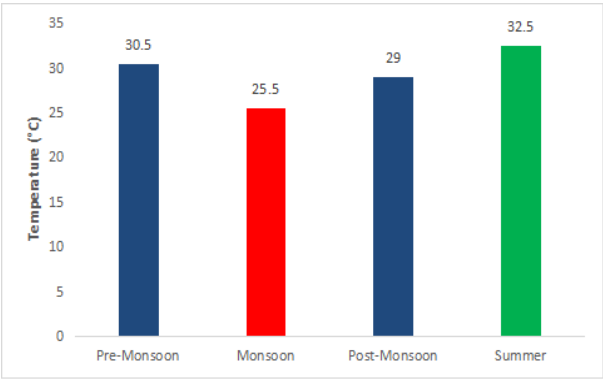

Fig. 2: Temperature of Kottaipattinam coast during July 2019 to June 2020.

Salinity is a fundamental water quality parameter monitored by freshwater and marine ecologists because of its influence on the biota. Most aquatic organisms are adapted to only a narrow range of salinity, beyond which they cannot maintain their osmotic and ionic balance. Some species tolerate only intermediate levels of salinity while broadly adopted species can acclimate to variable salinity ranging from fresh water to seawater. Generally, the range of salinity in brackish water is from 0.5 ppt to 30 ppt (Karleskint *et al*., 2009). In this study, salinity fluctuated between 28.0 and 37.0 ppt, with the minimum was recorded during monsoon 28.0 ppt and maximum at summer 37.0 ppt (Fig. 3).

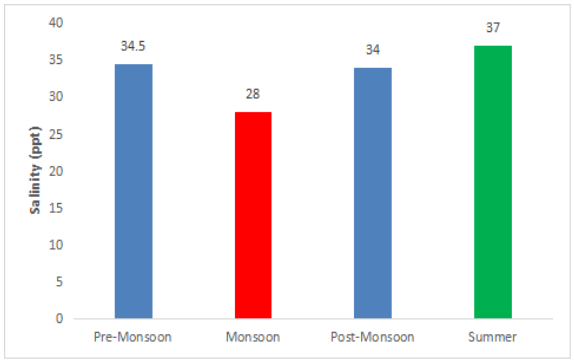

Fig. 3: Salinity of Kottaipattinam coast during July 2019 to June 2020.

pH is a measure of the acidity or alkalinity of water and is one of the stable measurements. pH is a simple parameter but is extremely important, since most of the chemical reactions in aquatic environment are controlled by any change in its value. Anything either highly acidic or alkaline

would kill aquatic life (Dineshkumar *et al.*, 2017) In this study, the pH varied from 7.15 to 8.22, the minimum was recorded during monsoon (7.15) and maximum was during summer (8.22) (Fig. 4). Changes in pH depend on the factor like the removal of CO_2 by photosynthesis through bicarbonate degradation, fresh water influx, reduction in salinity and temperature and decomposition of organic matter (Rajasegar *et al.*, 2002).

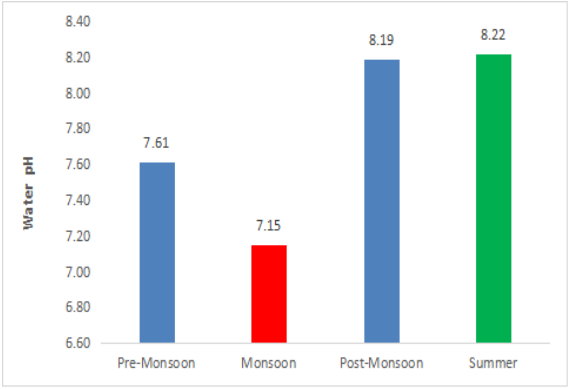

Fig. 4: Water pH of Kottaipattinam coast during July 2019 to June 2020.

Dissolved oxygen is a major component in an aquatic ecosystem which determines the quality of water and support aquatic life. Numerous scientific studies suggest that 4 – 9 mg/l of DO is the optimal range that will support a large, diverse fish population (Abdus-Salam *et al.*, 2010). As a general rule, concentrations of DO above 5 mg/l are considered supportive of marine life, while concentrations below this are potentially harmful. At about 3 mg/l, bottom fishes may start to leave the area, and the growth of sensitive species such as crab larvae is reduced. At 2.5 mg/l, the larvae of less sensitive species of crustaceans may start to die, and the growth of crab species is more severely limited. Below 2 mg/l, some juvenile fish and crustaceans that cannot leave the area may die, and below 1 mg/l, fish totally avoid the area or begin to die in large numbers (U.S. EPA, 2000). In the present study area, the DO ranged from 3.86 to 5.85 mg/l, the minimum was recorded during summer (3.86 mg/l) and maximum was recorded during moonsoon (5.85 mg/l) (Fig. 5). Dissolved oxygen showed marked seasonal variation throughout the study period. During summer and premonsoon less dissolved oxygen content was recorded, this could be due to the high temperature, salinity and biological activity (Davis, 1975; Levinton, 2001). High concentration of dissolved oxygen during monsoon and postmonsoon is attributed to high fresh water input and evidenced by the maximum occurrence of phytoplankton species (Morgan *et al.*, 2006).

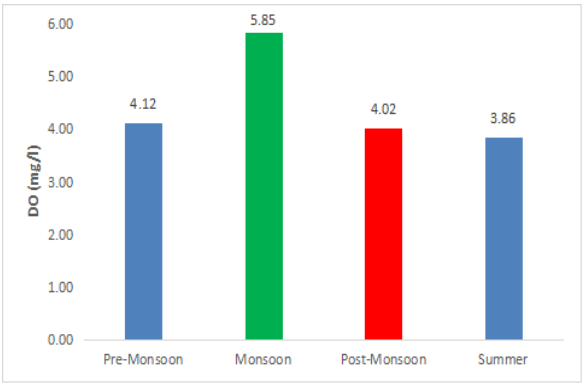

Fig. 5: Dissolved oxygen of Kottaipattinam coast during July 2019 to June 2020.

Conclusion

The present study attempted to record the seasonal variations of hydrographical parameters along the southeast coast of India. All the hydrographical parameters showed clear seasonal patterns, and are typical to the tropical marine environment without any marked variation. The values obtained for the pH, temperatures, salinity and dissolved oxygen were within the recommended values of the World Health Organization (WHO) and United State Environmental Protection Agency (USEPA) for survival, metabolism and physiology of aquatic organisms. Kottaipattinam coastal water is subjected to seasonal fluctuations in physico-chemical parameters depending upon the seasonal tidal amplitude and freshwater influx resulting in a continuous exchange of organic, inorganic, plant and animal matters.

Acknowledgements

The authors are grateful to the Secretary and Correspondent and the Principal of A.V.V.M. Sri Pushpam College (Autonomous), Poondi 613503,

Thanjavur for providing the infrastructure and necessary facilities to carry out research work successfully.

References

Morgan AM, Royer TV, David MB and Gentry LE. (2006) Relationships among nutrients, chlorophyll-*a*, and dissolved oxygen in agricultural streams in Illinois. J Environ Qual. 3(4): 1110-1117.

Abdus-Salam N, Adekola FA and Apata AO. (2010) A physico-chemical assessment of water quality of oil producing areas of Ilaje, Nigeria. Adv Natural Appl Sci. 4(3): 333-344.

Dhinamala K, Pushpalatha M, Samuel T and Raveen R. (2015) Spatial and temporal variation in the water quality parameters of Pulicat lake, Tamil Nadu, India. Int J Fish Aquat Stud. 3(2): 255-259.

Dineshkumar G, Karthik M and Rajakumar R. (2017) Study of seasonal water quality assessment and fish pond conservation in Thanjavur, Tamil Nadu, India. J Entomol Zool Stud. 5(4): 1232-1238.

Imam TS and Balarabe ML. (2012) Impact of physico-chemical factors on zooplankton species richness and abundance in Bompai-Jakar catchment basin, Kano state, Northern Nigeria. Bajopas 5(2): 34-40.

Davis JC. (1975) Minimal dissolved oxygen requirements of aquatic life with emphasis on Canadian species: A Review. J Fish Res Board Canada 32(12): 2295-2332.

Levinton JS. (2001) Marine Biology. In: The Chemical and Physical Environment, Oxford Univ. Press, New York.

Jena BK, Chandramohan P and Sanil Kumar V. (2001) Longshore transport based on directional waves along the north Tamil Nadu coast, India. J Coast Res. 17: 322-327.

Karleskint G, Turner RK and Small J. (2009) Intertidal communities. In: Introduction to Marine Biology (3rd ed.), Cengage Learning, pp. 356-411.

Lawson EO. (2011) Physico-chemical parameters and heavy metal contents of water from the Mangrove swamps of Lagos Lagoon, Lagos, Nigeria. Adv Biol Res. 5(1): 8-21.

Rajasegar M, Sirnivasan M, Ajmal Khan S. (2002) Distribution of sediment nutrients of Vellar estuary in relation to shrimp farming. Indian J Mar Sci. 31(2): 153-156.

Manjare SA, Vhanalakar SA and Muley DV. (2010) Analysis of water quality using physico-chemical parameters of Tamdalge tank in Kolhapur district, Maharashtra. Int J Adv Biotechnol Res. 1(2): 115-119.

Priyanka T, Amita B and Sukarma T. (2009) Evaluation of water quality: Physico-chemical characteristics of Ganga River at Kanpur by using correlation study. Nature Sci. 1(6): 91-94.

Ravanaiah G and Murthy NCV. (2010) Impact of industrial pollution on the changes of physico-chemical characteristics of water of the Pulicat Lake, Nellore district, A.P. Indian J Environ Ecoplanning 17(1-2): 163-174.

Strickland JDH and Parsons TR. (1972) A Practical Handbook of Seawater Analysis. Fisheries Research Board Canada, Bull. 167, Alger Press, pp. 310.

Thirupathaiah M, Samatha CH and Sammaiah C. (2012) Analysis of water quality using physico-chemical parameters in lower Manair reservoir of Karimnagar district, Andhra Pradesh. Int J Environ Sci. 3(1): 172-180.

Unanam AE and Akpan AW. (2006) Analysis of physico-chemical characteristics of some freshwater bodies in Essien Udim Local Government area of AkwaIbom State, Nigeria. In: Proc 21st Annual Conference of the Fisheries Society of Nigeria (FI50N) Calabar, 13th - 17th November, 2006.