A Case Study of Derla Tank Monitoring Limnological and Fish Cultural Aspects

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When I think of my guide, Dr. A. N. Kulkarni, M.Sc. Ph.D. Department of Zoology & Fisheries, Science college Nanded, remembered the most appropriate words "Always positive, never in doubt & by grace of God usually right,' written by Reginald Watson Jones. His contribution & energetic insight into this work remain the real inspiration for me. It would be facilitated on my part to express my gratitude for him in words.

I express my sincere thanks to Dr. S.B. Agase. Principal Science college Nanded Shri. Dr. V. D. Deshpande, Head, Department of Zoology & fishery Science, College Nanded, for giving me permission and providing Laboratory facilities.

I am greatful to my father Yeshwantrao, without his blessings this endeavour would have not been taken shape.

I also extend my thanks to my family members and Mrs. Manisha Arvind Kulkarni and all friends for their continuous encouragement.

Kulkarni Mahendrakumar Yeshwantrao
PREFACE

Water is the most valuable universal solvent for organic and inorganic substances. These substances have effects on the biotic and abiotic factors of the ecosystem. They differ from place to place and season to season.

Water quality testing is an important criteria for the study of biology of fish and their culture. The present study deals with the limnological and fish cultural aspects of the Derala tank.

The First Chapter deals with the general Introduction about the tank. The Second Chapter deals with Physicochemical Factors like air and water temperature, pH, dissolved oxygen, free carbon-dioxide and total alkalinity of the tank.

The Third Chapter deals with biological complexes of the tank, it includlthe study of planktons and Fourth Chapter deals with Primary Productivity of the tank. Fifth Chapter deals with Fish and Fisheries of Derala Tank. Sixth Chapter deals with Summary and Conclusion.
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</table>
CHAPTER I
INTRODUCTION

Indian fisheries plays an important role in Indian economy through employment generating, income generating and foreign exchange earnings. It provides employment to about 5.8 million fishermen with an equally impressive number of engaged in ancillary activities associated with it. Fish production has shown a phenomenal increase during VIIth and VIIIth plan. It was increased from 2.94 million tons in 1986-1987 to 5.14 million tons in 1996-97.

The per capita availability of fish is 8 kg/year in our country, where as W.H.O. recommended per capita consumption of fish is 11 kg/year to fulfill the nutritional requirement we need 6.3 million tons of fish/year (sinha 1998).

For the production of 6.4 million tons of fish/year more efforts has to be taken to utilize available inland resources, the available inland resource of our country are as follows.

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<table>
<thead>
<tr>
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<tr>
<td>1</td>
<td>Rivers</td>
<td>45000 km</td>
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<tr>
<td>2</td>
<td>Canals</td>
<td>126334 km</td>
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<td>3</td>
<td>Estuaries</td>
<td>0.27 million ha</td>
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<tr>
<td>4</td>
<td>Lagoons</td>
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<tr>
<td>5</td>
<td>Reservoirs</td>
<td>2.15 million ha</td>
</tr>
<tr>
<td>6</td>
<td>Flood Plain, wet lands</td>
<td>3.15 million ha</td>
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</tbody>
</table>

Reservoir fishery resources includes small, medium and large reservoirs, which are as follows.
<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Reservoirs</th>
<th>Number of Reservoirs</th>
<th>Area in Million ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Small reservoir (Water spread area less than 1000 ha)</td>
<td>19134</td>
<td>1.48</td>
</tr>
<tr>
<td>2.</td>
<td>Medium reservoir (Water spread area less than 1000-5000 ha)</td>
<td>180</td>
<td>0.53</td>
</tr>
<tr>
<td>3.</td>
<td>Large reservoir (Water spread area more than 5000 ha)</td>
<td>56</td>
<td>1.14</td>
</tr>
</tbody>
</table>

Production of the fish from these reservoirs is 30 kg/ha. The production can be increased up to 52-100 kg/ha through the development of fisheries. If resources are managed on scientific lines the average production will be 100 kg, 75 kg, 50kg/ha from small, medium and large reservoirs, respectively, reported by (Sugunan 1995).

Reservoir fishery resources of Maharashtra re in the form of ponds, tanks and reservoirs. Available water spread area is 3.32 Lakh ha out of this 60 % area is from large reservoirs (Goutam and Dongare, 1998).

Fishery resources of Nanded includes rivers, irrigation canal, reservoirs and ponds. The total water spread area of Nanded is 5171 ha. Fish production during the year 2000-2001 was 3700 metric tons. It costs nearly 9.25 Lakh rupee (The D.S.O. Nanded 2001).

**Location and topography of the tank:**
The Derala tank is constructed in 1973 for irrigation purpose. The tank is 15 km away from Nanded, on Nanded
The tank is surrounded by agricultural fields and village, Derala. The barren mountain strips of Balaghats are adjacent to the village. It is constructed on the Derala nala, a subtributary of Godavari. The average rainfall was 640mm/year in 1998. Temperature ranged from 20°C to 34.5°C. Climate was hot and dry in summer, cold in winter.

**Principal features of Derala:**

1. **Name of the Tank**: Derala Tank
2. **Location**
   a) Nearest Village: Derala
   b) Taluka: Loha
   c) District: Nanded
3. **Catchment Area**: 1.44 Sq miles
4. **Yield**
   a) Average rainfall: 34.58 mm/year
   b) Dependable yield 0 to 50% confidence limit: 20.33 mctft
   c) Live cap. at F.R.L: 15.11 mctft
   d) Gross cap. at T. R.L: 16.05 mctft
5. **Standard Level**
   a) Lowest bed level: 88.69
   b) FR.L: 95.50
   c) T.B.L: 98.30
6. **Sea proper**
   a) Length of earthen Dam: 434m
   b) Rak. height of earthen Dam: 9.31m
   c) Top width of Dam: 3.00m
7. Surplusing arrangement
   a) Type of surplus arrangement: Channel type 30’ ft viz. channel type free over fall 58m to 88m weir submerged weir etc.
   b) Maximum length of flood: 1.30m
   c) Total length of waste weir: 30m
   d) Maximum flood discharge: 2702 Cusses or 76.5 m³

8. Canals:
   a) No. of canal: 41
   b) Discharge through head: 2 cusses
   c) Size of the canal: ½:1 with B.W. 0.30m F.S.W.
   d) Hydraulic gradient: 1:100

9. Command:
   a) Gross command: 350 Acres
   b) Culturable command: 8300 Acres
   c) Irrigation command: 250 Acres

10. Year of completion: 1973
    (Source: Record from Z. P. Nanded)

   Water body has a different physicochemical and biological diversities. Which has its own impact on its ecology and ultimately on the productivity, therefore, the limnological studies of Derala Tank are necessary to evaluate productivity.

   Considerable scientific data is available on limnological studies of different water bodies. Verma (1954, 1964 & 1967) studied the hydrobiological survey of Dalsagar Tank, Seoni (M. P.) and observed the effect of Microcystis aeruginosa (Kuntz) bloom in a fish tank and suggested methods for improvement of fishery in the tank.

   Srivastava (1956) studied the bottom fauna of fresh water fish tank in Lucknow and noticed a marked variation
in its composition during different periods of the year. Sreenivasan (1964a) studied the hydrobiology of Bhavanisager, where as George (1962,) investigated occurrence of algal bloom in a fish tank at Delhi.

Becton (1965) investigated eutrophication of the St. Lawrence Great Lake U. S. A. Webb (1965) carried out the limnological study of Cedar lake, Manitobe and observed co-relationship between the physicochemical factors and bottom fauna.

Banerjee and Roy Choudhary in (1966) observed the physio-chemical changes of Chilka lake, Banerjee (1967) investigated water quality and soil condition of fish pond in some states of India in relation to fish production.

Biswas (1968) investigated various parameters and hydrobiology of Volta lake in Ghana. Duthie (1968) studied the various parameters controlling the seasonal development of phytoplankton in the lake Belwood Southern Ontaio.


Petelas (1969, 1975) observed that there was a strong trend for the number of species of crustacean plankton to increase with increasing temperature and mean depth upto certain limit. Fish (1970) undertook the study of limnology of four lakes near Rotora, New Zealand.

Alexander and Barsadate (1971) investigated the limnology and productivity of lake Taiga. Timus (1972) worked on some aspects of limnology of lake Thalkar Vectoria.

Brylinsky and Mann (1973) reported low level of

Kaliyamurti (1974) studied the planktonic ecology of Pulicat lake, Dwivedi and Chonder (1977) studied Hydrobiology and Fisheries of Keetham lake. George et. al. (1977) studied the productivity and seasonal abundance of important fishes of Govindsager reservoir.

Kohli ef. al. (1989) studied Hydrobiology and fisheries of Powai lake, Mumbai. Krishnarao et. al. (1999) studied the fisheries of Nelligudha reservoir Bangalore.

Data on Limnology and fish culture aspects of Derala tank is megere, therefore “A Case study of Derala tank monitoring Limnological and Fish cultural Aspect” was undertaken. It will be helpful to the local fishermen for development of fisheries. “Bhoi Samaj Matsya Vikas Cooperative Society” Taluka Loha, District Nanded, use this tank for fish culture.

For this study single spot was selected, because tank is very small. Selected spot is adjuscent to the village. Area near to the spot is used by the villagemen and women for day to day activities and village Sewage is also let in the tank at this spot. The Spot is called as spot ‘A’.

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CHAPTER II
PHYSICOCHEMICAL FACTORS OF DERALA TANK

Water is the most valuable universal solvent for organic and inorganic substances. These substances are present in free, gaseous or in colloidal state and they have effect on the biotic & abiotic factors of the ecosystem.

Water quality testing is an important criterion for the study of biology of fish and its culture, selection of species for culture, proper management practices for optimum economic returns. These factors differ from place to place and season to season.

Most of the workers have studied physicochemical factors of inland waters. Some of them are: Ramanna and Sreeramalu (1944) reported some aspects of limnology and fisheries of Vottigudda reservoir of Andhra Pradesh. Dwivedi and Chonder (1977) Studied Hydrobiology and Fisheries of Keetham Lake. Johari (1989) observed Limnological aspects of four important lakes of Kumaoun hills of Uttar Pradesh, Kolhi et al. (1989) Studied Hydrobiology of Powai Lake Mumbai.

Gopalkrishanan et al. (1991) studied the hydrobiology of the river Tambraparani in relation to its suitability for fish culture.


Trivedi and Gupta (1995) studied changes in pH, dissolved oxygen, free carbon dioxide, of three ponds of Mangalore, Karnataka, De Silva (1996) studied
Limnological aspects of three man made lakes of Sri Lanka.

“Bhoi Samaj Matsya Vikas Cooperative Society” Taluka Loha, District Nanded uses the Derala tank for fish culture. The physicochemical factors of this tank are not known, therefore, the present work was undertaken to find out some physicochemical characters like temperature, pH, dissolved oxygen, free carbon dioxide, total alkalinity.

For the study, water samples were collected from the selected spot A between 9.0 am to 11.0 am from August 1999 to September 2000 on first sunday of every months.

2.1 TEMPERATURE:
INTRODUCTION:

Temperature has profound influence on the characteristic of water body, distribution of water is governed by seasonal variation in temperature, it also effect on the life of fish, movement of fish is also depends upon temperature of surrounding water (Nikol’sky, 1963).

Body temperature of fishes is differ from ambient water temperature. The metabolic activities of fishes are connected with changes in temperature of surrounding water (Jhingran 1988).

Water temperature has also effect on dissolved oxygen, carbon dioxide, alkalinity, and other related parameters. The measurement of water temperature is most important study for fish Culture.

The temperature variation in fresh water reservoir studied by various workers Ganpati (1943 & 1962); Gonsalves and Joshi (1946); Devsundran and Roy (1954); Verma (1964 & 1967); Vyas and Kumar (1968); Sunita (1992); Sreenivasan (1972 & 1976); Munawar (1974); Zutchi

Data on variation in the air and water temperature of Derala tank is not available hence the present work was undertaken to find out changes in the temperature.

MATERIAL AND METHOD:

For the study Spot A was selected towards the village side. Details of the Spot A was described earlier. The temperature of air and water were recorded by using Centigrade thermometer: while recording air temperature, the thermometer holds in air 2-3 feet above water level.

The water temperature measured by dipping thermometer in surface water for sufficient time till the final reading observed. Temperature was recorded on first sunday of every month and regular intervals for fourteen months from August 1999 to September, 2000. Seasonal variation in temperature were calculated by taking average of 4 months for each season, months in summer are March, April, May, June and in monsoon July, August, September, October and in winter November, December, January, February.

RESULTS AND DISCUSSION:

Fluctuations in air and water temperature are shown in the Table No. (2.1) and Graph no (I & II). Seasonal variations in temperature are shown in the Table No. (2.2) and Graph No. (III).

Values of air temperature ranged between 20°C to 34.5°C and water temperature ranged between 18°C to 33.5°C, maximum air temperature was recorded during May 2000 (34.5°C) and minimum air temperature was recorded in month of December 1999 (20°C). Maximum
water temperature was recorded in May 2000 (35.5°C) and minimum was in December 1999. (18°C).

The seasonal variation in air temperature in summer it was highest (32.3°C), lowest in winter (21.5°C).

The seasonal variation in water temperature, in summer temperature of water was heighest (31.1°C) and lowest in winter (20°C).

DISCUSSION:

Temperature of water is highly co-related with atmospheric temperature. During the observation from August 1999 to September 2000, it observed that the water temperature was less than the air temperature, it was minium in winter and maximum in summer.

Kato (1941); Ganpati (1943 & 1962); Verma (1954 & 1967); Webb (1965) also observed same results.


Jayaraju (1987) found changes in air and water temperature which was ranged between 20°C to 40°C; it was highest in May 1986 and lowest in January 1982.


During summer temperature was more while in
winter it was less; it may be due to high intensity of sunlight and low water level in pond during summer. Less water temperature during winter may be low intensity of sunlight and high water level in the tank.

2.2 pH:
INTRODUCTION:

Hydrogen ion concentration of natural water is an important environmental factor. It maintains the carbonate and bicarbonate ions in the system of freshwater; it can be used for detection of water pollution. The pH could be correlated with temperature and dissolved oxygen (Lagler 1978).

Variation in pH are linked with species composition and life process of living organism. pH of natural water ranged between 4 to 9 (APHA, AWWA 1985).

The pH more than 8.7 is unsuitable for fish culture. Acid, water reduces the appetite of fish, growth and tolerance to toxic substances (Jhingran, 1988).

Generally natural water is alkaline with sufficient quantity of carbonates. pH of water changes due to, biological activities, water temperature, Industrial effluents and sewage.

Keeping in view the importance of pH in fish culture, the present study was undertaken to investigate the pH of Deralal tank.

MATERIALS AND METHODS:

For estimation of pH, water samples were collected from the spot A in morning hours. After collection of
sample pH, was measured by using pH meter.

Seasonal changes in pH were estimated. Months were grouped as per summer, monsoon and winter season.

**RESULTS AND DISCUSSIONS:**

The changes in pH are shown in Table (No. 2.1) and Graph No. (IV) the pH values ranged between 7.5 to 8.5. Seasonal variation are shown in Table (No. 2.2) and Graph No. (V). Seasonal variations in pH ranged between 7.5 to 8.4, maximum pH was observed in winter (8.4) and lowest in monsoon.

It is observed that water of this tank is alkaline in nature. The pH values were more in Summer and winter, whereas less in monsoon. (Saliskar and Yeragi, 1997) observed more pH in winter and less in summer.

Banerjee (1967) observed low values of pH during rainy season, and high in winter. Similar results were reported by Vyas Kumar (1968); Sumitra (1969) Sreenivasan (1974); Nadeem and Noor (1999).

### 2.3 DISSOLVED OXYGEN CONTENT:

**INTRODUCTION:**

Dissolved oxygen content is one of the important parameter in water quality assessment and reflect the physical and biological process of the ecosystem. It is essential to maintain biology in the non polluted water.

Sources of oxygen in the water are atmospheric oxygen, photosynthetic oxygen, waves, waterfalls & flow of water etc. Concentration of oxygen changes during day and night hours. These variations in oxygen concentration are called as diurnal pulse.
Water is a habitat for large number of animals, vegetations and decaying matters and which has a great shortage of oxygen. Shortage of oxygen in waterbody is unsuitable for life.

Several workers studied dissolved oxygen content. For example Banerjee and Roychoudhary (1966) reported physico-chemical features of Chilka lake. Banerjee (1967) reported water quality and soil condition of fish pond in some states of India. According to him oxygen is probably one of the primary important factor which regulates metabolic process in life.

**Table No. 2.1**

Readings of different parameters with respective units of Derla Tank noted in fourteen months from Aug. 1999 to Sept. 2000

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Month</th>
<th>Air Temp 0C</th>
<th>Water Temp 0C</th>
<th>pH</th>
<th>DO2 mg/ltr.</th>
<th>CO2 mg/ltr.</th>
<th>Alkalinity mg/ltr.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 99</td>
<td>29</td>
<td>27</td>
<td>7.5</td>
<td>5.8</td>
<td>6.5</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>Sep 99</td>
<td>23</td>
<td>22</td>
<td>7.5</td>
<td>5.4</td>
<td>7.5</td>
<td>150</td>
</tr>
<tr>
<td>3</td>
<td>Oct 99</td>
<td>23</td>
<td>21</td>
<td>7.5</td>
<td>5.2</td>
<td>6.5</td>
<td>150</td>
</tr>
<tr>
<td>4</td>
<td>Nov 99</td>
<td>20.5</td>
<td>20</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>100</td>
</tr>
<tr>
<td>5</td>
<td>Dec 99</td>
<td>20</td>
<td>18</td>
<td>8.5</td>
<td>9.3</td>
<td>5.5</td>
<td>100</td>
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<tr>
<td>6</td>
<td>Jan 00</td>
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<td>8.5</td>
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<td>7</td>
<td>Feb 00</td>
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<td>22</td>
<td>8.5</td>
<td>8.4</td>
<td>6.5</td>
<td>150</td>
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<tr>
<td>8</td>
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<td>8</td>
<td>6.5</td>
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<td>9</td>
<td>Apr 00</td>
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<td>33</td>
<td>8</td>
<td>6</td>
<td>9.5</td>
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<tr>
<td>10</td>
<td>May 00</td>
<td>34.5</td>
<td>33.5</td>
<td>7.5</td>
<td>5</td>
<td>10.5</td>
<td>275</td>
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<tr>
<td>11</td>
<td>Jun 00</td>
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<td>7.5</td>
<td>6.5</td>
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<td>14</td>
<td>Sep 00</td>
<td>23</td>
<td>22</td>
<td>8</td>
<td>6</td>
<td>6.5</td>
<td>200</td>
</tr>
</tbody>
</table>
Sunderajan et.al.(1 971) studied limnology and productivity of Poondi reservoir. They reported stable oxygen stratification. Khan and Azize (1 976) noted seasonal changes in the limnology of Perennial fish pond at Allighad. According to them high concentration of dissolved oxygen was at surface which lowers in mid and bottom strata respectively.

Sreenivasan (1 976) studied fish production and fish population in some south reservoir. The Study revealed that oxygen depletion was quite common in bottom. The Stanly reservoir has developed super saturation in the surface and completely anaerobic condition at bottom.

Keeping in view the impotence of dissolved oxygen content in water present work was undertaken to investigate dissolved oxygen content in Derala tank.

MATERIAL AND METHODS:

The details of Derala tank and selected spot A is described earlier For the estimation of dissolved Oxygen content at spot A at regular monthly intervals water Samples were collected for fourteen months. i.e. from August 1999 to September 2000. Water samples collected at 3- 4 feet deep and 20 - 30 feet away from the bank of the tank in BOD bottels. After collection these bottles were bottled properly and the dissolved oxygen was estimated at the spot by using Winkler’s method (Trivedi and Goel,1986).

In samples MnSo, and alkaline iodied (KI) 1ml each were added as a winkler’s A and B solutions. Sample bottles were then kept in dark place for thirty minutes. The obtained precipitate was dissolved with 1ml concentrated H$_2$So$_4$:

A 100 ml sample from the bottles were titrated
against 0.025N sodium thiosulphate solution. Starch solution used as an indicator. When sample become colourless then it is considered as the end point of the reaction.

Dissolved oxygen was estimated by using the following formula:

\[
\text{Dissolved oxygen content mg/l} = \frac{(\text{ml x N}) \times 8 \times 1000}{V_2 (V_1 - \frac{V}{V_1})}
\]

Where, \(V_1\) = Volume of sample bottle.
\(V_2\) = Volume of part of titrant containing.
\(V\) = Volume of MnSO₄ and KI added.

Dissolved oxygen was expressed in mg/l.

**RESULT AND DISCUSSION:**

Changes in dissolved oxygen are shown in Table No. (2.1) and Graph No. (VI). Dissolved oxygen ranged from 5 mg/l to 9.3 mg/l. Maximum dissolved oxygen was recorded in December 1999 (9.3 mg/l) and minimum was in the May 2000 (5mg/l).

Seasonal variations in dissolved oxygen are shown in Table No. (2.2) and Graph No. (VII), maximum dissolved oxygen was recorded in winter (8.2 mg/l) and minimum in monsoon (5.5 mg/l).

During the study low and high values of dissolved oxygen were noted. High values in winter and low values in summer may be due to changes in temperature of water. In the study it was observed that the temperature in summer was high and low in winter, Elli (1973) also reported similar
Banerjee and Roychoudhary (1966) noted higher values of dissolved oxygen in September, October, and lowest in the April and July. The low values of dissolved oxygen in summer and early monsoon is due to high temperature and shallow water. Lita and Agami (1976) reported maximum values of dissolved oxygen in winter and minimum in summer. Patil and Sen (1983) observed highest dissolved oxygen in winter.

Lal Mohan (1983) observed lowest values in December and higher values in monsoon season. Kulkarni et.al. (1995) studied diurnal variation in physicochemical characteristic in Sadatpur reservoir and noted that highest values in winter and lowest in the summer season.

In the Derala tank high values of dissolved oxygen were observed in winter and less in summer and monsoon season. This may be due to changes in temperature of water.

2.4 CARBONDIOXIDE:

Carbondioxide is present in water in three forms viz. carbonates, bicarbonates, and PCO,. Some amount of atmospheric carbondioxide gets dissolved while rain water descends through the atmosphere. It is also released during decomposition of organic substances present in the water and respiration of aquatic life Tonapi (1980).

Presence of free carbondioxide in water was reported by Juday et.al. (1935). Concentration of free carbondioxide over surface water reflects the pollution status of water body. Moore (1952) Bhora (1976).

Lal (1981) reported that the photosynthesis and respiration influences the concentration of carbondioxide in
water. The concentration of free carbon dioxide were depend upon the temperature and oxygen concentration in water. Free carbon dioxide content and dissolved oxygen content have inverse relationship. (Whipple and Parkar, 1902; Ganpati, 1943; Gupta, 1989; Shalini, 1994).

The determination of amount of free carbon dioxide in water body is important in fish management and became one of the criterion of testing environmental suitability for fish culture. High concentration of free carbon dioxide more than 20 ppm is toxic to fish. Lagler (1978).

Keeping in view the importance of free carbon dioxide in a water body the present work was undertaken to investigate the amount of free carbon dioxide content of Derala tank from August 1999 to September 2000.

MATERIAL AND METHODS:

The water samples were collected from the spot A, at a depth of 2 - 3 feet from surface. After collection, concentrated hydrochloric acid was added to the sample to attain pH 6.5. Free carbon dioxide content was estimated by titrometric method described by Trivedi and Goel (1986).

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Month</th>
<th>Air Temp 0°C</th>
<th>Water Temp 0°C</th>
<th>pH</th>
<th>DO2 mg/ltr.</th>
<th>CO2 mg/ltr.</th>
<th>Alkalinity CaCO₂</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>Monsoon</td>
<td>25</td>
<td>23.3</td>
<td>7.5</td>
<td>5.5</td>
<td>6.8</td>
<td>150</td>
</tr>
<tr>
<td>2</td>
<td>Winter</td>
<td>21.5</td>
<td>20</td>
<td>8.4</td>
<td>8.2</td>
<td>5.8</td>
<td>112.5</td>
</tr>
<tr>
<td>3</td>
<td>Summer</td>
<td>32.8</td>
<td>31.8</td>
<td>7.5</td>
<td>6.0</td>
<td>9.7</td>
<td>210</td>
</tr>
</tbody>
</table>

Table No. 2.2

Season wise readings of different parameters with their respective units
During the estimation water samples were titrated with strong NaOH at pH 8.3. At this pH all the free Carbon dioxide get converted into bicarbonate.

100 ml of water sample were taken in a conical flask then a few drops of Phenolphthalein were added in it as an indicator. When sample remains colourless, then it was titrated against 0.05N NaOH solution. Colour of the sample changed to pink. It is the end point of the reaction.

Free carbon dioxide was calculated by using formula as follows:

\[
\text{Free carbon dioxide mg/l} = \frac{(\text{ml x N}) \text{ of NaOH} \times 1000 \times 44}{\text{ml of sample}}
\]

RESULT AND DISCUSSION:

Changes in the free Carbon dioxide at Spot A are shown in the Table No. (2.1) and Graph No. (VIII), Seasonal variations in free Carbon dioxide content are shown in Table No. (2.2) and Graph No. (IX). Maximum Carbon dioxide was observed in the month of May - 2000 (10.5 mg/l) and minimum carbon dioxide was in January 2000 (5 mg/l). Changes in free carbon dioxide content were ranged from 5 mg to 10.5 mg/l.

Free carbon dioxide was observed more in summer and less in winter (i.e. in summer it was 9.7 mg/l and in winter it was 5.8 mg/l).

Changes in free carbon dioxide content may be due to the changes in temperature and dissolved oxygen content. Chakrobarti et.al. (1954), Ray and Parida (1966). Observed high concentration of free carbon dioxide during winter and low during monsoon. Dhanpakiran et.al. (1999) observed
maximum carbon dioxide in summer and minimum in winter. Similar observations were also reported by Rao (1965); Bhagat (1977); Subbama (1994); Pande (1988); Kohli et al. (1989) and Sinha (1998).

2.5 ALKALINITY:
INTRODUCTION:

Alkalinity of water is its qualitative capacity to react with a strong acid. It is measured as an aggregate property of water and can be interpreted in terms of specific substances only when the chemical sample is very known.

Alkalinity measurements are used in interpretation and control of water and waste water treatment. It also neutralizes strong acids. It is not harmful to human beings, when it is less than 100 mg/l.

Total alkalinity can be used for the measurement of productivity (Schaperclaus 1933).

Productive water must have alkaline condition and it should be more than 100 ppm Alikhuni (1957). Data on the total alkalinity on this tank is meager, hence the present work was undertaken to find out total alkalinity of this tank.

MATERIAL AND METHOD:

Total alkalinity was estimated on the spot A from August 1999 to September 2000 during morning hours for fourteen months. Seasonal variations were calculated by taking average reading of the months for respective season.

Alkalinity is estimated by using standard method described in Chemical and biological methods for water pollution studies Trivedi and Goel (1986).

For the estimation of alkalinity chemicals like 0.1N
HCI solution, 0.1 N sodium carbonate solution, methyl orange and phenolphthalein indicator were used.

100 ml sample were taken in a conical flask then two drops of phenolphthalein as an indicator added in it, if it remains colourless then, phenolphthaleine alkalinity is absent. If colour of the solution changed to pink, after, adding of phenolphthaleine then it was titrated with 0.1N HCl solution until colour disappear.

After the estimation of phenolphthalein alkalinity 2 to 3 drops of methyl orange were added in the same flask and it is titrated against 0.1 N HCl solution till pink colour appears.

Alkalinity can be calculated by using following formula.

\[
PA \text{ as calcium carbonate mg/l} = \frac{(A \times N) \text{ of HCl} \times 1000 \times 50}{\text{ml of sample}}.
\]

\[
TA \text{ as calcium carbonate mg/l} = \frac{(B \times N) \text{ of HCl} \times 1000 \times 50}{\text{ml of sample}}.
\]

where  
A = ml of HCl used with only phenolphthalein.

B = ml of total HCl used with phenolphthalein and methyl orange

PA = Phenolphthalein alkalinity

TA = Total alkalinity.

RESULT AND DISCUSSION:

The results of total alkalinity were presented in Table (no 2.1) and Graph (No. X). Total alkalinity ranged
between 100 mg/l to 275 mg/l. Minimum alkalinity was noted in the month of November, December (1999) and January (2000). It was 100 mg/l, maximum values were recorded in May 2000 (275 mg/l). The results of seasonal changes in Alkalinity are shown in Table No. (2.2) and Graph No. (11). Total alkalinity was more in summer season (200mg/l) and less in winter season (112 mg/l).

Philipose (1960) classified the confined water of India on basis of total alkalinity in three categories; as a low, moderately high and high alkaline.

Total alkalinity of Derala tank was ranged between 100 to 275 mg/l and this is productive water. Alikhunj (1957) reported water having 100 ppm alkalinity would be productive water. Alkalinity shows fluctuation according to seasons. It was more in summer and less in winter. High alkalinity values in summer may be due to high temperature and high photosynthetic rate.

Banerjee (1967) recorded high values in summer and low values in winter as well as in rainy season. Bhagat (1977) recorded alkalinity of Powai Lake in Mumbai less than 100 ppm. according to him this lake is not productive lake. Kulkarni and Mokashi (1995); Dhanpakiram et.al. (1999) also recorded similar results.
Graph No.1

Graph No.2
Graph No.3

Graph No.4
Seasonal Changes in Do2

Graph No. 7

Carbon Dioxide

Graph No. 8
Graph No.9

Seasonal Change in CO2

Graph No.10

Alkalinity
Seasonal Variation in Total Alkalinity

Graph No. 11
CHAPTER III
BIOLOGICAL COMPLEXES

Overall View of Derla Tank

Spot – A
Aguatic flora and fauna from the biological basis of the productivity of reservoirs these consist of plankton aquatic plants and benthic animals.

The plankton are the free-floating Organism and are classified as Phytoplankton and zooplankton. The Phytoplankton are directly and indirectly influenced by the Physicochemical characteristics of water. The Study of planktons is necessary for Proper assessment of aquatic potential. They play an important role in food chain. The planktons Show diurnal and seasonal distribution in the aquatic system Chandra Mohan (1977); Patil and Sen (1983) studied the planktons of reservoir in Shilong.

Sunita Rao (1984) reported distribution of Zooplanktons in different estuaries in East and West cost of India. Plankton diversity of Sadatpur reservoir was noted by Mokashi el. al.(1985).

The aquatic Weeds present in the tank are studied as marginal, free floating, Submerged and emergent weeds. If they are in large quantity they restrict plankton Production and also upset the equilibrium and physicochemical characteristics of water. It also provides breeding grounds for weed fishes, aquatic birds and insects.

Animals and plants which are Present at the bottom of a water body are called as benthos. The number of animals found at the bottom depends upon the Substrata, depth, physicochemical properties and biological complex of water.

Considering the importance of Biological complex in the reservoir, the present work was undertaken to find out the diversity of planktons, aquatic vegetations and benthic animals in the tank.
Material and Method:

The selection and details of the spot A is described earlier. Plankton Samples were collected at spot A by filtrating fifty liters of water through a plankton collecting net (No. 25). After collection samples were Preserved in 3% formalin and were identified in the laboratory as per the guidelines given by Needhan and Needhan (1962) and Tonapi (1980).

Aquatic weeds were collected by hand picking method and kept in moist condition in polythene bags and are identified in the laboratory as per the guidelines given by Naik (1960). Benthos animals were collected by hand picking method and are identified as per the guidelines given in “Fresh water animals of India”, Tonapi (1980).

Results and Discussion:
The planktons, aquatic weeds and benthic animals recorded during the investigation are as follows:

1) Planktons:
   a) Zooplanktons:
      Protozoa : Paramoecium, Amoeba, Euglena.
      Arthropoda : Cyclops, Daphnia, Moina and Nauplius larvae
   b) Phytoplanktons:
      Green algae: Chlorella valguris; Volvox gloaster:
      Spirogyra scandens; Oedogonium nodulosum.
      Bluegreen algae : Oscillatoria pinceps; Anabaena sphearia; Nostoc Mascarum.

2) Aquatic weeds : Following weeds noted during the investigation are.
   a) Marginal: Cyprus rotandus; Typha angustifolia; Ipomea frustulosa;
b) **Submerged:** Hydrilla species and Vallisneria natans.

c) **Algal mats and Scums:** Algal mats and scum observed during summer

3) **Benthos animals:**

   The tank found habitat of different species of mollusca such as Pilaglobularis; Pila mysorella; Costiger species; Pila melarriascabra. Dragon fly and May fly nymphs and other invertebrates found are nematode worms. High mortality of mollusca was noted in summer.

4) **Floating aquatic insects:**

   Ranatra, Back swimmer were noted in the tank. High mortality of mollusca was noted in summer.

**DISCUSSION:**

Kolhiet.al. (1989) reported the presence of phytoplankton and zooplanktons in Powai Jake, Mumbai. Patnike (1973) recorded presence of diatoms, blue green algae and diano-flagellates. Among zooplanktons copepods were dominant followed by nauplia, molluscs larvae, protozoan, polychete larvae etc in Chilka lake.

Dwivedi and Chonder (1977) recorded the presence of myxophyceae, chlorophyceae, bacilloriphycceae, in Keetham lake Agra reported the same during the study of limnological aspects of lake Kollaru (A.P.). Kanwate (2002) recorded presence of marginal weeds floating weeds, emergent weeds such as Cyperussps, Typha, Ipomea, Nymphaea, Hydrilla and Vallisneria.

In Derala tank among the phytoplanktons blue green algae, green algae, were comman. Zooplanktons include
Protozoa and Arthropoda. Among marginal weeds Cyperus, Typha, Ilpomea and submerged weeds Vallisneria, Hydrilla were recorded in the tank. Benthic and littoral biota were also noted. It included presence of Mollusca, Nymphs of dragonfly and May fly; nematode larvae etc. Floating insects included Ranatra and Back swimmer.

The presence of protozoa in our study indicate the contamination of water by human activities, domestic sewage, presence of aquatic weeds and benthic animals suggests that the Derala tank is a self sustained and productive tank.

****

Marginal Weed
Syprus Species
Submerged Aquatic Weed
Vallisneria Species

Submerged Aquatic Weed
Hydrilla Species
CHAPTER IV
PRIMARY PRODUCTIVITY

Productivity is living substance producing capacity of a water body, the living component of any ecosystem consist of producers and consumer. Producers involved in producing food material where as, consumers directly or indirectly depends upon the producer.


Data on primary productivity of Derala tank is not adequate hence present investigation was undertaken to find out primary productivity of Derala tank.

Material and Method:
Details about the spot A is described earlier .The primary productivity was estimated by using light and dark
bottle method as described in ‘Chemical and Biological methods for Water pollution studies’ Trivedi and Goel (1986). Samples were collected at spot A from August - 1999 to September - 2000. Three to four feet deep from the surface of the water then poured into three bottles, out of them two bottles were transparent and third one was painted with black and rapped in black cloth bag and kept for the incubation for four hour (8 to 12 noon).

Dissolved oxygen was estimated immediately from Initial bottle. Water samples were taken from the two remaining bottles (light and dark) after the incubation period and dissolved oxygen was estimated by using Winkler's methods as described by Trivedi and Goel (1986). Primary productivity was estimated by using the following formula.

\[
O_2 \text{ mg/lit/hr} = \frac{D_{o_2} \text{ in light bottle} - D_{o_2} \text{ in dark bottle}}{\text{Incubation period}}
\]

Primary productivity is converted in mg c/m³/hr. by using conversion factor mg O₂/I/hr. x 0.375 Tyagi & Goel (1986).

**Result and Discussion:**

Primary productivity is shown in Table No. (4.1) and Graph No. 12 values are ranged from 0.011 to 0.335 mg c/m³/hr. Maximum values were observed in November 1999. (0.335 mg c /m³/hr) and minimum was recorded in September (0.11 mg c /m³ /hr). Seasonal variation in primary productivity are shown in Table No. (4.2) and Graph No. 13. During winter season, productivity was 0.0972 mg c /m³/hr. afterwards it decreased upto monsoon.
Productivity shows three modes. First mode was in November 1999; second mode was in March - April 2000 and the third was in July 2000. Goldman and Witzel (1963) reported values were bimodal in clear lake of California. Kaff (1967) noted similar pattern in the Arctic pond. Nasar and Dutta (1975) observed maximum values of primary productivity in November and minimum in January and September.

Bhagat (1975) recorded maximum value in monsoon and post monsoon and minimum in Summer. Bisaral (1996) studied primary productivity in Supra reservoir and noted minimum value in September and maximum in April. In Derala tank maximum values were noted in November 1999 and minimum values were recorded in September 1999.

**Productivity:**

Table No. 4.1 shows primary productivity of Derala tank from August 1999 to September 2000 at spot A and it was expressed in mg c/m³/hr.

<table>
<thead>
<tr>
<th>Sr.</th>
<th>Months</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Aug 1999</td>
<td>0.067</td>
</tr>
<tr>
<td>2</td>
<td>Sep 1999</td>
<td>0.011</td>
</tr>
<tr>
<td>3</td>
<td>Oct 1999</td>
<td>0.033</td>
</tr>
<tr>
<td>4</td>
<td>Nov 1999</td>
<td>0.335</td>
</tr>
<tr>
<td>5</td>
<td>Dec 1999</td>
<td>0.0116</td>
</tr>
<tr>
<td>6</td>
<td>Jan 2000</td>
<td>0.0116</td>
</tr>
<tr>
<td>7</td>
<td>Feb 2000</td>
<td>0.055</td>
</tr>
<tr>
<td>8</td>
<td>Mar 2000</td>
<td>0.1228</td>
</tr>
<tr>
<td>9</td>
<td>Apr 2000</td>
<td>0.116</td>
</tr>
<tr>
<td>10</td>
<td>May 2000</td>
<td>0.0446</td>
</tr>
<tr>
<td>11</td>
<td>Jun 2000</td>
<td>0.0893</td>
</tr>
</tbody>
</table>
Table No. 4.2 shows average seasonal changes in primary productivity of Derala tank from August 1999 to September 2000 at spot A and is expressed in mg c/m$^3$/hr.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Season</th>
<th>Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Monsoon</td>
<td>0.037 mg c/m$^3$/hr.</td>
</tr>
<tr>
<td>2</td>
<td>Winter</td>
<td>0.103 mg c/m$^3$/hr.</td>
</tr>
<tr>
<td>3</td>
<td>Summer</td>
<td>0.092 mg c/m$^3$/hr.</td>
</tr>
</tbody>
</table>

**Graph No. 12**

Monthwise Production

Values of Productivity

0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4


Months
Seasonal Variation in Gross Productivity

Graph No. 13

Values of Gross Productivity

Summber  Monsoon  Winter

Seasons
CHAPTER V
FISH AND FISHERIES OF DERALA TANK

For the development of reservoir fisheries, a suitable management program is necessary. It also necessary to know the changes in physicochemical conditions and the productivity of the reservoir so that optimum production can be obtained. The stocking Program would be managed on the available stock.

The biological potential of reservoir was not evaluated to any reliable level till 1970. CIFRI, have taken All India Coordinate Research Project on ecology and fisheries of reservoirs and gave a new dimension for the development of fisheries (Sinha 1988).

Reservoir fisheries development is a must for quantitative jump in the inland fish production and improving the socio-economical conditions of the fishermen.

Reservoirs are the only inland fisheries resources, whose hectar age are bound to go up with increasing population and resultant developmental activities. Sreenivasan (1965 &1 979); Motawani et.al. (1974): Studied fish and fisheries of Sadatpur reservoir.

Most of the researches have Studied on the development of fresh water fisheries in India such as Chacko & et.al. (1952 &1 962), Abrahum and Andal (1952) etc. have stressed the need for development of reservoirs. Sreenivasan (1966) investigated the hydro biological features and primary production in relation to fisheries of Stanley reservoir of Mettur dam.

Tamilnadu fisheries department had undertaken
various activities for the scientific development and exploitation of reservoirs. (Sreenivasan 1976).

Derala Tank is a minor irrigation tank used for fisheries activities by the “Bhoi Samaj Matsya Vikas Cooperative Society” Taluka Loha, District Nanded. The available data on fisheries of the tank is not adequate and reliable. Hence the present work was undertaken to study the fishery activities performed by the fishermen so that this would help them to develop the tank.

MATERIALS AND METHODS:

For the study data on fish and fisheries, was collected from the oral interview and annual report of the society. For the estimation of pH, Dissolved oxygen content, free carbon dioxide content, alkalinity, primary productivity from the spot A. Samples were collected from August 1999 to September 2000.

Fishes were identified as per the guidelines given by Jayaram (1994) and the productivity was calculated as per the method given by Trivedi and Goel (1986).

RESULT & DISCUSSION:

CLIMATE:

The climate of Derala is tropical and characterized by hot and dry in summer, humid in monsoon and cold in winter.

WATER TEMPERATURE:

The minimum water temperature was in the month of December 1999 it was 18°C maximum water temperature was in the month of May 2000 it was 33.5°C.
pH:
The pH of the water is ranged from near 7.5 to 8.5.

TOTAL ALKALINITY:
The total alkalinity during March - May 2000 was maximum. The high value of the total alkalinity of the Derala tank, indicates super saturation of calcium carbonates exhibiting the high productivity of the tank these results are confirmed with the results of Singh (1990).

DISSOLVED OXYGEN:
The highest amount of dissolved oxygen recorded during March- April 2000. The oxygen was found to be varying from 3.2 mg/l to 10.5 mg/l. These results are in conformity with Singh (1990).

CARBONDIOXIDE:
Free carbon dioxide plays an important role in water ecology. The average free CO₂ content of the tank was 5.0 to 10.5 mg/l. It shows gradual increase from December 1999 to June 2000. The results are conformity with the results of Singh (1990).

FISH FAUNA:
Local fishes of the tank include six species which has been recorded in the commercial catches from the tank. For fishing gillnet was used. The collected fishes were identified and classified as per the guidelines given in ‘ fresh water fishes of India’ by Jayaram (1994).
Predatory Fish
Channa Marlius

Mystus Seenghala
The fishes of the Derala tank are as follows:

1) **C.marulius**: Systemic position
   Order: Channiformes
   Family: Channidae
   Genus: Channa (Scopoli)
   Species: marulius
   Scientific name: Channamarulius (Hamilton)

2) **C.punctatus**: Systemic position
   Order: Channiformes
   Family: Channidae
   Genus: Channa
   Species: punctatus
   Scientific name: Channa punctatus (Bloch)

3) **M.seenghala**: Systemic position
   Order: Siluriformes
   Family: Bagridae
   Genus: Mystus (Scopoli)
   Species: seenghala
   Scientific name: Mystus seenghala

4) **M.aor**: Systemic position
   Order: Siluriformes
   Family: Bagridae
   Genus: Mystus (Scopoli)
   Species: aor
   Scientific name: Mystus aor

5) **Wattu**: Systemic position
   Order: Siluriformes
   Family: Siluridae
   Genus: Wallago
   Species: attu
   Scientific name: Wallago attu
6) Puntius ticto : Systemic position  
Order : Cypriniformes  
Family : Cyprinidae  
Genus : puntius  
Species : ticto  
Scientificname : Puntius ticto (Hamilton)

Weed Fish  
Puntius Ticto

**MAJOR CARPS :**  
Following fishes of Indian major carps were cultured in the tank:  
1) Catlacatla : Systemic position  
Order : Cypriniformes  
Family : Cyprinidae  
Genus : Catla  
Species : catla  
Scientificname : Catlacatla (Hamilton)
2) **Labeo rohita** : Systemic position  
   Order : Cypriniformes  
   Family : Cyprinidae  
   Genus : Labeo  
   Species : rohita  
   Scientificname : Labeorohita (Hamilton)

3) **Cirhinus mrigala** : Systemic position  
   Order : Cypriniformes  
   Family : Cyprinidae  
   Genus : Cirrhinus  
   Species : mrigala  
   Scientificname : Cirrhinus mrigala (Hamilton)

---

**Indian Major Card**  
**Surface Feeder**  
**Catla Catla**
PISCIVOROUS BIRDS OF DERALATANK:

For the study of piscivorous birds of the tank birds were observed from August 1999 to September 2000, in the morning hours. On field, for observation, binoculars of 7X35 and 8X40 ranged were used. Birds were identified as per the guide lines given in. A pictoral guide to the birds of the Indian subcontinent (Ali and Ripley 1995). A list of birds observed is given in the Table (5.1). In all 18 species of birds were recorded during observation.
PISCIVOROUS BIRDS OF THE DERALA TANK

Table No. 5.1 shows list of piscivorous birds observed in Derala tank from August 1999 to September 2000.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Total No. of Birds</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dabchick</td>
<td>Tachybaptus ruficolis</td>
<td>13</td>
</tr>
<tr>
<td>2</td>
<td>Pond Heron</td>
<td>Ardeola gryayii</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Cattle Egret</td>
<td>Bulbulcus ibis</td>
<td>8</td>
</tr>
<tr>
<td>4</td>
<td>Gray Heron</td>
<td>Ardea cinerea</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Heron purpole</td>
<td>Ardea purpurea</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>White ibis</td>
<td>Threskiornis acthiopica</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>Spotte billduck</td>
<td>Anas poeciorhyncha</td>
<td>34</td>
</tr>
<tr>
<td>8</td>
<td>Tufted pochard</td>
<td>Aythya fuligula</td>
<td>6</td>
</tr>
<tr>
<td>9</td>
<td>Pintail</td>
<td>Anas acuta</td>
<td>6</td>
</tr>
<tr>
<td>10</td>
<td>Waterhen</td>
<td>Amaurorns phoenicurus</td>
<td>6</td>
</tr>
<tr>
<td>11</td>
<td>Purple moorhen</td>
<td>Porphyrio prophyrio</td>
<td>13</td>
</tr>
<tr>
<td>12</td>
<td>Coot</td>
<td>Fulica atra</td>
<td>19</td>
</tr>
<tr>
<td>13</td>
<td>Pheasant tailed (Jacana)</td>
<td>Hydrophasinus chirurgus</td>
<td>7</td>
</tr>
<tr>
<td>14</td>
<td>Little ringed plover</td>
<td>Charadrius dubius</td>
<td>4</td>
</tr>
<tr>
<td>15</td>
<td>White brested kingfisher</td>
<td>Halcyon smyrnensis</td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>Blue earned kingfisher</td>
<td>Alcedo meninting</td>
<td>16</td>
</tr>
<tr>
<td>17</td>
<td>Pied kingfisher</td>
<td>Ceryle rudis</td>
<td>8</td>
</tr>
<tr>
<td>18</td>
<td>Red wattle lapwing</td>
<td>Vanellus indicus</td>
<td>38</td>
</tr>
</tbody>
</table>
STOCKING OF INDIAN MAJOR CARPS SEED:

Before stocking, pre and post stocking managements was not done. Method for fish culture adopted by fishermen was a composite fishculture. Stocking of fish seeds was done according to their ecological niches such as Catla catla (surface feeder), Labeo rohita (column feeder), C. mrigala (bottom feeder) were stocked.

The stocking rate of fish seeds was 5000 fingerlings/ha. and species combination was in ratio of 40: 30:30 i.e. Catla: Rohu: Mrigal. Fish seeds was brought from Government fish seed farm Karadkhed and released in the month of July/August in early morning or in evening hours. Fishes grow on natural food.

FISHING :

Commercial fishing was done by the fishermen of the society. Fishing was started after monsoon and it was done in both day and night hours. Hook and line gear used for fishing of carnivorous fishes. Drag net, Gill net and Cast net used for fishing. The size of the net was depending upon the area of fishing and size of the mesh was depending upon size of fish.

Local boats like Coracle, Wooden plates, Thermacol sheets, Tubes etc were used for fishing and transportation. The radius of Coracle was four feet and it was made from bamboo splits and covered with polyethylene sheet so that it would become impervious to water. It was light in weight so that single fisherman can carry it. The size of theramacol, wooden sheet varies from 5 to 6 feet in the length and 3 to 4 in breadth.
PRODUCTION:

It was difficult to find out exact production of the tank because fishermen never maintain the records of their catches. It was very difficult to find out the growth rate of fish from the tank because of non-availability of scientific data.

The total production was approximately 150 tons and costs was in rupees 30 lakhs/year. This production cost was calculated on the basis of stocking rate and 50% survival of fingerlings in the tank.

Fishes were sold in local market, at Loha, Kandhar, Sonkhed and Nanded. After catching, fishes were immediately transported in fresh condition using suitable transporting vehicles such as tempo, lorry, etc during transportations fishes were packed in ice.

COOPERATIVE SOCIETY:

The cooperative Society was established in 1969 under the name of “Bhoi Samaj Mastya Vikas Cooperative Society” Taluka Loha, District Nanded. The society has 92 working members. It is a primary cooperative society.

DISCUSSION:

Hydrobiological features and fisheries of Derala spoke off its self sustained ecosystem. Alikhuni (1957) stated that the water having alkalinity over 100 PpmM are called as productive water body. According to Schaperclaus (1933) the ponds having alkalinity between 200 to 500 Ppm are the most productive.

The productivity of Derala tank ranged between 100
to 275 mg /Itr, it reveals that the tank is Productive and the Productivity of the tank is highest in winter and less in summer. Presence of aquatic weeds also indicates the tank is productive.

Predatory fishes like Watiu, murrals, M. seenghala etc. shows that the sufficient food is available for them in the tank. Presence of aquatic birds also shows that it is a best tank for them to Stay.

Peripheral margin of the tank is usually infested with typha which provide nesting ground for the water hen and other piscivorous birds.

Production of fish from the tank is supposed to be quiet encouraging because most of the fisherman of the society do fishing in the tank and get good returns from it.

Productivity of the tank could be increase by ploughing the exposed surface area especially during summer this will kill the pathogens by sunlight. Tank is infested with Typha and submerged Hydrilla; this can be controlled manually. Controlling of weeds disturb the breeding grounds of aquatic birds, insects, weed fishes. It is also useful for easy netting operation and provide free water and space for fishes.

Predatory fishes should be kept in control, so that it will provide the space, food for the cultured fishes. It was observed that the fresh water prawns were not cultured in the tank along with fishes. If they were cultured it would add in the production of the tank.

SUGGESTIONS FOR FUTURE DEVELOPMENT OF THE TANK:
1) Marketing should be done through the co-operative
society.

2) Illegal fishing should be prevented.

3) Mixed fishculture should be adopted such as culture of Indian Major carps and Exotic Carps to increase production.

4) Complete irradiation of weeds like Hydrilla, Vallisneria, Typha and Ipomoea from the tank. So that fishes can swim freely in the tank and netting operations will not be hampered.

5) Removal of predatory fishes is necessary.

6) Aquatic bird population should be checked so that fish production will increase.

7) Culture of grass carp along with common carp to control aquatic weeds.

8) It is suggestive to culture fresh water prawns along with major carps to increase production from the tank.

9) A suitable cold storage plant is required to store fishes.

10) Fishermen should be educated for the development of reservoir fishery.

11) The existing fish population should be protected.

12) Pollution due to agriculture waste, domestic swage should be prevented.

13) For future-stockling policy, total survey of the available stock is necessary.

14) Regular ecological and biological studies should be done for efficient management of the tank.

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CHAPTER VI
SUMMERY AND CONCLUSION

Large number of reserviors are constructed across the rivers and the number of these impoundments has been increasing. These are constructed for objectives like water Supply, irrigation, Power generation and fisheries etc. Proper development of fisheries in them will be a Significant and most valuable additional source of protein rich food for human consumption.

Derala tank came into existence in the year 1973. It is near about 15 KM away from Nanded. It is the minor irrigation tank. The fishing activity is performed by “Bhoi Samaj Matsya vikas Cooperative Society”.

The present work was undertaken to Study the limnological & fish cultural aspect of the tank and to find out the level of the Production of the tank and to suggest measures to improve the production and socioeconomic condition of the people.

Investigation work included monitoring the physical condition, chemical conditions, and Biological conditions of the tank along with fish and fisheries of the tank.

The work was carried out for fourteen month from August 1999 to September 2000 at a regular interval of a month. Water Sampling were taken in the morning hours (9 am. to 14 am.). The diurnal and seasonal changes in physicochemical factors were also observed.

TEMPERATURE :

The air and water temperature were recorded with a centigrade thermometer graded in 0.1°C intervals. The water
temperature was measured by dipping the thermometer in water, maximum temperature was recorded in month of May-2000 (34.4°C) and minimum in December-1999 (20°C).

**CHEMICAL FACTOR:**
1) **HYDROGEN-ION CONCENTRATION: (pH)**
   Hydrogen-ion concentration (pH) was estimated by using the pH meter, it was ranging between 7.5 to 8.5

2) **FREE CARBONDIOXIDE :**
   Free carbondioxide was estimated by titration of 100 ml sample against the 0.05N NaOH using phenolphthalein as an indicator. End point being the appearance of pink colour. The free carbondioxide was maximum, in the month of May-2000 (10.5 mg/l) and minimum was in month of December-1999 (5.5 mg/l).

3) **TOTAL ALKALINITY :**
   Total alkalinity was estimated throughout the work. It ranged between 150 to 275 mg/l.

4) **DISSOLVED OXYGEN:**
   The samples for dissolved oxygen were collected in stopper bottles and Winkler’s method was used for the estimation of dissolved Oxygen content. One ml Magnesium Sulphate and alkaline iodide was added in the bottle to fix the dissolved Oxygen.
   The sample was titrated with 0.025N sodium thiosulphate solution by using the starch as indicator and results are expressed in mg/l. The maximum value was
observed in December-1999 (9.3 mg/l) and minium in month of May-2000 (5 mg/l).

5) PRODUCTIVITY :

The Productivity was Studied by light and dark bottle method. Both bottles were kept for Four hours. The light bottle was used for immediate determination of Oxygen present in the sample during the time of Sample drawn. The bottles were removed after incubation period of four hours. The value are expressed in gc/m$^3$/hr. The Productivity was maximum during November-1999 (0.335 gc/m$^3$/hr.) and minimum in September-1999 (0.011 gc/m$^3$/hr).

6) ZOOPLANKTONS :

The zooplanktons were collected by filtering the 50 liter sample through plankton net and preserved in 3% formalin solution and Identified by using Compound microscope. The Zooplanktons include members from Protozoa, Crustacea.

7) PHYTOPLANKTONS :

90 liters of water was filtered through the plankton net. The sample collected were preserved by adding 3% formalin. They were identified under compound microscope. The phytoplanktons belongs to Chlorophyceae, Bacillariophyceae, Euglenophyceae, Rhodophyceae are seen.

a) AQUATIC WEEDS :

Aquatic plants have been identified and are grouped
as marginal, floating, emergent, submerged. Marginal include \textit{Ipomoea} a submerged include \textit{Hycrilla}.

\textbf{8) BENTHIC BIOTA:}

The molluscan fauna were found populated in the benthos region of the lake. chironomids and dragonfly and mayfly nymphs were in stray numbers. The insect representative could notice in patches. Other invertebrates were virtually absent. The mollusca’s were in no Table number.

\textbf{9) FISH AND FISHERIES OF DERALATANK :}

“The fishing activities are performed by the Bhoi Samaj Matsya Vikas Cooperative Society”. The society has 92 members, Stocking of fingerling of major carps was done in the month of July. Each member do Individual fishing. For fishing they use Gill net, Drag net, Cast net. After fishing fishes are sold in the local market. Sometimes they are also sold in other markets of the surrounding.

During our observation from August-1999 to September 2000 we have not studied the quantitative and qualitative measurement of the planktons and some of the physicochemical factors like turbidity, nitrates, phosphate and silicates.

It is observed that the tank is productive and the productivity of this tank can be increase by changing species combination and introduction of fresh water prawns. Finally it can be concluded that the tank has a self sustained eco-system and it is a productive pond. It can meet the requirements of the fishermen.


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