

Water Quality Analysis in Relation to Fish Biodiversity- A study on Manapadu coastal area

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Abstract: Water quality plays a vital role in distribution, abundance and diversity of fishes. Research on fish diversity data in relation to physico-chemical character analysis is very essential to create public awareness about the non-biodegradable materials and water pollutants affecting the livelihood of aquatic animals. This study was planned and executed for a period of 3 months during March, April and May 2017 in Manapadu coastal area. Water samples were collected from three stations to record water quality parameters. Various hydrological parameters including pH, Total dissolved solids, Electrical conductivity, Salinity and Chloride were tested. During the study period 34 species of fishes that belong to 19 families were collected and identified, of which 2 species belonging to the families Arridae, Lutjanidae, Scaridae, Lenthridae, Chirocentridae and Dasyatidae were observed and recorded. 3 species belonging to the families Serranidae, Scobridae were observed and recorded. 1 species belonging to the families Balistidae, Piracanthidae, Rachyuridae, Hemisyllidae, Synodontidae and Trichiuridae were observed and recorded. The studies reveal that the physico-chemical composition of all water samples mainly depend on seasonal variations and has its impact on species diversity of fishes which are in line with many study areas in and around Manapadu and in many coastal areas

Keywords—: Macroalgae; Coastal biodiversity; Rocky shores; Indian Ocean; Manapadu coastal area

INTRODUCTION

Water is a universal solvent as it provides the ionic balance and nutrients. Water is one of the most important components of this ecosystem. Water is necessary for the survival of all living things be it plants or animals' life. It is the most abundant commodity in nature but also the misused one [19]. The marine environment constitutes an especially important role in economic and social development and easily occupies an important place in the national economy. Moreover, this sector constitutes reservoir of food resources contributing significantly to the increase in the rate of national self-sufficiency. . The environmental conditions such as temperature, topography, water movement, stratification, salinity, oxygen and nutrients characterizing at particular water mass also determine the composition of its biota. Usually in the near shore waters and estuaries, temperature exhibit considerable seasonal variations depending on the local conditions of rainfall, tidal incursions, biotic processes, quantum of freshwater inflow affecting the nutrient cycle of different coastal environments . There are often variations in water temperature mainly due to seasonal changes and rainfall [5]. Both the atmospheric and water temperatures often get fluctuated with reference to the topography of the location and from season to season.

Fish populations are highly dependent upon the variations of physico-chemical characteristics of their aquatic habitat which supports their biological functions. Fisheries make crucial contribution to the world's well-being and prosperity. In the last five decades world's fish food supply has outpaced global population growth and today fish constitutes an important source of nutrition and animal protein for much of the world's population [9]. Fish and fisheries are the indispensable part of life and livelihood of the people since immortal time

MATERIALS AND METHODS

The present study area Manapadu (8.3765° N, 78.0563° E) fish landing center is in Tiruchendur taluk of Thoothukudi district. The fishery data were collected from the study area for about three months, i.e March to May 2017. Manapadu is a coastal village located in far south India, 60 kilometres from Tuticorin and 18 km south Tiruchendur. Manapadu lies along the Tamilnadu state highway "SH 49", Otherwise also popularly known as the "East coast Road". All these three places are well connected by road and rail networks to many major cities in India.

Sampling procedures- The quality of marine water was evaluated by the determination of the following physicochemical parameters: pH, Salinity, Electrical Conductivity, Turbidity, Salinity and Chlorides. Samples were collected periodically every month from selected sampling sites during morning hours. Sampling was usually carried out between the hours of 8.00 am and 12.00 noon. Both surface and bottom water were collected for analysis purpose using Mayer's water samples. The landed fish species were photographed at the landing Centre. The identification was done using FAO identification sheets, Book of Smith's fishes and fish base. The fishes were classified up to species level. The data on hydrobiology and fishes were subjected to relevant statistical techniques like ANNOVA and correlation using of software SPSS, PAST.

RESULTS AND DISCUSSION

The effect of physico-chemical parameters of aquatic bodies have been studied by various scientists, [10], [14], [16], [17]. The physico-chemical parameters exert direct as well as indirect influences of biological processes of any system. The variation in these physico-chemical factors can influence the faunal and floral diversity as well successful pattern in aquatic ecosystem hence regular monitoring of physico-chemical and biological water quality parameters is essential to determine the status of water body with reference to fish diversity.

WATER QUALITY ANALYSIS

During the study period the maximum pH was observed in spring season (March) as 8.64pH with respect to the bottom water and the minimum pH was observed in summer season (May) 7.24pH with respect to the bottom water. During the study period the

TDS was observed maximum in summer season (May) as 28210 mg/L with respect to the bottom water and minimum level of TDS was observed in spring season(March) as 6110mg/L with respect to the upper water . In the present study, Electrical conductivity was observed maximum during summer season (May) as 40200 mhos/cm with respect to the upper water .The minimum level of EC was observed during spring season(March) 8555 mhos/cm with respect to the bottom water. The Chloride level in estuarine water is known to be regulated by biological and geo-chemical functions. During the study period the chloride was observed maximum in summer season (May) as 12650 g/l. During the study period the salinity was observed maximum in summer season (May) as 28.5 g/l with respect to the bottom water and the minimum level of salinity was observed in spring season(March) as 9 g/l with respect to the upper water.(Fig :1) .

FISHES DIVERSITY

A Total of 36 species of fishes that belongs to 20 families were identified. Of which 2 species belong to the family Trichuridae, Lutjanidae, Scaridae, Lenthridae, Chirocentridae, Mulidae, Hemisyllidae and Dasyatidae. 3 species belong to the family Serranidae, Scombridae, Cynoglossidae, Sphyrnidae. 1 species each of Arridae, Acanthridae, Balistidae, Piracanthidae, Rachyiuridae, Dayatidae, Synodontae and Haemulidae were also recorded during this study (Fig:2). Maximum species diversity-Shannon Weiner index was recorded as 2.937 during the spring season- March. Minimum species diversity- Shannon Weiner index was recorded as 2.88 during the summer season, may . Maximum species abundance Alpha index was recorded as 4.321 during the spring season -March. Minimum species abundance- Alpha index was recorded as 3.261 during the summer- May. Maximum species richness- Margalf’s index was recorded as 3.124 spring season -March. Minimum species richness- Margalf’s index was recorded as 2.569 during the summer -May. Maximum species Menhinick was recorded as 0.9427 spring season -March. Minimum species Menhinick was recorded as 0.923 in April (Fig:3).

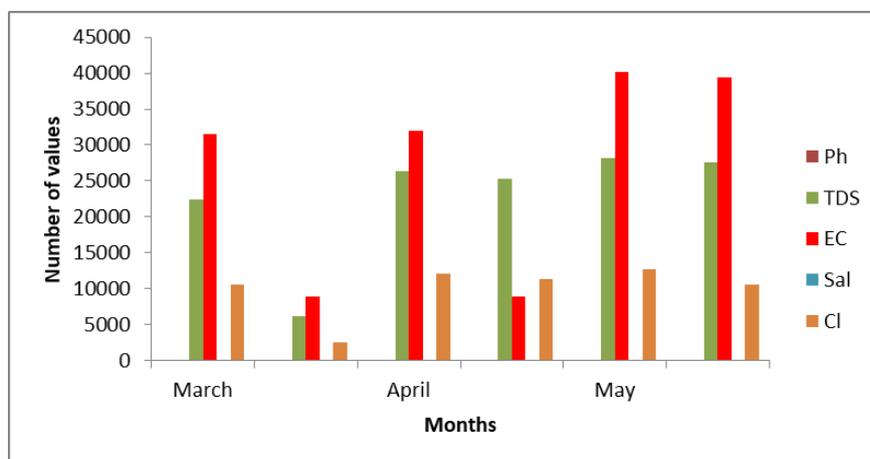


Fig:1 Physico-chemical parameters during the study period

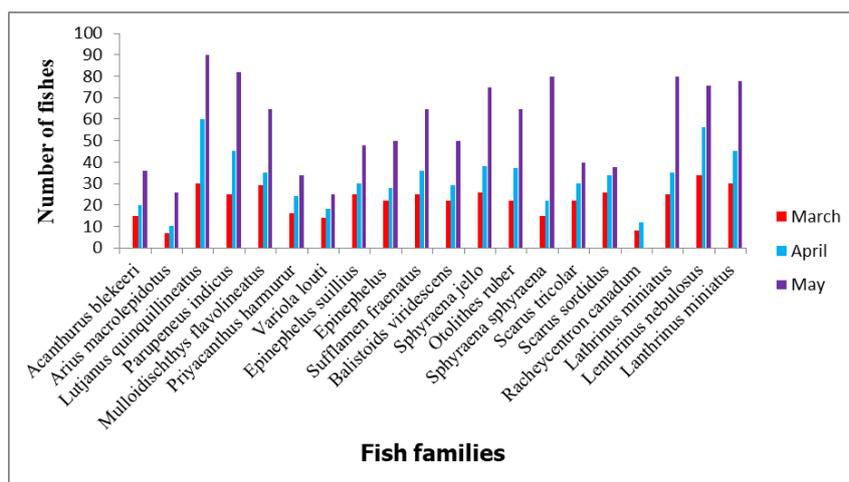


Figure.2:Total number of species encountered during the study period

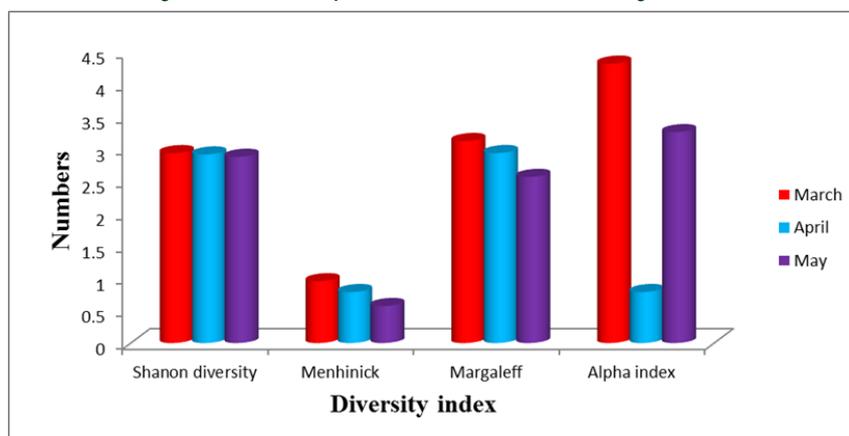


Figure 3: Diversity index during March-May2011

DISCUSSION

pH values in natural aquatic ecosystem are subjected to variations caused by different environmental parameters. This work seconds the values of [4], [20], who studied the effects of pH range from 6.5 to 9.0 and reported that the above said range suits the survival, growth and reproduction of fishes and pH values above 9.0 and below 6.5 range could have a detrimental effect to fish population, so the pH value recorded in the present study would not adversely affect the survival, growth and reproduction of fishes. Total dissolved solids were one of the major factors that declines the suitability of water (Nordstrom, 1987). The concentration of total dissolved solids in the samples collected from six sites reveal that this parameter of water fluctuates seasonally. Total dissolved solids concentration in the present study showed its maximum level during summer season (May) was similar to few other works done before by Dhankar, Sushila and Sangmen (2004). Total dissolved solids have been shown to be sensitive during fertilization and egg development of fishes. pH and total dissolved solids contribute to the formation of zooplankton communities which serves as feed for fish population [11]. The Detergent present in the water due to local utilization may be a reason for increased electrical conductivity. Mineralization of water due to dissolution of minerals and nutrients may also result in load of aquatic environment as mentioned by [3]. The chloride content, when present in higher level may be an indication of pollution; this condition may be a result of usage of the inorganic chemical fertilizers by farmers and irrigation drainage [5]. These parameters showed a positive correlation with carbon dioxide, dissolved oxygen, pH and Alkalinity. Salinity changes recorded in six sites exhibit marked seasonal variations. Seasonal variations noted in the salinity content of the coastal water was mainly due to monsoonal inflow of fresh water. The salinity in the coastal waters is under the influence of seasonal current, monsoon rain and rate of evaporation of the coastal waters. Similar ranges were found in the studies of [15]. Every diversity index showed maximum fish diversity in the month of March may be because of the favourable rainy days in the study area. Minimum fish diversity as shown in the month of May as indicated by diversity indices may be due to increased levels of salinity, chlorides, electrical conductivity and total dissolved solids recorded during that particular month. The family Lutianidae showed maximum abundance during the study period and a particular species, *Lutjanus quinquilineatus* is most abundantly seen in all three months due to its adaptability to different climatic conditions.

CONCLUSIONS

The water quality plays a vital role in the distributions, abundance and diversity of fishes. Fishes are probably best known for their ability to indicate the water quality. Various anthropogenic activities were shown to impact on the water quality. Overall analysis of result (physical and chemical) indicates the predominance of organisms bearable to organic matter, associated with climate change in the aquatic ecosystem.

This kind of fish diversity data and physico-chemical parameter analysis is very essential to create public awareness about the non-biodegradable materials like plastic covers, bottles, metals, glass pieces, garbage etc., that are thrown in to the sea and to educate the local public regarding the significance of the sea and its organism which has to be protected from pollution. Local panchayat officials and equally important public should come forward with protective measures to save the sea from deterioration and to conserve biodiversity

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