ABSTRACT OF Ph. D. THESIS ENTITLED

“HYDROBIOLOGICAL STUDIES OF THE MHASWAD TANK, MHASWAD, M.S, INDIA.”

1) Introduction

The Swiss Professor F.A. Foral, who was honored as ‘Father of Limnology’ after his publication of three volumes on limnology of Lake Geneva in 1892, 1895 and 1904, established the new branch of ecology called limnology or Hydrobiology. Hydrobiology is the sciences dealing with inter relation of processes and methods where by matter and energy is transferred within the lake. It also deals with scientific study of the interrelationship between organism and body of fresh water.

A Hydrobiological study generally involves analysis of physicochemical and biological parameter and reflects on the status of the environment in connection with both the biotic and abiotic factors. This is in turn help in utilizing the resources in right manner in order to curb the pollution, to boost the productivity and to conserve the prosperity of the biodiversity. Since there is a constant interaction and exchange of mass and energy in an ecosystem, the quality of water becomes an important and dynamic entity. That is exactly why the Hydrobiological studies have to be done on regular basis. It is essential for variety of objectives like increasing productivity and conservation of the potentials along with checking pollution if any. This will also help in proper development of agricultural activities, industrial activities, recreational programs, domestic usage
pattern and aquatic bird sanctuaries. It will play an important role in planning activation that strengthening biodiversity.

Ever since the spread of environmental awareness all over the world, monitoring of water resources through regular analysis has become crucially important feature. It is essential for exploration, exploitation and conservation of the potentials of the water bodies. Water, which is vitally important abiotic component of the environment, occurs in all the three basic states of matter, such as gaseous, liquid as well as solid and acts as a solvent for variety of organic and inorganic substances. The rainwater is perhaps less contaminated, but before very long, it becomes heavily contaminated with several substances and holds a key position in the biosphere. The quantity as well as the quality of water at given time and given space is very significant in relation to the life at that location at that time. It acts as a limiting factor and regulates in turn the diversity of biotic community and abundance of energy at various tropic levels. It also reflects upon the rate of succession.

2. **The Topographical setting of Mhaswad Water reservoir:**

The proposed ecological work will involve hydro biological study of a huge fresh water body namely Mhaswad Water reservoir, at Mhaswad, Dist.Satara, Maharashtra, India. The River Man begins its course close to the Sitamai hill (a part of Sahyadri hills) and flows towards eastern side for about 10 kms up to Andhali where minor irrigation tank is constructed. From Andhali River Man runs towards eastern side for 35 kms to reach Mhaswad where Mhaswad Medium water
tank is constructed in 1872 by Queen Victoria. Afterwards it runs towards eastern side for about 110 kms and merges with River Bhima at Sarkoli of Solapur district.

The Mhaswad Medium Irrigation Project envisages construction of a composite Dam across river Man near village Mhaswad in Man Tahasil of Satara District. It is the largest earthen dam. The construction of Mhaswad Dam was completed in 1872.

The salient features of this Mhaswad Water reservoir are as follows –

1. River – Man
2. Location – Longitude – 74° - 53’ - 0” E
   Latitude - 17° - 35’ - 0” N
3. Catchments area – 1243.15 sq. kms
5. Water availability as per studies carried out by C.W.C. New Delhi – 3.07 tmc.
6. Planned utilization – 1.63 tmc.
7. Gross storage – 1.63 tmc
8. Live storage – 1.62 tmc
9. Dead storage – 0.063 tmc
10. Length of Dam – 2473 ft.
11. Type of Dam – Centrally earth dam in the gorge with Masonry Dam on either flanks. Left flank Masonry dam accommodates left canal and char type spillway outlets whereas right bank masonry dam is for right canal.
13. Length of Spillway    _  1090 ft.


15. Maximum height of Dam    -  24 m

16. Controlling levels    -

   a) Top Bund Level

      Earth Dam    -  595 m

   b) Full Reservoir level (F.R.L.)    -  591 m

   c) Maximum Water Level (M.W.L.)    -  593.35 m

3. Objectives of the proposed work: -

   The principal objectives of the present study are as follow.

1. Determination of physical, chemical and biological characteristics of water.

2. Evaluation of quantity of water of Mhaswad Water Reservoir during different seasons of the year.

3. Identification of the changes in chemical & biological aspects.

4. Establishing patterns in variation of water quality, if there are any.

5. Establishing model for conservation of ecosystem, if required.

6. Establishing strategies for protection and conservation of birds, if there are any.
With these objectives in views the researcher has undertaken a research study entitled “Hydrobiological studies of the Mhaswad water reservoir at Mhaswad, District Satara, Maharashtra.”

**IV  Contents of thesis:**

The thesis is composed of seven chapters. The first chapter is developed to the introduction that narrates the scope and significance of present study. The chapter contains the introduction of ecological parameter, categorized as physical, chemical and biological parameters.

**Physical Parameters –**

- Color, Temperature, pH, Transparency, Total Suspended Solids, Total Dissolved solids and conductivity.

**Chemical Parameters -**

- Dissolved oxygen, Dissolved carbon dioxide, Alkalinity, Chlorides, Salinity, Sulphates, Hardness, Biochemical oxygen Demand etc.

**Biological Parameters -**

- Phytoplankton, Zooplankton, Aquatic macro flora,

**Microbiological Parameters –** Include bacterial count such as *E. coli*.

- The second chapter deals with the review of the literature.

- The third chapter deals with the salient features of study area.

- The fourth chapter embodies the material and methods applied in the present study.
All parameters are studied monthly for the period of two years. pH, temperature and color of water studied on the spot at the site and samples were collected for analysis in laboratory to find out remaining parameters. Analysis of parameters is carried out according to the standard methods given in the APHA, IABA, (Hyderabad) and Method of water analysis by Trivedi and Goel.

Plankton samples were collected with standard plankton net made of silk bolting cloth no. 25. The amount of water filtered during the plankton net was about 200 lit. The samples collected were concentrated to a 50 ml volume and preserved in 4% formalin. Identification was made up to the species level with help of standard texts, keys and monographs given by Pennak (1978), Tonapi (1980), APHA (1985), Fresh water biology by Vard and wipple, Zooplankton by Battis, The book of IABA, Hyderabad water analysis method.

Aquatic Macrophytes were collected with the help of string from Mhaswad tank at the study stations, kept in polythene bags and brought immediately to the laboratory, where they are washed under water. The plants were treated with 10% silver Sulphate (90 % Ethanol) for one minute to prevent fungal and bacterial infection. The plants were dried with blotting paper and herbarium sheet were made and identified with the help of published literature.

The fifth chapter deals with Result and Discussion. The result of morphometry, physico-chemical parameters and biological parameters is discussed in detail. In present investigation ambient temperature varied from 24.5\(^\circ\)C to 38.2\(^\circ\)C being highest in the month of May and lowest during the month of August while water temperature varied from 21.7\(^\circ\)C to 27\(^\circ\)C being highest in the month of
May and lowest during the month of December. The pH was found to be varying from 7 to 8.6, which is slightly alkaline. The pH was minimum in rainy and maximum in summer season. The transparency values ranges between 20 cm to 40 cm. The TSS fluctuated between 23 mg/lit. in the month of May-08 and 70 mg/lit. in the month of September-07 and 08. The TDS fluctuated between 160 mg/lit. in the month of November-06 and 290 mg/lit. in the month of January-08. Electric conductivity is ranging between 260 (µ mho/cm) and 402 (µ mho/cm). It is high in month of September-07 and low in month of November-06 and 07. During May-08 least DO was recorded (7.7 mg/lit.) and maximum DO was seen during August-07 (12.6 mg/lit). Free carbon dioxide was not detected in various months. The total alkalinity was ranged between 180 to 270 mg/lit. Chlorides in the water ranged between 49 mg/lit and 80 mg/lit. The Salinity fluctuated between 88.4 mg/lit. in the month of May-07 and 08, and 144.4 mg/lit. in the month of September-08. Sulphate was ranged between 30 to 60 mg/lit. Total hardness was ranged between 117 mg/lit and 167 mg/lit. In present study BOD value were found nil. During October-06 and 07 least M. P. N. was recorded (15) and maximum was seen during August-07 and 08 (45).

The minimum species diversity of phytoplankton is observed in the Mhaswad tank. The occurrences of certain species of phytoplankton during Oct. 2006 to Sept. 2008 are as follows.

**Bacillariophyceae** - *Navicula plecenta, Asterionella Diatoms.*

**Chlorophyceae** – *Chlorella, Spirogyra, Volvox.*
The diversity of zooplankton is also observed in the Mhaswad tank. The occurrences of certain species of zooplanktons during Oct. 2006 to Sept. 2008 are shown in following table.

<table>
<thead>
<tr>
<th>Group</th>
<th>Order</th>
<th>Family</th>
<th>Genus</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cladocera</td>
<td>Cladocera</td>
<td>Daphnidae</td>
<td><em>Daphnia</em></td>
<td><em>carinata</em></td>
</tr>
<tr>
<td>Copepoda</td>
<td>Cyclopoida</td>
<td>Cyclopidae</td>
<td><em>Nauplius</em></td>
<td><em>larvae</em></td>
</tr>
<tr>
<td>Rotifera</td>
<td>Ploima</td>
<td>Brachionidae</td>
<td><em>Anuraeopsis</em></td>
<td><em>fissa</em></td>
</tr>
<tr>
<td>&quot;&quot;</td>
<td>&quot;&quot;</td>
<td>&quot;&quot;</td>
<td><em>Mytilina</em></td>
<td><em>ventralis</em></td>
</tr>
</tbody>
</table>

No aquatic weeds have been recorded during the study period.

**Sixth chapter** consists of summary and conclusion of the work. The physico-chemical parameters of the Mhaswad tank are well under the prescribed limits for inland surface waters and can be used for aquaculture and for irrigation purpose. There exists positive correlation between total dissolved solids and conductivity.

The minimum species diversity of phytoplankton and Zooplankton was observed in the Mhaswad tank. The minimum diversity of zooplankton and
phytoplankton indicates that the water body is totally free from organic pollution and it is a pure natural water body. The M. P. N. of Mhaswad tank is less and BOD is below the detectable level hence the water is totally free from any kind of pollution.

The **seventh chapter** contains the references.

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