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Fish Diversity in Huchharayanakere, Shikaripura, Shivamogga District, Karnataka, India

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Abstract

Fresh water wetlands are fragile ecosystems, which are fast deterioring and shrinking due to manmade activities. The fish composition of Huchharayanakere of Shikaripura was studied for a period of twelve months from January to December 2015. The icthyo-faunal diversity of this pond confirmed the occurrence of 13 species of fishes belonging to 5 families. The family Cyprinidae represented by 9 species. Families Anabantidae, Bagridae, Clupeidae and Notopteridae were represented by only a single species. Simultaneously the physico-chemical condition of the water body revealed that water quality is suitable for fish culture. The study of fish fauna of an

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aquatic body is useful for planning of fisheries development. The pond needs proper management and utilization of this fish wealth and sustainable steps to monitor and conserve the fish health. The present study revealed that Huchharayanakere of Shikaripura harbors wide varieties of fish with economic importance in local and global trade. The study will provide future strategies for development and fish conservation.

Keywords: Fish diversity, Huchharayanakere, Shikaripura, Shivamogga, Karnataka

1. Introduction

Wetlands are one of the world's key natural resources. It is the transition between land and water and are the most productive ecosystems in the world. The biodiversity of the wetland ecosystem is variable in the world; it encompasses the range of living things, the degree of genetic variation, and the wealth of different habitats within a particular ecosystem. The wetland habitat is distinct from any other land-based terrestrial habitats and the organisms of this ecosystem face specific environmental problems. However, most of these problems are overcome through the development of a plant or animal's distinctive behavior. These wetland species are visible in different climatic regions due to their typical characteristics in various parts of the world; they are not confined to certain areas or particular zones of latitude as are most of the great global biomes, such as rain forest, savanna, and desert area. As a consequence, wetlands are a great source of global biodiversity within the major climatic belts due to the evolved collection of animals and plants.

Fresh water wetlands are fragile ecosystems, which are fast deteriorating and shrinking due to manmade activities. India has 65,000 wetlands covering an area of 4.5 million hectares [1]. Barring few studies on the ichthyofauna of few reservoirs, rivers, tanks and in estuaries, no scientific observations have been carried out Karnataka to assess the status of fish and fishery potentials, prepare a list of threatened species and enforce conservational measures.

There is an urgent need to undertake the study of other small wetlands, spread across different countries. The present study was undertaken to investigate certain physico-chemical parameters as well as assessment of the fish diversity.

2. Materials and Methods

2.1 Study area

Huchharayanakere is one of the oldest and medium largest perennial tanks. The tank was constructed about 400 years ago. The pond is located in Shikaripura taluk, Shivamogga district. The water spread area of the tank is 0.242 Sq km maximum depth is 5 meters with an overage. The longitudinal length of the tank is 1200.00 meters circumference 182300.00 meters and gross storage capacity in area is 280.00 MCFT.

2.2 Water sampling

The water was analyzed for physico-chemical characteristics, collected between 7 to 9am once a month. During the study period, a water sample measuring 2 liters was collected for the analysis of physico-chemical parameters.

2.3 Water analysis techniques

Immediately after collection of water samples, each sample bottle was labeled and brought to the laboratory for analysis. The water temperature was recorded at sampling site itself. Dissolved oxygen was fixed on the spot itself in BOD bottles. Other physico-chemical parameters were analyzed within 24 hours. Standard methods were adopted for the analysis of water samples [2].

2.4 Fish samples collection

The fishes were collected with the help of fisherman by repeated netting from selected localities during the study period from January to December 2015. Fishes were photographed at first for documentation of the fresh color and then preserved in 10% formalin. Fishes brought to the laboratory were fixed in the

solution in separate jars according to the size of fishes. Smaller fishes were directly placed in the formalin solution while, larger fishes were given an incision on the abdomen before they were fixed.

2.5 Fish identification

Identification of fishes is based mainly on external characters such as body shape, length, mouth, scales and nature of fish spines. Systematic identification of fish species were carried out by using the standard keys of Jayaram and Jhingran [3].

2.6 Conservation status and relative abundance

Red list of threatened fish species was made according to the report by IUCN (2014). The relative abundance of the fish was classified in to three categories: Abundant (+ + +) which constitute 71-100% of total catch, Moderate (+ +), which constitute 36-70% of the total catch Rare (+), which constitute 1-35% of the total catch, assuming the fish proportion remains constant for each catch.

3. Result and Discussion

The results of physico-chemical parameters are given in Table 2 & 3 and are depicted in plate 1.

3.1 Temperature

Temperature is one of the most important factors in the aquatic environment [4].Temperature plays a crucial role in physico-chemical and biological behavior of an aquatic system [5]. The temperature of Huchharayanakere ranges between 21-25.5°C. The maximum temperature was recorded during summer season and minimum was recorded during winter season. Generally water temperature correspond with air temperature indicating that the samples collected from shallow zone has a direct relevance with air temperature, shallow water reacts quickly with changes in atmospheric temperature [6-8].

3.2 Turbidity

Turbidity is the measure of the light scattered by suspended particles. It is due to the substances not present in the form of solution. Clay, silt, organic matter, phytoplankton and other microscopic organisms cause turbidity in pond water [9]. Light penetration is also highly affected by turbidity. Turbidity in Huchharayanakere recorded ranges between 10-39.7. The maximum turbidity in water was recorded during monsoon season and minimum turbidity was recorded during summer season.

High turbidity in pond water during monsoon season is due to addition of sand, clay, silt, dung and various other pollutant along with rain water from the surrounding area into the pond [10-12]. High turbidity during monsoon season is due to inflow of storm water from the surrounding area [13].

3.3 Total Dissolved solids

In natural water dissolved solids are composed mainly of carbonates, bicarbonates of calcium, magnesium, sodium, potassium, iron and manganese etc. Total dissolved solids denote mainly the various kinds of mineral present in the water. Dissolved solid do not contain any gas and colloids. The amount of total dissolve solid in Huchharayanakere ranges between 40-80 mg/L. The maximum amount of total dissolve solid was recorded during monsoon season and minimum was recorded during winter. The high value of TDS during monsoon may be due to addition of domestic waste water, garbage and sewage etc. in the natural surface water body. Indeed, high concentration of TDS enriches the nutrient status of water body which has resulted into eutrophication of aquatic ecosystem [5, 14].

3.4 Dissolved Oxygen (DO)

Dissolved oxygen affects the growth, survival, distribution, behavior and physiology of shrimps and other aquatic organisms [15]. The principal source of oxygen in water is atmospheric air and photosynthetic planktons. Obtaining sufficient oxygen is a greater problem for aquatic organisms than terrestrial ones, due to low

solubility of oxygen in water and solubility decreases with factors like- increase in temperature; increase in salinity; low atmospheric pressure, high humidity, high concentration of submerged plants, plankton blooms. Oxygen depletion in water leads to poor feeding of fish, starvation, reduced growth and more fish mortality, either directly or indirectly [16]. The amount of dissolved oxygen in Huchharayanakere ranges between 6.6-8.5 mg/L.

3.5 Biochemical oxygen demand (BOD)

BOD is the measurement of total dissolved oxygen consumed by microorganisms for biodegradation of organic matter such as food particles or sewage etc. The excess entry of cattle and domestic sewage from the non point sources and similarly increase in phosphate in the village ponds may be attributed to high organic load in these ponds thus causing higher level of BOD [17]. The amount of total BOD in Huchharayanakere ranges between 1.2-2.3 mg/L.

3.6 Alkalinity

Alkalinity is the water's ability to resist changes in pH and is a measure of the total concentration of bases in pond water including carbonates, bicarbonates, hydroxides, phosphates and borates, dissolved calcium, magnesium, and other compounds in the water. Lime leaching out of concrete ponds or calcareous rocks, photosynthesis, denitrification and sulphate reduction is mainly responsible for increasing alkalinity while respiration, nitrification and sulphide oxidation decrease or consume alkalinity [18, 19] and to a lesser degree it increases due to evaporation and decomposing organic matter. But if the alkalinity is low, it indicates that even a small amount of acid can cause a large change in our pH. The amount of total alkalinity in Huchharayanakere ranges between 25-47 mg/L.

3.7 Chloride

Chlorine (Cl) is a gas which is added in water as a disinfectant to control harmful bacteria and Chloride is the same element found in

the form of a salt, both have dramatically different chemical properties. Chloride is a common component of most waters and is useful to fish in maintaining their osmotic balance**.** The amount of chloride in Huchharayanakere ranges between 18-46 mg/L.

3.8 Fish diversity

13 fish species belonging to 5 families were recorded (Table 1 & Figure 1). The family Cyprinidae being the maximum (9 species), while Anabantidae, Bagridae, Clupeidae and Notopteridae were represented by a single species each. Puntius genera were found to be abundant when compare to other genera. Species composition of different families is depicted in Table 2. Based on the frequency of sightings after catching, five abundant, five moderate and three rare fishes were recorded. Based on IUCN status, 4 fishes are Not Evaluated, 7 species are Least Concerned, one is Critically Endangered and one is Vulnerable.

It is well known that the environmental conditions play an important role in fish species density. Most of the fishes collected were unevenly distributed within the study area.

4. Conclusion

The present investigation reveals that a slightly seasonal variation occurs in certain physicochemical properties of Huchharayanakere. The water quality parameters are within approximate range as suggested by Anita Bhatnagar and Pooja Devi (2013). Similar work was carried out by Ashashree *et al* (2008) [20] and Sayeswara *et al.* [21, 22]. This study also highlights the rich concentration of fish species which is economically important and of high commercial value.

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Sr.No.	Parameter	Range	Maximum permissible limit
1	Temperature	21-25.5°C	22-34°C
3	pH	6.9-7.7 Mg/L	6.0-8.5
4	Dissolved oxygen	6.4-8.5 Mg/L	1-15 mg/L
5	BOD	1.2-2.3 Mg/L	3-6 mg/L
6	Dissolved carbon dioxide	2.8-8.5 Mg/L	0-10 mg/L
7	Total Alkalinity	25-47 Mg/L	50-200mg/L
8	Total Hardness	30-65 Mg/L	120-180 mg/L
9	TDS	40-80 Mg/L	1500 mg/L
10	Chlorides	18- 46 Mg/L	250

Table 2 Physico-chemical parameters (Range and Maximum permissible limit)

Parameters	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Temperature	21	22.4	27	28	25.5	22	22.6	24.2	24.1	23	23.1	22
Turbidity	10	9.5	13.2	12.6	13.7	39.7	59.8	32	33	24	17	18
pH	7.7	6.9	7.3	7.2	7.0	7.0	7.1	7.3	7.2	7.6	7.0	7.4
DO	7.5	7.2	7.0	8.2	8.0	6.4	6.9	7.8	7.1	7.4	6.8	8.5
BOD	1.5	1.8	2.0	2.3	1.9	1.7	1.2	1.5	1.8	1.6	1.3	0.9
CO2	3.2	2.8	3.3	3.5	5.2	4.7	4.3	6.5	6.4	8.5	6.4	4.8
TA	25	35	33	47	36	42	38	33	31	37	39	45
TH	65	55	52	50	42	40	38	35	30	41	39	42
TDS	40	55	66	70	75	79	80	73	71	63	59	46
Chloride	18	18.9	35	46	30	32	30	29	27	23	21	19.1

Table 3 Physico chemical parameters of pond water year wise

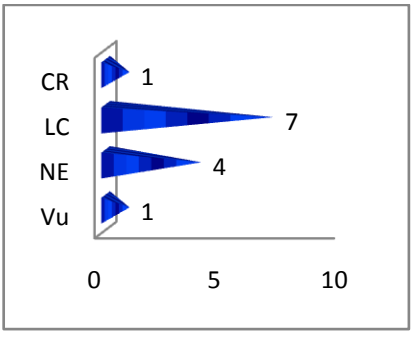

Figure 1: Fish diversity of Huchharayanakere

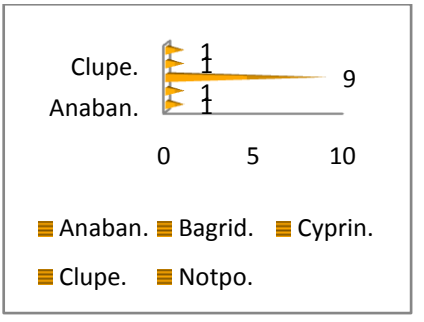

Figure 2: Species composition of families

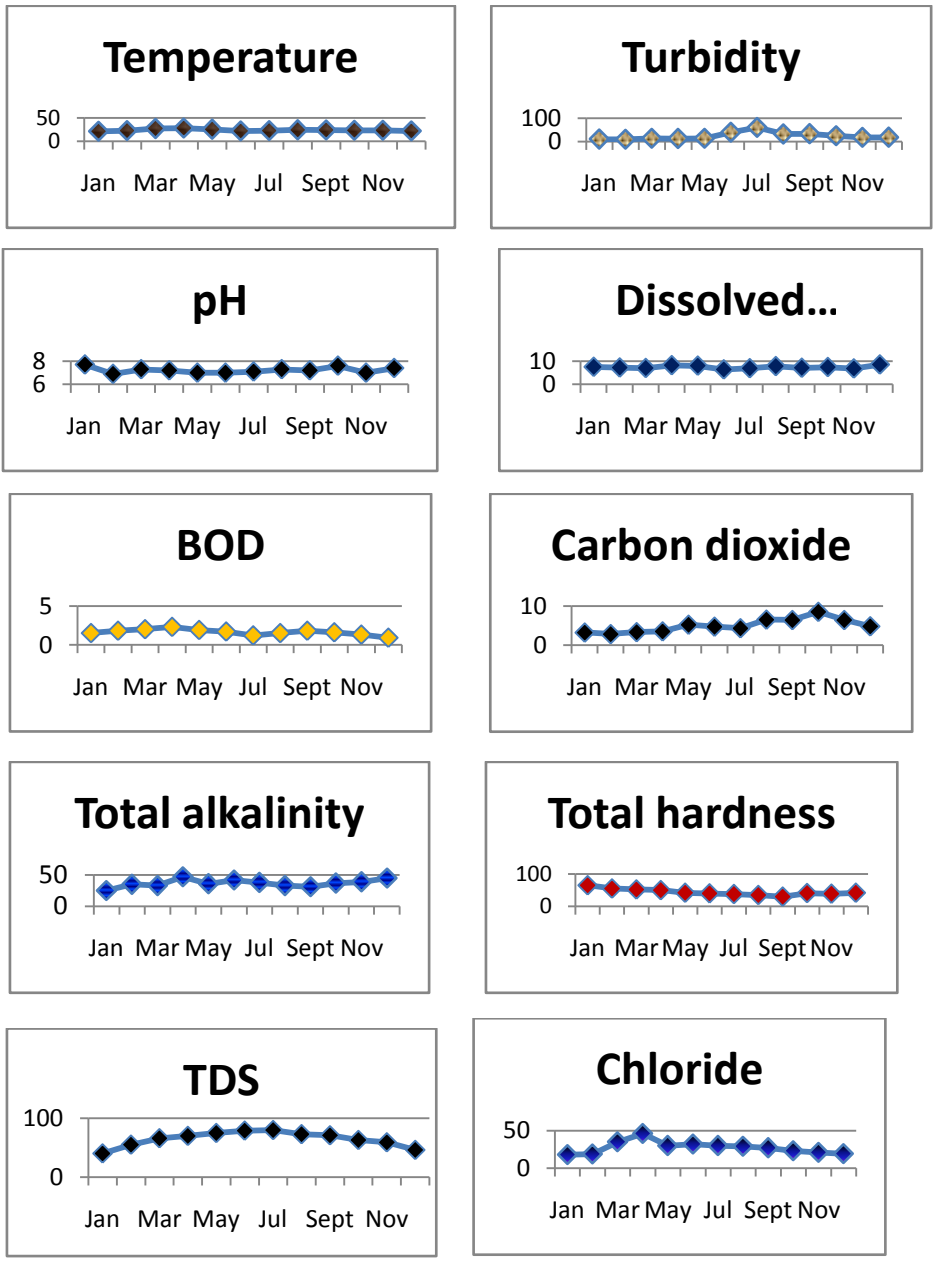

Plate 1: Monthly variations of Physico-chemical parameters