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Study the effect of the amount and concentration of pollution by sewage in the presence and density of Dinoflagellate in the city of Diwaniyah /Iraq.

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ABSTRACT

The present study was conducted to determine the environmental effects of the launch of the wastewater directly to some drains in Dinoflagellate presence in the city of Diwaniyah / Iraq, As the water samples collected on a monthly basis starting from June 2015 to September 2015 from three stations along the drain is located in an open area near the Technical Institute in the AL-Ascane district in Diwaniyah, It has been diagnosed with two species of Dinoflagellate *peridiniumcinctum* and *Peridiniumbipes* and they have the highest density (5449.5 cell × 10^3 / L) and 70% during the month of June 2015,It seems that the state of pollution a major impact on the studied algae, which can give early warning and accurate assessment about the quality of sewage before throwing it to the drain and from there to the river. The study also included a measurement of some physical and chemical properties of water, a temperature of air, water, pH, electrical conductivity and dissolved oxygen requirement of life for

Keywords: Dinoflagellate**,** wastewater, Drain, Chemical properties.

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INTRODUCTION

Oxygen and total soluble materials, nitrates, phosphates and sulfates:

Conflicts and wars have led to a severe disruption in water networks Iraqi sanitation and lacks a quarter of the population access to sanitation and safe facilities as the city of Diwaniya, without most of the regions of the sewage except center of the province and of the city of Diwaniya, where the sewage network covers systems (25%) of the area of the city[1].The wastewater is one of the most serious problems of public health in most third world countries as the wastewater treatment the priority it deserves and therefore industrial and household waste discharged directly into water bodies receiving no treatment and the result is to increase the pollution of rivers and loss of aquatic life and consumption of animals are not given and plants for water contaminated by finally reaching the human body, causing various health problems[2]. And sewage contain toxic substances, heavy metals and carcinogenic chemical compounds and inorganic toxic germs and viruses, plus it is very rich in salt, especially boron used in washing and cleaning materials used in homes powdery salt[3]. And sewage contain nutrients, especially nitrogen and phosphorus compounds leads to the occurrence of the phenomenon of Eutrophication and that results in a boom in the growth of algae, especially some of the undesirable species of algae, blue-greens Cyanobacteria.[4].In addition to the growth of Dinoflagellate that cause change color of the water as the cause of this type of algae, a phenomenon called Red tide is a natural phenomenon of environmental occur due to booming harmless to one or more types of algae or Phytoplankton in the water, causing water discoloration clearly[5]. Exposed to this phenomenon most beaches in the various maritime zones this phenomenon have emerged in the coastal waters of Brunei Darussalam because of growth of Dinoflagellate to spiceis *Pyrodiniumbahamense* var. *compressum* which led to the death of huge numbers of marine organisms including molluscs and fish as a result of some types of toxic plankton blooms causing red tide and eating some shellfish and fish so it reaches the gut of fish where they store the toxin in their tissues and be toxic to humans when they eat[6].It produces harmful Dinoflagellate algae *Karenia brevis* especially toxic substances such as Brevetoxin lead to fish kills in large numbers when there is high in concentrations in fish tissue. The decomposition of *K. brevis*algae cells. Leads to release the poison and which stay in the water for several months when the marking fish suffer human intake of these toxins which leads to illness, There is a neurotoxin Neurotoxin that affects the nervous system of fish.[7].Many international studies the subject of a Dinoflagellate them studying[8]. Who found that phosphorus is a limiting factor for the growth of these algae are plant nutrients and raw materials essential for the growth of phytoplankton, Finally, an outbreak of red tide has close ties with urban developments as human role through delivery of sewage and industrial wastes and effluents of agricultural land and the establishment of fish farms[9]. In the light of the above, and to see some Drain water pollution in residential areas by environmental pollutants, environmental study was intended to see Dinoflagellate pollution resulting put wastewater directly to some Drains in the city of Diwaniyah as we find scarcity of studies that relate to this effect at the local level.

MATERIALS AND METHODS

Study Area:

The study area Drain is located in an open area near the Technical Institute in AL-Ascandistrict in Diwaniya Figure (1) and water Drain is water teeth resulting from a pool of liquid and solid waste residential area and wide for a long time where there are close to him homes for the citizens it used for washing and personal hygiene and other household water subtracted from as consumption patterns are mixed with a large proportion of rainwater and water the streets, including in respect of dust since there is sewage in the area, and the length of Drain 660 meters and width of 1.75 meter, depth meter and a half almost. And located on either side drain plants such as *Tamarisk*, Three sites were selected along Drain which confined between latitudes along. 44.95.85. 59. east latitude 31.97.34.31.The water drain ruby red color during the study period and a length of 27 meters of the total length of the trocar Figure (2), as extended study of the month of June 2015 to the month of September 2015.Has been taking the current study, samples of each month, since almost water samples from the month of June 2015 until the month of September of the same year collected an average of three replicates of each month and a depth of 30 cm below the surface of the water using plastic bottles capacity (5) liter ,three replicates randomly collected in each Station to study the numbers of phytoplankton ,and has qualitative study of algae by using a network of phytoplankton diameter openings 31 microns as set amid drain was pulled for a quarter of an hour and the preserved samples by adding (Lugol's

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solution) were diagnosed algae relying on sources [10,11,12].As the numbers of phytoplankton account has followed the method described by[13], Calendar included the following steps: deposition and preservation, preparation calculate the number of phytoplankton cells sliced promised cells. The following physical properties were measured directly in the field, as measured by the air temperature and water-mediated thermometer Mercurial runway of (0-100) C^0. Portal was recorded water and smell color. Use as a Digital portable multimeter Model 350I/SET, For measuring pH, electrical conductivity of the water (µ/ cm), dissolved oxygen (mg / l).Total Dissolved Solids (T.D.S.) is as mathematical value based electrical connectivity, and it followed the Turbidimetric method to estimate the sulfates and expressed the results in units of mg / l. And measured manner nitrate-mediated Cadmium reduction column. And followed the way Stannous chloride To measure the concentration of phosphate.[14].

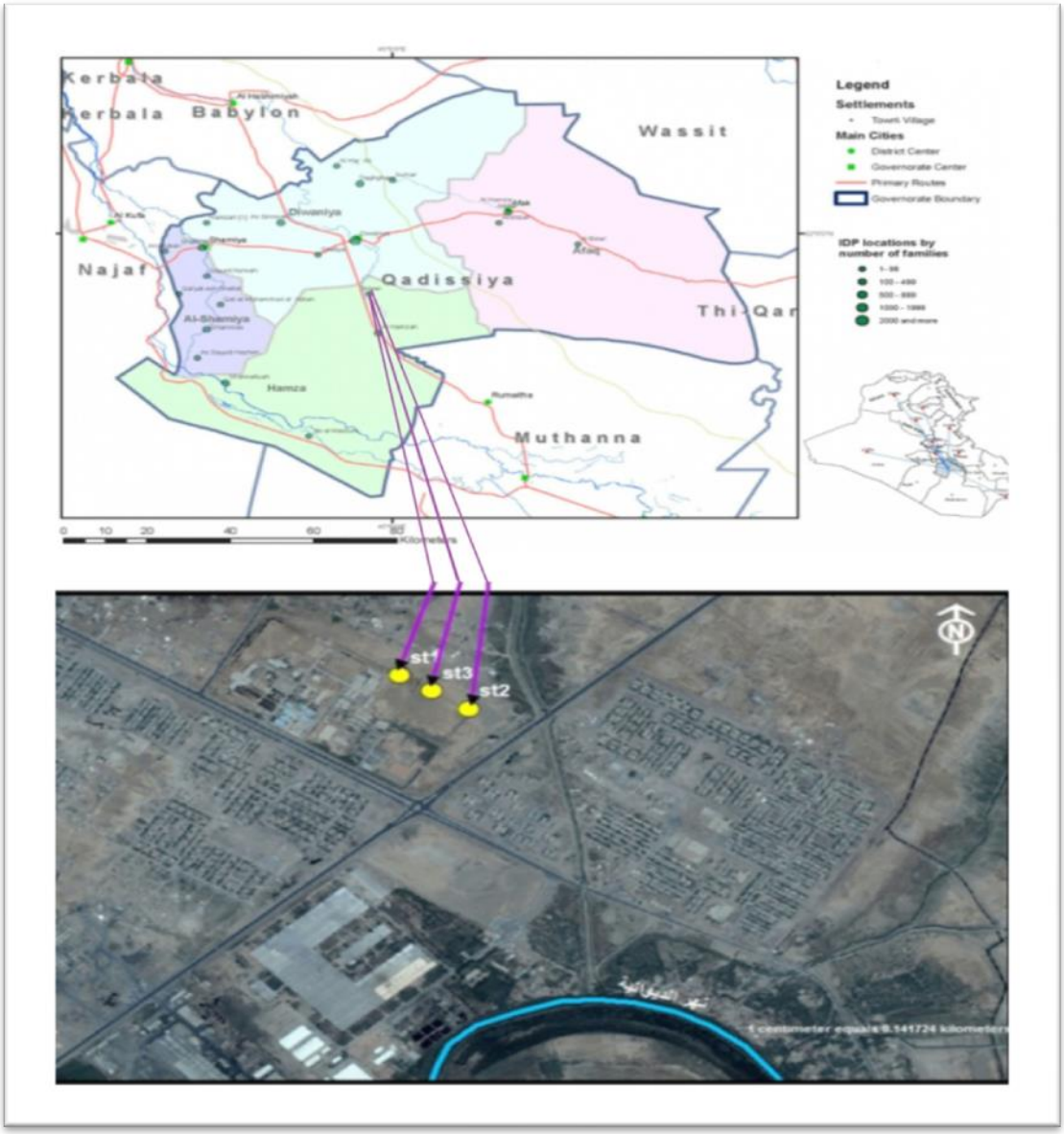

Figure 1: A map showing the study area.

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Figure 2: drain water color during the study period

RESULTS AND DISCUSSION

Qualitative study of Phytoplankton (Dinoflagellate):

Algae Dinoflagellate not been in the Iraqi bodies of water studies in spite of their importance in the ecosystem, The results of the current study has shown that the presence of algae in the water rain Dinoflagellate represented genus: *Peridinium*In all months study and there were two species of these algae *peridiniumcinctum* and *Peridiniumbipes,* Both species they return to Division Pyrrophyta Where they are classified as follows:[10].

Class Dinophyceae.
Order Peridiniales.
Family Peridiniaceae.
Genus*Peridinium*
1*: p. cinctum*species
species 2:*P. bipes,*

The present study showed a convergence diagnosed species, as the great similarities between the species in the study area are the result of expected because the main source of water is the same in all locations, also some taxonomic groups preference clear special environmental conditions appear, as the increase in read out the water was associated with the presence of a specific type of algae, Especially Dinoflagellates, which are some of the kinds of norepinephrine toxins[7]. Therefore it must take into consideration the quality and preparation of algae that will trickle down to the river at the end of the day and therefore can identify the factors and circumstances of those in control of the process.

The quantitative study of Phytoplankton (Dinoflagellate):

Through the results we note that the monthly changes of the total number of dinoflagellate were clear, as shown in Table (1) and Fig.(3,4) the total number of dinoflagellate plant plankton and their proportions in the study area and by months, It was the highest number it has reached (5449.5 cell × 10^3 / L)And 70% during the month of June 2015,table(1) Figure3,4The reason may be due to the increased concentration of nutrients drain as the water is exposed to the impact of sewage waste, which leads to contain high concentrations of nutrients[15].As it is the primary plant nutrients and essential materials for the growth of phytoplankton[8].The results showed the emergence of a single peak of growth at the beginning of the summer, as observed rise in the preparation of dinoflagellate clearly and many, Which may be due to the effect of some environmental factors such as mild temperature, light intensity, and the length of daylight hours, The lowest values in the total number of cells dinoflagellate has reached (184.2 cell × 10^3 / L) And 1 %were recorded during the month of September 2015,table(1) Figure(3), This may be due to the lack of nutrient concentrations or low temperature and then the rate of growth and metabolism in the algal cells slow[16,17].On the whole, the volatility and the difference in winning the overall numbers of phytoplankton within months, the study may contribute to many environmental factors in different aquatic environments[18]. It seems that the state of pollution a major impact on the studied algae, which can give early warning and accurate assessment about the quality of sewage before throwing it to the drain and from there to the river. During the results of the statistical analysis significant correlation has recorded positive rotary algae with nitrates and also scored a significant positive correlation with algae sulfates.

Physical and chemical characteristics:

Air and Water temperature:

Temperatures recorded high ranges during the period of the study that the study was conducted during the warm months, and has been observed that the air temperature influence on the temperature of the water was recorded values of the temperature of the air and water had reached their rates(42) C^0 and (40)$C^0$for both air and water respectively ,table(1)and Figure (5,6)this is due to the density of organic load found in the remnants of the houses of heavy water contaminated this water[19].It is known that temperature affects, directly or indirectly, on the phytoplankton, as the direct impact be clarified in algae movement taking place in the preferred thermal conditions, and the indirect effect are by changing the viscosity of the water as well as the water content of dissolved gases such as oxygen and carbon dioxide[20].

Color and Smell:

The water color usually impressed by the presence of organic or mineral, taste and smell are usually produced from a fungus and decaying material[21].And the water was in the study area with Ruby red color with a distance estimated at about (27)m this was noticeable field and capture photos drain Figure (2),This color is due to the presence of some genera of dinoflagellate which were present in great numbers, As a result of the availability of plant nutrients such as nitrogen compounds and phosphates in wastewater[22]. These are

unpleasant odor water where there are odors emitted by water may be sourced from these waters contain a percentage of gas (Hydrogen sulfide) that produces a rich substratum detritus[23].

Electric conductivity:

The results showed a clear rise in values of electrical connectivity in the study area which recorded the highest values (14880) µs/cm Table(1) and Figure (7),this could be attributed to put wastewater containing large amounts of salt ions[24].Generally observed high values of electrical connectivity during the warm months, probably because that temperature increase leads to increased melting salts and increased evaporation[25].While recorded its lowest values (12341) µs/cm during September 2015 Table(1) , and may be attributed to the low evaporation due to low temperatures.

Total Dissolved Solids (T.D.S.):

Salinity refers to the amount of substances dissolved in water where water naturally contains dissolved inorganic elements. The results of the study showed higher values of T.D.S .during August 2015, which recorded higher values (29760) mg/l, Table(1) and Figure(8) due to high temperature, which is one of the factors affecting the salinity in Iraqi waters add to put wastewater that contains large amounts of dissolved salts to the water drain [26].

pH:

PH is one of the most important environmental characteristics that affect the survival, growth and metabolism of Different aquatic organisms[27].PH values were leaning to the side for the duration of study Table(1) and Figure(9), and the baseband is a known phenomenon in Iraqi waters and may be attributed to the large organizational capacity for interior water due to the presence of carbonate and bicarbonate[28].High pH values can be attributed to the increasing numbers of algae and therefore consume carbon dioxide and high pH values, Statistical analysis results indicated the existence of a positive relationship between the overall numbers for algae and pH values ($P \leq 0.05$), The results also showed low pH values in some months studying this is due to the increase in the concentration of carbon dioxide in wastewater resulting from biodegradation of organic material leads to increased acidity and therefore low pH value[29].This is consistent with the indicated [30] that dissolved gases such as carbon dioxide and hydrogen sulfide and ammonia moral impact in lowering pH values.

Dissolved oxygen:

Most dissolved oxygen measurement is used to determine water quality [31]. The results of the study showed a clear decrease in the values of dissolved oxygen in waters of the drain the result of subtracting wastewater containing large amounts of organic matter degradation leads to the consumption of dissolved oxygen [32]. It has recorded lowest values (2.5) mg/l during August 2015,Table(1) and Figure(10) which may be due to rising temperatures which leads to increased activity of microorganisms in the processes of decomposition of organic substances resulting in increased oxygen consumption and that the observed rise in the value of the Biological Oxygen Demand during the same month, confirming that a relation inverse correlation with Biological Oxygen Demand.

Biological Oxygen Demand:

Results recorded the highest value of the requirement for oxygen(209.5) mg/l during August 2015**,**Table(1)and Figure (11) recalling high results in this study to a high State of organic pollution because of daily discharges untreated wastewater containing high amount of organic material.

Reactive Nitrite:

The current study recorded the highest value for nitrates (591 µg/l) in August 2015 and less valuable (280 µg/l) in September 2015, table(1)Figure(12). The decomposition of organic matter content in wastewater leads to the formation of large quantities of ammonia first and then her oxidation to nitrite and then to nitrate depending on the amount of oxygen available[33].However, the problem emerges when the concentration of

nitrogen compounds, especially nitrates coupled phosphates resulting food enrichment phenomenon Eutrophication resulting in negative impacts on aquatic ecosystems and the living present.

Phosphate:

The results showed a clear effect of subtracting wastewater lifting water phosphate value drain phosphate concentrations were the highest value (2145 µg/l) in August, table(1), Figure(13),This is due to contain large quantities of detergent phosphate rich plus decomposition of organic waste containing phosphorus in installed.[34].

Sulfate:

The results of the current study showed a clear rise in values of sulfate 394.97µg/l in July table(1), Figure(14), due to put wastewater[35],Containing household waste on organic sulfur container such as mthionin and allsthin which adds high concentrations of sulfur decomposes by microbiology[36].

CONCLUSIONS AND RECOMMENDATIONS

1-To increase the water passage as was associated with the presence of a certain type of algae is dinoflagellate so you have to take into account the quality and preparation of algae which will trickle down to the rivers eventually and thus can determine dominant factors and circumstances.

2-The study sites water contains a high density of phytoflagellates turnstiles this distinctive Guide to increasing concentrations of plant nutrients and food enrichment condition resulting from subtracting wastewater.

3-Reduce damage caused by drainage through these processing stations for water and reduce the pollutants to the limit which does not harm aquatic life and water quality .

4-Sewage networks in all cities of the province where the majority of their free city of Diwaniyah from sewage systems.

5-Get rid of swamps and bodies of water in some neighborhoods that have become places to collect a lot of pollutants that Act to drains and on to the river directly without any treatment.

Table (1): monthly variation rates of some physical and chemical specifications and total number of phytoplankton at the study sites.

Months / Factors	June2015	Jul2015	Aug. 2015	Sep.2015
Air temperature C^0	39	40	42	38
water temperature C^0	37	39	40	35
electrical connectivity µs/c	10409	12556	14880	12341
T.D.S. mg/l	20818	25112	29760	24682
pH	7.9	7.6	6.6	7.3
dissolved oxygen mg/l	5.8	4.5	2.5	4.7
Biological Oxygen Demand (mg/l)	129	185	209.5	86.8
$\mu g/l$ nitrate	755.4	239.34	225.7	316.2
$\mu g/l$ phosphates	1506.8	2011.93	2145	1034.37
sulfates µ/l	355.77	394.97	259.43	238.33
total number of phytoplankton cell x 10^3/l	5449.5	1420.5	820.8	94.2

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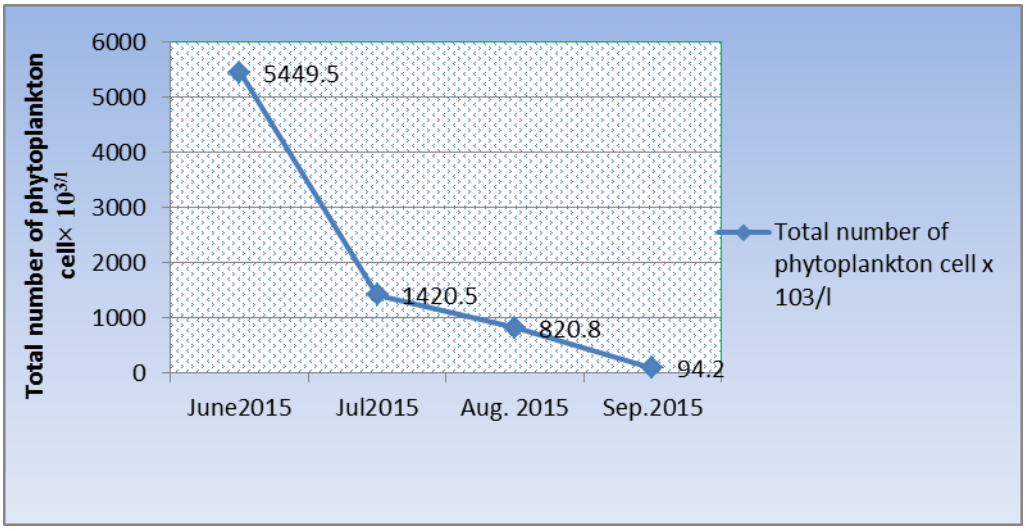

Figure (3) :Monthly rates for total number of phytoplankton (dinoflagellate) cell×10³/l during the study period

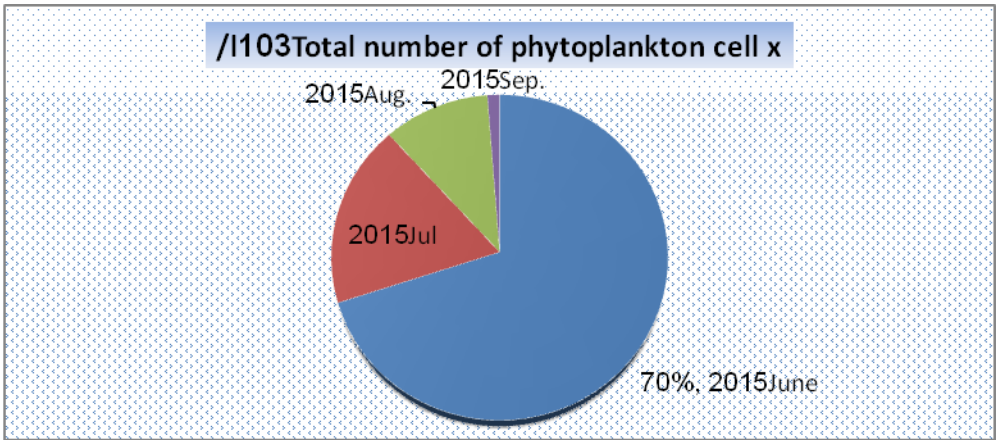

Figure (4): Percentages of occurrence of phytoplankton (dinoflagellate) during the study period.

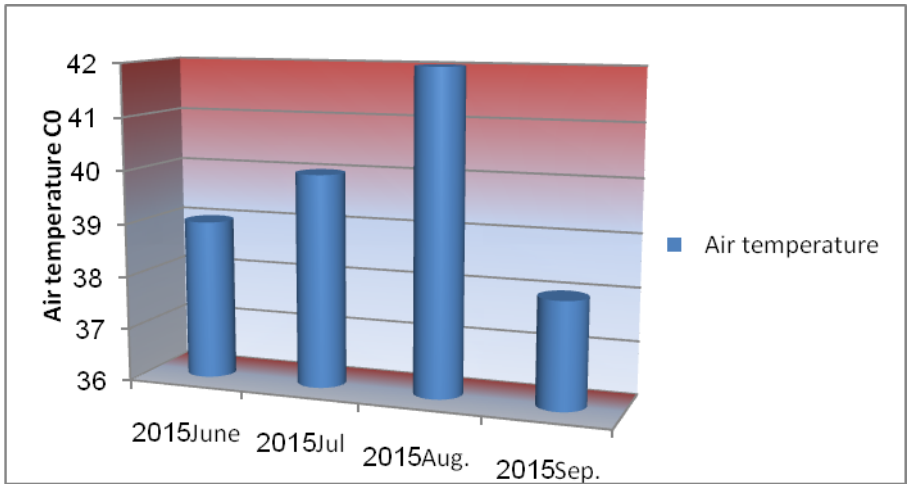

Figure 5: Monthly rates for air temperature C⁰ values during the study

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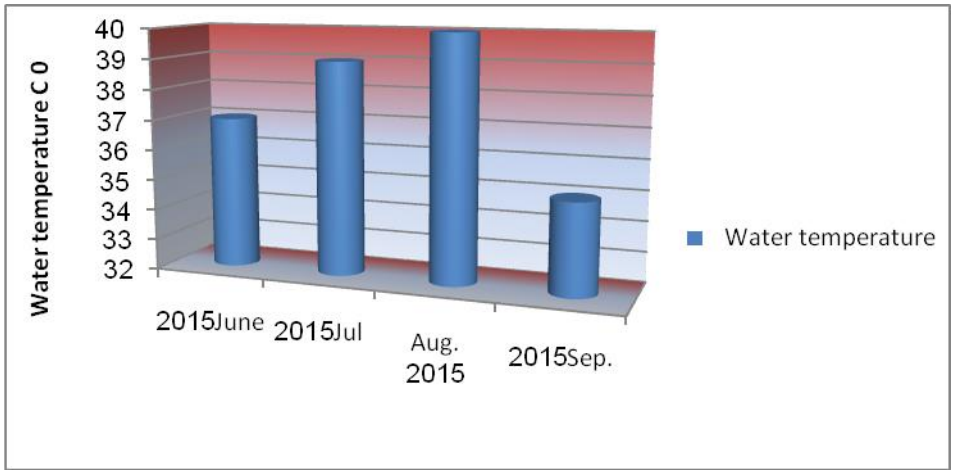

Figure 6: Monthly rates for water temperature C^0 values during the study period

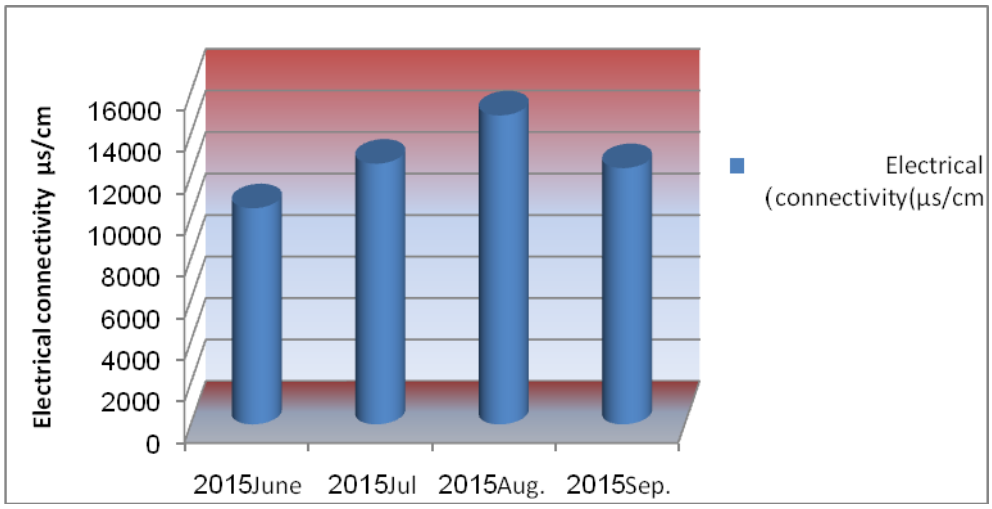

Figure 7: Monthly rates for Electrical conductivity(µs/cm) values during the study period.

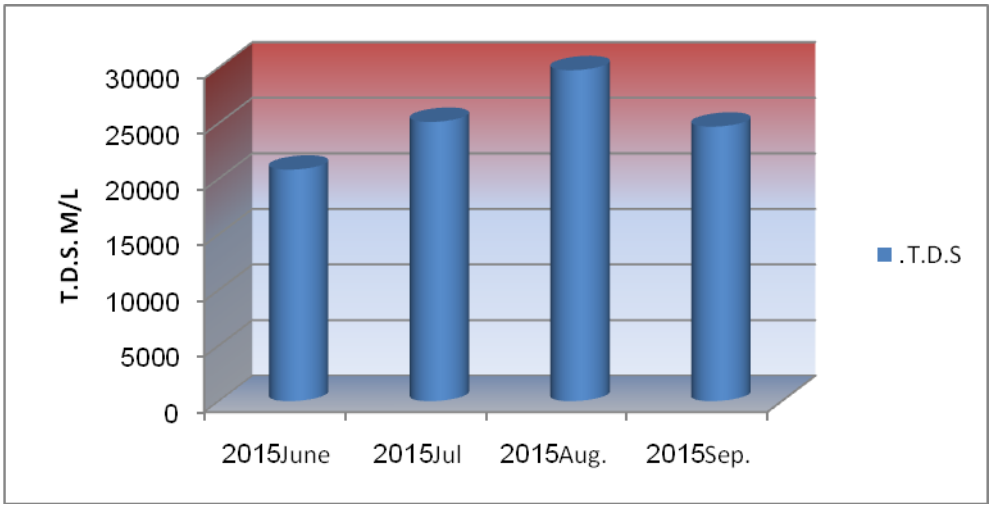

Figure 8: Monthly rates for T.D.S. (m/l) values during the study period

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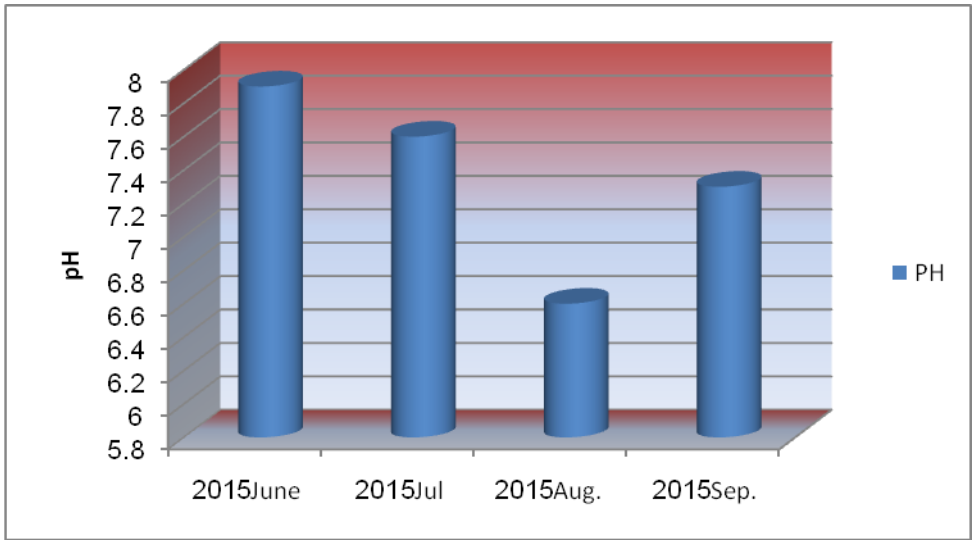

Figure 9: Monthly rates for pH values during the study period

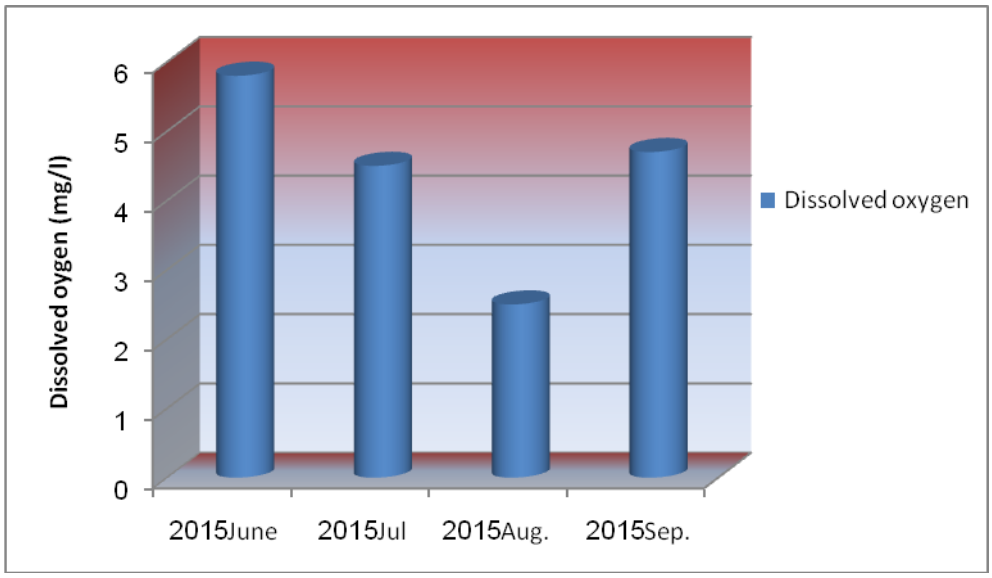

Figure 10: Monthly rates forDissolved oxygen(m/l) values during the study period

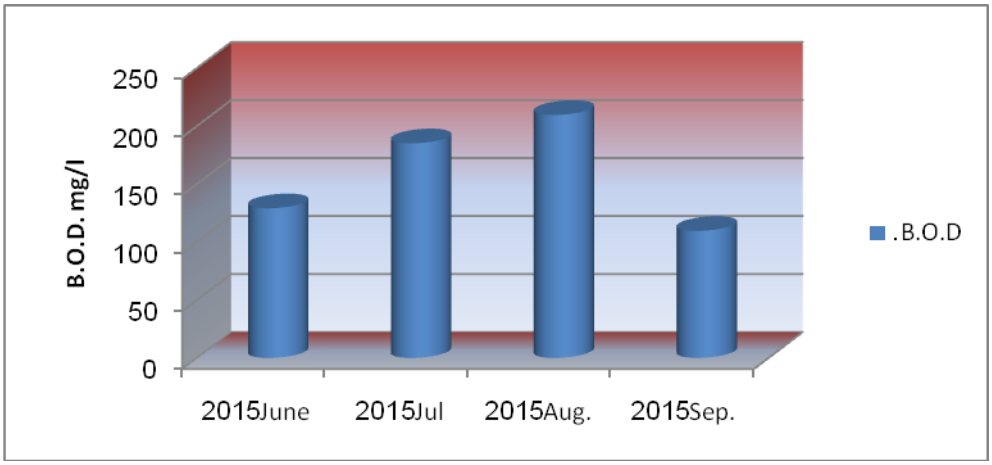

Figure 11: Monthly rates for Biological Oxygen Demand (mg/l) values during the study period

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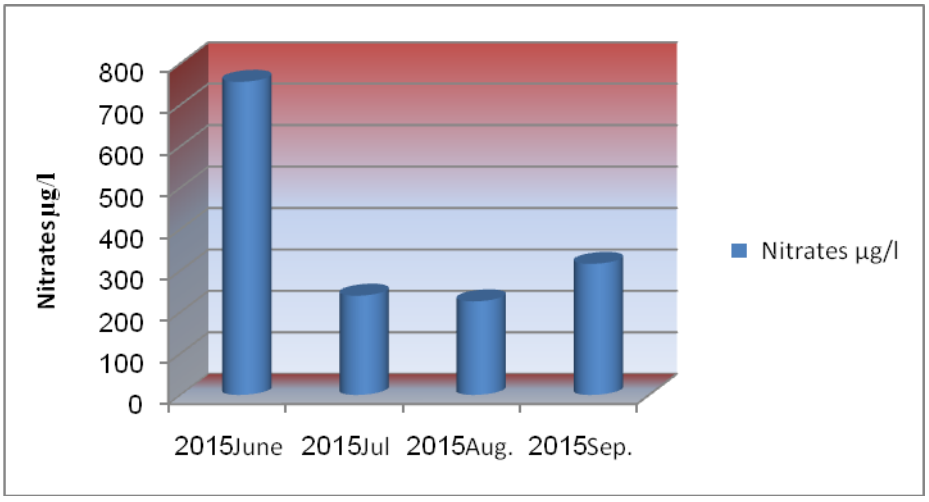

Figure 12: Monthly rates for Reactive Nitrite (µg/l) values during the study period

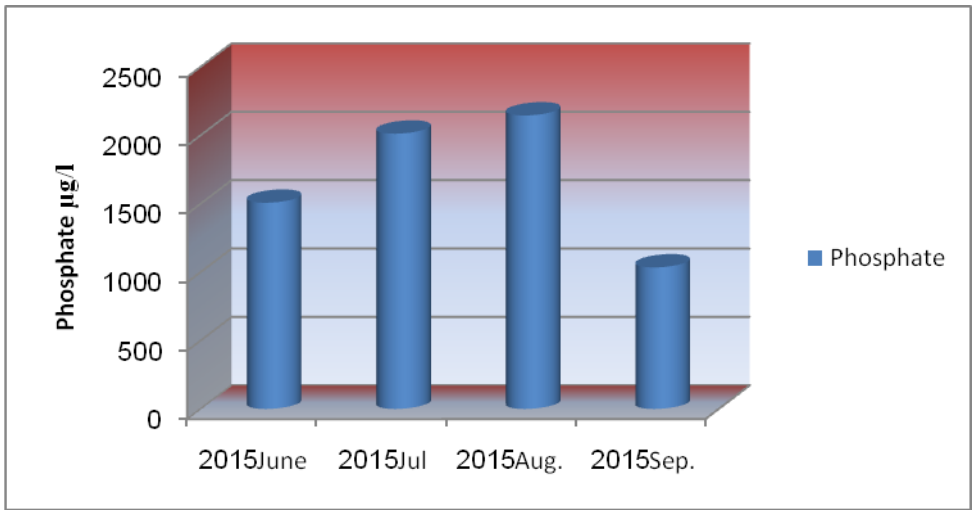

Figure 13: Monthly rates for Phosphate (µg/l) values during the study period

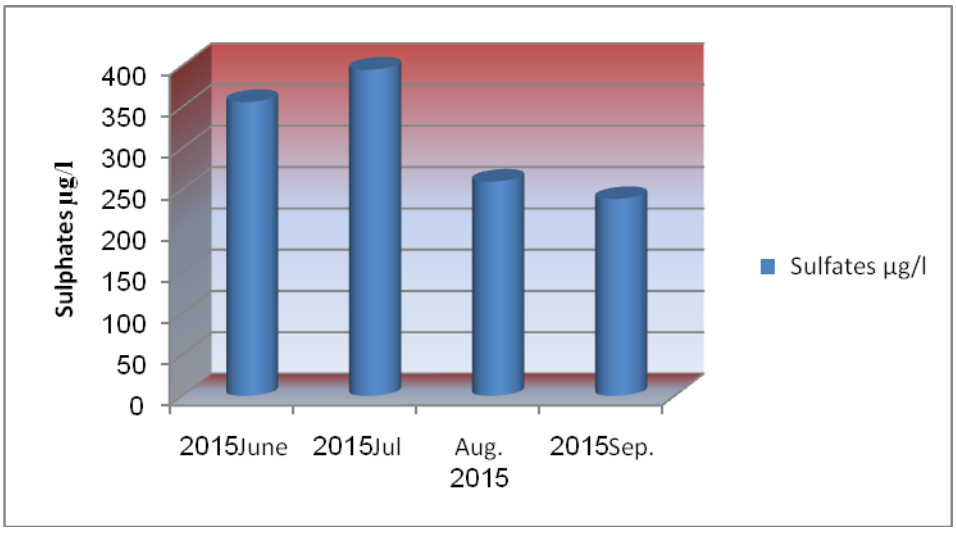

Figure 14: Monthly rates for Sulfate(µg/l) values during the study period

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