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Water Quality Parameters of River Kabul at District Charsadda

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ABSTRACT

A study on River Kabul at District Charsadda, Khyber Pakhtoonkhwa was conducted from March 2017 to September 2017, to measure some important water parameters in the presence of available laboratory material i.e. Alkalinity. PH, TSS, TDS, Water temperature, Air temperature, which are the key indicators of status of fresh water indicating the suitability of water for fish life. The mean value for these that were noted during this study are; Air temperature 26.42 C°, Water temperature is 22.54 C°, velocity of water is 0.35 m/sec, Ph is 7.31, Total suspended solids 125.1mg/l, Total dissolved solids is 115.75 mg/l, Alkalinity 253.33 mg/l, Water depth is 16 feet. The aforementioned values are all the mean values of every parameter measured during the present study period which indicate that River Kabul is suitable for Fish life but furthermore study is required to explore the Fish fauna and to takes some emergency steps to save the important Fish fauna in the precious River Kabul.

***Key-words**: River, Kabul, water, values, parameters.*

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INTRODUCTION

Water quality parameters are the physical, chemical and biological characteristics of water it is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose [1]. The abundance and distribution of fishes in the waters of the earth are the products of interaction among fishes and their chemical, physical and biological surroundings. All the communities in these habitats are continually changing. These recent pollution climates along with catastrophic 2010, flood demonstrate investigation of the current status of fish fauna of river Kabul [2].

The life depends on water and the quality of water can be determined through their physical, chemical and biological characteristic features [3].

Water quality characteristics of aquatic environment arise from a multitude of physical, chemical and biological interactions. All living organisms have tolerable limits of water quality parameters in which they perform optimally. A sharp drop or an increase within these limits has adverse effects on their body functions [4-5].

As fish is a cold-blooded animal, its body temperature changes according to that of environment affecting its metabolism and physiology and ultimately affecting the production. Higher temperature increases the rate of bio-chemical activity of the micro biota, plant respiratory rate, and so increase in oxygen demand. It further causes decreased solubility of oxygen and also increased level of ammonia in water. However, during under extended ice cover, the gases like hydrogen Sulphide, carbon dioxide, methane, etc. can build up to dangerously high levels affecting fish health.

Alkalinity is the water's ability to resist changes in pH and is a measure of the total concentration of bases in pond water including carbonates, bicarbonates, hydroxides, phosphates and borates, dissolved calcium, magnesium, and other compounds in the water. Lime leaching out of concrete ponds or calcareous rocks, photosynthesis, denitrification and sulphate reduction is mainly responsible for increasing alkalinity while respiration, nitrification and sulphide oxidation decrease or consume alkalinity [6-7] and to a lesser degree it increases due to evaporation and decomposing organic matter. But if the alkalinity is low, it indicates that even a small amount of acid can cause a large change in our ph. pH is defined as the hydrogen ion concentration. pH is measured mathematically by, the negative logarithm of hydrogen ions concentration. The pH of natural waters is greatly influenced by the concentration of carbon dioxide which is an acidic gas. Other water quality parameter like rate of flow of water, total dissolved solids and total suspended solids and Bankment condition are also of ecological importance [8].

MATERIAL AND METHODS

Charsadda

District Charsadda is surrounded by Mardan and Nowshehra in the west and south west and Mohmand and Malakand agencies in the north and north east as shown in fig (9).It is an area of rich population which is 16 lacks and 16 thousand according to the recent census report of 2017. Agriculture is the backbone of day to day economy but the presence of various water resource such as ponds, streams and river lakes make fishing an equally important occupation the region is arid, and the climate is moderately hot in summer. The presence of 5 rivers and many private fish ponds in Charsadda provide an ample livelihood opportunity to people living along these rivers. It lies between 3403' and 3438' north latitudes and 7128' and 7153' east longitudes. Charsadda is located in the west of the Khyber Pakhtunkhwa and is bounded by Malakand District on the north. Mardan district on the east, Nowshehra and Peshawar districts on the south and the Mohmand Agency of the Federally Administered Tribal Areas on the west. The district covers an area of 996 square kilometers [10].

River Kabul

River Kabul appears from the Wardak valley of Afghanistan and enters the newly named Khyber Pakhtunkhwa (KP) province of Pakistan, formerly called North West Frontier province. The entrance point is Mohmand agency 17 Km north of Torkham border area. The river divides into three main branches namely River Sha Alam, River Naguman and River Sardaryab. These tributaries unite about 13 Km downwards from Charsadda arriving at Nowshehra and Akora Khattak as a single main branch the River Kabul. Progressing forward the River falls in the mighty Indus near district Attock [11].

Study period

Study period start from March, 2017 to September, 2017.

Determination of Physical Parameters of Water

Determination of physic-chemical characteristics of water is essential for assessing the suitability of water for various purposes like drinking, domestic, industrial and irrigation (12)**.** All physical parameters except temperature were measured once during the present study in the month of august. Temperature was recorded for each month. The parameters investigated for the study includes: water temperature, pH, velocity of water, T.S.S, and T.D.S.

Air Temperature

The air temperature for the study period of March to September was measured through thermometer.

Water temperature:

Water temperature was measured with the help of simple thermometer in degree centigrade. Water temperature was measured by dipping the thermometer in water for about 3 minutes. The process was repeated three times.

Velocity of Water:

To find out the velocity of water point x and y was selected on the bank of river. A wooden piece was dropped in water at point x and time was recorded when it reached to point y. Then velocity is found with the help of the following formula: V = s/t; V: velocity of water; S: distance covered by wooden piece; S: (A) m; T: (B) sec; V: s/t Putting values V: XY Z/.

Total Alkalinity

Total alkalinity was estimated with titrimetric method. One drop of methyl orange indicator was added to 25 ml of sample and titrated against 0.02 NH2SO4 solutions until color changed from red to pink/orange.

$$Caco3 = \frac{N.E1000.v}{\text{Sampe(mL)}}$$

Total alkalinity $CaCo_{3\ (mg/L)} =$ N.E.1000.V/Sample (mL)

Where N is normality of H_2SO_4 (0.02 N), E is the Equivalent weight of CaCO3 (50), and V is the volume Of H_2SO_4 (ml) used during titration.

pH

The values of pH for the study period of March to September were determined through pH paper.

Velocity of water

To find out velocity of water flow, two points A and B were selected on the bank of the river. A wooden piece was thrown in water at point A and time was noted, when the wooden piece reached point B. time was recorded again. In this way time taken by the wooden piece to reach from A to B was determined velocity of water .it was calculated by using following formula.

$$V=S/t$$

Where, V = Velocity of water

S = Distance covered by wooden piece

t = Time taken

The average rate of flow of water or speed of water was determined

Total Suspended Solids

A dry filter paper (Watman.Cat No 1441125) was taken weighed on digital balance (Snowrex BBA-600,600*0.01g) denoted by W_1. Then 1000ml of water was taken from the river water in a clean beaker. Now this water was filtered through filter paper. The filter paper was then dried, and again weighed denoted by W_2. Subtracted w1 from w2 which give the amount of total suspended solids in the given water sample.

W_1 = Weight of dry filter paper

W_2 = Weight of filter paper + Suspended solids

Total suspended solids = $W_2 - W_1$

Total Dissolved Solids

Well dried empty China dish weighed, denoted by W_1 and W_2 then 100ml of river water was taken in the China dish, and placed on burner on till water got evaporated, when water was completely evaporated, China dish were again weighed denoted by W1. W2 and W1 was subtracted from W2 was subtracted from which gives the amount of total dissolved solids

W1 = Weight of clean China dish.

W2 = Weight of china dish + dissolved solids.

Total dissolved solids= W2-W1

RESULTS

Water Quality Parameters

Determination of physic-chemical characteristics of water is essential for assessing the suitability of water for various purposes like drinking, domestic, industrial and irrigation.

Along with the collection and identification of fish fauna, some physical and chemical parameters like temperature, pH, Bankment conditions, color, total suspended solids and total dissolved solids of river Kabul were also recorded The Water speed were almost same at all the localities.

Table 4.2 The Average Air and Water Temperature, from March to September 2017.

S.No	Month	Average Air Temperature	Average Water Temperature
1	March	13	9
2	April	22	16
3	May	33	23
4	June	36	30
5	July	34	28
6	August	30	26
7	September	27	23

Table 4.3 Average velocity of Water at different localities of River Kabul at Charsadda

S.No	Locality and water bodies	Average velocity
1	Adezai	0.35m/sec
2	Ghorambak	0.36m/sec
3	Jhamate	0.34m/sec
4	Sardaryab	0.35m/sec
5	Nissata	0.37m/sec
6	Agra	0.38m/sec

Table 4.4 pH of water at different collection sites of River Kabul in Charsadda

S.No.	Collection site	pH
1	Adezai	8.4
2	Ghorambak	8
3	Jhamate	7.5
4	Sardaryab	7
5	Agra	6
6	Nissata	7

Table 4.5 Total Suspended solids in river Kabul at different localities.

S.No.	Locality and Water Bodies	Total suspended Solids
1	Adezai	125mg/1000ml
2	Ghorambak	123 mg/1000ml
3	Jhamatay	121.4 mg/1000ml
4	Sardaryab	127.6 mg/1000ml
5	Agra	125.5 mg/1000ml
6	Nissata	128 mg/1000ml

Table 4.6 Total dissolved solids in river Kabul at district Charsadda

S.No.	Locality and Water Bodies	Total Dissolved Solids
1	Adezai	112.2 mg/1000ml
2	Ghorambak	112.5 mg/1000ml
3	Jhamatay	116.03 mg/1000ml
4	Sardaryab	115.52 mg/1000ml
5	Agra	117 mg/1000ml
6	Nissata	119 mg/1000ml

Table 4.7 Alkalinity of water of River Kabul at different collection sites in Charsadda

S.No.	Collection site	Alkalinity in mg/l
1	Adezai	250 mg/l
2	Ghorambak	240 mg/l
3	Jhamate	220 mg/l
4	Sardaryab	260 mg/l
5	Agra	270 mg/l
6	Nissata	280 mg/l

Table 4.8 Water Depth of River Kabul in Charsadda at Different Collection sites.

S.No.	Locality	Water depth in feet
1	Adezai	16
2	Ghorambak	16.5
3	Jhamate	15
4	Sardaryab.	15.5
5	Agra	16
6	Nissata	17

DISCUSSION

Effect of Temperature

Temperature play an important role in sustainability and suitability of all organisms including Fish species also which are sensitive to water temperature. Fishes display great variability in thermal tolerance in suitable range of temperature (23-29 C^{o}) a fish can grow easily and quickly.

In River Kabul also, a suitable range of temperature is found which is best for survival of Fish species due to this reason River Kabul act as a paradise for some species. On the other hand, Fish catch was quite high during the month of March: 26% April: 22% May: 18% June: 11% Jully: 9% August: 8% September: 6% *Clupisoma naziri*, *Tor macroplepis, Rita rita Wallago attu and Ompak pabda* which have great market commercial values.

In the light of above information, it appears that River Kabul is suitable for any of our cultivated species because the average temperature of River Kabul at district Charsadda lies within range of thermal tolerance for Fish species.

Effect of pH

The pH range of River Kabul as determined during the present study period was almost uniform at various localities ranging between 7 and 8.4 which is suitable for fishes as well as other aquatic life. However, on a locality at Agra pH recorded was quite low i.e. 6.

Khan and Khan [7] have reported a pH 7.6 for River Kabul. Urooj [9], have reported a pH 6.7 for River Swat at Mingora, Pakistan. Generally, our findings show that River Sardaryab water is more alkaline in comparison with River Swat, River Kabul at Azakhel.

Velocity

Recorded the mean value for velocity of water is 0.38 m/sec which is higher than our recorded mean value for velocity which is 0.35m/sec the reason is that he performed the survey after small time of 2010 flood which the water in that is still in high speed our recorded mean value is suitable for Fish movements in river indicating suitability of River Kabul for Fish life.

Total alkalinity

Froeze (1) conducted a survey in which she recorded the mean value 243mg/l, our recorded mean value is 253mg/l which show a slight difference indicating further addition of wastes to river Kabul which increase alkalinity. Higher levels of total alkalinity may be due to the leaching of soils during natural filtration.

Total suspended solids

According to Khan and Khan [7] the water of river Kabul shows high amounts of suspended solids during rainy seasons when high flow conditions are prevalent. At such times the suspended solids range between 10-800 mg/l. Performed a survey he recorded mean value of total suspended solids in River Kabul at 119.15 our recorded value for total suspended solids shows slightly increased, which is due to addition of further agricultural effluents and drainage [13].

Total Dissolved Solids

Zaighem [11] recorded the mean value for total dissolved solids is 120.13mg/l which shows a slight difference from our recorded values which is 115.75 mg/l the difference is due to reduction of particles and sitting of small particles in water beds due to slow movement of water which was high at that time but now it is good sign for living faunas.

Effects of 2010 floods

The 2010 flooding in the region of Pakistan. Severely affected the fish fauna. According to local fishermen fish catch declined distinctly with species went missing. However, at the time of present study condition have been normalized. We analyzed water samples for total suspended which are 124mg/l which are further increasing in rainy season Khan, *et al* [15] the water of river Kabul shows high number of suspended solids during rainy season when high flow condition is present however the normal values of pH, TSS, and TDS as investigated during the present study shows that the Kabul River has reverted.

CONCLUSION

The 2010 flood severely affected the region and perhaps the fish faunal structure of River Kabul. However the has stabilized itself after some time. Less diversity at some points shows the harmful effect of water pollution on fish fauna. Acidic pH might of water at this site might be a contribution of industries present in this region. The government should take steps to control this pollution in order to protect the fish fauna and its habitat i.e., River Kabul.

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