ABSTRACT OF Ph.D. THESIS

“BIO-DIVERSITY OF TURORI DAM, TURORI, DIST. OSMANABAD (M.S.) INDIA.”

The world consists of vast range of different species which are all inextricably linked. The eminent naturalist and television presenter, Sir David Attenborough, summed this up neatly when he said "The inter-dependence of species evolved over millions of years and underpins the complex diversity of life which exists on this planet."

‘Biological diversity’ or biodiversity is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the plant and animal species at different scales in space, local, in a regional, in the country and around the world, and various types of ecosystems, both terrestrial and aquatic, within a defined area.

Biological diversity deals with the degree of nature’s variety in the biosphere. This diversity can be observed at three levels; the genetic variability within a species, the variety of species within a community, and the organization of species in an area into distinctive plant and animal communities constitutes ecosystem diversity.

We can only guess at many of the interactions taking place within habitats. According to our knowledge of the natural world, we need to recognize that we are still fundamentally ignorant. With recognition of this ignorance comes the understanding that we need to preserve whole habitats intact, so that the complexity of interactions remains, whether we understand them or not. The fate of the entire planet is now dependent upon a single species - humans. This is unprecedented in the Earth’s 4.7 billion year history. Ultimately, conservation of
biodiversity will hinge upon the control of human populations. Continually expanding human numbers have led to an escalating competition with wildlife for the space required to house everyone, as well as to produce enough food to feed them. Increasing standards of living also require that further natural areas and resources are given over to sustaining western lifestyles and associated demands.

We are interfering with biodiversity on large account, from the molecular (genetic modification), all the way through habitats and possibly global climate change as well. However, the many predictions made about species and habitats losses need to be carefully examined in each case and not just taken at face value.

Anyone concerned about conservation needs to question whether the innumerable strategies and policies in place are actually being delivered. International conventions and national laws are in the end only ideas on pieces of paper. These must be translated into concrete action in local situations for anything to be truly accomplished.

On the plus side, it is possible to restore some habitats which have been lost or degraded. This is not to imply that it is permissible to destroy habitats in the first place. This causes the local extinction of all the species in the habitat and it can take hundreds of years for complex ecosystems to become re-established. The species which have recolonised the restored habitat will also not necessarily be of the same genetic make-up as the original inhabitants.

Climate change is a serious environmental challenge that could undermine the drive for sustainable development. Since the industrial revolution, the mean surface temperature of Earth has increased an average of 1° Celsius per century due to the accumulation of green house gases in the atmosphere. Furthermore, most of this change has occurred in the past 30 to 40 years, and the rate of increase is accelerating,
with significant impacts both at a global scale and at regional and at local levels.

The research, education and experiments can only take place with the help of nature. Environment consist of abiotic and biotic components i.e. air, water, land, flora and fauna that inextricably interlinked. Water bodies like lakes and reservoirs, rivers not only providing a life supporting system for the human society but also for animal and plants around they provide a shelter for many species and their existence is greatly dependent on the quality of water in which they live and survive hence this gives the importance of limnological studies.

Present lake is extremely rich in terms of food, plants and animals, because the temperature of water was often lower than that of the surrounding air, it acts as valuable feeding havens during the cold. In addition it provides water for drinking, bathing and offers protection from land predators. It is not surprising that this freshwater habitat is home of many bird species and visited by many other bird species not primarily adapted to aquatic life. Most of these are equally familiar in standing and flowing water, because of their size and the tendency of some types of flock together. Surrounding of lake is densely populated by animals aquatic animals as the food required for them will be obtained easily.

Water is one of the prime necessities of life. We can hardly live for a few days without water. Generally water contains Iron, Calcium, Manganese, Silica, Fluoride, Nitrite, Phosphate, Sulfates and Chlorides. When the quantity of these components increases then it affects the body systems and cause distractions of health e.g. Arsenic salts can cause cancer, Cadmium affects kidney while Barium carbonate has bad effects on veins.

The study of freshwaters in all their aspects physical, chemical, and biological is termed Limnology (Odom 1971) or it is the study of freshwater or saline water
which are contained within continental boundaries (Goldman and Horn 1983). Limnology is also described as “Hydrobiology or aquatic biology. According to Edgar do Bald a prominent Italian ecologist; limnology is the science dealing with internal action of processes and methods whereby matter and energy are transformed within the lake or pond. Welch (1952) stated it as the science dealing with biological productivity of water together with all casual influences on the qualitative and quantitative features along with its actual potential aspects. Wetzel (1975) defined limnology as “Study of the functional relationship and productivity of freshwater biotic environmental factors.”

The amount of total water available for use in India is estimated to be 1990 billion m$^3$ per year. About 86% of this comes from the surface runoff in river, streams, lakes and ponds, excluding ground water resources that still need to be tapped.

According to Water Frame Work Directive (WFD) some characteristics suggested for different type of lakes, the reference for each lake conditions must be established representing, as far as possible, undisturbed conditions and including biological as well as hydro morphological and physicochemical baselines. The purpose is to identify reference biological communities against which other communities will be compared (Heinonen et al. 2001). Normally, well-balanced ecosystem maintains fairly constant bio-geo-chemical and energy cycles, tropic status and bio-diversity. Bio-diversity is markedly reduced and succession sets in. Fishes occupy high position in the food chain, moderately cool climate, high degree of precipitation and tropical ecosystem in lake, sustain significant fish fauna.

Birds occupy an important position in the animal kingdom especially in relation to man. Economically, they are both useful and harmful to human interest.
Some of the important uses to men are as biological control, as scavenger, as pollinators, as seed disperser and as fertilizer.

Conventional models of freshwater food webs assume that fish occupy the top trophic level. These are the most important biotic determinant of trophic abundance lower down in the food web (Vannote et al. 1980, Fry 1991, Well Born et. al. 1996). However, many terrestrial predators, including many bird species, feed on aquatic system and therefore are components of trophic level in aquatic food webs (Steinmetz 2003).

Water birds are commonly grouped into several categories based on their behaviors, Diving birds, Waterfowl, Wading birds, Shore birds, Gulls and Terns (Eleanor C. Foerste 2000). One of the most common diving birds seen locally is the Coot. These small birds are dark gray to black with white bill. Large migratory flocks grouped on local lakes during the winter. They appear to walk on water before they get up enough lift to fly. Coot eats aquatic plants, including hydrilla and insects.

The inland water fishery sector has big river system, dams, reservoirs, lakes etc. but due to embalmment and construction of dams and reservoir on the river has given much stress on the Piscean fauna occurring in river. Due to change in habitat, the fauna also varies. The fishes are one of the important components of food cycle in an aquatic ecosystem.

Ever since the spread of environmental awareness all over 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 keeping this in view; we have made an attempt to evaluate the important physicochemical and biological parameter along with biodiversity form Turori dam, Turori.
Silent feature of Turori Dam, Dist. Osmanabad.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Salient Features</th>
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</table>
| 1       | Location                         | **Turori Dam**  
|         | Longitude                        | 76° 48”  
|         | Latitude                         | 17° 48”  
| 2       | Types of Dam                     | Earthen Dam  
| 3       | Catchments Area                  | 34.16 sq.kms.  
| 4       | Capacity of Live Storage         | 5.73 m.cu.m.  
| 5       | Full tank level Water            | 7.664 m.cu.m.  
| 6       | Capacity of dead storage         | 1.46 m.cu.m.  
| 7       | Length of tank                   | 1192 m  
| 8       | Height of the Tank               | 17.50 m  
| 9       | Command is for Irrigation        | 2190 hectares  

The Principal objectives of present study are

1 Determination of physical and chemical parameters of selected stations.

2 Evaluation of phytoplankton and zooplankton

3 Identification of Aquatic Macro flora.

4 Identification of Aquatic Macro fauna.

5 Determination of population ecology of Dam.
**Contents of thesis:-**

The Thesis composed of seven chapters

The **First Chapter** is developed to introduction that narrates scope and significance of present study. This chapter contains introduction of ecological parameter categorized as physical, chemical and biological parameters.

**Physical parameters:-**
1) Air temperature
2) Water temperature
3) Transparency
4) Turbidity

**Chemical parameters:-**
1) pH
2) Dissolved oxygen.
3) Free carbon dioxide.
4) Hardness.
5) Total Alkalinity.

**Biological Parameters:-**
1) Phytoplanktons.
2) Zooplanktons.
3) Aquatic Macroflora.
4) Aquatic Macrofauna.

**Second Chapter** deals with the review of literature.

**The Third Chapter** Deals with the salient features of the study area.

**The fourth chapter** deals with the material and methods applied during present study.
Material and Methods:-

During the present study period. The water samples collected from the Turori dam with the interval of one month during the period of two years from the selected spots of dam. pH, Temperature of water were recorded on the spot as these parameters may change during the transportation and for the remaining parameters the water samples brought in the laboratory. Analysis of parameters was carried out according to standard Methods given by APHA, IAAB (Hyderabad) and Methods of water analysis by Trivedi and Goel (1986).

Plankton samples were collected with standard plankton net of silk bolting cloth NO. 25. The amount of water filtered was about 200 liters. The samples collected were concentrated to 50ml. volume and preserved in 4% formalin. Identification was made up to species level with the help of standard texts as Pennak (1978), Tonapi APHA (1985). Fresh water biology by Vard and Wipple, Zooplanktons by Battis. The book of IAAB, Hyderabad, water analysis method.

Aquatic macrophytes were collected from Turori dam at selected water stations and laced in polythene bags and brought to laboratory where they washed under water and treated with 10% Silver Sulphate (90% Ethanol) for one minute to prevent them from fungal and bacterial infection. The plants were dried with blotting paper and herbarium sheets were made and indentified with the help of published literature.

Methodology:-

Water sampling of four selected sites of Turori dam, Tq. Omerga worked out during the study period. The fish material was collected with help of local fisherman from Dam for two years. The fish specimens collected were instantly fixed
in 4-5 % formaldehyde solution and subsequently after 3-4 hours fixation and washing with water, transferred to rectified spirit. The large sized specimens were injected with 10% formaldehyde and given incision on its belly. While identifying the fish specimens, stress was mainly given on stable characters both meristic and morphometric. The latest authentic books on fish systematics and fauna volumes such as Day (1878, 1889), Jayaram (1981,1991) Menon (1964, 1987) and Talwar and Jhingran (1991) were referred to for fish identification.

Bird counts were carried out around the Jun 2010 to May 2011 from all four sites of Turori dam, Turori. Bird counts were done by two different methods. An actual head counts were done by bird species which were small in number for fast moving birds or for birds present in flock. A bird behavior was studied by observing their movements and habitat. The identification of birds was done by the book of ‘Indian bird’ Salim Ali (2001) and ‘A pectoral guide to the Birds of the Indian subcontinent' Salim Ali and Replay.

The Fifth Chapter Deals with observation and result. The results of physico-chemical and biological parameters are discussed in details. In present investigation air temperature varied from 18 to 40°C being highest in the month of May and lowest during the month of January. The water temperature was varied from 13 to 35°C being lowest during month of January and highest during month of May. The transparency varies from 30 to 92cm. Turbidity varied from 7 to 24 NTU being highest during month of July and minimum during month of January. The pH Values of dam water varied from 7.1 to 8.4 being highest in the months of summer and lowed during months of winter.

The values of Dissolved Oxygen varied from 3.5 to 7.6 mg/lit being highest during the month the month of January and lowest during month of May. The values
of free carbon dioxide ranged from 2 to 5 mg/lit, being highest during month of May and January. The Total harness value ranged from 35 to 105 mg/lit, being highest during month December and lowest during month of May. Total alkalinity values ranged from 60 to 173 mg/lit.

The phytoplankton species observed during study period were as follows.

Table. No. 1

<table>
<thead>
<tr>
<th>Class</th>
<th>Order</th>
<th>Species</th>
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<tbody>
<tr>
<td>Baccilophyceae</td>
<td>Pennales</td>
<td>Fragillaria</td>
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<td></td>
<td></td>
<td>Navicula Placenta</td>
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<td></td>
<td></td>
<td>Pinnularia</td>
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<td></td>
<td></td>
<td>Meiosira granulata.</td>
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<td>Chlorococcales</td>
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<td>Chlorella.</td>
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<td></td>
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<td>Ankistrodesmus</td>
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<td></td>
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<td>Pediastrum</td>
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<td></td>
<td></td>
<td>Scenedesmus arcuatus</td>
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<td>Ulotrichales</td>
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<td>Ulothrix</td>
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<td>Oedogoaniales</td>
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<td>Oedogonium</td>
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<td>Zygnematales</td>
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<td>Spirogyra</td>
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<td>Cosmarium</td>
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<td>Myxophyceae</td>
<td>Chroococcaes</td>
<td>Microcystis</td>
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<td></td>
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<td>Chroococcus Minor</td>
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<td></td>
<td></td>
<td>Merismopedia elegans.</td>
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<td>M. Punctata</td>
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<td>Oscillatoriales</td>
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<td>Oscilatoria subbrevis.</td>
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<td>Nostocales</td>
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<td>Anabena</td>
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<td></td>
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<td>Nostoc.</td>
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<tr>
<td>Euglenophyceae</td>
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<td>Euglena spirogyra</td>
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</table>

Total = 04 09 21
The Zooplankton species observed during study period were as follows.

Table. No. 2

<table>
<thead>
<tr>
<th>Group</th>
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<th>Family</th>
<th>Genus</th>
<th>Species</th>
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<td>Rotifera</td>
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<td></td>
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<td>Brachionidae</td>
<td>Brachionus</td>
<td>angularis</td>
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<td>caudatus</td>
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<td>calyciflorus</td>
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<td>Keratella</td>
<td>procurca</td>
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<td>--,--</td>
<td>cochlearis</td>
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<td>--,--</td>
<td>Lecanidae</td>
<td>Le cane</td>
<td>bulla</td>
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<td>Flosculariacea</td>
<td>Testudinellida</td>
<td>Filinia</td>
<td>opoliensis</td>
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<td>Cladocera</td>
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<td>Daphnidae</td>
<td>Daphnia</td>
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<td>Moinidae</td>
<td>Moina</td>
<td>brachiata</td>
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<tr>
<td>Copepod</td>
<td>Cyclopoida</td>
<td>Cyclopidae</td>
<td>Cyclop</td>
<td>sps</td>
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<td></td>
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<td>--,--</td>
<td>Nauplius</td>
<td>larvae</td>
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<tr>
<td>Total</td>
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</tbody>
</table>

The aquatic macrophytes are important in the food web in aquatic ecosystem and letain species of Mocrophytes observed in the Turori dam as follows

1) Hydrilla vorticillata
2) Vallisneria spiralis
3) Ludurgia perennis
4) Commelina benghalensis
5) Caesulia axillaries

XXVIII
6) Typha *indica*
7) Bacopa *Monieri*
8) Cyathocline *Purpurea*
9) Murdannia *sps*
10) Canesora *diffusa*
11) Blumea *sps*
12) Saccharum *spontaneum*

Certain **Arthropods** species also observed in Turori dam as follows
1) Common Crab
2) Fresh water Palaemon.
3) Dragon fly.
4) Nepa (Water scorpion)
5) Ranatra.
6) Belostoma.
7) Dytiscus.

Certain **Molluscan** species also observed in Turori dam as follows
1) Lymnaea (Pond Snail)
2) Thiara *Scabra*
3) Unio (The Fresh Water Mussel)
4) Pila sp.

The Turori dam contains **Fish** species as given below
1) Catla- *catla*
2) Labeo *rohita*
3) Cirrhina *mrigala*
4) Glossogobius *giuris*
5) Channa *stratus*
6) Channa marulius
7) Wallago attu
8) Hypophamichyths molitrix
9) Cyprinus carpio
10) Ctenophyrgangdon idella
11) Notopterus notopterus
12) Channa punctatus
13) Mystus seenghala

This dam contains **Piscivorous Birds** as given below,
1) Red wattled Lapwing - Vanelius indicus
2) white breasted kingfisher - Halcyon smyrnensis
3) common coot - Fulica atra
4) Grey Heron - Ardea cinerea
5) Little Egret - Egretta garzetta
6) spot billed Duck - Anas poeciiorthyncha
7) Water Hen - Amaurornis phoenicurus
8) Purple moorhen - Porphyrio prophyrio
9) White ibis - Threskiornis actiopica

**Sixth chapter consists of Discussion.**

The present study was done on the physical and chemical parameters along with the diversity of phytoplankton, zooplankton, aquatic macrophytes, aquatic arthropods, mollusca, fish and Piscivorous Bird diversity of Turori dam

The **Seventh chapter** shows summary and conclusion of the present work.

The **eighth chapter** shows the references used for above said work.