WATER QUALITY ASSESSMENT OF LAR STREAM OF PULWAMA KASHMIR USING PHYSICOCHEMICAL PARAMETERS

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ABSTRACT

The present study was conducted on monthly basis from January, 2012 to May, 2012 with an aim to find out the physico-chemical nature of water at different sites of Lar Stream of Pulwama Kashmir. In order to assess the physical properties and chemical nature of its water, two sites were selected for the study purpose and the samples were collected on monthly basis. The physico-chemical characteristics of the Lar stream at different sites indicate that the stream exhibits some deteriorating (Nutrient pollution) trend. However, the various anthropogenic effects like, mini project constructions, agricultural activities , fertilizers and pesticides, raw sewage and domestic sewage, sewage effluents etc. find its way in to the stream and may eventually cause the change in the present tropic condition of the ecosystem. It was found that water characteristics at high altitudes compared to plains indicate a considerable change in physcio-chemcial features. Keeping the same in view the present study was taken into consideration in which an attempt was made to assess the water quality of Lar canal and it is believed that this study would be helpful in formulating control strategy in near future.

Keywords: Water, Physico-chemical, Anthropogenic Effects, Lar Stream

INTRODUCTION

Water is the most abundant and a vital renewable resource, which helps to maintain the earth's climate and dilute environmental pollution. It covers 70.9% of the earth's surface and is vital for all known forms of life. It is essential for the survival of life

next to the air. It constitutes about 50% to 97% by weight of all plants and animals and forms about 70 % of human body. The existence of liquid water and to a lesser extent its gaseous and solid forms, on earth are vital to the existence of life on earth as we know it. Water is one of the most important natural resource in the world since without it life cannot exist. Essentially, all life depends upon the water for being a major component of living organisms and an elixir of life. Human induced hydrological changes, physical disturbances (habitat alterations, land use) and point and non-point sources of pollution (chemical contamination surface run off, intensive agriculture) are the examples of processes responsible for a broad scale deterioration of lot ecosystems [1] .A species survival depends in part, on its environment. If physical, chemical and nutritional resources do not meet the minimum requirements of a species, then displacement from the habitat is inevitable [2]. However, if environmental conditions meet species-specific requirements, then biotic interactions, such as competition, predation, may also affect community composition. If changes in species diversity and population abundances result from either direct or indirect environmental stressors, then changes in biota may be used to elucidate changes in the environment. In this context, indicator species are those which by their presence, absence or abundance provide some indication of the prevailing environmental condition [3]. In recent decades, population growth, agricultural practices and sewage runoff from urban areas have increased nutrient inputs many folds to the level of their natural occurrence, resulting in accelerated eutrophication [4, 5].

The present study conducted on "Lar Stream" which is one of the principal left bank tributaries of the River Jhelum in the Valley of Kashmir (northern India), was an attempt to assess the water quality of the stream. The major objective of this study was to assess the water quality of Lar stream, Kashmir, India.

The primary objectives of this study were:

a) To analyse the physico-chemical characteristics of water in Lar stream, Kashmir.

b) To have an insight of pollution status of the water body.

The chemical composition of water plays a critical role in every aquatic ecosystem and the nutrient enrichment may adversely affect the stream community. Nowadays due to increased human population and manmade conditions, the water quality is deteriorating everywhere [6] Periodic monitoring and assessment of water quality

helps to develop management strategies to control surface water pollution [7].

Study Area

Kashmir valley lies between 33° 20` and 34° 54` N latitudes and 73° 55` and 75° 35` E longitudes and covers an area of 15, 948 km^2. Topographically, it is a deep elliptical bowl-shaped valley bounded by the lofty mountains of the Pir-Panjal Range in the South and South-West and the Greater Himalayan Range in the North and East, with 64% of the total area being mountainous. The valley is an asymmetrical fertile basin, stretching from South-East to North-Westerly direction. Its diagonal length (from South- East to North West corner) is 187 km, while the breadth varies considerably, being 115.6 km along the latitude of Srinagar. The altitude of the valley floor at Srinagar, the capital city, is 1,600 m a.s.l. and the highest peak among its surrounding mountains is that of the Kolahoi or 'Gwashibror' with a height of 5,420 m. River Jhelum traversing the valley. The Jhelum (also called Vitasta/Vyeth) has been and continues to be the key element of the ecosystem of Kashmir [8]. The shielded valley of Kashmir is characterized by distinct orographic features and snow clad peaks and resembles the mountainous and continental parts of the temperate latitudes. Thus, the Valley of Kashmir has a continental climate marked by well defined seasonality.

The present study was carried on the small sub tributary of river Jhelum and main distributary of famous Rambiara stream namely Lar stream, in Kashmir Himalaya. The Lar stream, which is under study for the assessment of water quality status through the application of aquatic macro invertebrates and physicochemical parameters, originates from the famous Rambiara stream, which in turn finds the the origin in Rupri Peak, the Bhagsar Lake, in the Pir panchal range near Naba Passes. It is one of the major distributaries of the Rambiara stream. The stream emerges as a tributary from the main stream, Rambiara near a famous village, Boherhalan/Tolihalan (District Shopian). The gushing waters of Lar flow through the foot-hills of Pir Panchal and the stream runs parallel to the giant Rambiara in its maximum coarse. It begins as a small stream in the mountains and flows through woods, farms and urban areas; the substrate changes from cobles at the head waters to fine sand near the mouth of the river Jhelum.

In the journey of its flow although the stream expresses virginity of ecological conditions in terms of physico-chemical parameters and biological characteristics, at the upstream sites due to least anthropogenic pressure yet, it tolerates a

great deal of pollutants from the catchments at the downstream locations. Agricultural runoff, domestic sewage etc. are the main harmful pollutants that enter the stream in its downstream coarse till it confluences with the River Jhelum at Banderpora, situated in District Pulwama. The stream also joins Romshi Nallah at Gulbugh (Pulwama) which too ultimately confluences with River Jhelum at Lelhar (Pulwama).The Lar stream completes its first half of the journey in District Shopian and the rest in District Pulwama before it confluences with the river. Generally speaking, in the former stage, the stream retains the virginity of ecological conditions and the later stage gesticulates towards the worsening ecological health of the stream.

MATERIALS AND METHODS

Physico-Chemical Parameters

Sampling was carried out at two sites of Lar stream viz; Zawoora and Wathoo (SI & SII respectively) having pristine and polluted conditions, on monthly basis from January, 2012 to May, 2012 on two successive days of sampling months.

Physical parameters including stream flow velocity, temperature, pH and conductivity were recorded on spot while, chemical parameters were determined in the laboratory within 24 hours of sampling. The water samples were collected from the sampling spot by dipping one litre polyethylene bottle just below the surface of water. Special recommended glass bottles were used for the estimation of dissolved oxygen. For estimation of dissolved oxygen, samples were fixed at the sampling site in accordance with modified Winkler method. Other parameters were determined in the laboratory. All the physico-chemical parameters were determined by adopting the standard methods of **APHA [9, 10, 11]**.

Temperature

Atmospheric and water temperature of the stream was recorded using Celsius mercury thermometer calibrated up to $0.1^{\circ}C$. For measuring the water temperature, the bulb of the thermometer was dipped in water for at least two minutes. The results were expressed in "^{o}C".

Hydrogen-Ion Concentration

The hydrogen ion concentration of water was determined by using a digital pH meter (Micro processor pH system-1011E). The pH meter was standardized with the help of standard solution having pH 4.0 and 9.2 before taking the reading of the samples.

Conductivity

The value of the conductivity was recorded with the help of 104 Systronics model conductivity meter. Standardization of the conductivity meter was done with the standard potassium chloride solution (0.01 KCl). The results were expressed in μS.

Dissolved Oxygen (DO)

The dissolved Oxygen content of the water was determined by Winkler's modified method as described by **APHA, 2005**. The water samples were collected in stoppered glass bottles of 250-300 ml capacity. Fixation was done on the spot by adding 1 ml of MnSO4 and 1ml of alkali-iodide-azide. The bottles were tilted several times to develop the precipitate and then the precipitate was allowed to settle down. The precipitation was dissolved by adding 1ml of concentrated H_2SO_4. 50 ml of this solution was titrated against 0.025N sodium thiosulphate using starch as indicator.

The Dissolved Oxygen was determined by using the following formula:

DO (mg/l) = Volume of titrant ($Na_2S_2O_3$) used $\times$ 0.2$\times$ 1000/Volume (ml) of sample used.

Where 0.2 values represents 1ml of sodium thiosulpahte equivalent to 0.2 mg of Oxygen

Total Hardness

The total hardness of water was determined by EDTA method (CSIR), Pretoria, 1974). To 50ml of sample, 1ml of ammonium buffer followed by 5 drops of Erichrome black- T indicator, was added. The sample was then titrated with EDTA solution to a pure blue end point. Total hardness was calculated as:

Total hardness as mg CaCO3 = 20 $\times$ T1 $\times$ f1.

Where T1 = ml of EDTA required for titration

f1= Erichrome black T standardization factor for EDTA

Calcium

To 50ml of water sample 1ml of 2N NaOH and a pinch of Murexide as indicator was added in a titration flask. The solution was then titrated with standard 0.01M EDTA till colour changed from fine red to pink/purple and the volume of EDTA used was noted. The calcium hardness was obtained by the following formula

Ca (mg l^{-1}) = V$_I$ X 1000 X 1.05 / V$_2$

Where, V$_1$ $_=$ Volume of titrant (EDTA) used;

V$_2$ $_=$ Volume of sample used

Free Carbon Dioxide

The free Carbon Dioxide concentration was obtained by the titration method using Phenolpthalein as indicator. Here 50ml of the water sample was taken in a titration flask and two drops of the indicator were added to it. If on addition of phenolphthalein water turns pink, there is no free carbon dioxide and if it remains colorless, presence of free carbon dioxide is confirmed. Then titration of the aliquot with 0.1N NaOH is done till pink color is obtained by gentle stirring.

The free Carbon Dioxide concentration is obtained by

CO_2 mg/l =Titrant used (ml) x 20

Or CO_2 mg/l = Titrant used (ml) x1000 /Volume of sample used

Total Alkalinity

Total alkalinity, (Carbonate and bicarbonate alkalinity) was determined as per the methodology given by **Mackereth *et al*., 1978, [9]**. Alkalinity was analyzed by

titrating the sample against 0.02N sulphuric acid using phenophthalalein indicator in the first step (P) and methyl orange in the second step (M). The change of colour was pink to colourless in first step and yellow to orange in the second step. The alkalinity was calculated by using the formula:

Total alkalinity (mg/l) = Volume of titrant used (0.02 N H_2SO_4) × 1000 / ml of water sample taken

Chloride

Titrimetric method was employed for the determination of chloride as per **[8]**. The water sample was titrated against 0.0141 N Silver nitrate till the colour formed by Potassium chromate indicator changed into faint brick colour. From the volume of titrant used the content of chloride in the water was calculated by the formula:

Chloride (mg/l) = Volume of titrant used × a × b × c / Volume of water sample

Where a = 35.466 (At. Wt. of chloride), b = 0.0141 (N of AgNO3), c = 1000

Ammonical-Nitrogen

It was estimated by Phenate method **(APHA, 2005)**. To 25ml sample in 50ml conical flask, 1ml phenol solution, 1ml sodium nitropruside solution and 2.5ml of oxidizing solution were added after thorough mixing. Samples were covered by plastic wrap or paraffin wrapper film to develop colour at room temperature (22 to 27°C) in reduced light for at least 1 hour. Absorbance was measured at 640 nm spectrophotometrically (Systronics 106,

Spectro-photometer). Results were computed from the standard curve obtained from the known standards passed through the same process. Ammonium nitrogen (NH4-N) and nitrate nitrogen (NO3-N) was determined by phenate method **[12]** and phenyldisulfonic acid method **[12]** respectively, using spectrophotometer.

Nitrate-Nitrogen

It was estimated by Salicylate method **[13]**. To a 50ml of sample 1ml of Sodium Salicylate solution was added and the resultant solution was evaporated to dryness on a hot plate. To the residue, 1ml of concentrated H_2SO_4 was added. The beaker was tilted so as to wet the bottom completely and then it was allowed to stand for 10 minutes. Thereafter 6ml of distilled water and 7ml 30% sodium hydroxide solution were added cautiously. Since the development of yellow colour is possible only in alkaline medium, pH of colourless samples was checked and if required more NaOH was added. The resultant samples were transferred to 50ml volumetric flask and diluted to the mark and mixed thoroughly. The optical density was measured at 410 nm with the help of Spectrophotometer, at least 10 minutes after the addition of hydroxide.

Total Phosphorus

The stannous chloride method was used for the analysis of total phosphorus. 1ml conc.

H_2SO_4 and 5ml conc. HNO_3 were added to 25ml of water sample and the mixture was evaporated to approximately 1ml on hot plate. The sample was cooled for some time and on cooling, 20ml of distilled water and 1 drop phenolphthalein indicator were added and the sample was titrated against 1N NaOH solution until faint pink colour developed. After this, volume was raised to 100ml by adding distilled water. Strong acid solution was added to discharge the pink colour. After this, 4ml of ammonium molybdate reagent and 0.5ml of stannous chloride were added. Blue colour developed after about 10 minutes. The absorbance was measured at 690nm. The total phosphorous was computed from the standard curve obtained from the known standards passed through the same process.

RESULTS AND DISCUSSION

Physicochemical analysis of water Monthly variation in physico-chemical parameters of water at two sites of Lar stream, Kashmir from January, 2012 to May, 2012.

Air Temperature

Temperature is an important and vital factor that has a profound effect upon the survival of a living organism. During the study months (January, 2012 to May, 2012) the studied stream experienced seasonal fluctuations in air temperature corresponding to water temperature. It ranged between a minimum of $2.4^{o}C$

(January) and $14.4^{o}C$ (maximum) at site I Where as at Site II, it recorded the highest of $22.8^{o}C$ in May and a minimum temperature of $7^{o}C$ in the month of January. The overall mean values of $8.2 ^{o}C$ and $14.5^{o}C$ were recorded at the Sites I and II respectively (**Table 1 and Figure 1**).

Water Temperature

Water temperature acts as a limiting factor to the aquatic biota for it controls various physical as well as biological processes in the aquatic ecosystem. The surface water temperature varied in the same fashion as the air temperature, following a similar trend of fluctuation. Water temperature of the stream at site I recorded its minimum and maximum values of 1 and $10^{0}c$ in the respective months of January and May with a mean of $5.4^{o}C$. At site II, water temperature showed lowest value of $4.5^{o}C$ during January and the highest of $14^{o}C$ during May. The overall mean at site II was recorded to be $9.7^{o}C$ (**Table 2 and Figure 2**).

Water Velocity

Water flow velocity is an essential factor which decides the water quality of any lotic ecosystem. Lar stream registered obvious temporal and spatial variations in terms of water velocity. Site I registered maximum flow velocity of 169cms^{-1} during May and a minimum of 87cms^{-1} was recorded during January. The overall mean velocity of this

site was measured to be 122.8 cms^{-1} .At site II, the highest velocity (63cms^{-1}) was recorded during May and lowest (31 cm s^{-1}) was registered during January. The overall mean at site II was calculated to be 44.4cms^{-1} (**Table 3 and Figure 3**).

pH (Hydrogen Ion Concentration)

The pH fluctuated from slightly acidic to alkaline. pH of the stream ranged from. A minimum pH of 7.2 was measured at site I during February and the maximum value of 8.3 was registered during May having 7.7 as overall mean. At site II minimum pH of 7.3 was recorded in February while maximum of 7.9 was recorded during May with an average value calculated to be a pH of 7.5 (**Table 4 and Figure 4**).

Conductivity

Conductivity of water an excellent measure of total dissolved salts in water varied in close relationship with the catchment characteristics of the stream under study. Conductivity at site I registered a minimum value of 103µs/cm during February and a maximum of 173µs/cm was recorded during January with a mean conductivity of 129.6 µs/cm.

Site II recorded a minimum conductance of 109µs/cm in the month of February and a maximum of 238µs/cm was measured in the month of January with a mean value of 163.4µs/cm (**Table 5 and Figure 5**).

Carbon Dioxide

The free carbon dioxide fluctuated from 4 mg/L to 9 mg/L during the months (January and May each) at site I with an overall mean of 5 mg/l. The free carbon dioxide content at site II registered a lowest of 6 mg/L during January against the highest of 9 mg/L during May, with a mean concentration of 7.6mg/L (**Table 6 and Figure 6**).

Total Alkalinity

In the present study, total alkalinity fluctuated in the range of 45 mg/L and 88 mg/L during January and March respectively at site II with an overall mean of 64.6 mg/l.

Site I experienced a minimum alkalinity of 28 mg/L during April against a maximum of 69 mg/L in May with a mean alkalinity of 42.2 mg/L (**Table 7 and Figure 7**).

Dissolved Oxygen

At site I the highest value (12.9 mg/L) of dissolved oxygen was recorded during February and a minimum value of 6.8 mg/L in May with an overall mean of 10.1 mg/l. The highest value of dissolved oxygen at site II was 9.7 mg/L during February and it declined to as low as 6.4 mg/L in May with the mean value of 8.18 mg/L (**Table 8 and Figure 8**).

Chloride

At site I, chloride content recorded a minimum value 5 mg/L and a maximum of 11 mg/L in the respective months of January

and May with a mean of 7.6 mg/L. Site II registered a minimum chloride content of 10 mg/L during January and a maximum of 17 mg/L during May, the average of the observations being 12.6 mg/L (**Table 9 and Figure 9**).

Total Hardness

The maximum value of total hardness at site I was 98 mg/L during January and minimum of 69 mg/l was recorded during February with a mean of 84.8 mg/l. Similarly, at site II the highest value of total hardness (130 mg/L) was recorded in the month of May against the lowest of 91 mg/L during the month of February with a mean value of 112.2 mg/L (**Table 10 and Figure 10**).

Calcium Hardness

Calcium hardness showed the similar trend of change at the two sites during the entire period of investigation. site I recorded a minimum calcium hardness of 19.36 mg/L in January and maximum value of calcium hardness of 45.63mg/L was registered during May. The overall mean was recorded to be 32.3mg/L. At site II a minimum calcium hardness of 25.6 mg/L was recorded in February against a maximum of 66.68 mg/L during May; having 47.7 mg/L as the mean of the observations obtained at the site (**Table 11 and Figure 11**).

Total Phosphate Phosphorus

Site I registered minimum total phosphorus (85 µg/L) during January and maximum (141 µg/L) in the month of May while the mean was 111.2 µg/L. Similarly, at site II, the minimum value of total phosphorus was recorded to be 159µg/L during February and a maximum of 223µg/L was recorded in the month of May with an overall mean of 185.2µg/L (**Table 12 and Figure 12**).

Ortho Phosphate Phosphorus

Site I registered minimum total phosphorus (37 µg/L) during January and maximum (50 µg/L) in the month of May while the mean was 42.6 µg/L. Similarly, at site II, the minimum value of total phosphorus was recorded to be 80 µg /L during April and a maximum of 112µg/L was recorded in the month of January with an overall mean of 93.2µg/L (**Table 13 and Figure 13**).

Nitrate Nitrogen

The maximum value of Nitrate nitrogen at site I was 231µg/L during May and minimum of 189 µg/L was recorded during January with a mean of 211.4 µg/L. Similarly, at site II the highest value of Nitrate nitrogen (242 µg/L) was recorded in the month of May against the lowest of 227 µg/L during the month of January with a mean value of 233.4 µg/L (**Table 14 and Figure 14**).

Ammonical Nitrogen

The concentration of Ammonical nitrogen fluctuated from a minimum 101 µg/L during

January to a maximum of 170 µg/L in May with average of 147.6 µg/L at site I while as at site II it fluctuated from minimum of 155µg/L during January and maximum of 180 µg/L in April with average of 166.8 µg/L (**Table 15 and Figure 15**).

The Lar stream, Kashmir, which was under the investigation has a vital ecological importance and is the backbone of agriculture and water supply schemes especially in two South Kashmir districts, Shopian and Pulwama.

The said water body is under a severe ecological stress. Appropriate steps are thus needed to control human interference by sound management policy and relative measures before it is too late. The significance and present pollution status of the particular ecosystem should be highlighted and consequences exposed so as to protect it from further degradation.

The physico-chemical characteristics of water play an important role for the functioning of the stream by determining the environment and habitat characteristics used by stream. These characteristics of water have great role in determining the distribution and abundance of organisms. Any change in a single parameter is bound to, directly or indirectly, reflect a series of change in biological setup of water body.

It can be inferred from the present study that the stream is showing signs of deterioration in its water quality at lower reaches, as evinced by low dissolved oxygen and higher calcium content, Nitrogen, phosphorus and chloride concentrations all pointing towards the nutrient enrichment and therefore productivity of the system.

Table 1: Effect of Air Temperature Upon the Survival of a Living Organism

Parameter	Months	Site 1	Site 2
Air Temperature (^{o}C)	January	2.4	7
	February	4.5	10.5
	March	8.7	14.6
	April	11	17.6
	May	14.4	22.8
	Mean	8.2	14.5

Figure 1: Effect of Air Temperature Upon the Survival of a Living Organism

Table 2: Effect of Water Temperature Upon the Survival of a Living Organism

	Months	Site 1	Site 2
Water Temperature (°C)	January	1	4.5
	February	2.7	7.5
	March	4.5	11
	April	9	11.5
	May	10	14
	Mean	5.44	9.7
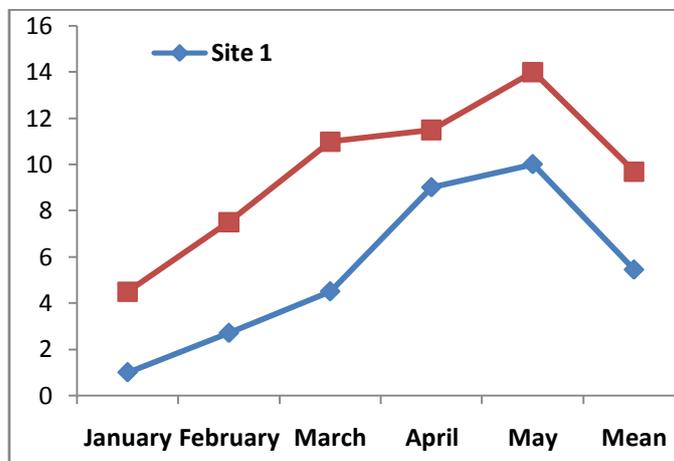
Figure 2: Effect of Water Temperature Upon the Survival of a Living Organism
Table 3: Water Flow Velocity

	Months	Site 1	Site 2
Water Velocity (cm/s)	January	87	31
	February	99	39
	March	116	42
	April	143	47
	May	169	63
	Mean	122.8	44.4
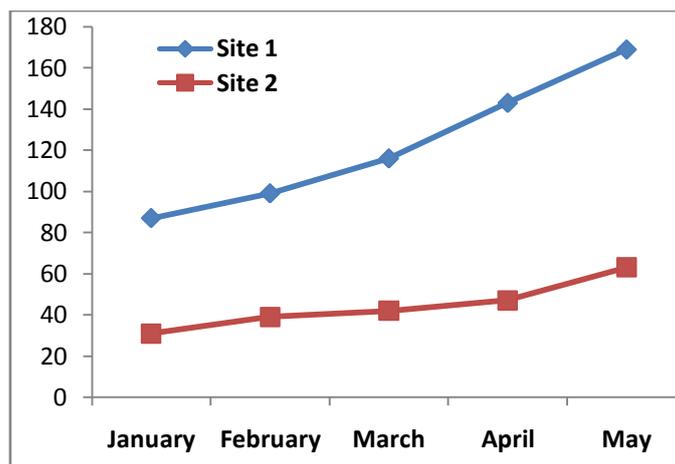
Figure 3: Water Flow Velocity

Table 4: Study on pH of Stream

	Months	Site 1	Site 2
pH	**January**	**7.5**	**7.4**
	February	**7.2**	**7.3**
	March	**7.6**	**7.5**
	April	**7.9**	**7.8**
	May	**8.3**	**7.9**
	Mean	**7.7**	**7.58**
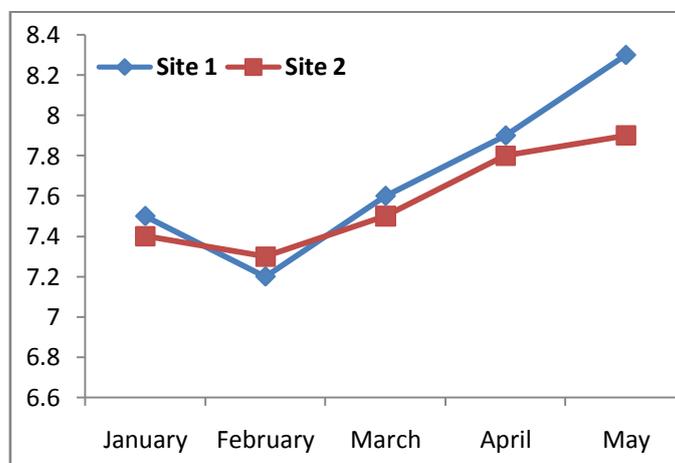
Figure 4: Study on pH of Stream

Table 5: Study on Conductivity of Water

	Months	Site 1	Site 2
Conductivity (µs cm^{-1})	**January**	**173**	**238**
	February	**103**	**109**
	March	**152**	**188**
	April	**113**	**147**
	May	**107**	**135**
	Mean	**129.6**	**163.4**
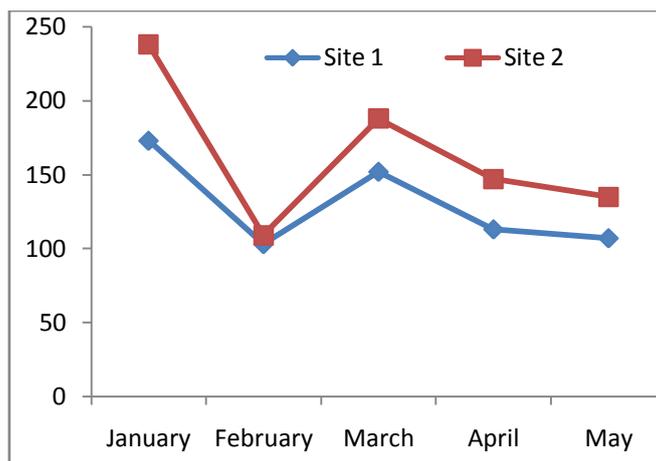
Figure 5: Study on Conductivity of Water

Table 6: Study on Carbon Dioxide Content

	Months	Site 1	Site 2
Carbon Dioxide (mg L^{-1})	**January**	4	6
	February	4	7
	March	5	8
	April	6	8
	May	6	9
	Mean	5	7.6
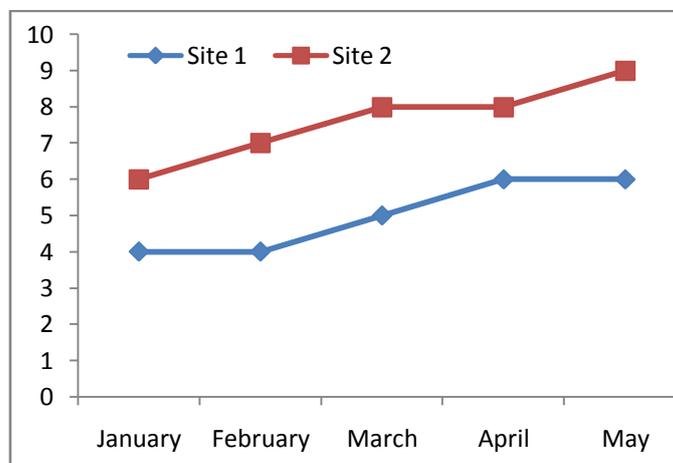
Figure 6: Study on Carbon Dioxide Content

Table 7: Study on Total Alkalinity Content

	Months	Site 1	Site 2
Alkalinity (mg L^{-1})	**January**	33	45
	February	37	35
	March	44	88
	April	28	49
	May	69	66
	Mean	42.2	64.4

Figure 7: Study on Total Alkalinity Content

Table 8: Dissolved Oxygen

	Months	Site 1	Site 2
Dissolved Oxygen (mg L^{-1})	**January**	**12.3**	**8.7**
	February	**12.9**	**9.7**
	March	**10.6**	**8.5**
	April	**7.9**	**7.6**
	May	**6.8**	**6.4**
	Mean	**10.1**	**8.18**
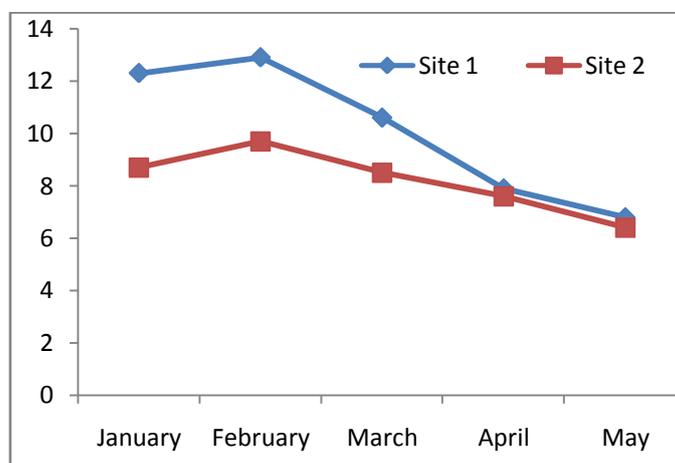
Figure 8: Dissolved Oxygen

Table 9: Chloride Content

	Months	Site 1	Site 2
Chloride Content (mg L^{-1})	**January**	**5**	**10**
	February	**7**	**11**
	March	**8**	**13**
	April	**7**	**12**
	May	**11**	**17**
	Mean	**7.6**	**12.6**
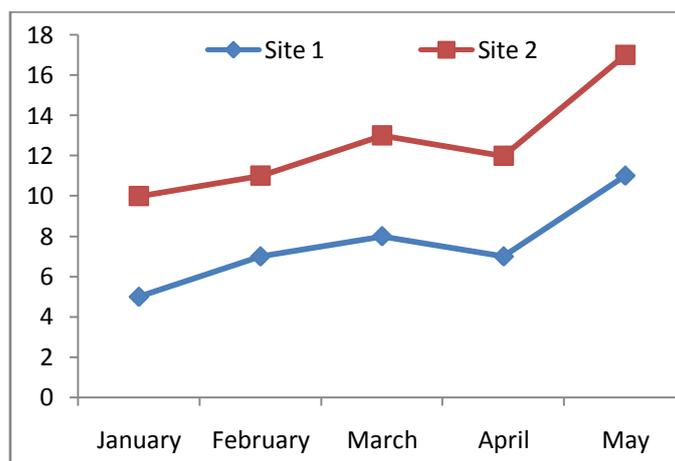
Figure 9: Chloride Content

Table 10: Total Hardness

	Months	Site 1	Site 2
Total Hardness (mg L^{-1})	**January**	**98**	**108**
	February	**69**	**91**
	March	**80**	**114**
	April	**84**	**118**
	May	**93**	**130**
	Mean	**84.8**	**112.2**
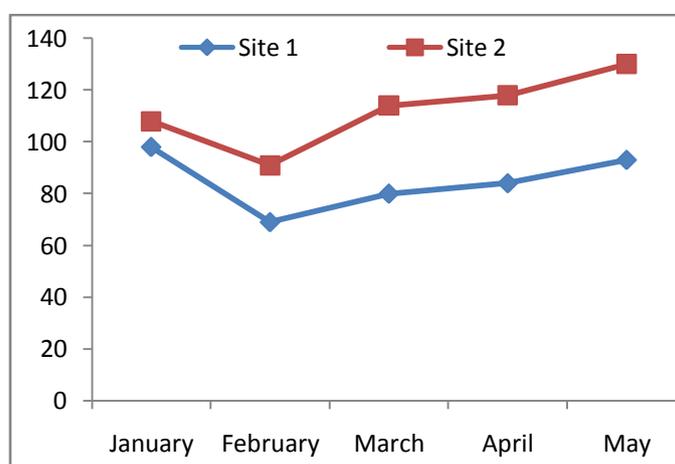
Figure 10: Total Hardness

Table 11: Calcium Hardness

	Months	Site 1	Site 2
Calcium Hardness (mg L^{-1})	**January**	**19.36**	**40.73**
	February	**24.2**	**25.6**
	March	**32.9**	**45.4**
	April	**39.9**	**60.2**
	May	**45.63**	**66.68**
	Mean	**32.3**	**47.7**
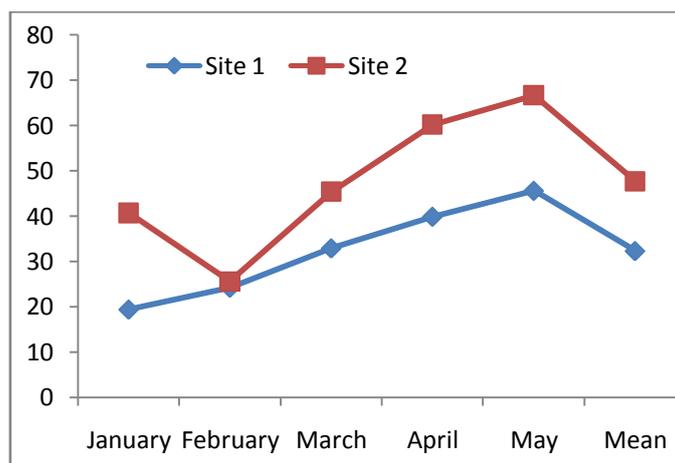
Figure 11: Calcium Hardness

Table 12: Total Phosphate Phosphorus

	Months	Site 1	Site 2
Total phosphate phosphorus (µg L^{-1})	**January**	**85**	**161**
	February	**98**	**159**
	March	**102**	**195**
	April	**130**	**188**
	May	**141**	**223**
	Mean	**111.2**	**185.2**
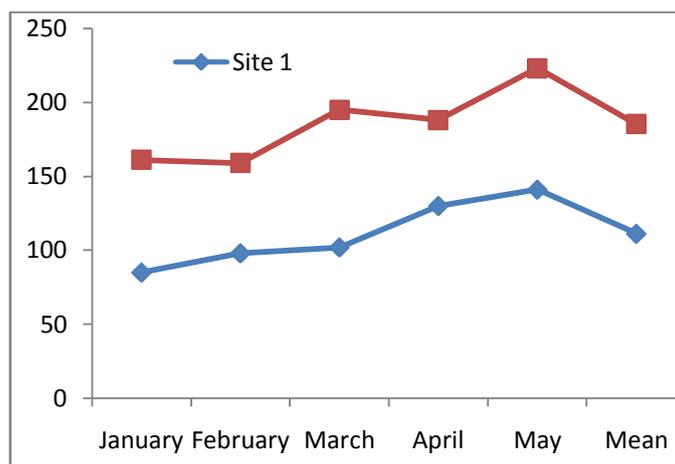
Figure 12: Total Phosphate Phosphorus

Table 13: Ortho Phosphate Phosphorus

	Months	Site 1	Site 2
Ortho-phosphate (µg L^{-1})	**January**	37	112
	February	38	94
	March	43	89
	April	45	80
	May	50	91
	Mean	42.6	93.2
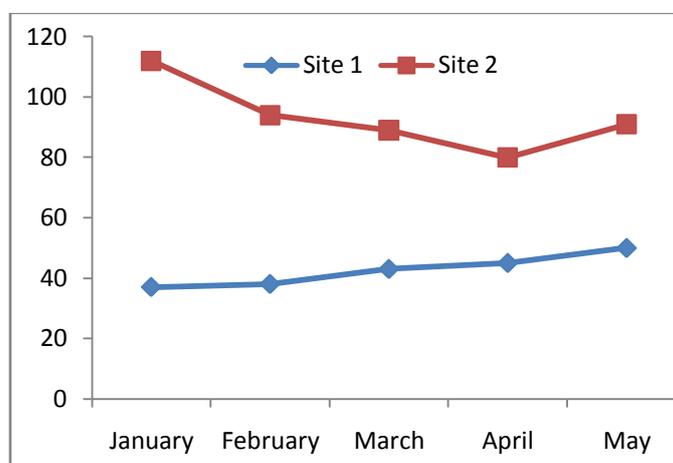
Figure 13: Ortho Phosphate Phosphorus

Table 14: Nitrate Nitrogen

	Months	Site 1	Site 2
Nitrate nitrogen (µg L^{-1})	**January**	189	227
	February	205	233
	March	213	230
	April	219	235
	May	231	242
	Mean	211.4	233.4
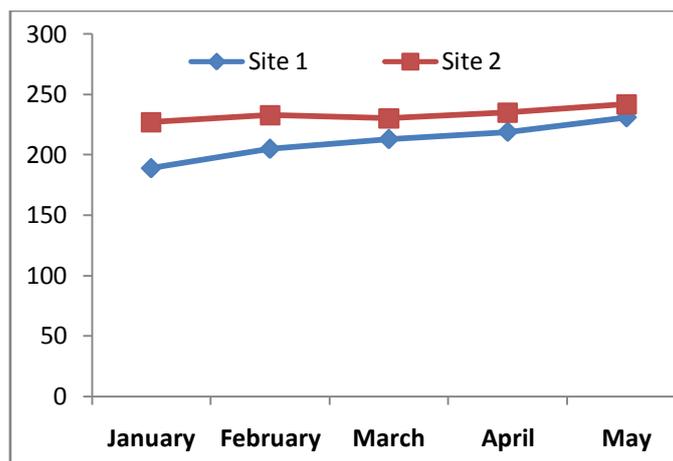
Figure 14: Nitrate Nitrogen

Table 15: Ammonical Nitrogen

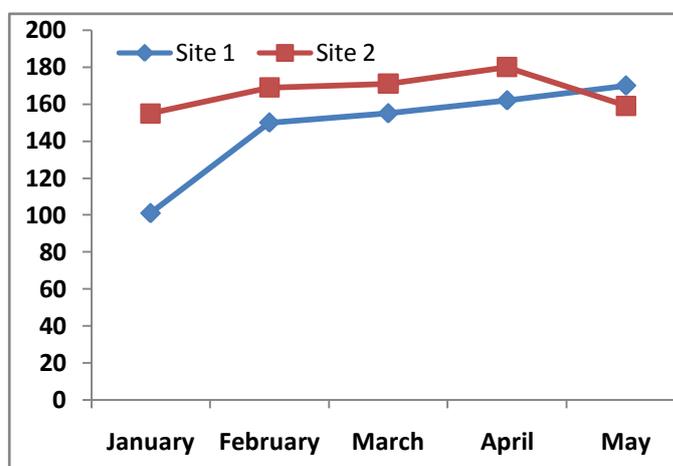|	Months	Site 1	Site 2
Ammonical Nitrogen (µg L-1)	January	101	155
	February	150	169
	March	155	171
	April	162	180
	May	170	159
	Mean	147.6	166.8

Figure15: Ammonical Nitrogen

CONCLUSION

The physico- chemical characteristics of the Lar stream at different sites indicate that the stream exhibits some deteriorating (Nutrient pollution) trend. However, the various anthropogenic effects like, mini project constructions, agricultural activities, fertilizers and pesticides , raw sewage and domestic sewage, sewage effluents etc. find its way in to the stream and may eventually cause the change in the present tropic condition of the ecosystem. It was found that water characteristics at high altitudes compared to plains indicate a

considerable change in physcio-chemcial features. From the experiments it was conclude that, wathoo site, is subjected to more anthropogenic pressure and therefore experience more pollution as compared to other site viz; zawoora village. Thus it may be concluded that Lar stream of Pulwama Kashmir is unpolluted at upstream locations while as, at downstream positions it is polluted and the main sources of degradation are sewage disposal and agricultural wastes from the catchment area of the stream. Agricultural runoff and domestic waste showed alarming shift or total elimination of sensitive biotic community form the habitat. As the human population continues to grow, it will contribute significantly towards the process of stream biodegradation.

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