



Seasonal Physico-chemical variation of Banshelki reservoir from Udgir region Dist. Latur (M.S) India.

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Abstract

The Banshelki reservoir (Latitude.18.360069⁰ N, Longitude 77.095784⁰ E) is small sized reservoir constructed for irrigation and water supply purpose near village Banshelki Tq Udgir Dist. Latur. Banshelki reservoir is 5.5 Km away from Udgir, situated on south west direction of Udgir. Banshelki reservoir is very important as drinking water is supplied to town Udgir from this reservoir so water quality check up is important in recent study. Physico-chemical parameters of Banshelki reservoir were investigated during December 2020 to November 2021. During the present study the investigated physio chemical parameters are Temperature is 21.90⁰C to 31.1⁰C with mean temperature 27.07⁰ C, Transparency 38 to 130 cm with mean transparency 82.25 cm, pH 7.3 to 9.1 cm with mean pH 8.39, Dissolved Oxygen(DO) is 3.4 to 5.8 mg/litre with mean DO 4.15 mg/litre, Free CO₂ is Nil to 0.6 mg/litre with mean Free CO₂ 0.29 mg/litre, Total Alkalinity is 192 to 230 mg/litre with mean 211.50 mg/litre, Total Hardness 160 to 270 mg/litre with mean 224.50 mg/litre, Calcium hardness 73.50 to 136.50 mg/litre with mean 101.50 mg/litre, Magnesium hardness 21.11 to 37.03 mg/litre with mean 30.05 mg/litre, calcium 29.45 to 54.70 mg/litre with mean 40.74 mg/litre, Chlorides 26.94 to 59.55 mg/litre with mean 43.01 mg/litre, Salinity 48.66 to 107.50 mg/litre with mean 77.66 mg/litre and TDS 310 to 390 mg/litre with mean 361.66 mg/litre were analyzed and recorded.

Key Words: Banshelki reservoir, Seasonal Physico-chemical parameters, physio chemical. Water parameters.

Introduction

Surface water is the most important source of potable water and irrigation use in Udgir region. Now surface water is becoming vulnerable for pollution due to disposal of pollutants and waste-water [1]-[2]. India's inland resources are important source of food and provide employment to sizeable sections of the society in rural area. To assure waters safe and stable use evaluation of surface water quality is an important issue [3]-[4]. Water is important component of environment for all living organism and it is used for drinking purpose, for industrial use and most in agricultural field. Without water life does not exist. But now days we are facing water related problems like water contamination due to extensive anthropogenic

emissions of nutrients and sediments. The quality of surface water is becoming worst in the past few decades due to growing population, urbanization, agriculture, and industrialization. Udgir Tahsil of Latur District is one of the most important agriculturally developed area of southeast Maharashtra having 97 villages (Census 2011). The region receives average 600-700 mm rainfall annually. In this region there are some minor irrigation water reservoirs which form a source of water. These water bodies are very useful to the local people in various ways. The Banshelki reservoir (Latitude. 18.360069° N, Longitude 77.095784° E) is a small sized reservoir constructed for irrigation and water supply purpose near village Banshelki Tq Udgir Dist. Latur. Banshelki reservoir is 5.5 Km away from Udgir, situated on the south west direction of Udgir. Banshelki reservoir is very important as drinking water is supplied to town Udgir from this reservoir so water quality check up is important in recent study. So water quality check up is important in recent study. To resolve this problem, it is necessary to carry out water quality assessment, planning, and management, in which water quality monitoring plays an important role. Physico-chemical parameters of Banshelki reservoir like, Temperature, Transparency, pH, DO, CO₂, Calcium, Total Alkalinity, Carbonate, Bicarbonate, Total Hardness, Calcium hardness, Magnesium hardness, Calcium, Chlorides, Salinity and TDS were investigated during December 2020 to November 2021.

Material and Method.

Monthly Physical parameters like Temperature and Transparency/turbidity and chemical parameters like pH and Total dissolved Solids were studied on site of the Banshelki reservoir by using different equipments. Viz, water Temperature is recorded by using thermometer ranging 0° to 100° C. Transparency by using Secchi disc, pH by using Digital pH meter, TDS by digital TDS meter. Monthly water is collected in two liter clean polyethylene bottles and kept in dark place safely at normal temperature during transportation and brought to laboratory for further Chemical Parameter estimation of reservoir water samples like Dissolved O₂, Free CO₂, Total Alkalinity, Total Hardness, Calcium hardness, Magnesium hardness, calcium, Chlorides and salinity were analyzed in the laboratory by titration method given in "Methodology for water analysis" by Kodarkar *et al.* 1998 (IAAB [5] and APHA standard methods (1985, 2005) [6]-[7]).

Results and Discussion

Physical parameters

1. Temperature (°C); The surface water temperature was recorded with the help of a standard centigrade thermometer in °C. Water temperature plays an important role in influencing the periodicity occurrence and abundance of phytoplankton. Reservoirs having water temperature more than 22 °C are the highly productive reservoirs. Seasonal variation in water temperature is presented in Table 1 and graphically presented in Graph 1 and A. During December 2020 to November 2021 water temperature range in Banshelki reservoir is 21.9°C to 31.1°C with mean temperature 27.07°C, the minimum Temperature 21.9°C was recorded in month December 2020 where as Maximum Temperature 31.1°C was recorded in June 2021.

2. Transparency/Turbidity; Turbidity was directly calculated from transparency (cm). The Transparency (light penetration) of water was measured by a Secchi disc of 20 cm diameter with four quadrants by on upper surface painted alternate black and white, is used. The Secchi disc was lowered into the water with the help of a graduated rope to a hook in the center. Two readings of depth; one at a point when the disc just disappears (A) and the other at which it reappears (B) was taken as Secchi disc transparency in cm. Water transparency is dependent on turbidity, which is directly proportional to the amount and density of suspended matter. Seasonal variation in water Transparency is presented in Table 1 and graphically presented in Graph 1 and B. During December 2020 to November 2021 Transparency in cm range at Banshelki reservoir is 38 to 130 cm with mean transparency 82.25 cm, The minimum Transparency 38 cm recorded at in month July 2021 where as Maximum Transparency 130 cm was recorded at in month May 2021.

CHEMICAL PARAMETERS

1.pH or Hydrogen Ion concentration .The hydrogen ion concentration (pH) values were recorded at the water sample collection sites with the help of digital pH meter. Seasonal variation in water pH is presented in Table 1 and graphically presented in Graph 1 and C .During December 2020 to November 2021 pH range at Banshelki reservoir is 7.3 to 9.1 cm with mean pH 8.39, The minimum pH 7.3 recorded at Banshelki reservoir in month December 2020 where as Maximum pH 9.1 was recorded at Banshelki reservoir in month June 2021.

2.Dissolved oxygen (mg/l).The water samples were collected from fresh water bodies in early morning in 2 litre water containers bottles and brought to the laboratory for estimation of dissolved oxygen by wrinkler's method. Seasonal variation in Dissolved oxygen (DO) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and D. During December 2020 to November 2021 Dissolved oxygen (DO) in range at Banshelki reservoir is 3.4 to 5.8 mg/litre with mean DO 4.15 mg/litre, The minimum Dissolved oxygen (DO) 3.4 mg/litre recorded at Banshelki reservoir in month January 2021 where as Maximum Dissolved oxygen (DO) 5.8 mg/litre was recorded at month October 2021. Dissolved oxygen (DO) in reservoir waters found increasing after June 2021 as there was no raining upto July 2021 in the catchment area of Banshelki reservoir, hence due to addition of water after raining in the monsoon season Banshelki reservoir Oxygen level found increasing upto September 2021.

3.Free carbon di-oxide (mg/l). The sample containing free CO₂ in the form of H₂CO₃ is titrated against an alkali (0.22N NaOH) and resultant change in PH from acidic to neutrality to alkalinity is detected by phenolphthalein. 1 ml of 0.2272 N NaOH = 1 mg of free CO₂. Seasonal variation in Free Carbon di-oxide (CO₂) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and E. During December 2020 to November 2021 Free Carbon di-oxide (CO₂) in range at Banshelki reservoir is Nil to 0.6 mg/litre with mean Free Carbon di-oxide (CO₂) 0.29 mg/litre, The Free Carbon di-oxide (CO₂) was Nil in April and May 2021 where as Maximum Free Carbon di-oxide (CO₂) 0.6 mg/litre was recorded at Banshelki reservoir during November 2021.

4.Total Alkalinity (mg / l). Alkalinity is defined as quantitative capacity to neutralize an acidic solution, the alkalinity to waters is mainly implanted by three predominant bases; carbonates(CO₃), bicarbonates (HCO₃) and hydroxides (OH). Thus alkalinity is estimated as total. Water with free CO₂ also acts on CaCO₃ = Ca (HCO₃). Water samples with high planktonic biomass and productivity are usually more alkaline(more than 100mg). The acid titrant (0.02N H₂SO₄) converts carbonates into bicarbonates effectively reducing pH neutrality. The reduction in pH proportional to the strength of CO₂ is detected by phenolphthalein. Seasonal variation in Total alkalinity in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and F. During December 2020 to November 2021 Total alkalinity range at Banshelki reservoir is 192 to 230 mg/litre with mean Total alkalinity 211.50 mg/litre, The minimum Total alkalinity is 192 mg/litre in month June 2021 where as Maximum Total alkalinity is 230 mg/litre was recorded at Banshelki reservoir in month March 2021.

5.Total Hardness (mg / l). Hardness is mainly due to the presence of bicarbonates of Ca⁺⁺ and Mg⁺⁺ ions. It is an important parameter in detection of water pollution. Seasonal variation in Total Hardness (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and G. During December 2020 to November 2021 Total Hardness (mg/l) in range at Banshelki reservoir is 160 to 270 mg/litre with mean Total Hardness 224.50 mg/litre, The minimum Total Hardness 160 mg/litre recorded in month June and August 2021 where as Maximum Total Hardness 270 mg/litre was recorded at Banshelki reservoir in month June 2021

6.Calcium hardness: Seasonal variation in Calcium Hardness (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and H. During December 2020 to November 2021 Calcium Hardness (mg/l) in range at Banshelki reservoir is 73.50 to 136.50 mg/litre with mean Calcium Hardness 101.50 mg/litre, The minimum Calcium Hardness 73.50 mg/litre recorded at in month August 2021 where as Maximum Calcium Hardness 136.50 mg/litre was recorded in month June 2021

7. Magnesium hardness: Seasonal variation in Magnesium Hardness (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and I. During December 2020 to November 2021 Magnesium Hardness (mg/l) in range at Banshelki reservoir is 21.11 to 37.03 mg/litre with mean Magnesium Hardness 30.05 mg/litre, The minimum Magnesium Hardness 21.11 mg/litre recorded in month August 2021 where as Maximum Magnesium Hardness 37.03 mg/litre was recorded at Banshelki reservoir in month July 2021

8.Calcium Seasonal variation in Calcium (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and J. During December 2020 to November 2021 Calcium (mg/l) in range at Banshelki reservoir is 29.45 to 57.40 mg/litre with mean Calcium 40.74 mg/litre, The minimum Calcium 29.45 mg/litre recorded in month August 2021 where as Maximum Calcium 57.40 mg/litre was recorded in month June 2021.

9.Chlorides (mg/l)Seasonal variation in Chloride (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and K. During December 2020 to November 2021 Chloride (mg/l) in range at Banshelki reservoir is 26.94 to 59.55 mg/litre with mean Chloride

43.01 mg/litre, The minimum Chloride 26.94 mg/litre recorded in month June 2021 where as Maximum Chloride 59.55 mg/litre was recorded at Banshelki reservoir in month January 2021

10.Salinity (mg/l) Seasonal variation in Salinity (mg/l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and L. During December 2020 to November 2021 Salinity (mg/l) in range at Banshelki reservoir is 48.66 to 107.50 mg/litre with mean Salinity 77.66 mg/litre, The minimum Salinity 48.66 mg/litre recorded in month June 2021 where as Maximum Salinity 107.50 mg/litre was recorded at Banshelki reservoir in month January 2021

11.TDS(Total Dissolved Solids) : Seasonal variation in TDS (Total Dissolved Solids (mg /l) in reservoir waters is presented in Table 1 and graphically presented in Graph 1 and M. During December 2020 to November 2021 TDS (mg/l) in range at Banshelki reservoir is 310 to 390 mg/litre with mean TDS 361.66 mg/litre, The minimum TDS 310 mg/litre recorded in month June 2021 where as Maximum TDS 390 mg/litre was recorded at Banshelki reservoir in month December and January 2021.

Ganie and Khan.(2012)[8] studied monthly basis seasonal Variations In Physico-Chemical Characteristics of Pahuj Reservoir, District Jhansi, Bundelkhand Region, Central India during August 2008 to July 2009. B. Elayaraj and M. Selvaraju (2015) [9] studied Physico-Chemical Parameters of Sri Kamatchiamman Temple Pond Chidambaram from January to December 2014. Ramanathan S and Amsath A(2018) [10] reported that Temperature, pH, Dissolved Oxygen, Total hardness, of freshwater aquaculture pond in Puthukulam at Pudukkottai town, Tamilnadu were found to maximum in the period of summer where as Turbidity, Alkalinity, were recorded maximum during monsoon. Chilgar O. S. and Jagtap H. S. (2018) [11] carried out Comparative Study of Physicochemical Parameters Of Majalgaon dam from Beed District, Yeldari, Siddheshwar and Masoli dams of Parbhani District and Vishnupuri dam from Nanded District of Marathwada Region, Maharashtra during January to February, 2017 and reported range of values for all reservoir water were suitable for fish culture. Jignasha et.al (2019) [12] studied physico-chemical parameters Wadhvana Irrigation Reservoir, Gujarat during July 2016 to May 2017. S. Kumar et.al (2021)[13] analysed monthly variations in physico-chemical parameters during July 2019 to June 2020 of Akshar Vihar pond, Bareilly, U.P. Barot and Patel (2014) [14] studied seasonal variation in physicochemical characteristics like pH, calcium hardness, total hardness, phosphate, chloride, potassium, sodium, carbonate and bicarbonate, total alkalinity, Biological oxygen demand, Dissolved Oxygen for winter, summer and monsoon season of two wetlands of Mehsana district of North Gujarat during March 2013 to February 2014. Regular checkup of ground water condition is effective and protective for better conservation in future ways.[15].Pollution of water reservoir reduces the quality of ground water and it's become impure form [16]. Many researchers investigated physico- chemical properties of river, lakes, dam and reservoirs. [17] to [27] and concluded that most of water resources parameters are under permissible limits.

Conclusions:

Physico chemical parameters of Banshelki water reservoir were studied for a period December 2020 to November 2021. pH of Banshelki reservoir was above WHO and BIS limit in summer season hence water must be treated before use for drinking purpose. pH of surface water is within allowable limit of 6.5-8.5 mg/l during post monsoon and winter season.

During investigation the parameters like D.O is very less during December 2020 to July 2021 (3.4.- mg/litre).

CO₂ is nil in summer, Alkalinity is very high above permissible limit of BIS during study period. Chloride content was below the maximum allowable limit described by BIS and WHO. Total Hardness, Calcium hardness, Magnesium hardness, calcium, Chlorides and salinity were high during December to May where as during July to November all parameters are coming in normal range due to increased water level of reservoir during monsoon and thereafter up to November 2021.

Physico-chemical analysis is the prime consideration to assess the quality of water for its best utilization for fisheries. Water hardness is within acceptable hardness limit. Maximum value of hardness was found 270 mg/l and this is very close to permissible recommended limit of BIS hence it is recommended to treat surface water before human consumption.

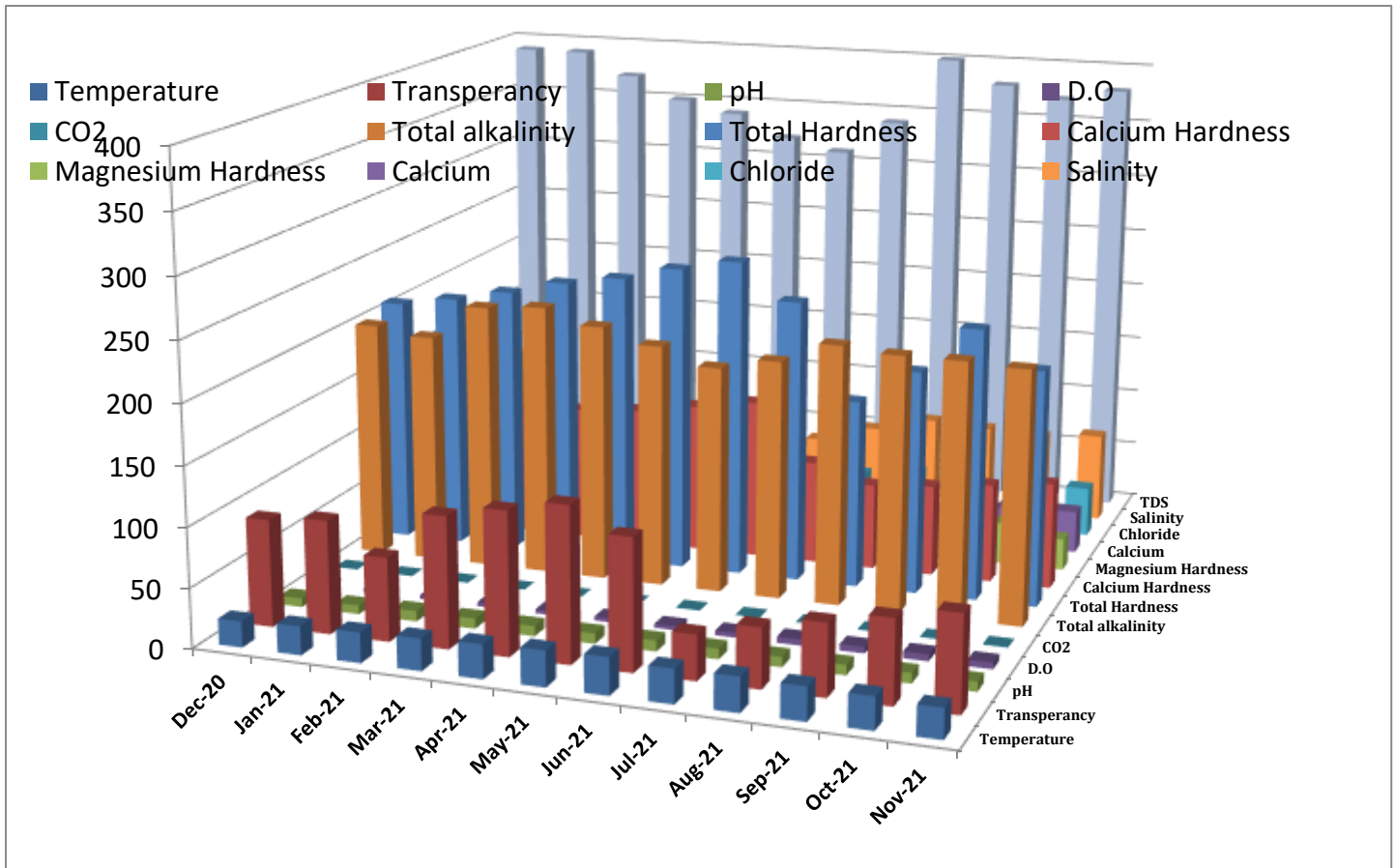
It is strongly recommended that surface water of Banshelki reservoir should be given proper treatment followed by aeration before human consumption.

Acknowledgement

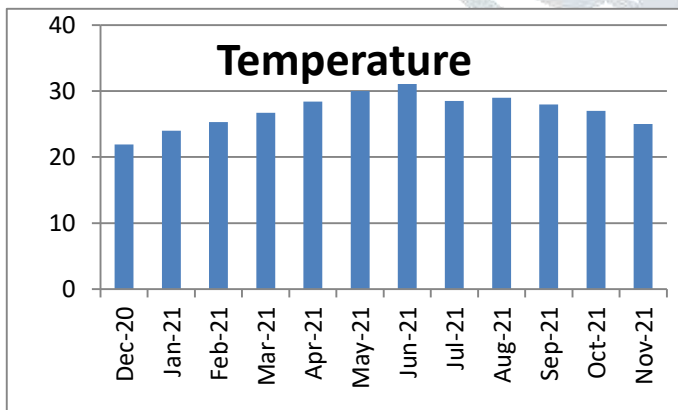
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Table 1. Monthly variation of Physiochemical characteristics of Banshelki reservoir from Udgir region from month December 2020 to November 2021

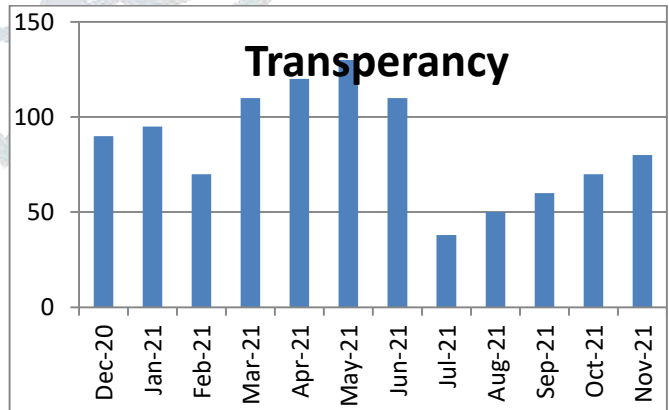
Month	Temperature	Transparency	pH	D.O	CO ₂	Total alkalinity	Total Hardness	Calcium Hardness	Mg Hardness	Calcium	Chloride	Salinity	TD S
Dec-20	21.9	90	7.3	3.5	0.3	202	210	94.5	28.18	38.71	58.13	105	390
Jan-21	24	95	7.4	3.4	0.2	196	218	100.8	28.59	40.4	59.55	107.5	390
Feb-21	25.3	70	8.8	3.5	0.3	226	228	109.2	28.98	43.76	48.22	87.05	370
Mar-21	26.7	110	8.6	3.4	0.2	230	240	115.5	30.37	46.29	45.37	81.92	350
Apr-21	28.4	120	8.5	3.4	0	218	248	119.7	31.31	47.97	41.12	74.26	340
May-21	30	130	8.7	3.4	0	206	260	128.1	32.69	51.34	35.45	64.02	320
Jun-21	31.1	110	9.1	3.4	0.4	192	270	136.5	32.57	54.7	26.94	48.66	310
Jul-21	28.5	38	8.7	4	0.4	202	240	88.2	37.03	35.35	35.45	64.02	340
Aug-21	29	50	8.4	5.2	0.3	220	160	73.5	21.11	29.45	42.54	76.81	400
Sep-21	28	60	8.5	5.4	0.4	216	190	77.7	27.4	31.14	41.12	74.26	380
Oct-21	27	70	8.5	5.8	0.4	216	230	84	35.62	33.66	39.7	71.7	370
Nov-21	25	80	8.2	5.5	0.6	214	200	90.3	26.76	36.19	42.54	76.81	380
Average	27.07	85.25	8.39	4.15	0.29	211.5	224.5	101.5	30.05	40.74	43.01	77.66	361.66



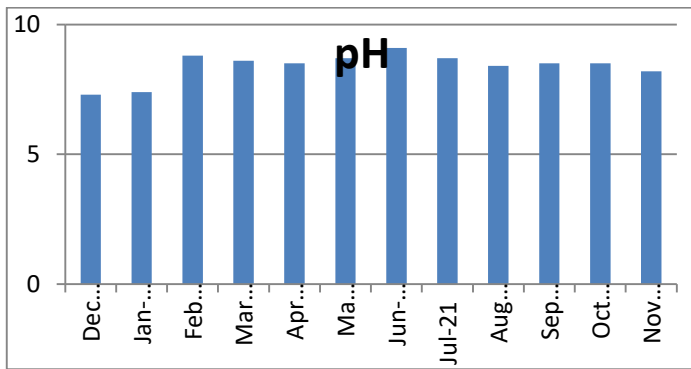
Graph 1. Monthly variation of Physiochemical characteristics of Banshelki reservoir from Udgir region from month December 2020 to November 2021.



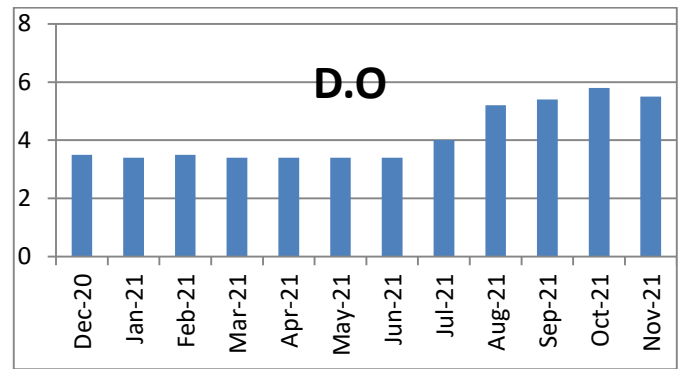
Graph A: Seasonal variation in Temperature



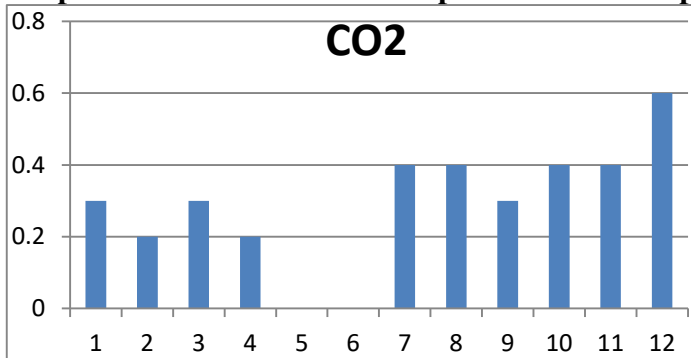
Graph B: Seasonal variation in Transperancy



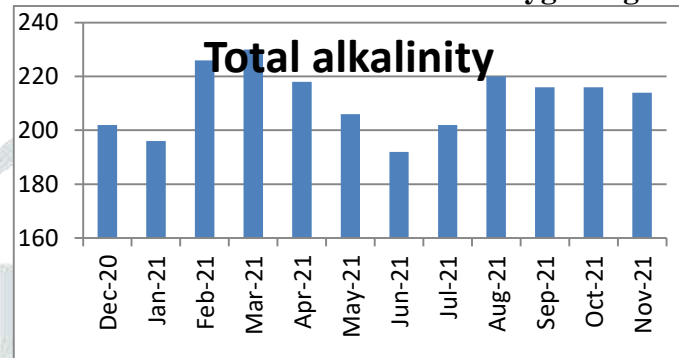
Graph C: Seasonal variation in pH



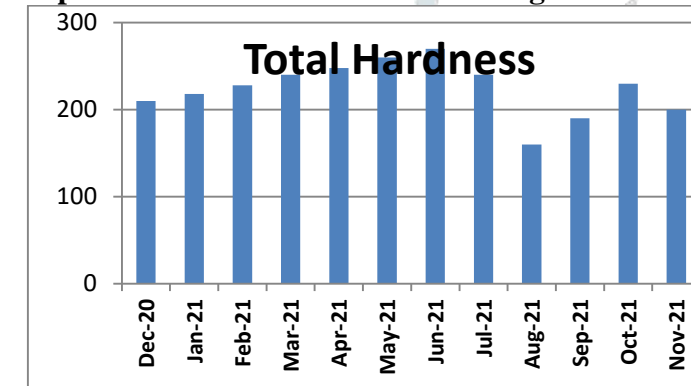
Graph D: Seasonal variation in Dissolved Oxygen mg/l



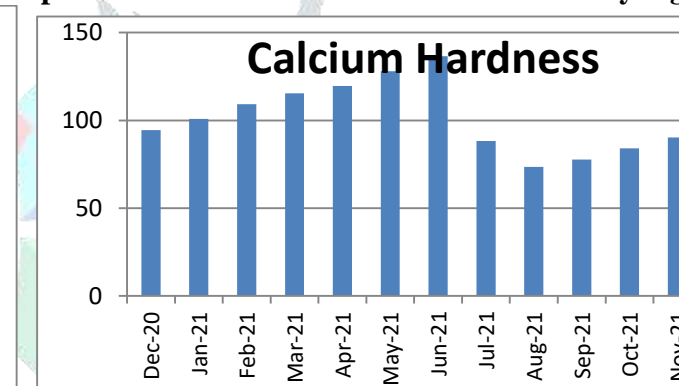
Graph E: Seasonal variation in CO₂ mg/l



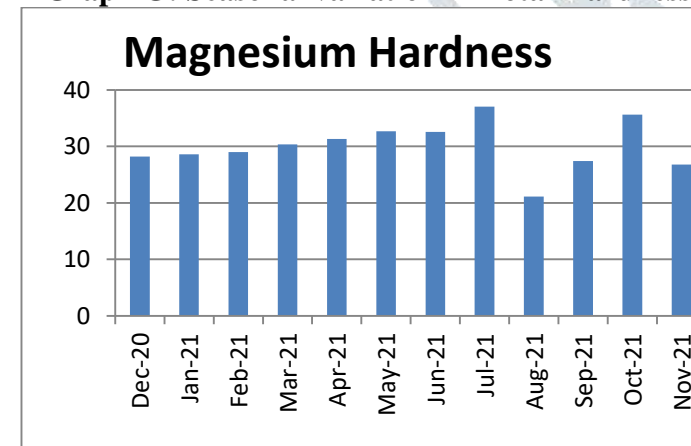
Graph F: Seasonal variation in Total Alkalinity mg/l



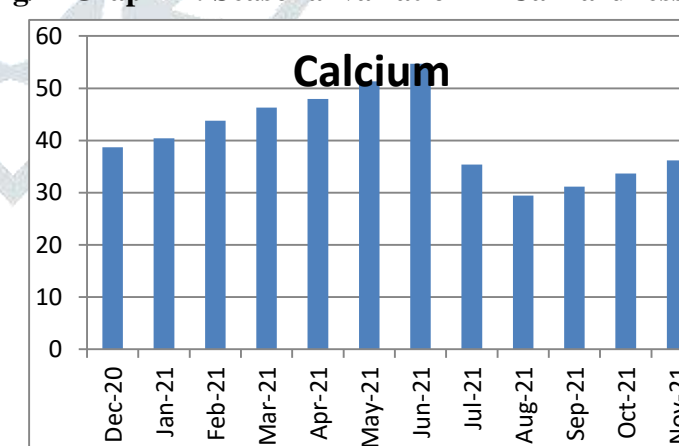
Graph G: Seasonal variation in Total Hardness mg/l



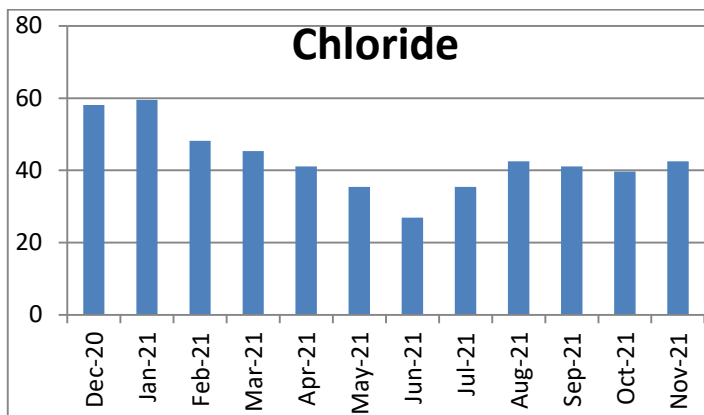
Graph H: Seasonal variation in Ca Hardness



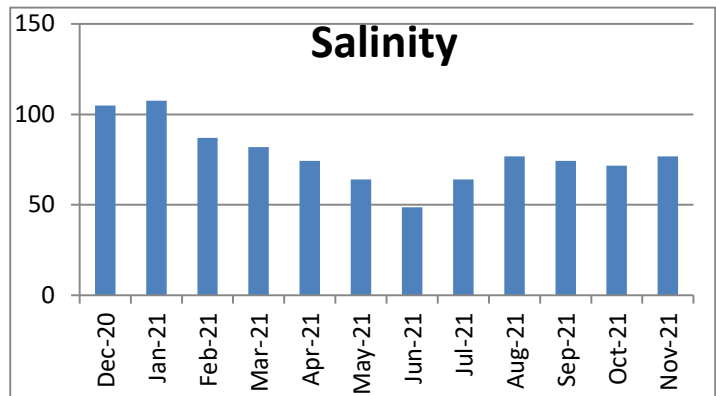
Graph I: Seasonal variation in Mg Hardness



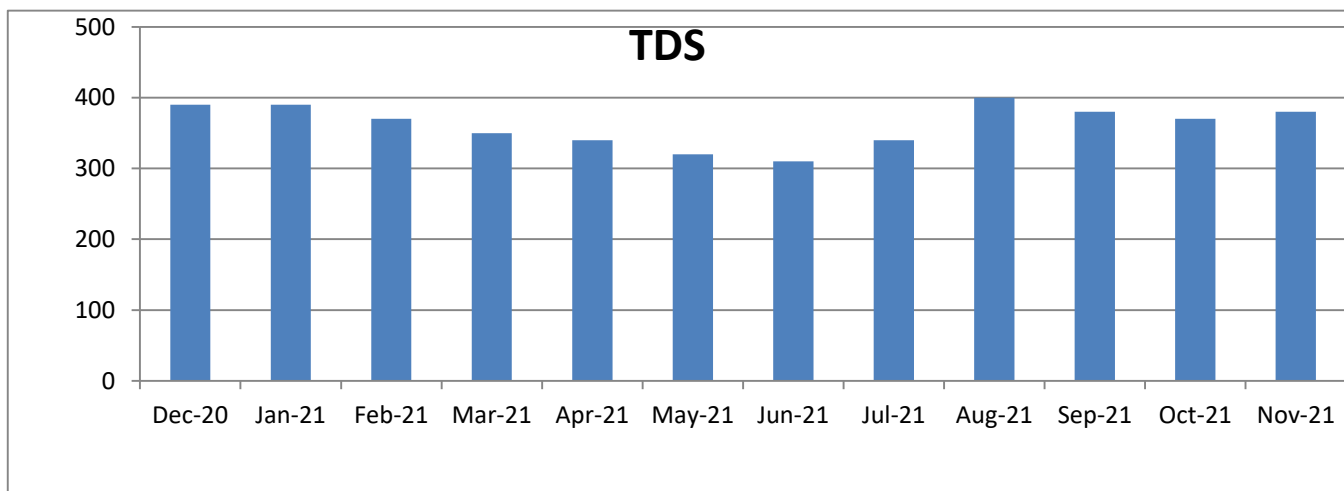
Graph J: Seasonal variation in Calcium



Graph K: Seasonal variation in Chloride in mg/l



Graph L: Seasonal variation in Salinity in mg/l



Graph M: Seasonal variation in TDS in mg/l

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