

## RESEARCH ARTICLE

## Physicochemical parameters of Erai dam, Chandrapur (MS) India

Jadhao RG\* and Dhage DM

P.G. Department of Zoology, Shri Shivaji Science College, Amravati.(M.S.) India.

\*Corresponding author Email: Dr. RG Jadhao, Associate Professor and Head, P.G. Department of Zoology, Shri Shivaji Science College, Amravati.(M.S.) India. | Email: [rajusingjadhao@gmail.com](mailto:rajusingjadhao@gmail.com)

Manuscript details:	ABSTRACT
<p>Received: 03.09.2015 Revised: 12.10.2015 Accepted: 10.12.2015 Published : 30.12.2015</p> <p><b>Editor: Dr. Arvind Chavhan</b></p> <p><b>Cite this article as:</b> Jadhao RG &amp; Dhage DM (2015) Physicochemical parameters of Erai dam, Chandrapur (MS) India. <i>International J. of Life Sciences</i>, 3(4): 387-391.</p> <p><b>Copyright:</b> © 2015   Author(s), This is an open access article under the terms of the Creative Commons Attribution- Non-Commercial - No Derives License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.</p>	<p>The study area was visited monthly and water sample were collected from five stations and carried to the laboratory. Standard method were used to determine the concentration, total suspended matter and Physicochemical parameters, such as temperature, pH, conductivity, turbidity, free CO<sub>2</sub>, dissolved oxygen, chloride, total hardness, calcium hardness, magnesium hardness and total phosphorus were estimated.</p> <p><b>Keywords :</b> Physicochemical Parameters, Erai Dam.</p> <p><b>INTRODUCTION</b></p> <p>Water plays a vital role in human life. The physicochemical parameters are very important in the study of any aquatic environment. For the developmental activities of the region water resource quality from any region is an important aspect, because the rivers, lakes and manmade dam or reservoir are used for water supply to domestic, industrial, agricultural and fish culture. The water quality is describes by its physical, chemical and microbial characteristics. The data collected would create environmental awareness for the local people concerning the status of the dam.</p> <p><b>MATERIAL AND METHOD:</b></p> <p>Erai dam is situated in Chandrapur District (Maharashtra State), at latitude and longitudinal area of the dam was 20.1677381° N and 79.3048096°E respectively. The height 30m(98 ft),Length 1620 m(5310 ft), Dam volume 985 km<sup>3</sup> (236 cu mi), Total capacity193000km<sup>3</sup>(46,000 cu mi),Surface area58000 km<sup>3</sup>(22000 sq mi)The dam water used for irrigation, thermal power plant, CSTPS and Chandrapur city. The live storage capacity of the Erai dam between R.L. 200.5m to R.L. 207.00m inMm<sup>3</sup> and full original</p>



**Map 1: Location map of study site**

capacity in the year (1983-85) was 193.003m and SRS survey based capacity in year (2007-08) was 144.796m in Mm<sup>3</sup>, the live storage capacity was reduced due to siltation. Reduction rate of capacity in Mm<sup>3</sup> was 48.207. The amount of silt is estimated as the difference between original capacity and the present capacity. The study area was visited monthly and water sample were collected from five stations and carried to the laboratory analysis. Standard method were used to determine concentration, total suspended matter and physicochemical parameters, such as temperature, pH, conductivity, turbidity, free CO<sub>2</sub>, dissolved oxygen, chloride, total hardness, calcium hardness, magnesium hardness & total phosphorus were estimated by using the standard methods of APHA(198).

## RESULTS

The result from data analysis showed that the water quality is suitable for aquatic life. This study involves determination of physicochemical parameters of water, different stations are summarized in table 1.

Variation in temperature affects the biological productivity 20<sup>o</sup> C to 41<sup>o</sup> C temperatures was required range of fish culture. In present investigation shows temperature value range between 22<sup>o</sup> C to 30<sup>o</sup> C which is suitable for the fish culture. Similarly reported earlier by Borse and Bhawe (2000). The water was highly turbid in the monsoon season. The turbidity of water body

due to the suspended material like salt and clay. Turbidity restrict light penetration, which is directly affect on bioproductivity. Turbidity value was observed during study is between 1 NTU to 6 NTU. So value indicates that dam was suitable for fish and other aquatic culture. The pH ranging from 6.5 to 9.00 before daybreak is most suitable for culture. The present study reveals that pH range between 7 to 9, so the water quality was good for aquatic culture. WHO (1984) and ICMR prescribe these values. In the present investigation conductivity range between 114 to 200 mho/ cm in the summer season the total volume of water decreases as a result, the conductivity increases. The conductivity value of Erai dam was favoring to the biological productivity.

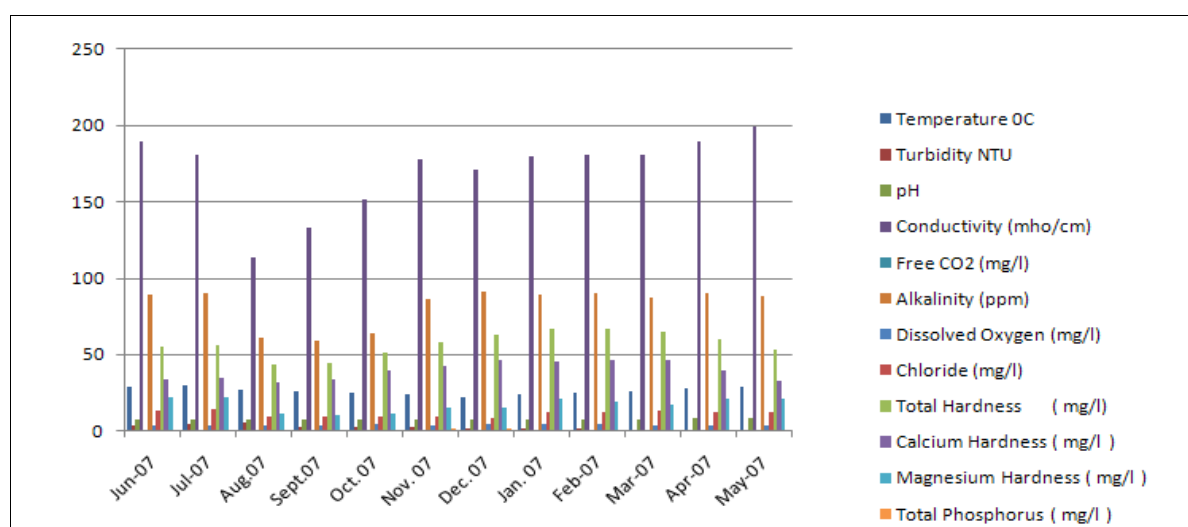
According to Swingle (1967) more than 15mg/l, CO<sub>2</sub> range is detrimental for fishes. Present study showed that the range of CO<sub>2</sub> is between optimum level which is suitable for dam life. Alkalinity and pH are so closely related. High alkalinities are able to shift in pH. The standard level of alkalinity was 20-200 mg/l. Total alkalinity during study period was shows that water quality suitable for aquatic life. D.O. is another vital parameter regulating survival of aquatic life. In present investigation showed that the D.O. range between 3 to 5 mg/l. In the month of December and January the higher range of D.O. documented which good for production. The chloride range was observed high in the summer season. Presence of chloride in the water source is used as indicator of pollution.

The values of calcium and Magnesium hardness never exceeded the standard limit of WHO (1989) i.e. 200 mg/l and 100 mg/l respectively. And a positive co-relation shows between calcium magnesium and total hardness Phosphorus is a vital factor for fertility less than 0.5mg/l is unfavorable for fish growth. In the present investigation phosphorus range between 0.10 to 0.70 mg/l which is favorable for fish growth

Temperature is one of the important physical parameter which directly influence some chemical reactions in aquatic ecosystem. In present study period, the temperature of water range between 22° C to 30°C and the lowest temperature were observed in the month of November and December and maximum temperature were observed in the month of May, June and July (2007-08).

**Table 1: Annual average of physicochemical parameters of Erai dam**

Parameter	Jun-07	Jul-07	Aug-07	Sept-07	Oct-07	Nov-07	Dec-07	Jan-07	Feb-07	Mar-07	Apr-07	May-07
Temperature 0C	29	30	27	26	25.5	24.6	22.3	24.7	25.2	26.2	28.2	29.5
Turbidity NTU	3.2	3.8	5.4	2.6	2	1.8	1.4	1.2	0.8	0.2	0.4	0.6
pH	7.8	7.78	7.45	7.58	7.7	7.57	7.79	7.77	7.95	8.16	8.64	8.75
Conductivity (mho/cm)	190	182	114	134	152	179	172	181	182	182	190	200
Free CO2 (mg/l)	0.48	1.14	0.38	1.16	0.4	0.36	0.014	0.4	0.14	1.14	1.22	0.18
Alkalinity (ppm)	90	91	62	60	64	87	92	90	91	88	91	89
Dissolved Oxygen (mg/l)	3.46	4.1	4.28	4.34	4.54	4.3	5.2	5.02	4.78	4.26	3.84	3.8
Chloride (mg/l)	14	15	10	10	10	10	9	13	13	14	13	13
Total Hardness (mg/l)	56	57	44	45	52	59	63	67	67	65	61	54
Calcium Hardness (mg/l)	34	35	32	34	40	43	47	46	47	47	40	33
Magnesium Hardness (mg/l)	22	22	12	11	12	16	16	21	20	18	21	21
Total Phosphorus (mg/l)	0.11	0.12	0.1	0.11	0.52	0.66	0.62	0.59	0.28	0.25	0.18	0.16



**Fig. 1: Annual average of physicochemical parameters of Erai dam**

The fresh water are generally alkaline and acidic conditions, The pH observed at various stations range between 7 to 9, highest in the month of May and lowest in the month of October. Conductivity is strongly dependent parameter on temperature. Conductivity can approximately as being directly Proportional to temperature. Also depend upon number of ions present in water. The conductivity of said dam range between the 130 to 200 mho/cm. The free carbon dioxide was observed throughout the investigation period. The concentration varied between 0.014 to 1.22 mg/lit. Its maximum concentration was recorded during April and minimum during December. During the study period, total alkalinity range between 60 ppm to 92 ppm. The maximum value was observed in December and minimum in September. Phenolphthalein alkalinity was significantly absent. Dissolved oxygen is very essential for metabolism of all aquatic organism (Wetzel,1975). The result shows that D.O. ranged between 3 to 5 mg/lit, The lowest D.O. in June and highest in December.

Although the chlorides are not harmful concentration beyond 250 mg/lit. The maximum concentration was observed in July and minimum in December. The chloride value observed between 9 to 15 mg/lit. The total hardness of Erai dam was recorded from 44 to 67 mg/lit. The peak value was observed in January and February and lowest value was in August. Calcium which is utilized in bone building and shell formation, occurred between 30 to 50 mg/lit, while its required level is at 25-80 mg/lit. Maximum calcium observed in December, February and March, while lowest in August.

The magnesium was recorded ranged between the 10 to 25 mg/lit. The peak valued of magnesium hardness was observed in June and July and lowest in September. Phosphorus is a vital factor for fertility less than 0.5mg/lit, is unfavorable for fish growth. In the present study total Phosphorus ranged between 0.10 to 0.70. The maximum value in November and minimum observed in August. Alkalinity and pH are so

closely related high alkalinity are able to shift in pH. The general standard level for alkalinity was 20-200 mg/lit are typical of fresh water. Total alkalinity range showed that water quality suitable for aquatic life.

Dissolved oxygen (D.O.) is another vital parameter regulating survival of aquatic life .Rao et.al.(1998) found the D.O. range between 3.7 mg/L to 5.72 mg/L in water ponds and 3.02 mg/L is observed an annual range. Similarly present investigation shows that the D.O. ranged between 3 to 5 mg/L. In the month of December and January the higher range of D. O. documented is good for production. The chloride range was observed high in the summer season. Presence of chloride in the water source is used as an indicator of pollution Koshy and Nayar (1999) evaluated that there was same fluctuation of chloride similarly Shinde (1995) observed its gradually increase from August to May. The Calcium and Magnesium hardness are the two elements which form the most abundant ions in freshwater. The values of Calcium and Magnesium hardness never exceeded the standard limit of WHO (1989) i.e. 200 mg/L and 100 mg/ L respectively. A positive correlation shows between Calcium, Magnesium, and total hardness.

## DISCUSSION

The result from data analysis showed that the water quality is suitable for aquatic life. This study involves determination of physical and chemical parameters of water at different points. Many of the physical, chemical and biological characteristics of dams are directly affects by water temperature. A wide range of temperature can occur due to many factors warmer water cannot hold as much oxygen as cooler water, also increase the energy consumption by dam life to greater oxygen used by dam life. Some organism can suffer by internal damage. The 20°C to 41°C temperature was required range of fish culture. In present investigation shows temperature value

ranged between 22°C to 30°C which is suitable for the fish culture. Similarly reported earlier by Borse and Bhave (2000). High water temperature observed in May, similar work was done by (Kumar (1984), Ramesh (1989) and Mridula Mendon (2000).

The water was highly turbid in the monsoon season due to flooding. And because the thermal power plant is located near to the dam which discharge ash in the Erai river, it is clear that from the analysis, that industries have negative impact on water resources. The turbidity of water body due to the suspended material like silt and clay. Turbidity did not permit the light penetration and affect photosynthesis, which is directly affects on bioproductivity. Some fishes are tolerate high ranges of turbidity (Jhingran, 1991). Turbidity was observed during study is between 1 NTU to NTU. So the range of turbidity is in optimum level so it indicates that dam was suitable for fish and other aquatic culture.

The pH ranging from 6.5 to 9.5 before day break is most suitable for culture, while values more than 9.5 are unsuitable in the absence of carbonates Swingle (1967). The present study reveals that pH range between 7 to 9 so the water quality was good for aquatic culture. WHO and ICMR (1999) with in the maximum permissible limit prescribe these values. The present investigation shows that the conductivity range between 114 to 200 mho/cm in the dry season, the total volume of water decreases as a result, the conductivity increases. The conductivity of Erai dam was favoring to the biological productivity.

According to Swingle (1967), CO<sub>2</sub> range more than 15 mg/L is detrimental for fishes. Present study showed that the ranged of CO<sub>2</sub> is between optimum level. It is suitable for dam life. The amount of hydrogen and hydroxyl ions is equal than chemically pure water is neutral. Water is said to be alkaline when the concentration of the hydroxyl ions exceeds that of hydrogen ions.

## REFERENCES

- APHA (1985) standard methods for the examination of water and waste, New York, 16<sup>th</sup> Ed.
- Borse SK and Bhave PV (2000) Seasonal temperature variation and their influence on the level of dissolved carbondioxide
- Jhingran (1991) Inland Fishes of India adjacent countries-Vol,Oxford and IBH publishing co. pvt. Ltd. New Dehli, 541pp.
- Koshy and Nayer (1999) The quality of water usually described according to it's physical,chemical and biological characteristic.
- Kumar SR (1984) Studies on the diatribution of plankton in waters of Mangalore-M.F.Sci thesis univ. agric.,sci.,Banglore, pp231.
- Mridala Menon (2008) Seasonal variation in physicochemical charaterstics of water, sediment and soil texture in arid zone Mangroves of Kachcch-Gujrat *J. of Environ. Bio.*, 29(5)725-732pp.
- Ramesh AM (1989) Distribution of copopodes and copopodies in relation to phytoplankton and hydrography of the coastal waters of Mangalore M.F.Sci thesis univ. agric.,sci.,Banglore, pp193.
- Rao et al. (1998) Limnological studies on fresh water pond of Hyderabad.
- Shinde et al. (1995) Limnological studies on Mir Alam lake.
- Swingle HS (1967) Standardiztion of chemical analysis for water and muds, *Ibid* 44 (4) :397-442.
- WHO (1984) International guideline for drinking water quality volume 1- (Health criteria and other supporting information, Geneva 7pp.
- WHO (1989) Safe use of waste water and excreta in agriculture
- WHO And ICMR (1999) Workshop on health research management at Chennai.
- Wetzel (1975) Book review bolic zone in a majority of the lakes of the world.