

## **Abstract of Ph. D. thesis**

### **Entitled**

### **“STUDIES ON THE HYDROBIOLOGY AND MONITORING AVIFAUNA OF JANGAMHATTI DAM OF CHANDGAD TEHSIL DIST. KOLHAPUR, (MAHARASHTRA)”**

#### **I. INTRODUCTION**

The total amount of water on earth is  $35 \times 10^{20}$  gallons of which 97% is found in sea while fresh water is only 37 million  $\text{km}^3$  of this 0.8% occurs in polar ice. Due to hydrological cycles on water, earth in constant circulation by evaporation, precipitating, percolation and run off. There is natural balance between evaporation and precipitation. Water bodies like and reservoirs not only provide a life supporting system for human society, animals and plants around but also provide a home for many species. The existence is dependent on the quality of water in which they lived and grew the importance of limnological studies out of the total reservoirs of water approximately 1.4 million cubic  $\text{Km}^3$  on the earth 97% is present in the form of ocean, 2% in the form of ice-cap at polar region and just 1% in the form of surface water and ground water. The 1% fresh water is available in the form of rivers, lakes and streams.

Water is universal solvent as it dissolves more substances than any other liquid without undergoing any chemical change. Thus water; the unique component of nature has played an important role in the life from molecules to man, hence since the time unmemorable the great human civilization has originated evolved and flourished around water resources. Water covers about 71% of the earth's surface but only 2.7% of the total water is fresh water, of which 1% is ice free water in the rivers, lakes, and atmosphere and as biological water. It has been estimated that only 0.00192% of the total water on the earth is available for human consumption Trivedi (1998).

Numerous anthropogenic activities like disposal of sewage and industrial water, recreational activities, excesses fertilization of both surface and ground water. In addition to this, due to the uneven distribution of fresh water on earth, due to development thrust of man and due to difference in the per capita availability of water, the water has become scarce natural resources and national wealth. Water pollution now a day is considered not only in terms of public health but

also in terms of its conservation, aesthetics and preservation of natural beauty and resources. Water pollution has however threatened to reduce the quantity available in ponds, lakes, rivers and reservoirs due to disposal of sewage, industrial waste and due to other human activities (Trivedi and Chandrasekhar, 1999). Population explosion, industrialization, urbanization and development thrust of man have created these problems of water pollution. According to different surveys, 70 to 80 percent of the Indian water sources are polluted and different enteric diseases affect millions of the people every year. United Nations Organization report has indicated that mortality of world population lack reliable sources of drinking water. Hence now –a-day raw water body is being analyzed for its utility like drinking, aquaculture, industrial and irrigation purpose.

India has rich fresh water resources in the form of rivers, lakes and rivulets. From all the resources in India, the total available fresh water is estimated to be 1900 billion cubic meters per year. About 80% of this water is lost as surface run –off. The surface flow represents 97% of the available water. The water –spread area of reservoirs and tanks is about 3 million hectare; where as lakes and ponds of India measures more than 1.5 million hectare. In India there are about 1, 17000 small and large natural and manmade fresh water bodies. (Ann. India, 1983). Every year there is an addition in the total water supply tanks. City water supply tanks, Irrigation tanks, flood control reservoirs etc. Srivastava et. al (1983) and Join (1984) reported the approximately estimate of cultural water spread area as 2.3 million hectare in India.

Most important of the small water bodies are located in the vicinity of temples area and mosques like religious places. Most of the “Yatras ” and “Meals’ are celebrated near these lakes. The day –to –day maintenance of these reservoirs is neglected. These activities cause pollution of these holy water bodies. Water is precious and therefore it is duty of each and every individual on the earth to conserve the all the available water. It is due to negligence of man many ground water and surface water sources get contaminated. Ultimately the contamination of water lead to many hazards situations and many times it becomes harmful to the large community. The contaminated water is dangerous to aquatic flora and fauna and to the precious vegetation grown on such water.

The biological diversity index gives us a measure of the way on which individuals in a community are distributed. Some lakes die because of lack of oxygen. In a normal lake, the amount of dissolved oxygen in the water varies little with depth.

In entropic lake oxygen count varies from sufficient at the surface to very slow at the bottom. The population pressure and activities near lake like bathing and cloth washing contribute substantially in reduction of the oxygen level of the lakes. The surface area run – off increases the volume of nitrates and phosphates flowing in to the lake water, which stimulate weed growth.

Thus, the increasing pace of developmental activities and extensive use of water resources are subjecting the quality and hydrobiology of fresh water resources (Mishra and Trivedi , 1993). These activities not only influences the micro fauna of fresh water but also favor the development of variety of undesirable new fauna, rendering the water unfit for human consumption. This increases in the nutrient status is termed as “ Eutrophication”, which makes the water body unfit for most of use.

## **II) The Topographical Setting Of Jangamhatti Dam Of Chandgad Tehsil Dist. Kolhapur, (Maharashtra)”**

The Kolhapur district is much older. From there on words the Karvir (Kolhapur), Kagal, Panhala, Shahuwadi, Hatkanagale, Shirol, Gaganbawada, Radhanagri, Bhudargad, Gadhinglaj, Ajara and Chandgad these are all Tehsils in this District. Chandgad is D. Zone ( remote) Prone Tehsil with heavy rainfall .

The climate of Chandgad Tehsil is mainly Hilly extent in October when humidity rises. The Hilly (cold weather) is little lesser till the month of March. The average rainfall in Jangamhatti Dam is 2364 mm and 2100 mm in 2008-2009 and 2009 -2010 respectively. The maximum temperature is 39<sup>0</sup>C and minimum 28<sup>0</sup>C as such Kolhapur has hot summer and comparative cooler winter. The forest area about 13000 hect and fertile area about 34000 hect in the Chandgad Tehsil. The soil of the region has light type soil, laterite, reddish, and gray white in color and semi fertile.

The Chandgad Tehsil is famous for crop rice particularly Indrayani and Ghansal these types of rice are cultivated in this Tehsil. Thick forest area of Chandgad Tehsil contains medicinal plants such as Hirda, Behada etc. The Chandgad Tehsil has few natural water bodies. These are some miner irrigation water tanks constructed by Government of Maharashtra.

**The Salient Features of Jangamhatti Dam Of Chandgad Tehsil are as follows :**

Sr. No.	Salient Features	Jangamhatti Dam
1.	Location Latitude Longitudinal	Jangamhatti 150 <sup>0</sup> – 51' - 30'' ( North) 74 <sup>0</sup> – 18' – 00'' ( East)
2.	Types of Dam	Earthen Dam
3.	Maximum height of Dam	31.40 m
4.	Catchments Area	8.25 sq.km.
5.	Capacity of Live Storage	12000 TMC.
6.	Gross storage capacity	34.11 Cubic meter
7.	Source Name of River	Ghatprbha River
8.	Mean Water Depth	20 m.
9.	Annual Average rainfall	2364 mm.
10.	Irrigation Command Area	3700 hect.
11.	No. of villages in Command	10
12.	Distance from Nearest Village Chandgad to Dam	10 km
13.	Distance from Dist Kolhapur to Dam	155 km.

The Jangamhatti medium project Honal Nala of Ghatprabha river basin. It lies 155 Km from Kolhapur South side 30 Km from Belgaum West and 90 Km from Goa North East. It is formed by earthen dam about 960 meter long and 31.40.meter in greatest height. Long in the left bank provides for the escape of flood – water. The type of waste weir is of F.O.F channel type.

This Jangamhatti dam was constructed for irrigation purpose, however in the passing of the time the water use pattern has changed from agricultural to domestic purpose, such as washing hatching and cleaning etc. the local fishermen started the fishing activities in the reservoirs. Increased human activities over the recent past years are imposing greater stress on these ecosystems. It is well known that almost all human activities change the quality of our water resources. Direct human activities in the form of washing, bathing, cattle wading may prove to be the much more effective factor for pollution. The causative factors responsible for

degradation of water quality need to be evaluated so as to take proper steps before the situation becomes worst and uncontrollable.

In recent studies on hydrobiology of the fresh water lentic habitats, about its physico-chemical characteristic and their productivity is well documented by Trivedy and Geol. ( 1988 ) Subbamma and Rama Sarma ( 1992 ) and Pandey et al. ( 1993) Throat (2000) Patil et al. (2002 ) Shastri and Sonwane ( 2004) Sampathkumar and Ramakrishna ( 2004)

In order to utilize a freshwater body it is very important to study the biotic and abiotic factor influencing the biological production of said water body. Research in this field is no doubt of indirect assistance but it will serve as a guideline to maximize the use of the productivity of water.

Thus in present investigation an attempt has been made to evaluate the important physico-chemical parameters, biological parameters such as plankton, aquatic micro flora, macro fauna and avifauna of the Jangamhatti Dam Of Chandgad Tehsil.

### **iii) The principal objectives of the present study are**

- 1) To determine physico-chemical and biological parameters of water.**
- 2) Assessment of suitability of water for various purposes such as drinking, irrigation and fisheries.**
- 3) Determination of pollution sources.**
- 4) Monitoring Avifauna visiting to the Jangamhatti Dam.**
- 5) Analysis of Avifauna according to ecological status.**
- 6) Establishing pattern in variation of water quality, if there are any.**
- 7) Establishing pattern in conservation of ecosystem.**

### **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, turbidity, total dissolved solid and conductivity.

**Chemical parameters-**

Dissolved oxygen, Free carbon dioxide, Hardness, Total alkalinity, Chlorides, Salinity and Sulphates.

**Biological parameters**

Phytoplankton, zooplankton, aquatic macro flora, macro fauna

**Microbiological parameters-** include bacterial count such as

*E. coli*. And B.O.D.

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

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

**The forth chapter** embodies the material and methods applied in the present study.

The physic-chemical and biological parameters are studied monthly for the period of two years (June 2008 to May 2011). 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, IAAB, (Hyderabad) and method of water analysis by Trivedi and Geol ( 1986).

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 APHA (1985) fresh water biology by Vard and Wipple , zooplankton by Battis, the book of IABA, Hyderabad water analysis method .

Aquatic macro phytes were collected with the help of string from Jangamhatti Dam 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.

Birds' counts were carried out during Jan 2009 to Dec 2009 from all four sites. An actual head counts were done by bird's species which were small in number for

fast moving birds as well as for birds present in flock. Birds behaviors were studied by observing their movements and habitat the identification of bird was based on Ali (2002) and Ali Repley (1983) Books. All observation there mode using binocular (Olympus 8X40) Photographic documentation was done with Nikon FE and with 300 mm. Telephoto lens.

### **The fifth chapter**

Deals with result and discussion. The result of morphometry, physico – chemical parameters and biological parameters along with population of aquatic birds is discussed in detail. In present investigation ambient temperature varied from 28<sup>0</sup>C to 39<sup>0</sup>C being highest in the month of May and lowest during the month of January while water temperature varied from 15<sup>0</sup> C to 30<sup>0</sup> C being highest in the month of May and lowest during the month of January. The pH was found to be varying from 7.5 to 8.8 which are slightly alkaline the pH was minimum in winter and maximum in summer season. The Transparency values range between 30 cm to 93 cm. Turbidity of dam water was ranged between 6 to 32 NTU. The TDS fluctuated between 98 mg/ lit. In the month of November and 210 mg / lit. In the month of March. Electric conductivity is ranging between 230 (mho/ cm) & 490 (mho/ cm). It is high in month of March and low in month of November. During May least DO was recorded (3.6 mg/ lit) and maximum DO was seen during winter (January, 7.9) Free Carbon dioxide ranging between 5 to 8 mg/lit. It is high in month of May and low in month of January .The Total Alkalinity was ranged between 79 to 188 mg/lit. Chlorides in the dam water ranged between 46 mg/lit and 150 mg/lit. Total Hardness was ranged between 110 mg/lit and 145 mg/lit. Sulphate was ranged between 1.6 to 16 mg/ lit .in present study BOD value was ranged between 1.6 mg/lit to 32 mg/lit.

The maximum species diversity of phytoplankton is observed in the Jangamhatti Dam. The occurrences of certain species of phytoplankton during Jun 2008 to May 2010 are as follows.

**Bacillariophyceae** – melosira granulate, naviculo plecenta,

**Chlorophyceae** – scenedesmus arcuatus.

**Euglenophyceae** – euglena eherenbergiia, euglena spirogyra and

**Myxophyceae** – chraococcus minor, micro cystic wesenbergii, merismopedia elgans, merismopedia punctata, oscillatoria brevis, microcrystal aeruginosa.

The diversity of zooplankton is also observed in the Jangamhatti Dam. The occurrences of certain species of zooplanktons during June 2008 to May 2010 are shown in following table.

Group	Order	Family	Genus	Species
<i>Rotifera</i>	<i>Ploimida</i>	<i>Epiphanidae</i>	<i>Epiphanies</i>	<i>clavulata</i>
	--,,--	<i>Brachionidae</i>	<i>Brachionus</i>	<i>angularis</i>
	--,,--	--,,--	--,,--	<i>caudatus</i>
	--,,--	--,,--	--,,--	<i>calyciflorus</i>
	--,,--	--,,--	--,,--	<i>quadridentatus</i>
	--,,--	--,,--	<i>Keratella</i>	<i>procurca</i>
	--,,--	<i>Lecanidae</i>	<i>Le cane</i>	<i>bullia</i>
	<i>Flosculariacea</i>	<i>Testudinellidae</i>	<i>Filinia</i>	<i>opoliensis</i>
<i>Cladocera</i>	<i>Cladocera</i>	<i>Daphnidae</i>	<i>Daphnia</i>	<i>carinata</i>
		<i>Moinidae</i>	<i>Moina</i>	<i>brachiata</i>
		<i>Bosminidae</i>	<i>Bosmina</i>	<i>longirostris</i>
Copepod	Cyclopoida	Cyclopidae	Mesocyclop	sps
			<i>Cyclop</i>	<i>sps</i>
			<i>Nauplius</i>	<i>larvae</i>
Total	4	8	11	14

Aquatic weeds are important in food web in aquatic ecosystem. They provide support, shelter and oxygen to other organisms and play a vital role in biological production. The list of some Aquatic weeds is given below.

1. Hydrilla verticillata (L.F.) Royle
2. Ludwigia perennis L.
3. Bacopa monieri (L) Wettst.
4. Commelina benghalensis L
5. Caesulia axillaries Roxb,
5. Canscora diffusa vahl.
6. Blumea sps.
7. Murdannia sps.
8. Cyathocline purpurea
9. Podostemon sps.
10. Sccharum Spontaneum L
11. Linderial/Sautera sps.
12. Vallisneria spiralis L

The Maximum species diversity of phytoplankton and zooplankton and birds were observed in the dam water . The dam was extremely productive in terms of food, plants and animals. Because the temp of water was often higher than that of the



surrounding air in winter. It acts as valuable feeding havens during the cold months. In addition it provides waters for drinking and bathing and open water also offers protection to fishes and birds from land predators. It is not surprising therefore that this fresh water habitat is home of many species of birds and also visited by many other species of birds not primarily adapted to aquatic life.

A systematic observation of biodiversity from Jangamhatti Dam, Chandagad Tehsil and surrounding forest, Dist. Kolhapur, during Jan 2009 to Dec 2009. Frequent visits were arranged to observe the birds from Jangamhatti Dam, over a period of one year. The observation shows that birds from Jangamhatti Dam forest represented eleven orders like Anseriformes, Ciconiiformes, Charadriiformes, Falconiformes, Gruiformes, Coraciiformes, Piciformes, Galliformes, pelecaniformes, Passeriformes and columbiformes. About 45 species were recorded during study period which could be treated as a good state of biodiversity. Naturally this can be correlated with physico-chemical properties of water and aquatic vegetation found in Jangamhatti Dam.

The common and more in winter season in present dam but the number is reduced in summer and rainy season.

The study of Phytoplanktons, Zooplanktons, birds and micro phyts (weed) were carried out and discussed in details.

**Sixth chapter consists of summary conclusion of the work.** The physico-chemical parameters of the reservoir 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 maximum species diversity of phytoplankton and zooplankton was observed in the reservoir. There is positive correlation with zooplankton and phytoplankton. The occurrence of certain members of *Myxophyceae*, *chlorophyceae*, *Bacillariophyceae* and *Euglenophyceae* that are tolerant to organic pollution in the lake indicates the polluted nature of water bodies. The occurrence of rotifer species such as *Brachionus angularis*, *B. californicus*, *fillina opliensis*. Etc. are the indicators of the eutrophic status of lake.

**The seventh chapter contains the references.**