



LIMNOLOGICAL STUDIES ON DHANEGAON RESERVOIR, DHENAGAON, DIST- OSMANABAB, MAHARASHTRA (INDIA)

LOKHANDE, M.V

Department of Zoology, Indira Gandhi (SR) College,
CIDCO, Nanded, Maharashtra (India)

Abstract:

Limnological study was carried out on Dhanegaon reservoir, Dhanegaon Dist – Osmanabad, Maharashtra for a period of two years during 2003-2005. In the present investigation 16 parameters had been studied. During the study period pH ranged between 7.0 to 8.6. It is alkaline in trend. Dissolved oxygen varied from 7.2 to 13.6 mg/l, Total alkalinity varied from 97 to 147 mg/l, Chloride varied from 9.94 to 36.92 mg/l and Total hardness varied from 75 to 126 mg/l. The nutrient values were found in within limit and the reservoir water was found may be suitable to use of domestic, agriculture and fish culture.

KEYWORDS:-

Limnology, Dhanegaon reservoir, Water quality.

INTRODUCTION

The reservoirs are constructed to meet the requirement of human being, irrigation, hydro-electrical powers, flood control, storage of water for drinking purpose and suitable development of fisheries for the purpose of human food. Water is one of the most important compounds required for very existence of life. Without water neither human nor the environment, which sustain them, can survive. To safeguard the long term sustainability of water resources, the quality of the water needs to be continually monitored. Water is used in day-to-day activities for drinking, bathing, washing, recreation, irrigation and industrial purposes. The availability of safe and reliable source water is thus an essential pre-requisite for the establishment of a stable community. The increasing industrialization, organization and development which have caused pollution of water have brought veritable water crises.

Several contributors are to be noted who have made achievement in the field of limnology in India and abroad. Some of the important and recent contributors are Ganapati (1943), Lewis W.M. Jr (1978), Shrivastava and Kulshreshtra (1990), Prescott (1994), Singh and Roy (1990), Pradeepkumar Jain (1999), Mathew (1978), the other pioneer workers likes Eddy (1934), Thienemann (1925), Frobes (1877) who have studied the Limnological parameter of the various lakes without relating them to biological events occurring in the ecosystem. The Dhanegaon reservoir is large sized reservoir constructed on Manjara river near village Dhanegaon Taluka Kalamb Dist. Osmanabad. The reservoir is constructed in 1980 lies in between 1825 to 1855 N latitude, 7515 to 7615 E longitudes. The reservoir is particularly constructed for the irrigation (Agriculture) purpose. The reservoir is reach in flora and fauna around and in as there is no any industry on both sides as well as in catchments area. The 73 villages are of Beed, Osmanabad and Latur is supposed to be beneficiaries of this project. Hence it is totally free from pollution load. The catchments area about 2371 km. The water capacity of reservoir 260.70 million/cubic mtrs. The reservoir is constructed for only irrigation purpose.

MATERIALS AND METHODS

In order to cover the whole topography of the reservoir three sampling spots selected for the study the sites named as spot –A, B and C respectively.

During the period of study (June 2003- May 2005) Monthly water samples were collected for the analysis of physico-chemical parameters of water. In the present investigation the parameters like water temperature, turbidity, conductivity, pH, Dissolved oxygen, Carbon dioxide, Total alkalinity, Chlorides, Total Hardness, Total dissolved solids, Sulphate, Phosphate, Biological oxygen demand, Chemical oxygen demand with analysed by standard methods suggested by APHA (1989), IAAB (1998) and these parameters are discussed in detail.

RESULTS AND DISCUSSION

Water temperature:- Water temperature is one of the important physical parameter. It is determining factor in seasonal distribution of organisms. It effects the chemical and biological reactions in water. In general, water slightly warmer than optimum, provides better growth and food conversion than water with low temperature. Metabolic rate slows at the temperature below optimum for a particular species and increases as temperature rises above the optimum level at certain extent and no relationship can be deduced between chemical conditions and phytoplankton population at any specific time. The monthly variation of temperature of water in the three sites of Dhenageon reservoir reveals that temperature was maximum (31.0 0c, May 2005) at spot C and minimum 20.10c (January, 2005) at spot A temperature increased to maximum 30.8 0c, 30.4 0c, 30.3 0c (May, 2004) at spot A, B and C respectively. But the maximum trend was similar in the year 2005 in the month of May temperature recorded as 30.9 0c, 30.8 0c and 31.0 0c at spot A, B and C respectively and decreased in minimum value of temperature recorded in the month of August during the two year study period in all spots.

During summer season water temperature was higher because of low water level low velocity, clear atmosphere and greater solar radiations naturally the minimum water temperature in the rainy season and winter months due to frequents clouds high percentage of humidity, high current velocity and high water levels. In the present investigation the maximum and minimum water temperature recorded due to the changes in atmospheric temperature in the different season and sampling of water at different spots.

CONDUCTIVITY:-

Conductivity is a numerical expression of its ability to carry on electric current, which depends upon the ionic strength. Absolutely pure water is actually a poor electrical conductor. It is the substances (or salts) dissolved in the water, which determine how conductive the solution will be. Monthly variation in conductivity of water at three sides of the reservoir revealed that it was maximum 313 mhoms at spot A and minimum 221 mhoms at spot A. In the spot A it ranged from 221 to 311 mhoms the maximum being recorded in the month of May (2004) and minimum in the month of December (2003). In spot B it was ranged from 230 to 312 mhoms the maximum being recorded in the month of May (2004). The similar trends of conductivity were observed at the spot c but the value it ranged from 225 to 308 mhoms.

The seasonal trend of conductivity showed that maximum in the summer season and minimum in the winter season. The seasonal changes in the conductivity was may be due to increase concentration of salts because of discharge of agricultural waste and organic matter from the near by agricultural fields.

pH:- pH is an important parameter in water body. Most of the aquatic organisms are adapted to average pH and do not withstand abrupt changes. The pH of freshwater is highly susceptible to changes in the concentration of carbon dioxide and the nature of sediment, unlike the pH of seawater. The parameter showed varied fluctuations during the study period with three spots maximum and minimum (7.5 to 8.6) value were noticed at spot C at the reservoir the maximum was found in (April 2004) where at its minimum was in August (2003) it is gradually increased from 8.1 in January (2004) to maximum 8.6 April (2004 and 2005) and decreased to 8.4 in May (2004 and 2005) and again decreased in the June (2003 and 2004).

In the present investigation the pH of the reservoir water was alkaline ranging from 7.0 to 8.6 maximum in summer season and minimum in winter season at all spots. The reservoir water was alkaline throughout the period of investigation.

During the study period in the summer season photosynthetic activity was reduced due to higher temperature which resulted in the accumulation of carbon dioxide and the subsequent decrease in the pH.

Total Dissolved Solids:- Total dissolved solids are the amounts of particles that are dissolved in the water. It may include all suspended solids that may or may not pass through a filter. The monthly variation in total dissolved solids of water at three spots of the reservoir showed that it was ranging from 100 to 415 mg/lit,

100 to 365 mg/lit and 105 to 415 mg/lit at spot A, B and C respectively.

In the present investigation the seasonal distribution of TDS the minimum in winter season and maximum in the rainy season. It slightly fluctuated in the summer season due to the leaching of surrounding rain water.

Dissolved oxygen:- Dissolved oxygen is one of the most important factors in water quality assessment and reflects the physical and biological process prevailing in the natural water. Dissolved oxygen level in natural and waste water is dependent on the physical, chemical and biological activities, prevailing in the water body. The monthly variation of dissolved oxygen at three spots of reservoir showed it maximum value 13.6 mg/lit in January 2004 at spot C and minimum 7.2 mg/lit in July 2003 at Spot B. The monthly values of Dissolved oxygen varied from 7.2 to 12.6 mg/lit, 7.2 to 1.8 mg/lit and 7.2 to 13.4 mg/lit at spot A, B and C respectively during the study period 2003 to 2005. The season wise analysis showed that dissolved oxygen was maximum in winter while minimum and least during summer. The dissolved oxygen high in winter due to photosynthesis at low temperature.

Total alkalinity:- The monthly variation of alkalinity of water at three spots of the reservoir was recorded 97 to 147 mg/lit minimum (97 mg/lit) at spot B in May 2004 and maximum (147 mg/lit) at spot A in January 2005. In spot B it was ranged from 102 mg/lit (May 2005) to 137 mg/lit (January, 2005). In spot C it was ranged from 97 mg/lit (May, 2004) to 127 mg/lit (January, 2005). The similar trend of minimum and maximum value recorded at three sites. The total alkalinity between 220 to 360 mg/lit indicates pollution of the water body but in the present investigation the alkalinity is ranged from 97 to 147 mg/lit it is within the range of polluted water body, hence the present water body indicates the highly productive from alkalinity point of view of it's water.

Chloride:- Chloride occurs practically in all waters and is often a major inorganic constituent. In natural waters, chloride results from the leaching of chloride containing rocks and soils with which the water comes in contact. In coastal regions salt water intrusion may contribute to the chloride content of inland waters. The monthly variation in chloride of water at the three sites of the reservoir was ranged from 9.94 mg/lit (July, 2003) to 36.92 mg/lit (May, 2005). In the spot A it is ranged from 11.36 mg/lit (June, 2004) to 36.92 (May, 2005). In spot B it ranged from 11.36 to 35.5 mg/lit the maximum being recorded in May 2005 and minimum (June, 2004). In spot C it ranged from 9.94 to 35.5 mg/lit. The minimum and maximum value recorded in the similar manner at spot A and B. The season wise analysis showed that the maximum value recorded in the summer season while minimum in the rainy season due to dilution of water by rain. Thus the water body indicating the purity and slightly free from pollution.

Total Hardness:- Hardness is defined as the concentration as multivalent metallic cations in solution. At super saturated condition, the hardness cations will react with anions in the water to form a solid precipitate. Hardness is classified as calcium hardness and magnesium hardness, depending upon the anion with it associates. Ecologically, temporary hardness plays a important role in buffering capacity thus neutralizing and off set in pH due to addition of acidic product. This has a great effect on biotic diversity and biomass in ecosystem. Hardness also restricts water use. Hard water is unsuitable for cooking, washing and bathing due to high boiling point in the first while poor lather forming capacity in the later two uses. The temporary hardness and permanent hardness is caused due to sulphate and chloride. In general, hardness is measured the sum of concentration of calcium and magnesium as calcium carbonate which is high on concentration as compared to other cations. The total hardness of water at the three sites of the reservoir ranging from 75 to 126 mg/lit the minimum value was found (75 mg/lit) in the month of June 2004 and maximum value (126 mg/lit) in the month of January 2004. The value ranged from spot A 75 to 126 mg/lit, at spot B 82 to 120 mg/lit and at spot C 80 to 115 mg/lit. The season wise analysis showed that the maximum value was recorded in winter season while minimum in the summer season during the study period. Similar results were observed by Mathew Varghese & Naik (1992) in Chindwara pond. According to Prasad and Manjula (1986) the richness of bicarbonates in water is concurrent with the view quantity water rich in bicarbonate is usually rich in calcium. The higher concentration of Calcium and Magnesium present in water indicates increased level of pollution. According to Kulkarni and Goal (1985) Stated that higher concentration of ions like calcium and magnesium are generally associated with their increased level of pollution.

Calcium Hardness :- The presence of calcium in water results from passage through or over deposits of limestone, dolomite, gypsum and such other calcium bearing rocks. Calcium contributes to the total hardness of water and is an important micro-nutrient in aquatic environment. It is especially needed in large quantities by molluscs and vertebrates. Small concentration of calcium carbonate prevents corrosion of metal pipes by laying down a protective coating. But increased amount of calcium precipitates on heating to form harmful scales in boilers, pipes and utensils. The calcium is present in all surface water as Ca^{++} and is usually dissolved from rocks in calcium minerals. The cation is abundant in surface water and along with magnesium is responsible for the hardness of water. It is an important constituent in all organisms and is

incorporated into the shells of many invertebrates and bones of vertebrates. The calcium concentration in natural waters is < 15 mg/l. The calcium content of water at three spots in the reservoir ranging from 40 to 93 mg/lit the minimum (40 mg/lit) was found in the month of May 2004 while maximum (93mg/lit) in the month of January 2005. The monthly variation of calcium hardness ranging from 52 to 90 mg/lit, 47 to 84 mg/lit and 40 to 90 mg/lit at spot A, B, and C respectively. The season wise analysis showed that the maximum in winter less in summer. The maximum value recorded in the summer season as high temperature causes rapid decomposition of organic matter and minimum value was recorded in the winter season due to low temperature. Similar results were observed by Abubakar et.al. (2004), Chowahay and Zaman (2006).

Magnesium Hardness:- The magnesium hardness of the water at three spots of the reservoir ranging from 3.17 to 11.71 mg/lit. The minimum value was recorded in the month of October 2003 at spot C and maximum in the month of December 2004 at spot A. The monthly variation of calcium hardness during the study period was found in between 3.66 to 11.71 mg/lit at spot A, 6.1 to 11.71 mg/lit at spot B and 3.17 to 10.49 mg/lit at spot C. The season wise analysis showed that minimum in rainy season and maximum in summer season. The present investigation results revealed that finding of Kumar (1997) studies on Kunjawani pond at Jammu.

Sulphate:- Sulphur exist in a number of oxidation states from the most oxidized sulphates to the most reduced sulphide. The monthly variation of sulphate of water at three spots revealed that, sulphate ranged from 10 to 26 mg/lit the maximum in January 2005 and minimum in July and August 2003. the concentrations of sulphate was maximum recorded in the month of January and minimum in July during the year 2003 to 2005. The fluctuation of sulphate value in the reservoir was attributed to the waste and some human activity near the reservoir. Similar results were observed by kulkarni and Patil (1995) studied on Sadatpur reservoir, Ahmednager.

Phosphate:- Phosphorous is one of the most important and major nutrient that is required by the biota. Phosphorous occur in very small quantities in natural waters and plays important role in the maintenance of pond fertility. It occurs mostly as dissolved orthophosphates, polyphosphate and organically bound phosphates. The monthly variation in phosphate of water at three sites in reservoir ranged from 0.07 to 0.48 mg/lit. The maximum in (August,2003) at spot C and minimum in (May,2005) at spot C. The phosphate value ranged from 0.08 to 0.38 mg/lit at spot A, 0.09 to 0.48 mg/lit at spot B and 0.07 to 0.46 mg/lit at spot C. Similar results were observed that the Yogesh Shashtri (1999) in Mosam river at Malagaon. The season wise analysis showed that the maximum in rainy season and minimum in summer season. The value is fluctuated in the investigation the minimum in summer season due to the decomposition and utilization of phosphate for the growth of phytoplankton.

Biological oxygen demand:- In unpolluted water of BOD is lower while it is higher in case of polluted water. In the present study the BOD value varied from 9.0 to 20.4 mg/lit during the two year study period at three sampling spots. The minimum value (9.0 mg/lit) in the month of January 2004 and maximum (20.4 mg/lit) in the month of May 2004. The monthly variation of BOD values ranges from 9.3 to 17.7 mg/lit, 9.6 to 17.4 mg/lit and 9.0 to 18.6 mg/lit at spot A, B and C respectively. In the present study the values of BOD of water of the reservoir due to low and thus indicating non polluted water body. Similar observation were made by Durve (1979) studied on Udaipur lake. The season wise analysis showed that in present investigation minimum in winter season and maximum in summer season. The fluctuation of the value from season to season was possibly due to the presence of organic matter and microbial activity.

Chemical oxygen demand:- Chemical oxygen demand test is useful in pinpointing toxic condition and presence of biochemical resistant substances. Chemical oxygen demand of water at three spots of reservoir showed that the value ranged from 3.36 to 12.96 mg/lit. The minimum (3.36 mg/lit) in the month of May 2005 and maximum (12.96 mg/lit) in the month of July 2003. The monthly variation of COD ranges from 3.52 to 9.6 mg/lit, 3.36 to 11.04 mg/lit and 3.52 to 12.96 mg/lit at spot A, B and C respectively.

The season wise analysis showed that the values of COD minimum in summer season and maximum in rainy season. The minimum and maximum value of COD recorded in the reservoir water due to the presence of accumulation of organic matter at the bottom of reservoir water. The similar results observed by Drusilla et.al. (2004).

CONCLUSION:-

From the above studied the different physico-chemical characteristics of Dhanegaon reservoir water showed that the reservoir quality of water survey of three different spots during the present investigation indicates the non-polluted water, thus the water is use for the agricultural and aquaculture practices. All the parameters are quite suitable for the growth of fishes as well as the phytoplankton. Finally, it is concluded that the water of reservoir is quite suitable for human consumptions.

ACKNOWLEDGMENT:-

Authors are thankful to the Principle Dr. R. L. Kawale, and Dr. D. G. Solunke, Head of the Department of Zoology, Rajarshi Shahu College, Latur for valuable help and co-operation during the study period.

REFERENCES:

- APHA- AWWA- WPCF (1981). Standard Methods for examination of waters and waste water, American public health Association Washington D.C.
- Chowdhary Abdullah Harun and M. Zaman (2006), Limnological Conditions of Utricularial Habitat. *Ecol. Env. and Cons* 12(1): PP 17-23.
- Drusilla, R., Kumaresan, A. and Narayanan, M. (2005), Studies on the water quality of lotic systems in and around Courtallam, Tamilnadu-Part II. *Poll. Res.* 24 (1): 177-185 p.p
- Eddy, S. (1934), Study of freshwater plankton communities III *Biol. Monjor.* (12): 1-93 p.p.
- Frobe, S.T. (1877) *Abgedruckt in selected readings in biology* 33 (2 Auf 1) (Second editing) Chicago University press. 1-22 p.p.
- Ganpati, S.V. (1943), An ecological study of garden pond containing abundant zooplankton *Proc. Ind. Acad. Sci, B.* 17 (2): 14-50 p.p.
- Kulkarni, S.D. and Patil, R.P. (1995), Diurnal changes in physico-chemical characteristics of sadatpur Reservoir. *J.A.B.* Vol 10 (1): 21-23 p.p.
- Kumar, S. (1997), Altitude related Limnological studies on Himalayan lakes. *Recent trends in fresh water biology* Vol II (4): 63-72 p.p.
- Kumar, S. (1997), Limnological studies on Kunjwani pond Jammu I. physico-chemical features and its Scope to fish culture. *Recent advances in fresh water biology* vol. II (1): 1-20 p.p.
- Lewis, W.M. Jr., (1978), Dynamic and Succession of Phytoplankton in a Tropical lake, Canoo, Philippines, *J. Ecol* 66: 849 - 880 P.P.
- Mathew Varghese, Anil Chaugan and Naik, L. P. (1992), Hydrobiological studies of Tropical pond I. *Poll. Res.* 11(2): 95-100 p.p.
- Mathew, P.M. (1978), Limnological investigation on the plankton of Govindgarn lake and its correlation with Physico-chemical factors. *proc. Semi. Eco & fish of fresh water reservoir:* 37-46 p.p.
- Pradeep Kumar Jain (1991), Assessment of water quality of khnop reservoir in chhaterpur M.P. India. *Ecol. Env. and cons* 5 (4): 401 - 403 P.P
- Prasad, B.N. and Manjula, S. (1980), Ecological study of blue green algae in river gamati. *I. J. of Environ. Health.* 22 (2): 151 - 168 P.P
- Prescott, G.W. (1984), *The algae a review* B.S. M.P.S. publication, Dehradun India: 436.
- Shastri Yogesh (1999) Hydrobiological study of river mosam, malagaon maharashtra Vol. 26 (4).
- Shrivastava, U.S. and Kulshreshtha (1990) Seasonal variation in certain physico-chemical parameter in Ganga, Yamuna and Towns in Alahabad region (U.P. India) *Recent Trends in limnology* 351-363 p.p.
- Singh, D.K., Roy, S.P., Dattamunshi, J.S. (1990) Assessment of drinking water quality of Santhal pargana, Bihar. *J. Environmental Ecology & Cons.* 8(3): 937-941 p.p.
- Thieneman (1925), *Die binnengewasser Mitteleuropas, die binnengewasser I, Vela schweizerbrt* Stuttgart.

Table no.1 Range of Physico-chemical parameters of Dhanegaon reservoir during the period of (2003-2005).

SR.NO	PARAMETERS	RANGE OF PARAMETERS IN DHANEGAON RESERVOIR
1	WATER TEMPERATURE (0 _c)	20.1 TO 30.8 0 _c
2	CONDUCTIVITY (mhoms)	221 TO 313 (mhoms)
3	Ph	7.1 TO 8.6
4	TOTAL DISSOLVED SOLIDS(mg/l)	100 TO 415
5	TOTAL HARDNESS (mg/l)	75 TO 126
6	CALCIUM HARDNESS (mg/l)	40 TO 93
7	MAGNIISIUM HARDNESS (mg/l)	3.17 TO 11.71
8	DISSOLVED OXYGEN (mg/l)	7.2 TO 13.6
9	CHLORIDE (mg/l)	9.94 TO 36.92
10	SULPHATE (mg/l)	10 TO 26
11	PHOSPHATE (mg/l)	0.07 TO 0.48
12	BIOLOGICAL OXYGEN DEMAND (mg/l)	9.0 TO 20.4
13	CHEMICAL OXYGEN DEMAND (mg/l)	3.36 TO 12.96