MATERIAL AND METHODS

The analysis of various physico-chemical parameters are used from standard methods for the examination of water (APHA 1985, Trivedy and Goel 1984).

Physicochemical Parameters

1. Colour:

   Colour in water may result from the presence of natural metallic ions (Iron and Manganese), humas and peat materials, plankton, weed etc. For the determination of colour, samples were collected in clean glass bottles and the analysis made soon after collection of samples, otherwise the colour may get changed biologically or physically during storage.

2. Temperature:

   The temperature of the water body was measured at sampling sites by mercury thermometer of 0 to 50°C range and 0.2°C least count. The water sample was taken in a plastic container and its temperature was recorded immediately by dipping the thermometer for about one minute. The temperature was recorded in degree Celsius (Trivedy and Goel 1984) while taking the reading; the scale of the thermometer should be immersed in the water up to the level of mercury in the capillary column.

3. Total Dissolved Solids (TDS):

   The total dissolved solids were estimated by gravimetric method. (Trivedy and Goel, 1984). The result was expressed in mg/l.

   \[
   \text{TDS (mg/l)} = \frac{A - B \times 10,000}{V}
   \]

   Where,

   \(A = \) Final weight of the dish in g
B = Initial weight of the dish in g
V = Volume of sample taken in ml.

4. Transparency:

Transparency is a water quality characteristic of lake and can be measured quickly and easily using Secchi disc. The Secchi disc was lowered down with the help of a graduated rope till it disappeared from the view and then lifted till it reappeared. The average reading of these two depths (in cm) was considered the limit of visibility and was taken as Secchi disc transparency.

\[
X + Y
\]

Transparency (cm) = \[\frac{X + Y}{2}\]

Where,

\(X = \text{Depth of disappearance (cm)}\)
\(Y = \text{Depth of reappearance (cm)}\)

5. Turbidity:

Turbidity arises because of wide variety of suspended colloidal materials, run off from barren areas during rain is the most natural contributor of turbidity, particularly silt and clay. Turbidity is interference to the passage of light by suspended particles in water. The scattering of the light is generally proportional to the turbidity.

6. Conductivity:

Pure water is a poor conductor of electricity. Acids, bases and salts present in water make it relatively good conductor of electricity and such substances are called electrolytes.

The conductivity of water sample was measured with help of a conductivity meter. Electrical conductivity was calculated using observed conductance, cell constant and temperature factor at 25°C (Trivedy and Goel 1984). The result was expressed as μmhos/cm.
7. **pH:**

The pH of most of the natural waterfalls is within the range of 4 to 9. pH is the negative logarithm of hydrogen ion concentration, or more precisely hydrogen ion-activity. Portable digital pH meter was used for the measurement of pH values. Standard buffer solutions of pH 4.0 and 9.2 were used for calibration.

8. **Dissolved Oxygen (DO):**

It is one of the most important water quality parameter. Dissolved oxygen was determined by modified Winkler’s method (Golterman *et. al* 1978, Trivedy and Goel 1984). The water sample was collected in 125ml glass Stoppard oxygen bottle. Then carefully, 1ml Manganous sulfate and 1ml of alkaline KI solution was placed at the bottom of the bottle to fix the dissolved oxygen. It was thoroughly mixed and then brown precipitate was allowed to settle. 2ml of concentrated sulphuric acid was added along the sides of the bottle and the bottle shaked well to dissolve the precipitate. 50ml of the above solution was taken in a conical flask and titrated with 0.025 N sodium thiosulphate solution using starch as an indicator to a colourless end point.

\[
\frac{X \times N \times 8 \times 1000}{Y}
\]

Dissolved Oxygen (mg/l) = \[
\frac{X \times N \times 8 \times 1000}{Y}
\]

Where,

- \(X\) = volume of sodium thiosulphate used (ml)
- \(Y\) = Volume of sample (ml)
- \(N\) = Normality of sodium thiosulphate.

9. **Free Carbon dioxide (CO₂):**

Free CO₂ was analyzed at the sites by using Phenolphthalein indicator and sodium hydroxide titrant. 50ml of sample was taken in a conical flask and five drops of phenolphthalein indicator added. If the colour turned pink,
free CO₂ was taken as absent, when it remained colourless, it was titrated
with 0.02 N sodium hydroxide until pink colour appeared.

Free CO₂ (mg/l) = \( \frac{X \times N \times 50 \times 1000}{Y} \)

Where, 
X = ml of titrant
Y = ml of sample
N = Normality of titrant

10. Biochemical Oxygen Demand (BOD):
The Biochemical Oxygen Demand was measured by dilution of water
sample in a glass container by bubbling compressed air in distilled water for
about 30 minutes. To each liter of diluted water sample, 1 ml each of phosphate
buffer, magnesium sulphate, calcium chloride and ferric chloride solutions was
added and the solution mixed thoroughly. Then the DO from the sample was
exhausted using 1 N sodium hydroxide. Two sets of BOD bottles were prepared
from samples following above procedure.

One set of BOD bottle was incubated at 20°C for 5 days and one set used
for determination of DO content. After 5 days of incubation the DO content was
measured from one set using following equation.

BOD (mg/l) = (D₀ - D₅) x dilution factor

Where,
D₀ = Initial DO in the sample
D₅ = Do after 5 days

11. Total Alkalinity:
Two drops of Methyl orange indicator were added to the solution in
which Phenolphthalein alkalinity was already determined. This was titrated with
0.1 N HCl to the end point, when the colour changed from yellow to pink.

Total alkalinity (mg/l) = \( \frac{X \times N \times 50 \times 1000}{Y} \)

Where, 
X = ml of titrant
Y = ml of sample
N = Normality of titrant.
12. Total Hardness:

The total hardness was determined titrometrically using (Ethylene Diamine Tetra Acetic acid Di Sodium salt) EDTA method. 50 ml of sample has taken in a conical flask. One ml of Ammonia Buffer and a pinch of Erichrome black T indicator was added and titrated against 0.01 M EDTA titrant till colour changed from the wine red colour to sky blue.

\[ \frac{X \times 1000 \times Z}{Y} \]

Total Hardness (mg/l) = \( \frac{X \times 1000 \times Z}{Y} \)

Where

- \( X \) = ml of titrant used
- \( Y \) = ml of sample
- \( Z \) = mg CaCO\(_3\) equivalent to 1.0 ml EDTA titrant

13. Phosphate:

Evaporate 125 ml of sample to dryness on hot water bath. Dissolve the residue in perchloric acid, heat the flask gently to decolorize solution cool the mixture and add 10 ml distilled water. Titrate the sample against 1 N Sodium hydroxide (NaOH) using phenolphthalein as indicator, end point as appearance of slight pink colour.

Make up the volume to 25 ml by adding distilled water. Add 1 ml of Ammonium molybdate and 3 drops of stannous chloride (SnCl\(_2\)) measure the absorbance of blue colored solution at 690 nm on Spectrophotometer simultaneously running distilled water blank. Read the value of total phosphate from a standard graph.

14. Nitrates:

Evaporate 25 ml water sample preferably overnight in a hot air oven adjusted at 50\(^\circ\)C. Dissolve the residue in 0.5 ml of Phenoldisulphonic acid by rotating the flask to run the acid over residue. In it add 5 ml of distilled water and 1.5 ml of KOH solution, and read the absorbance of yellow colored product
at 410 nm on a spectrophotometer using distilled water blank, compared with a standard graph.

15. Chloride:

Chloride was determined by titrometric method (Trivedy and Goel 1984). 2 ml of potassium chromate indicator was added to 50 ml of sample and titrated with 0.02 N silver nitrate until a persistent red tinge appear.

\[
\text{Chloride (mg/l)} = \frac{X \times N \times 35.5 \times 1000}{Y}
\]

Where, \( X \) = ml of titrant used.
\( Y \) = ml of sample
\( N \) = Normality of titrant.

16 Sulphate:

Water sample from Mahasangavi dam was filtered through Whatmann filter paper No.1. 50 ml of filtered water sample was taken into conical flask containing not more than 10 mg/l Sulfates. Added 0.15 gm, of barium chloride and mixed for 30 min. using a magnetic stirrer, measured the absorbance against a distilled water blank at 420 nm and compared with the standard curve.

BIOLOGICAL ANALYSIS

Physical and chemical characteristics of water bodies affect the abundance, species composition, stability, productivity and physiological condition of aquatic organism. Biological method is used for assessing water quality such as pollution which has chemically oriented and biological aspect has a subsidiary position because of number of complications in analysis and interpretation, collection of biological data. Biologically analysis of water includes collection, counting and identification of aquatic organisms.
1. **Plankton Analysis:**

   The two hundred liters water samples were filtered through the net number 25 bolting silk. The samples collected were concentrated to a 50ml volume and preserved in 4% formalin. Each replicate of phyto and zooplankton samples was identified under research microscope using suitable keys, standard texts and monographs given by Pennak (1978), Tonapi (1980) and APHA (1985).

2. **Fish studies:**

   Fishes were collected with the help of local fisherman. The fish specimens collected were instantly fixed in 4-5% formaldehyde solution and subsequently transferred after 3-4 hours fixation and washing to rectified spirit. The large sized specimen was injected with 10% formaldehyde and given incesion on its belly. While identifying the fish specimens, stress was mainly given on stable characters both meristics and morphometric. The shape of the snout, presence or absence of barbels, number of dorsal fin rays, number of scales in lateral line, scale in transverse lines, predorsal scale etc,with the help of Z.S.I. center pune The latest authentic books on fish systematic and fauna volume such as Day (1878, 1889), Jayaram (1981, 1991) Menon (1964, 1987) and Talwar and Jhingran (1991) were referred for fish identification.

3. **bird studies:**

   The wet labd birds were observed during the year July 2006- June 2008. The birds were observed at the morning period. The behaviour of birds was studied by observing their movement and habitat. The wetland birds appeared at the morning and evening at the edge of dam. The identification of wetland bird was done with the help of Ali (2001), Ali and Ripley’s (1983) books. Observations were made by using binocular (Olympus 8x40).