

RESEARCH ARTICLE

THE STUDY ON FRESHWATER FISH BIODIVERSITY OF UKKADAM (PERIYAKULAM) AND VALANKULAM LAKE FROM COIMBATORE DISTRICT, TAMIL NADU, INDIA

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ABSTRACT

Wetlands of India preserve a rich variety of fish species. Globally wetlands as well as fauna and flora diversity are affected due to increase in anthropogenic activities. The present investigation deals with the fish bio-diversity of selected major wetlands Periyakulam famously called Ukkadam Lake, Singanallur Lake and Sular Lake of Coimbatore district fed by Noyyal River. Due to improper management of these lentic wetlands water bodies around Coimbatore district by using certain manures, insecticides in agricultural practices in and around these selected areas has polluted the land and these fresh waters creating hazards for major vertebrate fishes which are rich source of food and nutrition, an important and delicious food of man. The results of the present investigation reveals the occurrence of 19 fish species belonging to 5 order, 8 families 18 species recorded from the Ukkadam wetland followed by Singanallur wetland with 5 different orders 7 different families and 14 species. *Ichthyofaunal* diversity of Sular wetland compressed of 6 families with 14 species. The order *Cypriniformes* was found dominant followed by *Perciformes*, *Ophicephalidae*, *Siluriformes* and *Cyprinodontiformes* species in Ukkadam and Singanallur wetland lakes while in Sular it was recorded as *Cyprinidae* > *Cichlida* > *Ophiocephalidae* > *Anabantidae* > *Bagridae* > *Heteropneustidae*. This study on the freshwater fish species diversity of these wetlands would help in explore the fish fauna status and estimate the factors that may need rectification for fish conservation and management.

Keywords: Freshwater, Fish species, Biodiversity, Valankulam Lake and Ukkadam Lake.

1. INTRODUCTION

Water is the elixir of life, an expensive gift of nature to mankind and millions of other species living on the earth. It is fast becoming a scarce commodity in most part of the world. Due to the urbanization and expending economic activities, nearly 13% of the world's populations do not have to access the safe drinking water. Wetlands situated in the vicinity of the cities generally undergo rapid degradation due to various factors related with city development such as waste dumping, industries and large-scale reclamation for other uses. Globally, wetland is estimated to cover 5-10% of the earth's terrestrial surface (Mitsch and Gosselink 2007). Coimbatore being a rapidly developing city in the western part of Tamil Nadu, has several wetlands and lakes in and around its limits. These wetlands have been facing rapid degradation due to liquid or solid waste disposal, filling and reclamation, real-estate ventures and industrial development has open drainage and sewerage systems which joining these lakes without any prior treatment. Hence, the present review was undertaken in Coimbatore on urban lakes wetlands to know about water quality of these water bodies with reference to the pollution from various sources. It is also one of the fastest growing cities in Tamil Nadu, India that has around 28 wetlands in and around the city which are fed by the river Noyyal.

These wetlands serve as storage and percolation tanks. They are the major recharge sites for groundwater (Rachna et al., 2010).

Fish constitutes almost half of the total number of vertebrates in the world. They live in almost all conceivable aquatic habitats. They exhibit enormous diversity of size, shape and biology, and in the habitats they occupy. Of the 39,000 species of vertebrates in the world, Nelson (2006) estimated 21,723 extant species of fish under 4,044 genera, 445 families and 50 orders in the world, compared to 21,450 extant tetra pods. Of these 8411 are freshwater species and 11650 are marine. Day (1889) described 1418 species of fish under 342 genera from the British India. Freshwater fish has been identified a suitable tool for biological assessment due to its easy identification and economic value measure has to be taken to conserve these bioindicators. In order to preserve the freshwater fish diversity that is declining rapidly each day due to unending anthropogenic stress in the wetland bodies it is necessary to conserve these wetland water bodies of Coimbatore district. Categories and report on the freshwater fish diversity in selected wetlands Ukkadam Lake and Valankulam Lake of Coimbatore district fed by Noyyal River.

Ukkadam lake is spread over an area of 1.295 km² (0.500sq mi) and has an average depth of 5.82m

(19.1 ft) 10 58 54 " N 76 51 17 E in 2010 the lake was taken over by Coimbatore corporation on a 90 years lease from the public works department of the government of Tamil Nadu. The lake is fed by canals derived from Noyyal River. The lake has also receives water from Selvachinthamani Lake located upstream in the north. The lake has an outlet connecting it with Valankulam Lake. The water can be released through four sluice gates located on the south side of the lake. It is situated between Trichy road and Sungam bypass road connecting with Ukkadam. A railway track connecting Coimbatore junction and Podanur passes over the lake. Various birds including little grebes and purple moorhen can be seen in this lake.

Water can be obtained mainly from two sources namely surface water and ground water. Surface water is any water that travels or is stored on top of the ground. This would be the water in rivers, lakes, streams, reservoirs, and even the oceans. Rain water is the purest form of natural water, since it is obtained as a result of evaporation from the surface water. However, its downwards journey through atmosphere it dissolves a considerable amount of industrial gases like CO₂, NO₂, SO₂, etc and suspended solid particles both of organic and inorganic 3 origin. Ponds with water in large quantity for most part of the year are available in Coimbatore and also it has only a very few rivers like Siruvani to supply water. But the quality of water obtained from these ponds is not reliable because it contains suspended matter and number of other impurities. The main source of ground water is rain water. A major part of rain water is absorbed into the earth. The absorbed water percolates into the earth and goes deep down the earth. Water beneath the surface comprises the next largest store of water. Ground water and soil water together make up about 0.5% of all water (by volume).

Lakes situated in the Coimbatore city undergo rapid degradation due to the various factors related with city development, waste dumping, industries and large scale reclamation for other uses. There are around 28 lakes in and the city limits which are largely fed by the river Noyyal, flowing alongside the city. The present study has been carried out to assess the freshwater fish biodiversity of Ukkadam (Periyakulam) and Valankulam Lake from Coimbatore District and to examine the changes in water quality that have happened during the last decades.

2. MATERIALS AND METHODS

2.1 Study area

To study the freshwater fish diversity the major wetland Sukkadam and Valankulam Lake of Coimbatore district. It receives water from rain and also from catchment areas of the catchment area of the pond is about 10.75 sq. Miles. The sides of the ponds are surrounded by human settlements and markets.



Fig 1: Map showing study area

2.2. Data Collection

The study has been conducted for 4 months from October, 2018 to January, 2019. The data has been collected for a period of 4 months. Data were collected from five fishing points where the intensity was high. Data were collected after 15 days interval, twice in a month from 10 selected fishermen by asking questions from a field trailed organized questionnaire.

2.3 Sample Collection

Fish samples were collected every month during the study period from the catchment point and fish landing centres with help of skilled fishermen. Fish samples were collected through experimental fishing using cast nets (dia. 3.7m and 1.0m for collecting fish in shallow areas, monofilamentos gill nets (vertical height 1.0m 1.5m; length 100m - 150m), drag net (vertical height 2.0m) and a variety of traps. Sampling points were distributed throughout the site to cover its whole area.

Catla catla



Cirrihinus mrigala



Labeo rohita



Mystus vittatus



Labeo calbasu



Clarias batrachus



Labeo bata



Gambusia affinis



Channa marulius



Channa striatus



Oreochromis mossambicus

2.4. Identification of Fish Species

All fishes caught were identified to species level using standard taxonomic Fishes of India, FAO identification sheets, ITIS (integrated taxonomic information system) standard report (<http://www.itis.gov>), and other reference book using standard keys of jeyaram (1999), Qureshi and Qureshi (1983), Talwer and Jhingran (1991), Day Francis (1994) and Shrivastava (1998). Fish base website was also referred for various aspects of fish fauna (www.fishbase.org).

2.5. Collection of Water Samples

The samples were collected from the surface of the ponds for a period of 4 months [October 2018 to January 2019] with an interval of 1 month. The samples were collected during 12.30 to 1.30 pm and this was uniformly maintained throughout the study period. The samples were

collected in collected in clean white plastic containers.

2.6. Assessment of water quality

The physico-chemical characters were analysed in Ukkadam (Periyakulam) and Valankulam Lake of Coimbatore district.

2.6.1. pH

pH is measured mathematically by, the negative logarithm of hydrogen ions concentration. The pH of natural waters is greatly influenced by the concentration of carbon dioxide which is an acidic gas (Boyd, 1979). The pH in all ponds water was alkaline throughout the experimental period. Different authors have reported a wide variation in pH from 6.7 to 8.3 (Hossain et al. 1997), 7.18 to 7.24 (Kohinoor et al. 1998), and 7.37 to 8.65 (Kohinoor et al. 2004) in fertilized fish ponds and found the ranges productive. The ranges and mean values of pH in the present study were 7.5-8 indicating the productive nature of the fertilized ponds.

2.6.2. Dissolved oxygen

Estimation of dissolved oxygen in the water samples were analysed by the Winklers method. Add 1 ml of manganese sulphate solution followed by 1 ml of alkaline iodine solution, below the surface of the water sample displacing the water at the top. Shake well and gently allowed the solution to precipitate and settle down into the bottle. After the precipitate forms add 1 ml of concentrated sulphuric acid settling the acid to run down at the neck of the bottle, then stopper it. Shake well and see that the iodine is diffused slowly and evenly distributed, before drawing the sample for titration. Take 50 ml of the above solution in a conical flask and add 1 ml of starch solution in it. Which develops a blue in colour then titrate against 0.025 N sodium thio sulphate solution.

2.6.3. Dissolved dioxide (DO) and Biological Oxygen Demand (BOD)

Dilution water was prepared in glass container by bubbling compressed air in distilled water for 30 minutes. 1ml each of phosphate buffer magnesium sulphate, calcium chloride and ferric chloride solution was added for each litre of dilution water and mixed thoroughly. The sample was neutralized to Ph 7.0 by using 1N NaOH or H₂SO₄ Required dilution were prepared in a bucket, mixed thoroughly in and filled in two set of BOD bottles One set of the BOD bottles was kept in BOD incubator at 20⁰c for 5 days and another set DO was determined immediately. DO in the sample bottle was determined immediately after the complexation of

5 days incubation Similar procedure followed for the blank (dilution). $BOD\ mgr1 = DO1 - DO2 - BC \times 100 / \text{Percent of sample}$; DO 1-Initial dissolved oxygen DO 2 -Dissolved oxygen after 5 days of incubation; BC-Blank correction.

2.6.4. Carbonates and Bicarbonates

Take 25 ml of water sample in a clean conical flask to that add 2 drops of phenolphthalein indicator. Then the solution is titrated against 0.02N sulphuric acid taken in the burette. The end point is reached when the carbonate is neutralized and solution become colourless. To this colourless solution add 2 or 3 drops of methyl orange indicator. Now the colour changes into light orange or light pink colour. Then, this is titrated against 0.02N sulphuric acid. Till the light orange changes to dark pink colour.

2.6.5. Total alkalinity

100ml of sample was taken in a conical flask and 2 drops of phenolphthalein indicator was added. If a pink colour appeared the solution was titrate against 0.1N hydrochloric acid. If the solution remained colourless 2-3 drops of methyl orange was added to the same sample and titrate against 0.1N hydrochloric acid until the yellow colour changed to pink as the end point. The gives the total alkalinity.

3. RESULTS

Table 1: Fish diversity of Ukkadam wetland

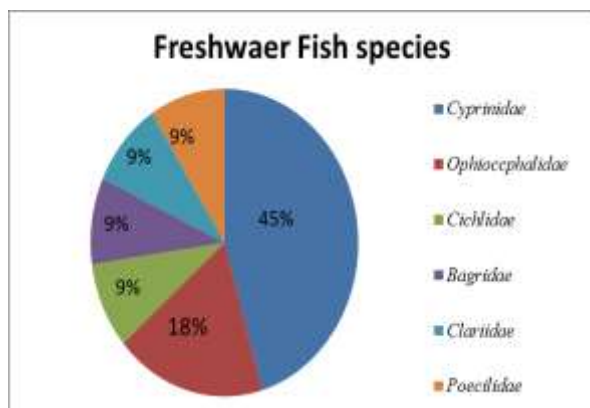


Fig: 1. Diagrammatic representation on family wise fresh water fish composition at Ukkadam Lake

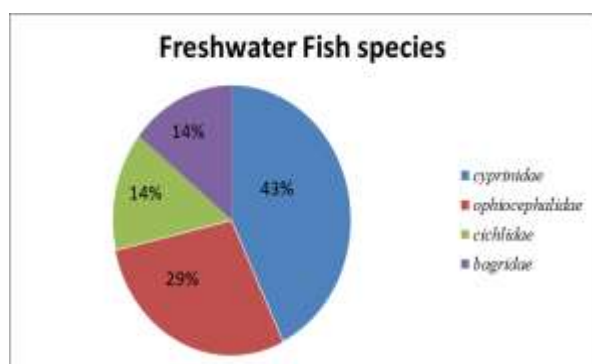


Fig 2: Diagrammatic representation of family wise fresh water fish composition at valankulam lake

Table 2: Fish diversity of Valankulam wetland

S.No	Order	Family	Species
1	Cypriniformes	Cyprinidae	<i>Catla catla</i> <i>Cirrihinus mrigala</i> <i>Labeo rohita</i>
2	Ophiocephaliformes	Ophiocephalidae	<i>Channa marulius</i> <i>Channa punctatus</i>
3	Perciformes	Cichlidae	<i>Oreochromis mossambicus</i>
4	Siluriformes	Bagridae	<i>Mystus vittatus</i>

S.No	Order	Family	Species
1.	Cypriniformes	Cyprinidae	<i>Catla catla</i> <i>Cirrihinus mrigala</i> <i>Labeo rohita</i> <i>Labeo calbasu</i> <i>Labeo bata</i>
2.	Ophiocephaliformes	Ophiocephalidae	<i>Channa marulius</i> <i>Channas triatus</i>
3.	Perciformes	Cichlidae	<i>Oreochromis mossambicus</i>
4.	Siluriformes	Bagridae	<i>Mystus vittatus</i>
		Clariidae	<i>Clarias batrachus</i>
5.	Cyprinodontiformes	Poeciliidae	<i>Gambusia affinis</i>

4. DISCUSSION

The results of the present study revealed the occurrence of 11 fish species belonging to 6 families and 5 orders were recorded from the Ukkadam Lake. The order cypriniformes was dominant with 5 fish species followed by ophiocephaliformes 2 and siluriformes with 2, followed by order perciformes 1 fish species. During the present investigation in the Ukkadam wetland the order of dominance was as follows. Cypriniformes > ophiocephaliformes > siluriformes > perciformes > cyprinodontiformes. The family cyprinidae was represented by 5 species namely catlacatla, cirrhinusmrigala, labeorohita, labeocalbasu and labeobata. The family ophiocephalidae was represented by 2 species namely channamarulius and channastriatus. The order siluriformes was represented by 2 species namely mystusvittatus and clariasbatrachus. The family poecilidae was represented by 1 species namely gambasiaaffinis. The diversity of Valankulam Lake comprises of 4 families namely cyprinidae, ophiocephalidae, cichlidae and bagridae. The sequence of dominance of encountered families is as follows: Cyprinidae > ophiocephalidae > cichlidae > bagridae. On the basis of species richness, order cypriniformes was dominant with (3 species)

followed by ophiocephaliformes (2 species) perciformes (1 species) and siluriformes (1 species). The family cyprinidae was represented by 3 species namely catlacatla, cirrihinusmrigala and labeorohita. The family ophiocephalidae was represented by 2 species namely channamarulius and channapunctatus. The family cichlidae was represented by 1 species namely oreochromismossambicus. The order bagridae was represented by 1 species namely mystusvittatus.

The result of the present study will provide future strategies for development and fish fauna conservation in and around the river Noyyal fed wetlands of Coimbatore district, Tamil Nadu. Proper utilization, developing advanced techniques for fish culturing, banning illegal methods of fishing and care for propagation of fish culture and to prevent further depletion of freshwater fish resource will be highly beneficial for the socially and economically poor people of these areas. The physico-chemical characteristics of an aquatic ecosystem undergoes changes due to the action of tides, inflow of domestic and industrial effluent. During rainfall, consequently, the biological characteristics are also likely to change. Rainfall results in the inflow of fresh water from rivers and estuaries (Hale et al., 1995, 1998; Hale and Guardia, 2001). In the present study,

surface water temperature showed variations between stations and increase in temperature was recorded during months of November and February. The surface water temperature in the Nuyal River also showed a corresponding increase even up to Pabundance from Valankulam and Ukkadam of Coimbatore district, about ten kilometers up south from Coimbatore.

Generally, higher pH values may be attributed to sea water mixing and redox variations in sediment and water column; while lower pH values observed during month of November may be due to influx of freshwater and tide action (Panigrahy *et al.*, 1999). When thermal coolant water was released, variations can be attributed to the release of coolant from the power plant. pH has a positive effect on the biotic component on an aquatic ecosystem. Stress in aquatic systems are mostly related to pH and is thought to alter the biochemical changes in the organisms that make up communities, thereby altering the way of the metabolic function (Linton and Warner, 2003). In the present study, the pH values did not show much variation between the stations and a very little difference was noticed between the seasons, if any, due to coolant water released from the power plant.

Table 3. Data on the seasonal variations in the chemical of the Periyakulam pond Coimbatore for a period of 4 months (Oct 2018 to Jan 2019).

Months	pH	DO 1	DO 2	BOD	Carbonates	Bicorbanates	Total alkalinity
October	7.50	3.50	2.90	2.40	2.33	1.90	9.10
November	7.90	2.20	3.30	2.70	2.33	10.20	12.50
December	8.45	1.28	6.60	3.80	2.80	13.20	16.00
January	8.40	1.30	6.00	3.60	2.75	12.80	15.55

Table 4. Data on the seasonal variations in the chemical of the Valankulam pond Coimbatore for a period of 4 months (Oct 2018 to Oct 2019)

Months	pH	DO1	DO2	BOD	Carbonates	Bicarbonates	Total alkalinity
October	8.50	3.48	2.90	2.40	2.33	1.90	9.10
November	7.50	2.25	3.30	2.70	2.33	10.20	12.50
December	8.20	1.29	6.60	3.80	2.80	13.20	16.00
January	8.47	1.30	6.00	3.60	2.75	12.80	15.55

In general, salinity revealed clear seasonal variations with lowest values in the monsoon season, while the higher values of salinity coincided with the November and February months during the study periods. The salinity was higher at less

polluted sites indicating a gradual increase and combined effect of seawater through the creek as observed elsewhere (Padmalal and Seralathan, 1991; Babu *et al.*, 2000). Since the tidal amplitude is comparatively large, the volume of water entering

the system for freshwater run-off is small compared to tidal flushing and could be a result of high salinity zones in the less polluted sites (Hall et al., 1995). Dissolved oxygen recorded a minimum of 0.134 mg/L from Valankulam sites and a maximum of 0.873 mg/L in less Ukkadam sites. This could be due to the H₂S found in solution and gas effervescence originating from the bottom when disturbed (Raman, 1995). The low DO values also indicate that the waters were highly polluted during low tidal cycle, turbulence and, mixing of seawater. Low DO values may be due to the closeness of the sampling stations to the effluent discharge points in the creek, and due to the combined effect of temperature, photosynthetic action and biochemical degradation of wastes entering the freshwater ecosystem from Valankulam and Ukkadam of Coimbatore district (Ganapathi and Raman, 1973).

5. CONCLUSION

The freshwater fish biodiversity in abundance from Valankulam and Ukkadam lake of Coimbatore district, Tamil Nadu. The main aim of study is to know edible and wild fishes of the particular area and its fishery potential. The data obtained in the present is also important in variety of manners such as to know the present status of fish fauna in the local region it is helpful for the researchers as well as fishermen's to get an idea about the tolerance and diversity of fish found in both research study region from Valankulam and Ukkadam and choose exact variety of fish species for the culture so as to get maximum yield. Moreover the results also suggests that the selected wetlands are important as it provide a wide diversity of piscine fauna with good economic potential and highly significant from fisheries point of view for the fishermen living in its vicinity. Proper utilization, developing advanced techniques for fish culturing, banning illegal methods of fishing and care for propagation of fish culture and to prevent further depletion of freshwater fish resource will be highly beneficial for the socially and economically poor people of these areas. In the light of present study of wetland of Coimbatore District, Tamilnadu it is time to conserve, protect, make proper policies and take necessary steps to implement so that the future generation can get the fishes lively on earth rather than photographs in literature.

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