ABSTRACT

“STUDIES ON BIOMONITORING OF POLLUTION IN THE RIVER KRISHNA AT SANGLI, MAHARASHTRA.”

Introduction –

In recent years environmental monitoring through regular analysis of quality of water has become a crucial factor in the exploitation for conservation of aquatic resources. Water the most vital abiotic component is unique in many respects. It occurs in all three states (Gaseous, liquid & solid) on the earth and acts as a solvent for variety of inorganic, organic and gaseous substances. In hydrobiological cycle rainwater is perhaps less contaminated but on precipitation it becomes a mixture and acts as abiotic component of aquatic ecosystem. Quality of water thus, at a given time and space acts as a limiting factor that, in turn, regulates biotic diversity and biomass, energy and material cycle, trophic levels and rate of succession.

In the western countries, scientists have been monitoring aquatic resources for last 100 years or so. This is because the impact of industrialization on environment was first observed in these highly developed countries and hence they took the initiative and introduced concepts like environmental awareness. In these countries pioneering institutions like American Public Health Association (APHA), Environmental Protection Agency (EPA), Fresh water Biological Association (FBA), etc. came into existence. It is an account of the research activities of these institutions that a plethora of literature that is useful for undertaking any work on aquatic ecosystem is readily available. As compared to the extensive work that has
been done in the developed countries in their regard, the picture in developing countries is far from satisfactory. Bulk of aquatic ecosystems in the less developed countries still remain unexplored and are yet to be fully investigated. Hence there is a tremendous scope for undertaking such studies, which can prove highly beneficial and fruitful.

In India, aquatic resources are subjected to adverse impact from three major factors; agricultural practice, industrialization and population explosion. The influence of such factors varies in magnitude depending on the geographical location. For example, impact of industrialization is mainly confined to ecosystem in the vicinity of urban centers. Tropical ecosystem is general and aquatic ecosystem of the Indian subcontinent in particular, is unique in physicochemical, biological and pollutional characteristics and there is a vast scope and need for a through investigation on the same.

Water quality assessment generally involves analysis of physiochemical biological, and microbiological parameters and reflects on abiotic and biotic status of the ecosystem. This in turn helps in utilizing the resources in the right manner check pollution and conservation of scarce resources. Further due to this open nature a constant exchange of matter and energy goes on between ecosystem and its surroundings, thus making water quality a dynamic entity. That’s why water quality assessment is a continuous process undertaken on regular basis. To summarize, environmental monitoring through water quality assessment which in itself, is a continuous process should be undertaken on regular basis for a variety of objectives like testing suitability of water for Agricultural, Industrial, Aqua-cultural, Recreational and domestic purposes. The investigation will check of pollution and help in
conservation of ecosystem. With this objective in view the researchers have undertaken a research project entitled – “Studies On Biomonitoring Of Pollution In The River Krishna At Sangli, Maharashtra.”

II The topographical setting of River Krishna.

The river Krishna is one of the major river in southern region of India which flow through three states that is Maharashtra, Karnataka and Andhra Pradesh and finally joins to Bay of Bengal at Machalipattan. The river Krishna Originates at Dhom Mahabaleshwar ranges in Satara District at a Height of about 1220 meters. It flows over Deccan Plateau from western crest to east crest. The rivers Venna, Koyana, Gayatri and Savitri also originate at Mahabaleshwar. At first it runs south then towards east and finally southeast. In Maharashtra it flows from north to South.

The total length of river Krishna is 1280 kms. In Maharashtra it measures about 282 kms. The total area of Basin Measures 2,59,000 sq. kilometers, while in Maharashtra its basin is about 28,700 sq. kilometers. At Origin River Krishna lies between 17° 59’N latitudes and 73° 38’ east latitude. The River Krishna is fed by number of tributaries out of them main three are River Koyana, River Warana And Panchganga, which originates at Mahabaleshwar, Patherpunj of Satara district and Prayag Chikhali Respectively. All Tributaries are on the right bank. The river Koyana Joins at Karad of Satara District, River Warana merges into river Krishna at Haripur of Sangli District while the River Panchganga Joins Near Kurundawad of Kolhapur District.

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 River Krishna.

**III The Principal Objectives Of The Present Study Are-**

1) Evaluate the quality of surface water during different seasons of the Years 2005-06 and 2006-07.

2) Detection of any sign of deterioration in water quality.

3) Identification in the chemical and biological aspects.

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

5) Recognize microbial pollution if any.

6) Establish pattern if any in over all conservation of ecosystem.

**IV Contents of thesis:**

The thesis is composed of six 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 –**

Temperature, pH, Transparency, turbidity, total suspended solids, total dissolved solid and conductivity.

**Chemical Parameters -**

Dissolved oxygen, free carbon dioxide, Hardness, Total Alkalinity, Chlorides, nitrogen, COD, Phosphate and Sulphates.

**Biological Parameters -**

Phytoplankton, Zooplankton, Aquatic macro flora,

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

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

Plankton samples were collected with standard plankton net made of silk bolting cloth no. 25. The amount of water filtered during the plankton net was about 200 lit. The samples collected were concentrated to a 50 ml volume and preserved in 4% formalin. Identification was made up to the species level.

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

The fifth chapter deals with Result and Discussion. The result of morphometry, Physico-chemical parameters and biological parameters is discussed in detail. In present investigation ambient temperature varied from 28°C to 40°C being highest in the month of May and lowest during the month of December while water temperature varied from 21°C to 32°C being highest in the month of May and lowest during the month of January; The pH was found to be varying from 6.8 to 8.3 which is slightly alkaline. The pH was minimum in winter and maximum in summer season. The transparency values ranges between 12.75 cm to 66.5 cm. The TDS fluctuated between 0.2 mg/lit. in the month of June and 5.51 mg/lit. in the month of October. The TSS fluctuated between 0.01 mg/lit. in the month of August and 0.56 mg/lit. in the month of November. Electric conductivity is ranging between 0.00004 (µmho/cm) and .00178 (µmho/cm). It is high in month of February and low in month of September. The DO was recorded in the range between 0-to 81.5-mg/lit. Free carbon dioxide ranging between 0 to 52.8 mg/lit. It is high in month of March. The total alkalinity was ranged between 0 to 20 mg/lit.
Chlorides in the water ranged between 49.36mg/lit and 1914.3 mg/lit. Total hardness was ranged between 54 mg/lit and 654 mg/lit. Sulphate was ranged between 2.48 to 42.95 mg/lit. In present study BOD value was ranged between 0 mg/lit to 3566.36 mg/lit. COD value was ranged between 24 mg/lit to 1044 mg/lit. Salinity in the water ranged between 4 mg/lit and 3455.64 mg/lit. The MPN was recorded in the range from 43-to 2800 per 100 ml of water.

The maximum species diversity of phytoplankton is observed in the River Krishna. The occurrences of certain species of phytoplankton during Jun 2005 to May 2007 are as follows.

**ALGAE**

**Diatoms:**

Naviculata, Closterium, Pediastrum, Pinnularia, Diatoma,

Pleurosigma, Campylodiscus.

**Blue Green Algae**

Osscilatoria, Spirogyra, Spirulina

**Volvox**

**HYDROPHTYES**

**Floating Hydrophytes**

Limna, Eichhornia.

**Submerged Hydrophytes**

Hydrilla

3) **ZOOPLANKTONS**

The diversity of zooplankton is also observed in the River Krishna. The occurrences of zooplanktons during June 2005 to May 2007 are Protozoon, Rotifers, and Cyclops etc.
Sixth chapter consists of summary and conclusion of the work. The Physico-chemical parameters of the river 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 river. There is positive correlation with zooplankton and phytoplankton. The higher values of M.P.N. of *E.coli* in the river water indicate that human waste in the form of sewage is polluting the water. There is also exists a negative correlation between M.P.N. of *E.coli* and dissolved oxygen.

The seventh chapter contains the references.

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