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Fish composition in a Fresh water body of Shivamogga taluk, Karnataka: A Case Study in Sogane Tank

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Abstract

The present study was undertaken to study the fish diversity of Sogane tank of Shivamogga, Karnataka. About 19 fish species were identified in this tank which were represented by 5 orders, 10 families and 16 genera. The family Cyprinidae dominated by 09 species followed by Siluridae with 02 species in this tank. Among fish orders, 09 species belong to Cypriniformes, 05 species to Siluriformes, 03 species to order Perciformes and ultimate 1 species to orders Osteoglossiformes and Cyprinodontoformes respectively. According to Biodiversity status of fishes is concerned 01 species belonged to Endangered; 03 species included under Lower risk - least concern; 08 belongs to Lower risk-near threatened; 05 included as vulnerable and 02 species are categorized as Not assessed. The study of fish fauna of an aquatic body is useful for planning of fisheries improvement. The water quality of this tank was analyzed to study its influence on fish.

The nature has endowed with a wealth *ie*., biodiversity and its environment, that's essential for the lifestyles to maintain on this earth. Biodiversity is the range and variability of flora, animals and microorganisms in its environment. India is endowed with a considerable expanse of open inland water. There are about 31,53,366 hectare reservoirs, 2,02, 213 hectare lakes, 2200, 000 hectare ponds, besides 29, 000 km duration of rivers[21]. India represents approximately 11.72% of fish species consisting of 23.96% genera, 57% families and 80% orders of the arena [6]. There are about 2,500 species of fishes in India, of which 930 belong to freshwater, 1,570 species are marine[7].

Fishes exhibit great variety in terms of their morphology, habitat and biology[8]. Fish can be used for ecological assessments in any respect stages of organic employer, assessment methods are available at the levels of ecosystem, populations, individuals, organs and at the cell and molecular stages[9]. Besides to these credit, fishes are taken into consideration as one of the important protein rich meals source some

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of the aquatic fauna[22] . In India, fish tradition is practiced more often than not in ponds/tanks because pond range is represented via a number of aquatic plants and animals including plants, plankton, weeds and diverse bottoms residing forms. Freshwater ponds and reservoirs contain a essential thing of the atmosphere in growing countries on the grounds that they provide a excessive degree of public interface. For the closing to a few a long time numerous investigators have studied the hydrobiological profiles of various lentic bodies (ponds, reservoirs, lakes) with the cause to assess the water fine[10,19-20].

Physico-chemical study of water help in understanding the structure and function in relation to its habitats. Abundance of particular element might suggest the type of organism that may be found as well as indication of ecologically unfavorable ecosystem which can have negative or positive impact on the population *i.e.* high concentration of nitrate or phosphate is indicative of eutrophication[15,16].

Recently, Arunachalam *et al.*[3]; Venkateshwarlu *et al.*[26,27], Shahnawaz *et al.*[18] mentioned fish diversity in some rivers of Karnataka. But as some distance as pond/tank fish variety is involved, little facts is to be had. Venkateshwarlu *et al.*,[28] suggested biodiversity of fish fauna of Mudigodu tank and Venkateshwarlu *et al.*[25] stated diversity of fish fauna in Keladi pond, Karnataka. Therefore, it is the want of the hour to observe the fish range which will boom our national economy on clinical basis. Keeping the above in view, the prevailing have a look at has been undertaken.

Sogane tank is situated at Latitude of 13° 55' N, Longitude 75° 50' E within the Shivamogga taluk at the space of 10 km. Field investigation turned into achieved for a length of three hundred and sixty five days from February 2018 to January 2019. Fishes were accrued via using monofilament and multifilament gill nets of numerous mesh sizes ranging from 6-15 mm, dragnets, scoop nets and solid nets. Fishes were examined, counted and few specimens (5-10) which had been preserved in buffered formalin (10%) and transported cautiously to the laboratory for similarly analysis. Fishes have been identified based on the keys for fishes of the Indian subcontinent[12,24].

The water sampling changed into accomplished at some point of morning hours between 9.00 10.30to A.M. For physico-chemical evaluation, water samples had been accrued in a thousand ml plastic bottles. The water temperature was recorded at the sampling website online itself. Dissolved oxygen became fixed immediately itself in BOD bottles. Various parameters like unfastened CO_2, alkalinity, BOD, phosphate, nitrate, total hardness, Ca, Mg, TDS and Chloride were predicted as in line with the standard strategies[2].

Statistical analysis :

One-Way ANOVA and Tukey HSD data for density of fishes in Sogane tank is carried out by using statskingdom.com software.

An overall of 19 species of fishes represented by means of 05 orders, 10 families and 16 genera were recorded within the Sogane

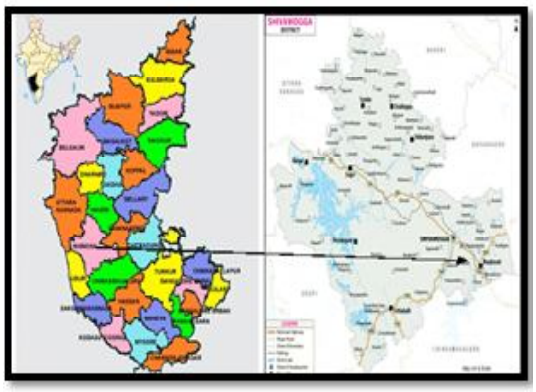

Figure 1. Study area map

Figure 2. Coracle with oar and gillnets used by the fishermen for fish catching

tank (Table-1). Out of 19 fish species, 09 species belong to order Cypriniformes, 05 species to Siluriformes, 03 species to order Perciformes and ultimate 1 species to orders Osteoglossiformes and Cyprinodontoformes respectively. The circle of relatives Cyprinidae is dominated the the fish fauna in this water body. The outcomes are in confirmatory with Wakid and Biswas[30]. The equal observations were additionally made with the aid of Venkateshwarlu *et al*.[25].

Table-1. List of fishes from Sogane tank

Order: Osteoglossiformes Family: Notopteridae	
1	*Notopterus notopterus*
Order: Cypriniformes Family: Cyprinidae Subfamily: Cyprininae	
2	*Cyprinus carpio communis*
3	*Cirrhinus fulungee*
4	*Catla catla*
5	*Labeo rohita*
6	*Cirrhinus reba*
7	*Labeo calbasu*
8	*Cirrhinus mrigala*
9	*Salmophasia sp*
10	*Puntius chola*
Order: Siluriformes Family: Bagridae	
11	*Mystus cavasius* (Hamilton-Buchanan)
Family: Siluridae	
12	*Ompok bimaculatus* (Bloch)
13	*Ompok pabo* (Hamilton-Buchanan)
Family: Claridae	
14	*Clarias batrachus* (Linn)
Family: Heteropneustidae	
15	*Heteropneustes fossilis* (Bloch)
Order: Perciformes Family: Cichlidae	
16	*Oreochromis mossambicus* (Peters)
Family: Gobidae	
17	*Glossogibius guiris* (Hamilton-Buchanan)
Family: Mastacembelidae	
18	*Mastacembelus armatus* (Lecepede)
Order: Cyprinodontiformes Family: Poeciliidae	
19	*Gambusia punctata*

The four foremost species of carps had been located like Catla, Rohu, Mrigal and Cyprinus carpio. Based on the fish length, the gathered fish species may be divided into big

fish, medium fish and small sized fish. In the fish assemblage the big fishes are *Cyprinus carpio* (2500gm and above), *Labeo rohita, Catla catla, Cirrhinus mrigala* and *Clarias batrachus*. In the medium class fishes include are (1.5 kg and beneath) *Cirrhinus fulungee*, *Ompok bimaculatus*, *Cirrhinus reba, Ompok pabo, Mystus cavasius, Notopterus notopterus, Glossogibius guiris, Labeo calbasu, Oreochromis mossambicus* and *Mastacembelus armatus*. The small fish includes *Puntius chola* of length approximately 30-150 gm. Fish species abundance and prevalence is proven inside the Table-2. Out of 19 species recorded from the tanks, 16 are indigenous and final 3 species are exotic along with *Catla catla, Labeo rohita* and *Oreochromis mossambicus*. Among the fish composition eight species (*Notopterus notopterus, Cirrhinus fulungee, Cirrhinus reba, Mystus cavasius, Heteropneustes fossilis, Oreochromis mossambicus, Channa punctatus* and *Mastacembelus armatus*) were observed to be the maximum abundant and relaxation of the species had been considerable and seldom discovered inside the water our bodies. The Sogane tank is natural and constantly gets water from the Bhadra channel, where *Catla catla* and *Labeo rohita* percentage trap was less. In this tank *Mystus cavasius* predominant followed by *Notopterus notopterus* respectively. The fish species recorded up to now were all economically essential and having high commercial significance.

Figure 3. Fishes of Sogane tank

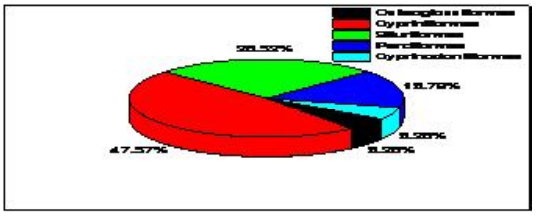

Figure 4. Percentage occurrence of fish orders in Sogane tank

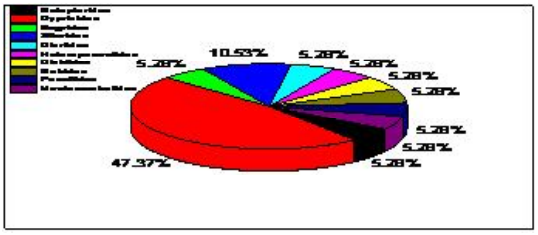

Figure 5. Percentage occurrence of fish families in Sogane tank

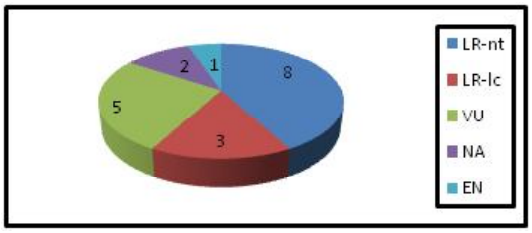

Figure 6 : Biodiversity status of fishes in Sogane tank (EN = Endangered; LR- Ic= Lower risk - least concern; LR- nt = Lower risk-near threatened; VU= Vulnerable; NA = Not assessed)

The fish species recorded to this point were all economically crucial and having high commercial importance. Kumar[14] pronounced 51 fish species of 9 families in Govindsagar reservoir, Himachal Pradesh, out of which almost all had been commercially vital. The present fish take a look at has additionally proven that most of fish species recorded were predatory in nature. Sukumaran and Das[23], Kiran and Nagaraj Parisara[13] have also made the identical observation and stated that majority of the reservoirs of Karnataka have a large population of predatory fish species. As some distance as biodiversity status[11] is involved, out of 19 species, 01 species is endangered, 08 species as lower risk-near threatened , vulnerable 05 species , lower risk least concern is 03 and 02 are covered below the class of Not assessed (Fig. 6).

Table-2. Fishes of Sogane Tank with their abundance biodiversity status and economic status

Species	Abun-dance	Biodi-versity Status	Econo mic Status
Notopterus notopterus	A (3-4)	LR-nt	Less
Cyprinus carpio *	A2	LR-lc	High
Cirrhinus fulungee	A (3-4)	LR-nt	High
Catla catla	A2	VU	High
Labeo calbasu	A2	LR-nt	Less
Labeo rohita	A2	LR-nt	High
Ompok pabo	A2	NA	Less
Cirrhinus reba	A (3-4)	VU	Less
Mystus cavasius	A (3-4)	LR-nt	Less
Ompok bimaculatus	A2	EN	High
Cirrhinus mrigala	A2	LR-nt	High
Clarias batrachus	A2	VU	Less
Heteropneustes fossilis	A (3-4)	VU	Less
*Oreochromis mossambicus**	A (3-4)	NA	High
Glossogibius guiris	A2	LR-nt	Less
Mastacembelus armatus	A (3-4)	LR-nt	Less
Puntius chola	A2	VU	Less
Salmophasia sp.	A2	LR-lc	High
Gambusia affinis	A1	LR-lc	Less

Abundance: A2-abundant, A (3-4) - Most abundant, EN= Endangered; LR- Ic=Lower risk least concern; LR- nt = Lower risk-near threatened; VU= Vulnerable; NA = not assessed. *=Introduced species

Physico-chemical parameters :

The physicochemical variables of each the water bodies showed effective correlation and had been wealthy in organic materials, because of elevation in sedimentation amount, then without delay promote the boom of macrophytic plants . This led to discount in water preserving capacity and reduce intensity of water in tank. Therefore, it's far indicated that both the water our bodies are suitable for fish way of life.

Air temperature and water temperature ranged from 25.50-33.0^{O}C respectively. Mean water temperature is located to be lower than air temperature that's attributed to much less heating of the ponds. The pH values (6.9- 8.4) didn't show a precise seasonal surge and excessive fee was recorded in the course of March and low in October inside the tank. This can be because of turbidity of water which in flip reduce photosynthetic pastime of algae leading to accumulation of CO_2 and subsequently reduction of pH[1].

Dissolved Oxygen (DO) suggests physical, chemical and organic sports in a water body. It is an crucial indicator of water great. DO affect the solubility and availability of many vitamins and consequently productiveness of aquatic ecosystems[31]. In the present study, DO values had been located to be greater than 4.8 mg/l, which suggests that the wetlands are top-quality for aquatic life. The low values of BOD indicate the low levels of biodegradable substances and lack of non-biodegradable substances. The chloride ranged 10.14-36.5 mg/l, which suggests that water seems to be appropriate for irrigation functions. A decrease trend inside the chloride content in each the ponds for the duration of winter season may be related to the absence of dilution effect of water. Biologically critical nutrient.

Phosphate fluctuated 1.8- 6.14 mg/l and displaying its maximum range throughout wet season indicating the influx of rain water containing fertilizers from the encompassing agricultural fields. Sulphate concentration of the ponds became found to be beneath permissible limits and version in sulphate content in ponds is probably due to variable natural enter. Total hardness (mg/l $CaCO_3$) and total alkalinity were found to be low and ranged from 30.50 to 90 mg/l and 32.30 to 36.40 mg/l respectively and such water our bodies can be taken into consideration as smooth. Acidity varied from 6.05 to 30.0 mg/l all through the take a look at . The concentration of NO_3 fluctuated from 0.30 to 0.70 mg/l and variant.

Shanawaz *et al*.[17] and Venkateshwarlu *et al*.[29] have reported the fish diversity in two lentic water bodies of Shimoga district. Ashashree and Kiran[4] have studied the physico-chemical parameters and biotic communities of Hosahalli pond of Shivamogga district, Their results have revealed that the Hosahalli pond is contaminated due to human conflict, entry of domestic waste and agricultural runoff from the nearby area. Ashashree and Kiran[5] have assessed the physico-chemical and fish composition characteristics of water in in Tammadihalli tank of Bhadravathi taluk, Karnataka. Water quality in Tammadihalli tank is influenced by hydrology, topography and other environmental factors, which cause variations in nutrients. The physico-chemical analysis of water samples from this tank showed that the water is within the safe limits

Table-3. One-Way ANOVA and Tukey HSD data for density of Fishes in Sogane tank

Source	DF	Sum of square	Mean square	F statistic	P-value
Groups (between groups)	3	233.7368	77.9123	1.791	0.1566
Error (within groups)	72	3132.2108	43.5029		
Total	75	3365.9476	44.8793		

of drinking, irrigation and fisheries.

One way ANOVA test, using F distribution df (3,72) :

Since p-value > α, H_0 is accepted.The averages of all groups assumed to be equal. p-value equals **0.156551**, [p(x≤F)=0.843449]. It means that if we would reject H_0, the chance of type1 error (rejecting a correct H_0) would be too high: 0.1566 (15.66%).The bigger the p-value the stronger it supports H_0. The test statistic F equals **1.790966**, which is in the 95% region of acceptance: [-∞ : 2.7318]. The observed effect size f is **medium** (0.27). That indicates that the magnitude of the difference between the averages is medium. The η^2 equals 0.069. It means that the **group** explains 6.9% of the variance from the average (similar to R^2 in the linear regression). There is no significant difference between the means of any pair.

The study of fish diversity and analysis of the physico-chemical parameters of Sogane tank of Shivamogga District, Karnataka revealed that all water quality parameters of this tank is under permissible limits and are rich in fish fauna diversity. However, it is recommended to monitor regularly this tank in order to conserve fish faunal diversity.

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