

## STUDIES ON WATER QUALITY AND FISH DIVERSITY OF SADATPUR LAKE IN AHMEDNAGAR DISTRICT MAHARASHTRA

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### ABSTRACT

The present study deals with the water quality and ichthyofauna of Sadatpur lake. Monthly changes in water quality parameters such as temperature, pH, dissolved oxygen (DO), total alkalinity, chlorides, sulphate, phosphate and nitrite have been studied for a period of one year beginning from January 2005 and were investigated to assess the suitability of this lake for fish and fisheries practices. All the physico-chemical parameters determined, revealed that the fluctuations in water temperature, pH, dissolved oxygen, alkalinity and nitrite, were within the desirable limits. On the other hand, chloride and sulphate were lower whereas phosphate was higher than the desirable limits. Altogether 24 fish species belonging to 17 genera and 2 orders were found to be present in the lake. Among fish species family Cyprinidae dominated the lake. The lake subsistence fishery served the need of local fishermen community.

**Key Words :** Sadatpur lake, Water quality, Fish diversity.

### INTRODUCTION

The distribution of aquatic organisms is influenced by physical environment, chemical quality and biological interactions (Hynes, 1960). Changes in quality of water affects aquatic life. Pollution of water caused by various human activities affects fish species (Hidaka and Tatsukawa, 1985). The environmental variability also strongly influences the fish population (Rekhow *et al.*, 1987; Freeman *et al.*, 1988).

In the last few decades much attention is being paid to aquaculture as a source of food to feed the growing population of the country. Fishes constitute the most conspicuous component of inland aquatic fauna and rank very high as a source of proteins. For sustained exploitation and simultaneous conservation of fisheries resources, basic scientific information on

biodiversity is vital (Sone and Malu, 2000; Shendge, 2008). Productions of fish from water bodies basically depend on right selection of cultivable varieties and control of predatory and weed fishes (Sone and Malu, 2000). The study of fish diversity in reservoir used for fish cultivation becomes an essential tool for better fish production. In the field of fish diversity earlier contributions were made by Rao *et al.* (1998), Sharma and Nayak (2001), Sakhare and Joshi (2002), Khedkar (2005), Meshram and Meshram (2005), Muley and Patil (2006), Savalla and Piska (2006) and Sharma and Mehta (2008).

Due to the lack of information on fish diversity and popularizing less known fish variety in Sadatpur lake, there is a need to survey fish fauna, which will help in planning method for their effective exploitation for fish production. Therefore, an attempt has been made to determine physico-chemical

conditions and survey of fish fauna found in the Sadatpur lake and examine how far this lake could be used for fish and fisheries practices.

## MATERIAL AND METHODS

Sadatpur lake is located (between latitude  $19^{\circ} 34$  to  $19^{\circ} 36$  N and longitude  $74^{\circ} 26$  to  $74^{\circ} 27$  E) near Sadatpur village, taluka Sangamner in Ahmednagar district, Maharashtra state. During the study for determining physico-chemical conditions of Sadatpur lake, monthly water samples were collected between 08.00 to 09.00 am over a period of one year from January to December 2005. Water sample were collected in polythene bottle. Temperature and pH were recorded at the time of sample collection using portable kit (Labtronics, LT - 59). For determination of dissolved oxygen, water was fixed in the field and brought to the laboratory in an icebox for further processing. Total alkalinity, chlorides, sulphate, phosphate and nitrite were determined in the laboratory, employing methods described in Golterman *et al.* (1978) and APHA (1985).

Fishes for the present study were collected with the help of fishermen at every month during collection of water sample. The specimens were brought to the laboratory and preserved in 5% formalin solution after noting their original colour and general pigmentation. Identification of fishes was done with the help of standard texts (Datta Munshi and Shrivastava, 1988; Day, 1994).

## RESULTS AND DISCUSSION

Sadatpur lake receives water coming from Pravara irrigation canal every month and rain water during rainy season and remains full, but in summer, water level decreases due

to less amount of water coming from canal.

The water quality of Sadatpur lake presented in Fig. 1 revealed that the surface water temperature was slightly higher than the air temperature in January to April, July to September and November to December. The water temperature ranged between  $19^{\circ}\text{C}$  (February) and  $30^{\circ}\text{C}$  (May) which was within the tolerance limit for most of the cultivable fishes. According to Jhingran and Sugunan (1990) reservoirs having water temperature more than  $22^{\circ}\text{C}$  are found to be highly productive.

Boyd (1982) reported that DO level in warm water habitats should not be less than 5 mg/l. DO level less than 3 mg/l suffocates the animals. In the present study, the DO content varied from 3.29 (May) to 7.84 mg/l (August), which indicated good water quality for fish survival. However, somewhat low level of DO recorded during summer, might be due to depletion of water level and high respiratory activity of the fauna and flora of the lake.

The pH values ranged between 8 (June) and 9.02 (May). The diurnal fluctuation of pH should remain in the range of 6.4 to 8.5 in order to support the optimum fish growth (Das, 1996). The average pH value of Sadatpur lake was 8.49, suitable for optimum fish growth and indicated medium productive nature of lake.

Water having 40 mg/l or more levels of total alkalinity is considered to be more productive than water of lower alkalinity (Moyle, 1945; Maris, 1960). In the present investigation the total alkalinity ranged from 58 to 110 mg/l, being minimum in July and maximum in September indicated medium productive nature of Sadatpur lake.

Higher chloride content was considered as an index of water pollution (Thresh *et al.*, 1944). Munawar (1970) and Saha and Pandit (1986) have reported lower

chloride values in unpolluted ponds. In the present study chloride ranged between 17.58 (April-May) and 21.380 mg/l (November). The comparatively low chloride values might be due to the absence of pollution from animal or

human origin, and also likely to be due to continuous availability of water in Sadatpur lake.

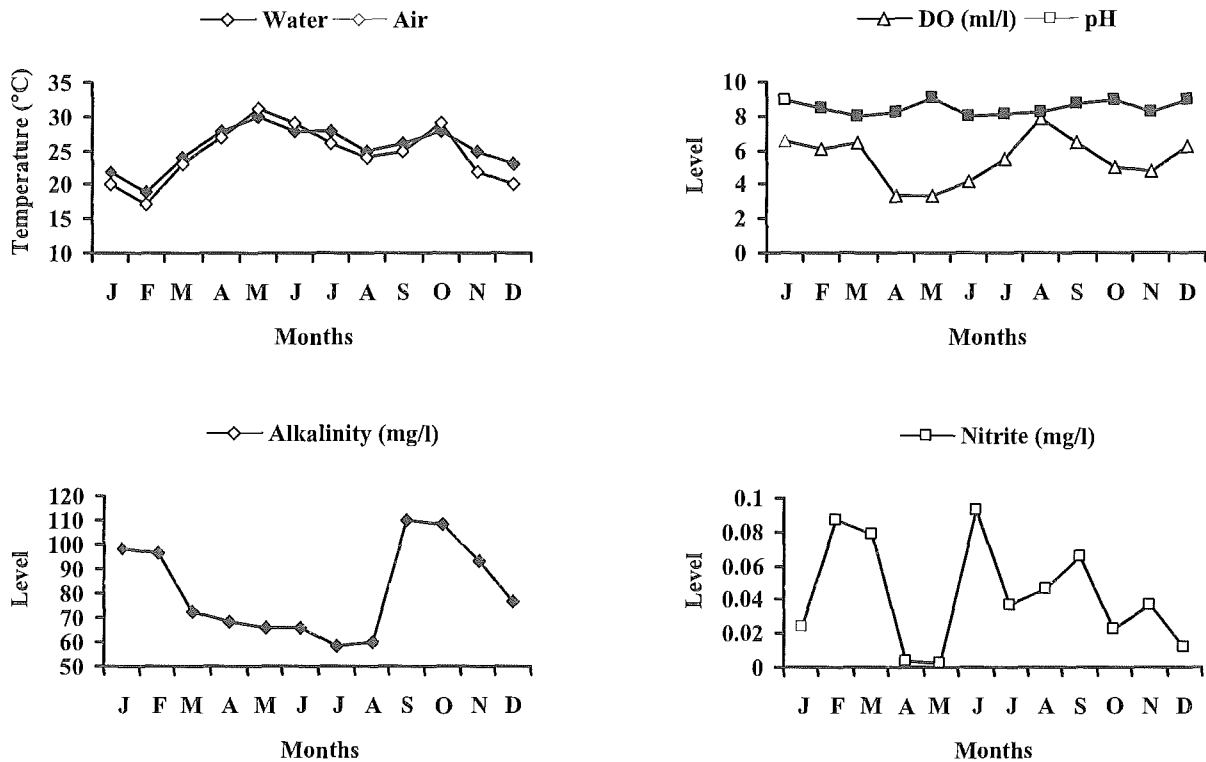


Fig. 1. Monthly variations in the physico-chemical parameters of Sadatpur lake during January to December 2005.lake by feeding canal.

Sulphate ranged between 1.0 and 18.32 mg/l, being minimum in March and maximum in November. Phosphate ranged between 0.2 (September) and 2.256 mg/l (June). Nitrite level varied between 0.002 (May) and 0.093 mg/l (June), suitable for fish and fisheries practices.

The fish fauna is an important aspect of fishery potential of a water body. It was observed that the distribution of fish species is quite variable because of geographical and geological conditions. In the present investigation 24 fish species belonging to 17 genera and 7 families belonging to 2 orders were reported from Sadatpur lake (Table 1). The order Physostomi was dominant with 20

**Table 1 : Systematic fish diversity, feeding habits, relative abundance and economic importance of fish species from Sadatpur lake.**

Name of the fish	Common Name	Feeding habits	Relative abundance	Economic importance
Class : Pisces				
Sub class : Teleostei				
Order – I : Acanthopterygii				
Family – I : Percidae				
1) <i>Chanda nama</i> (Ham.)	Glass fish	W	M	AF, LV
2) <i>Chanda ranga</i> (Ham.)	Glass fish	W	M	CF, AF, LV
Family – II : Gobiidae				
1) <i>Glossogobius giuris</i> (Ham.)	Gobius	P	A	CF, LV
Family – III : Rhynchobdellidae				
1) <i>Mastacembelus armatus</i> (Lacepede)	Fresh water eel	P	A	FF, CO
Order – II : Physostomi				
Family – I : Siluridae				
1) <i>Macrones bleekeri</i> (Bleeker)	Cat fish	P	A	FF, CO
	Cat fish	P	M	CF
2) <i>Macrones malabaricus</i> (Day)	Cat fish	P	M	CF
3) <i>Wallago attu</i> (Schn.)				
Family – II : Cyprinidae				
Sub family – I : Cyprinina				
1) <i>Amblypharyngodon mola</i> (Ham.)	Minnows	H	M	AF, FR, LV
2) <i>Barbus chilinoides</i> (Day)			M	
3) <i>Barbus pinnauratus</i> (Ham.)			M	
4) <i>Chela untrahi</i> (Day)	Minnows		R	CF
5) <i>Cirrhina fulungee</i> (Ham.)			M	
6) <i>Diptychus maculatus</i> (Day)	Gara		M	CF
7) <i>Discognathus modestus</i> (Hackel)	Major carp		A	FF, CO
8) <i>Labeo boga</i> (Bloch)	Chilara	W	A	CF, LV
9) <i>Labeo boggut</i> (Cuv)	Carp	H, W	M	CF
10) <i>Oxygaster bacaila</i> (Ham.)	Minnows	H, W	M	CF, AF, BT, LV
11) <i>Puntius choila</i> (Ham.)	Carp			LV
12) <i>Puntius sarana</i> (Ham.)	Minnows	H, W	A	CF, AF, BT, MV, LV
13) <i>Puntius sophore</i> (Ham.)	Carp			

Sub family – II : Cobitidina				
1) <i>Nemacheilus botia</i> (Ham.)	Minnows	W	R	AF, FR
2) <i>Nemacheilus beavani</i> (Day)		W	R	AF
Family – III : Clupeidae				
1) <i>Chanos salamoneus</i> (Day)			R	
Family – IV : Notopteridae				
1) <i>Notopterus K apirat</i> (Lacep)	Feather back	P	R	FF, MV

- P Predatory fish; H Herbivorous fish; W Weed fish.
- A Abundant; M Moderate; R Rare.
- CF Coarse food; FF Fine food; CO Commercial food.
- LV Larvivorous; MV Medicinal value; AF Aquarium fish; FR Forage fish.

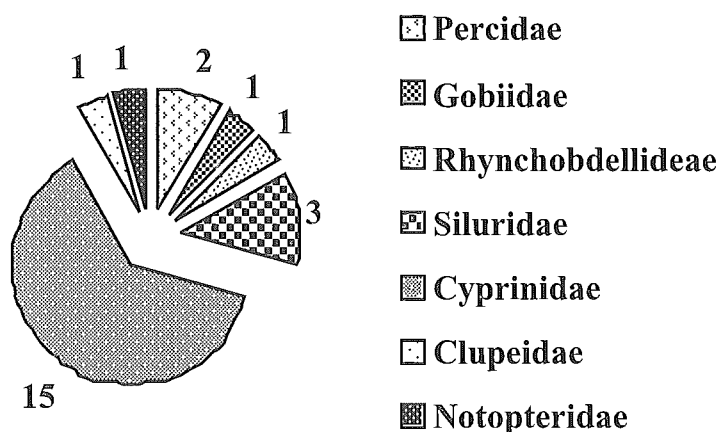


Fig. 2. Number of fish species in a family from Sadatpur lake.

species. Among 7 families (Fig. 2), the family Cyprinidae was dominant with 15 species followed by Siluridae with 3, Percidae with 2 and Gobiidae, Rhynchobdellidae, Clupeidae and Notopteridae with 1 species each. Dominance of fish species belonging to family Cyprinidae was also reported by Ahirrao and Mane (2000), Meshram and Meshram (2005) and Khedkar (2005) from other freshwater bodies.

A good number of fish species availability and there production in Sadatpur

lake may be related to the suitable ecology of water body which provides proper breeding ground for fish. The comparison of water quality of Sadatpur lake with limits laid down by fresh water quality criteria for fish and fisheries practices (Chandra Prakash, 2001), suggest that the water parameters of the lake are within the permissible limit for fish and fisheries practices. However, low level of chloride and sulphate and high level of phosphate were recorded, which need to be brought to favourable limits for fish and fisheries practices.

In the present study, the collected fish species (Table 1) were also classified on the basis of their economic importance (Lagler, 1956). Out of 24 species recorded, only 4 species were found to be commercially important. Six species of fish including 3 commercial fish species were observed to be having food value. Eight species of fish have been classified as coarse food fishes that are of minor importance as food fish but form a substantial protein rich food for the poor people of this region. Seven fish species have ornamental value due to small size and bright colours, suitable for aquarium purpose. Fishes such as *Amblypharyngodon mola* and *Nemacheilus botia*, which form prey to the predators, were classified as forage fish. Seven fish species are useful in public health as larvivorous fishes. Some fishes like *Puntius sophore* and *Notopterus kaptat* are of medicinal value and some are useful as bait. Similar type of results were also recorded by Rao *et al.* (1998) and Sakhare (2001).

Based on the food and feeding habits, the fishes were also classified in to predatory, herbivorous and weed fishes (Table 1). The weed fishes are active competitors with the major carps. They generally consume large quantities of zooplankton, the main food of carp spawn. The young weed fishes directly feed on carp hatchlings and spawn. On the basis of relative abundance (Table 1) the fish species were also classified in to abundant, moderate and rare.

The observations on the Sadatpur lake selected for present study revealed that: 1) The water quality of Sadatpur lake was within the permissible limit for fish and fisheries practices. However, low level of chloride and sulphate and high level of phosphate were recorded, which need to be brought to favourable limits. 2) The occurrence of total 24 fish species indicated good fish diversity. 3) Fishes belonging to

family Cyprinidae dominated the lake. 4) In order to carp culture, the population of predatory and weed fishes should be under control. But Sadatpur lake is a large water body. The entry of predatory and weed fishes in the lake is also unavoidable since it receives water by canal every month. Therefore, it is suggested that for carp culture the application of advanced techniques like cage culture/ release of fish seed of larger size should be followed to assure survival and higher production of the cultivable species.

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