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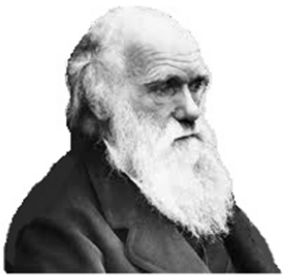

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Study of Ichthyofauna, Fish Population and Homogeneity in Sant-Sarover Pond, Mount-Abu, Rajasthan, India

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ABSTRACT

The management of biodiversity in an aquatic ecosystem is considered as one of the leading concern of enabling sustainable use of natural resources. Fishes have a broad impact on the survival and prosperity of other living creatures in their habitat. Diversity in freshwater fishes and its richness in Sant-Sarover Pond, Mount Abu were studied in the period of 2018-2019 in five different sampling sites. The present study deals with the total number of précised fish population, species dispersion patterns and homogeneity in Sant-Sarover Pond. The pond exhibits nearby eight fish species which indicates that the pond supports eternal fish inhabitants. The variety in fish population in Sant-Sarover Pond is a significant marker of enormous diversity in an aquatic ecosystem, as an outcome it pursue vast range of survival conditions.

***Keywords*:** Quadrat, Demography, Ichthyofauna, Sant-Sarover, Mount-Abu, *Aorichthys seenghala, Carassius auratus, Catla catla, Labeo gonius, Labeo rohita, Puntius sarana, Gambusia affinis, Heteropneustes fossilis*

1. INTRODUCTION

Sant-Sarover Pond (Mount Abu) is an important water reservoir of the city. The beauty of the pond is its presence bounded by hills of Aravali mountain range. It fulfills annual drinking and other water needs of the endemic species of the mountain range. In a fresh and marine water ecosystem, fishes play a significant character. Fish controls the population of planktons by consuming it as food, and exploited as prey for animals on higher trophic level in an ecosystem.

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It is indecisive to calculate the exact estimation of fish population, without stocking them in reservoir with known numbers, or fishes are counted openly by draining out water from the waterbody. Usually fishes may have colonies, cyclic, irregular or migratory movements, or other ethological patterns which effect vulnerability in sampling.

2. MATERIALS AND METHODS

2. 1. Study Area

Figure 1. Total area by GIS of Sant-Sarover Pond, Mount-Abu

Figure 2. GIS view with zone and site specifications of Sant-Sarover, Mount Abu

Sant-Sarover Pond is situated at Delwara; Mount Abu, highest peak of Aravali mountain range in Rajasthan. The pond is annually filled by rainwater, and chosen for study of ichthyofauna and fish demography and homogeneity. The total surface area of Sant-Sarover Pond is 5,234.08 m^2 identified by GIS tool (**Fig. 1**) with a depth of 25-30 feet, it is also an important asset to fulfill the need of water for endemic species in that habitat.

Location: Latitude 24.36° N, Longitude 72.43° E

City: Mount Abu

State: Rajasthan

Country: India

Max. Depth: 25-30 ft.

2. 2. Sampling Procedure

A quadrat is typically a square area of the same size, can be made by using string or sticks of wood, plastic, or metal. Fishing net quadrat of a definite size with the square area of 10×10 meter was used to regulate population abundance and density within the pond. Once the fishing net quadrat is set up in a particular site, the numbers of fish individuals within the boundary were counted. Quadrat samplings were performed throughout the pond at five random locations, which ensure the recorded numbers of fish individuals for the overall pond. The recorded data of quadrat sampling method was used to evaluate the fish population size and density within the unified pond habitat, the total surface area of the pond is 5,234.08 m^2 identified by GIS tool (Fig. 1). To gauge the total fish population of Sant-Sarover Pond, the pond was classified into five specific sites or regions, on the basis of geography (**Fig. 2**). Further, the samples were collected from five pre-selected sampling sites and their data were calculated to identify the precised population and homogeneity in Sant-Sarover Pond.

3. RESULT AND DISCUSSION

The total number of precised fish population counted in Sant-Sarover Pond was 1,617.29, where the population of small fishes were 586.20, and population of large fishes were 1031.09. From **Table 1**, it results that the total number of small and large fish species found in all five sites of Sant-Sarover Pond was 112 and 197, respectively. Comparative analysis of fish population density in Sant-Sarover Pond indicates that the highest fish's population was found in site-5 (**Figs. 3** and **4**). One of the reasons might be, the continuous food supply to the fish species in that site. The comparative analysis indicates that, there was a wide distribution of small fishes in all sites of the pond (Figs. 3 & 4) due to the avaliblity of planktons and algae as a part of food. The type of dispersion pattern of fish population in Sant-Sarover pond appears to be random dispersion; individuals were distributed or dispersed randomly without any predictable arrangement. The major cause of extinction of most freshwater fishes is due to alteration in habitat. Fish communities differ with different freshwater lake systems; hence fish biodiversity and its conservation can be maintained through the site-specific management.

Ichthyofauna in Sant-Sarover Pond involves 8 to 10 different species of common small carps and large fishes (**Table 2**). In summer and rainy season the fish species are abundantly available in all the sites of the pond and migration of fishes in the summer and rainy season was

more compared to winter season, as the air temperature of Mount Abu varies from –3 to 9 °C in winter, which affects the temperature of surface water, therefore fish species persist at bottom water rather than roaming to surface. Gothwal and Gupta (2018) studied the icthyofauna in Sant-Sarover pond, Mount-Abu, India. Their finding suggested that the fish population in Sant-Sarover pond is having the ability to reduce eutrophication. The variations in the rate of pH also affect the growth rate of icthyofauna in Sant-Sarover pond.

3. 1. Demographic Analysis

Estimation of precised fish population from the sample size in Sant-Sarover Pond, Mount Abu is given in Table 1:

a) Total area of Sant-Sarover Pond (Fig. 1) = 5,234.08.1 m^2
b) Size of selected quadrat is 10 × 10 meter = 100 m^2
c) Total number of quadrat counts available in Sant-Sarover Pond is 5,234/100 = 52.34

Table 1. Number of fishes found at different sites of Sant-Sarover Pond.

S.No	Quadrate Type	No. of fishes (Small)	No. of fishes (Large)
1	Site-1	22	46
2	Site-2	18	34
3	Site-3	26	29
4	Site-4	15	37
5	Site-5	31	51
	Total	**112**	**197**

Sample mean ($\overline{x}$) represents an estimate of the true population mean (μ).

$$\overline{x} = \frac{\sum_{i=1}^{n}(x_i)}{n}$$

where: x_i = Total sample observation of individuals
n = Total sample size (number of plots) = 10.

On the behalf of Table 1:

(A) The total number of Small fishes in sampling observation is 112. Total sample size (number of plots) = 10

$$\frac{\sum_{i=1}^{n}(x_i)}{\bar{x} = n}$$

$$\bar{x} = \frac{112}{10}$$

$$\bar{x} = 11.2$$

Total no. of Small fishes in Sant-Sarover Pond = 52.34 × 11.2 = 586.20 ..... (1)

(B) The total number of Large fishes in sampling observation is 197. Total sample size (number of plots) = 10

$$\frac{\sum_{i=1}^{n}(x_i)}{\bar{x} = n}$$

$$\bar{x} = \frac{197}{10}$$

$$\bar{x} = 19.7$$

Total no. of Large fishes in Sant-Sarover Pond = 52.34 × 19.7 = 1031.09 ..... (2)

Hence, from (1) and (2), the total no. of précised fish population calculated in Sant-Sarover Pond was 586.20 + 1,031.09 = 1,617.29.

Figure 3. Comparative analysis of percentage of fishes in Sant-Sarover Pond

Table 2. List of Fish species identified in Sant-Sarover Pond, Mount Abu during 2018-2019

S.No	Fish Species		Summer					Rainy					Winter				
			Site-1	Site-2	Site-3	Site-4	Site-5	Site-1	Site-2	Site-3	Site-4	Site-5	Site-1	Site-2	Site-3	Site-4	Site-5
	Class: Bagriidae																
	Order: Siluriformes																
1	Aorichthys seenghala		+	+	+	-	+	-	+	+	-	-	+	-	+	+	-
	Class: Cyprinidae																
	Order: Cypriniformes																
2	Carassius auratus		+	+	+	+	-	+	-	-	+	+	+	-	+	+	-
3	Catla catla		-	+	-	-	+	+	+	+	+	-	+	-	+	+	-
4	Labeo gonius		+	-	+	+	+	-	+	-	-	+	-	+	-	-	+
5	Labeo rohita		+	+	-	+	+	+	-	+	+	+	+	-	+	-	+
6	Puntius sarana		-	-	+	-	-	+	-	+	+	-	-	+	+	+	-
	Class: Heteropneustidae																
	Order: Siluriformes																
7	Gambusia affinis		+	-	+	+	-	+	-	+	+	-	+	+	+	+	-
8	Heteropneustes fossilis		+	+	+	-	+	+	+	+	-	+	-	-	+	+	-

Table 3. Contingency table of fishes in Sant-Sarover Pond (Expected ratio 3:1)

S.No	Quadrat	Frequency	Observed Value of	Observed Value of	Total Observed	Degree of	Chi Square
	Type		Large Fishes (fo)	Small Fishes (fo)	Value (fo)	Freedom	(χ2)
1	(Site-1)	fo - Observed frequency	46	22	68	4	1.96
		f_e - Expected frequency	51	17			
		(f_o-f_e)	−5	5			
		(fo-fe)2 /fe	0.49	1.47			
2	(Site-2)	fo - Observed frequency	34	18	52	4	2.56
		f_e - Expected frequency	39	13			
		(f_o-f_e)	−5	5			
		(fo-fe)2 /fe	0.64	1.92			
3	(Site-3)	fo - Observed frequency	29	26	55	4	14.54
		f_e - Expected frequency	41.25	13.75			
		(f_o-f_e)	−12.25	12.25			
		(fo-fe)2 /fe	3.63	10.91			
4	(Site-4)	fo - Observed frequency	37	15	52	4	0.4
		f_e - Expected frequency	39	13			
		(f_o-f_e)	−2	2			
		(fo-fe)2 /fe	0.1	0.3			
5	(Site-5)	fo - Observed frequency	51	31	82	4	7.16
		f_e - Expected frequency	61.5	20.5			
		(f_o-f_e)	−10.5	10.5			
		(fo-fe)2 /fe	1.79	5.37			
Total							**26.62**

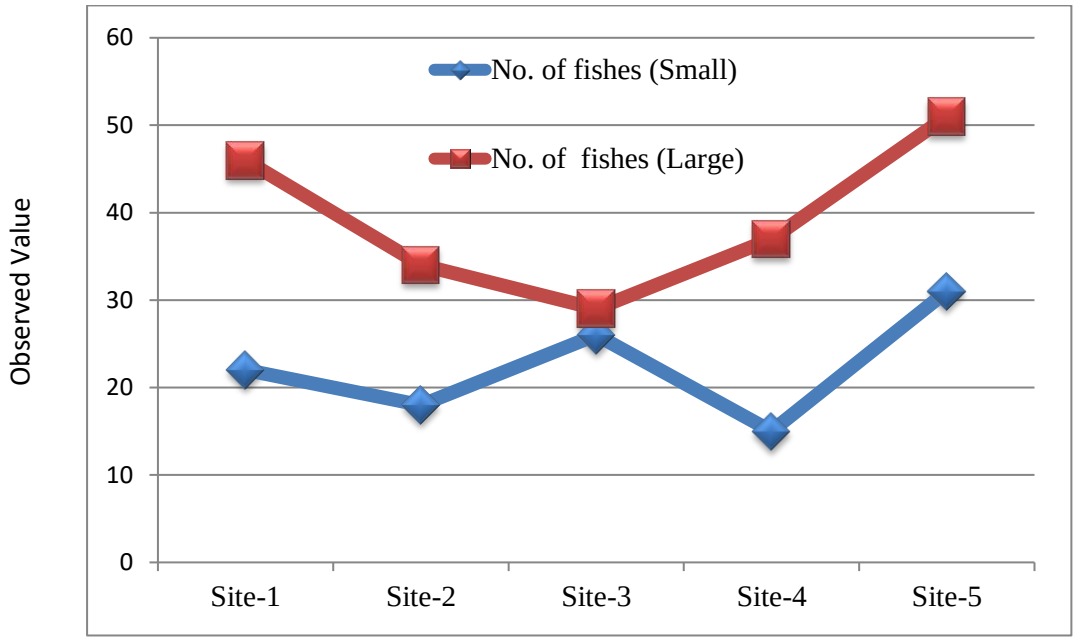

Figure 4. Comparative analysis of population density in Sant-Sarover Pond

Homogeneity in fish population of Sant-Sarover Pond, Mount Abu, India. In the given sampling of fish population from Table 1:

(H_0): Population of small and large fishes are homogenous (accept Null hypothesis)

(H_A): Population of small and large fishes are not homogenous (does not accept Null hypothesis).

4. CONCLUSION

Fishes exhibit a broad impact on survival and prosperity of other living creatures at any water-ecosystem. The present research is relevant to calculate the study of precised number of fishes population and fish species available in Sant-Sarover pond. The homogeneity in fish population (Table 2) illustrates that the calculated Chi-Square value ($\chi 2$) is 26.62 for 4 degree of freedom at 5% level of significance. However, tabulated Chi-Square value ($\chi 2$) is 9.48 for 4 degree of freedom at 5% level of significance. Therefore, the calculated Chi-Square value ($\chi 2$) is more than the tabulated Chi-Square value ($\chi 2$), hence it does not accept null hypothesis.

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