



## Study of Fish Diversity and Water Quality at Kasar Sai Dam, Hinjewadi, Pune, MS, India

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### Abstract

*The Kasar Sai dam is situated near Hinjewadi, Pune. This medium sized dam is mainly constructed for irrigational purposes. It is about 20 km away from Pune city and is surrounded by hills, agricultural fields and village Kasar Sai. The present study deals with the changes in physico-chemical parameters, such as water temperature, pH, dissolved oxygen, alkalinity, chlorides and suspended solids. These parameters were observed and analyzed from December 2009 to October 2011 at every alternate month. Simultaneously the fish fauna along with plankton availability in the dam water was also studied. Based on the findings of the present study, the suggestions are given to increase the fish production by scientific approach.*

**Keywords:** Physico-chemical, kasar sai dam, fish fauna.

### Introduction

Fresh water resources are used for various purposes, like agricultural, industrial, household, recreational, environmental activities, etc. In fact the fresh water resources are very precious for the life on our planet. The number of dams, reservoirs, tanks, etc. has significantly increased in last few years. The development of fisheries in these fresh water resources needs to be increased through the scientific development<sup>1</sup>. The quality of water should be checked at regular intervals to prevent deterioration of water quality and to maintain aquatic biota. The quality of water can be described by its physical, chemical and biological parameters or characteristics.

Considering the importance of fresh water resources in inland fishery, number of studies had been conducted, involving various aspects of dams and reservoir fisheries such as on Chilka Lake<sup>2</sup>, Stanley Reservoir<sup>3</sup>, Sardar Sagar<sup>4</sup> and Kandhar Tank<sup>5</sup>, Some fresh water Ponds of Dhar Town<sup>6</sup> and Halali Reservoir<sup>7</sup>, Underground water analysis in Gwalior City<sup>8</sup> and Sama Pond<sup>9</sup>, etc.

The Kasar Sai dam is situated at Kusgaon near Hinjewadi, Pune. It is located in 18<sup>o</sup> 37.30' 13" N Latitude and 73<sup>o</sup> 39.22' 55" E Longitude. This dam is built on a natural source of water. A seasonal water stream surrounded by hills was developed into a fresh water resource by constructing a dam. It has a spread area of approximately 336 hectare, mainly constructed for irrigational purpose.

As per the available records no scientific study on the water quality and Fish fauna availability has been conducted here so far. Few families and a contractor are dependent on the fish production through this water body. But the fish production is not sufficient for their livelihood. This is one of the reasons for

the selection of this water body. The present work has been undertaken, to understand the seasonal fluctuations in water quality, fish fauna and to suggest measures for the improvement of the fish production to uplift the economic condition of the fishermen.

### Material and Methods

As there were no previous records available about the study at Kasar Sai dam, a detailed survey of dam site was conducted. Inputs were collected from the local fishermen and the fishing contractor at the dam. The personnel of irrigation and fisheries departments were also consulted. Based on the data obtained and the survey, five locations were selected for water sampling. Water sampling was done at every alternate month from December 2009 to October 2011. The seasonal fluctuations in water quality and fish fauna were observed. Fishing and collection of Planktons were carried out simultaneously.

From the predefined locations water samples were collected and the analysis of physico chemical parameters like dissolved oxygen, pH, alkalinity, chloride contents, suspended solids, temperature were carried out as per the standard methods<sup>10,11</sup>. The zooplanktons and phytoplankton were also identified<sup>12,13</sup>.

The fish fauna identification was also carried out simultaneously. The fish fauna was identified<sup>14,15</sup> and was further confirmed by experts of department of fisheries.

### Results and Discussion

The observed physico chemical water parameters were tabulated and analyzed to understand the water quality. Similarly the variations in the fish fauna were also observed and efforts were made to understand the correlation between them, if any. A

comparative study of parameters was done to understand the seasonal fluctuations. Details of two locations are tabulated as table 1, figure 1 and table 2, figure 2.

**Dissolved Oxygen (DO):** The values of DO fluctuate from 7.50 mg/l to 11.82 mg/l. The maximum value (11.82 mg/l) was recorded in the month of June (summer) and minimum value (7.50 mg/l) was recorded in the month of December (winter). In the summer season the high DO was due to increase in temperature. At the same time the duration of bright sunlight also increases and influences the percentage of soluble gases (O<sub>2</sub> and CO<sub>2</sub>). The longer days and intense sunlight, during summer helps to accelerate photosynthesis rate. The Phytoplankton utilizes CO<sub>2</sub> and gives off oxygen. The greater quantity of O<sub>2</sub> during summer season may be due to the increase in the photosynthesis rate in summer. The quantity of O<sub>2</sub> is slightly lesser during winter season was also supported by another study<sup>16</sup>.

**pH:** The pH values were ranging from 8.35 to 9.63. The maximum pH value (9.63) was recorded in the month of December (winter) and minimum (8.35) in the month of April. The same results were also observed in a study conducted in a lake<sup>17</sup>. The changes in air temperature bring changes in the pH of water. Most of bio-chemical and chemical reactions are influenced by the pH. The reduced rate of photosynthetic activities reduces the assimilation of carbon dioxide and bicarbonates which are ultimately responsible for increase in pH.

**Alkalinity:** Total alkalinity ranges from 48.69 mg/l to 65.93 mg/l. The maximum value (65.93 mg/l) was recorded in the month of June (summer) and minimum value (48.69mg/l) in the month of December (winter). The maximum alkalinity was observed in June (summer) due to increase in bicarbonates in the water. Similar results were also reported that the alkalinity was maximum in summer and minimum in winter due to high photosynthetic rate<sup>18</sup>.

**Water Temperature:** In the present study, the water temperature ranges from 20°C to 26°C. The maximum temperature (26°C) was recorded in the month of June (summer) and minimum (20°C), in the month of December (winter). It showed higher temperature in summer and relatively lower temperature in winter. It is supported by two different studies<sup>19</sup>. It was observed that during summer, water temperature was high due to low water level, high temperature and clear atmosphere. Water temperature plays a very important role. It influences the chemical, biochemical and biological characteristics of the water body.

**Chlorides Contents and Suspended Solids:** The values of chloride contents and suspended solids found to be almost negligible in the collected water samples. This may be due to absence of any polluting industry in nearby areas. The sewage content is also negligible as the area is sparsely populated.

**Fish Fauna:** The fishing was done during all the seasons. Very limited fish fauna was observed in the water body. Almost 15 varieties of fish species along with few crabs were found in the water body. Very small local fishes were observed in the rainy season for a limited period of time.

The fishes found in the water body<sup>20</sup> belong to major carps, exotic carps, local variety and very limited variety of crabs. Fish species found in the dam are *Puntius spp.*, *Catla spp.*, *Labeo spp.*, *Tilapia spp.*, *Mastacembelus spp.*, *Goby spp.*, *Crabs.*, *Non Paenied Prawn*, *Macrobiom spp.* (*Giant Prawn*), *Mystus spp.*, *Cirrhinus spp.*, *Cyprinus spp.* The major and exotic varieties of fishes are available because the contractor breeds these fishes in the water body.

It was observed that the fish production is approximately 250 to 350 kg per month from December to February and raises up to 1000 kg per month from March to May. These figures indicate that the fish production increases in summer season and reduces in winter season.

**Planktons:** The phytoplankton species<sup>21</sup> observed in the water body were green algae like *Chlorella spp.*, *Valvox spp.*, *spirogyra spp.* and the Zooplanktons found in the water body were Rotiphers, Cyclops and Daphnia. These Zooplanktons<sup>22</sup> were observed in very limited quantity. In few samplings the zooplanktons were absent. The planktons are the major food source for the fishes in the water body. But, very limited quantities of planktons were observed in the water body.

## Conclusion

Alkalinity, dissolved oxygen and temperature are higher in summer season and lower in winter season. This may be due to higher photosynthetic rate in summer season. Whereas the pH value is higher in winter season and lower in summer season. It indicates reduction in photosynthetic activities in winter which reduces assimilation of carbon dioxide and bicarbonates.

From the results it was observed that the water is alkaline in nature and the dissolved oxygen level is also low. Whereas, the water body that has the alkalinity over 100 ppm is called as productive water body<sup>23</sup>.

The depth of the dam does not allow the Sun light to penetrate into it and obstructs the plankton growth. The rocky bottom and bushes in the dam water also limits the plankton growth. The lesser quantity of planktons may be one of the major reasons for the limited fish fauna in the water body.

Based on the results of the present study it can be stated that, the productivity of the Kasar Sai dam can be improved, if the alkalinity of the water can be made over 100 ppm. This may help in growth of the planktons, which intern may help to increase the fish production.

The control and eradication of aquatic weeds, aquatic birds, predatory fishes and aquatic insects is must. For the control of weed growth, grass carp can be cultured along with the major carps. Fresh water prawns can also be cultured along with the major carps. Illegal fishing, control of water pollution caused by agriculture, domestic wastes, regular monitoring of water quality, etc. will definitely help to improve the fish productivity of water body.

Major carp culture can be introduced in the water body and training to the villagers can be provided for the same. For fish culture practice, Pan Culture or Cage Culture may be suggested. Regular fish culture practice will help to explore the water body in a better manner. The harvesting of the fishes at regular intervals may help the upliftment of the natives.

### Acknowledgements

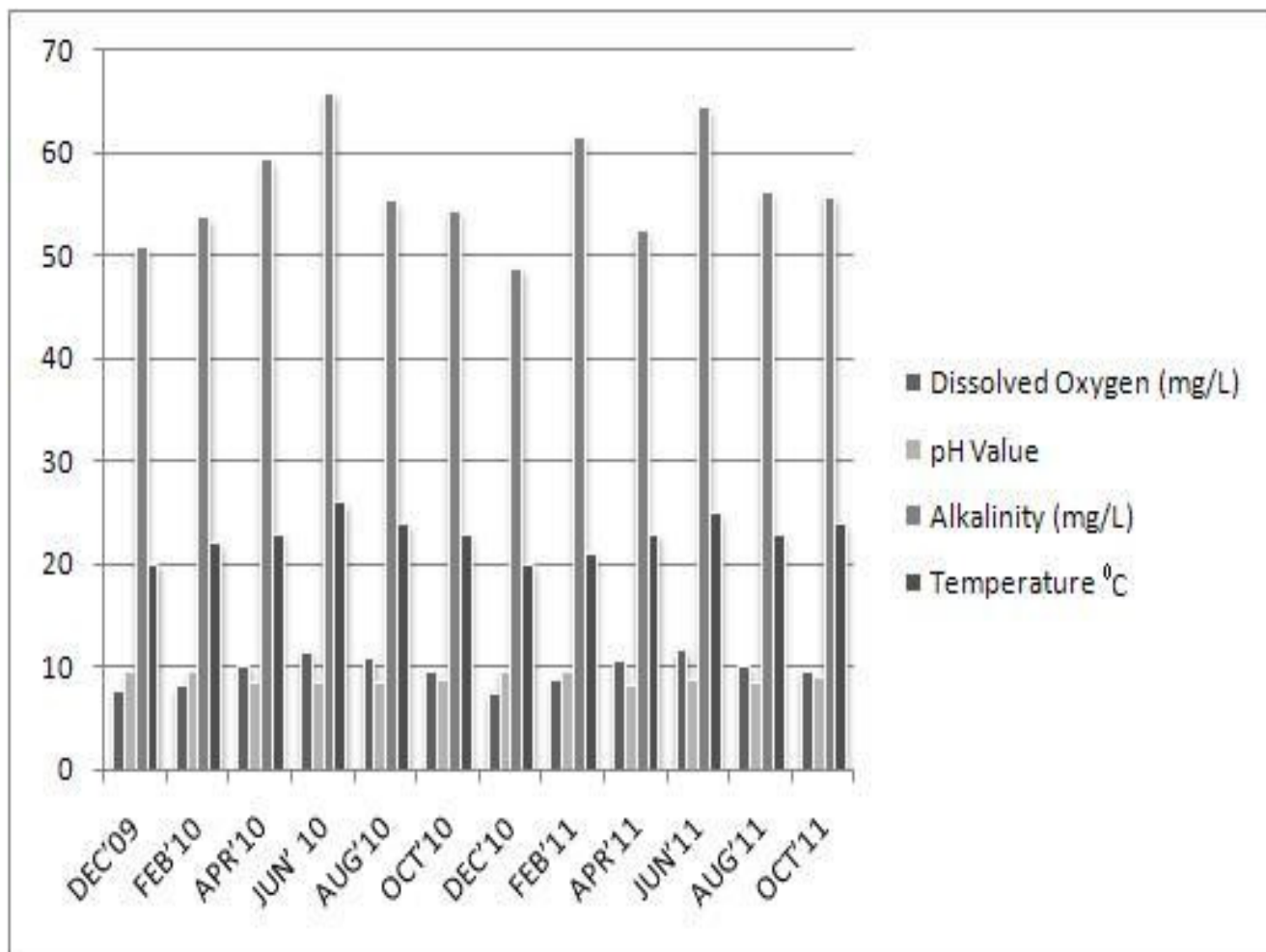
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**Table-1**  
**Observations Near the Dam wall**

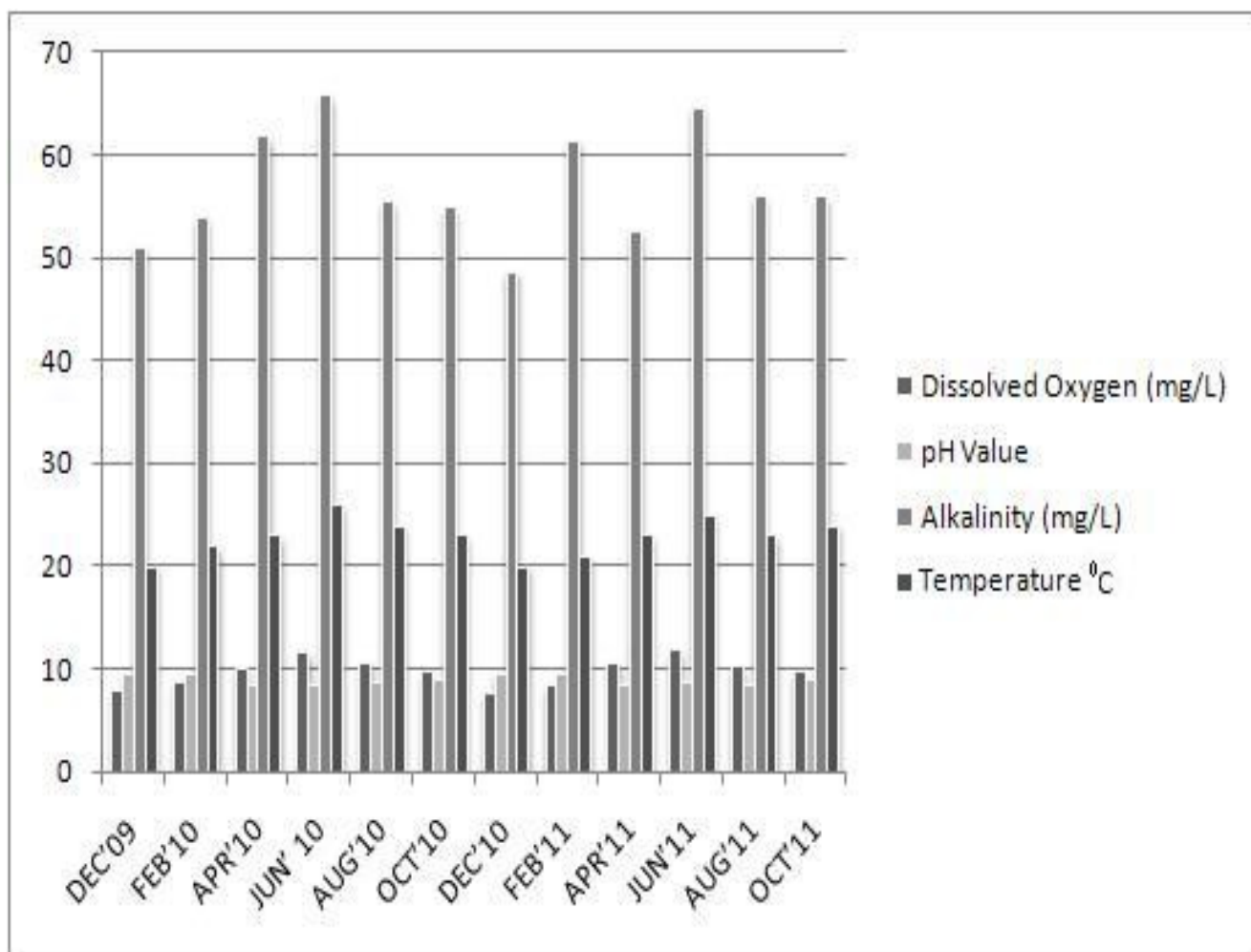
| S. No. | Month  | Dissolved Oxygen (mg/L) | pH Value | Alkalinity (mg/L) | Temperature °C |
|--------|--------|-------------------------|----------|-------------------|----------------|
| 1      | DEC'09 | 7.63                    | 9.51     | 50.82             | 20             |
| 2      | FEB'10 | 8.11                    | 9.49     | 53.75             | 22             |
| 3      | APR'10 | 10.18                   | 8.49     | 59.4              | 23             |
| 4      | JUN'10 | 11.54                   | 8.58     | 65.93             | 26             |
| 5      | AUG'10 | 10.82                   | 8.52     | 55.43             | 24             |
| 6      | OCT'10 | 9.57                    | 8.83     | 54.45             | 23             |
| 7      | DEC'10 | 7.5                     | 9.63     | 48.87             | 20             |
| 8      | FEB'11 | 8.84                    | 9.51     | 61.59             | 21             |
| 9      | APR'11 | 10.53                   | 8.35     | 52.47             | 23             |
| 10     | JUN'11 | 11.69                   | 8.64     | 64.45             | 25             |
| 11     | AUG'11 | 10.14                   | 8.49     | 56.23             | 23             |
| 12     | OCT'11 | 9.58                    | 8.93     | 55.84             | 24             |



**Figure-1**  
 Graphical analysis of samples collected from Dam wall side

**Table-2**  
**Observations at the Centre of the Dam**

| S. No. | Month  | Dissolved Oxygen (mg/L) | pH Value | Alkalinity (mg/L) | Temperature °C |
|--------|--------|-------------------------|----------|-------------------|----------------|
| 1      | DEC'09 | 7.94                    | 9.56     | 51.12             | 20             |
| 2      | FEB'10 | 8.83                    | 9.45     | 53.86             | 22             |
| 3      | APR'10 | 10.18                   | 8.49     | 61.78             | 23             |
| 4      | JUN'10 | 11.59                   | 8.56     | 65.84             | 26             |
| 5      | AUG'10 | 10.68                   | 8.59     | 55.58             | 24             |
| 6      | OCT'10 | 9.72                    | 8.86     | 54.89             | 23             |
| 7      | DEC'10 | 7.68                    | 9.59     | 48.69             | 20             |
| 8      | FEB'11 | 8.36                    | 9.62     | 61.45             | 21             |
| 9      | APR'11 | 10.58                   | 8.41     | 52.63             | 23             |
| 10     | JUN'11 | 11.82                   | 8.62     | 64.58             | 25             |
| 11     | AUG'11 | 10.31                   | 8.51     | 56.11             | 23             |
| 12     | OCT'11 | 9.69                    | 8.97     | 55.95             | 24             |



**Figure-2**  
 Graphical analysis of samples collected from Centre of the Dam