Effect of some physical and chemical factors on the Aquatic Annelida(Oligochaeta) in Al- Hilla River/ Iraq

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Abstract

This study was carried out to determine the effects of some physical and chemical factors on the qualitative and quantitative composition of the aquatic Oligochaeta in sediment of Al- Hilla Rive. The samples were collected monthly from 3 sites for period from June 2014 to May 2015.In the present study 7 physical and chemical parameters were measured including (Water temperature (^{o}C), Salinity (‰),pH, Dissolved Oxygen(Mg/L), Biological Oxygen Demand (Mg/L), percentage of organic matter (%) and Soil texture).The minimum and maximum values of Water temperature (^{o}C), Salinity (‰), pH, Dissolved oxygen(mg/l) and Biochemical oxygen demand (BOD5) (Mg/L) were (10 - 24; 0.65-0.98; 6.21- 8.22; 5.53-11.93 and 1.45-4.67) respectively. The range of percentage organic matter (%) was (1.11- 4.30) and the nature of the bottom is a mixture of sand, clay and silt with a small percentage of stones, especially at Site 2.

The results were recorded a total of 20 species belong to 5 families and 11 genus including 8 species from Tubificidae family,7 species from Naididae family,2 species from Aeolosomatidae family, 2 species from Lumbriculidae family, and 1 species from Lumbricidae family. .

The results were revealed that the highest density values of Oligochaeta were 1480 (Ind./m^2) in July 2014 and lowest values were 120 (Ind./m^2) in February 2015, these values showed significant correlation (positive and negative) with some studied factors which indicated significant positively correlation with each of water temperature,BOD5 and percentage of organic matter($r = 0.77$, $r = 0.75$,$r = 0.79$,$P < 0.05$) respectively while significant negative correlation with dissolved oxygen ($r = - 0.65$,$P < 0.05$) .

In the present study the family Tubificidae was recorded highest density among other families ranging from higher value 850 (Ind./m^2) in June 2014 to lowest value 50 (Ind./m^2) in February 2015, while The second family Naididae was recorded density values ranging from highest value 225 (Ind./m^2) in March 2015 to lowest value 30 (Ind./m^2) in January 2015 .The results were showed according to relative abundance index that the *Limnodrilus hoffmeisteri*, *Tubifex tubifex* and *Branchuira sowerbyi* were appeared as dominate species .while other species were appeared between few to rare species except species *Peloscolex feroxand* was abundant in all sites and species *Dero sawayai* in site1 .The results also showed that the highest biodiversity value according to Shannon-weaver Index was 2.125 (bit/Ind). in October 2014 while the lowest value was 0.551(bit/Ind) in July2014.

Key words :Annelida, Oligocheata, Al-Hilla River:

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Introduction

Aquatic Oligochaeta are an important group of the benthic invertebrates community that live in sediments of lakes, ponds, marshes ,rivers and streams, they can be distinguished by body color may be red, brown or black and may have a short setae that help in the worms movement[1] these worms are rich with essential elements of feeding animal as protein and fatty acid therefore they constitute a good and suitable food source for various species of fish, birds, and other invertebrates organisms, in the primary and secondary level consumers [2].Most their species are detritivorous feeding by ingestion of sediment particles, and digest selectively species of bacteria, algae and extract nutrients from bacteria and organic matter associated with sediment and other swim and graze of aquatic vegetation while a few are predaceous [3].The most species Oligochaetes increases abundant in the shallow mud ,organically contaminated and low dissolved oxygen habitats and many of them can tolerate low dissolved oxygen and can be found in large numbers in organically contaminated habitats[4] so can use these worms as bioindicater to assess the quality of the water body, the degree of contamination and the degree of eutrophication in water [5].The presence and spread of Oligochaeta in the environment affected by several factors such as water temperature, pH ,depth, and type of endemic plants but most important environmental variables that affect in the abundance of these worms the nature of the sediment at the bottom , so it was divided into two groups: Group-loving bottom mud Pilophilous assemblage and Group loving sandy bottom Psammophilous[6]. In Iraq there are a few studies concerning the Oligochaetes which aimed to identify qualitative and quantitative composition as well as find out the effect of some physical and chemicals factors on these worms in some water bodies, such as [7] study the effect of environmental factors on the seasonal abundance of *Tubifex tubifex* in some branches of Shatt- Al-Arab and showed that theses worms have ability to live in a wide range of temperatures, low oxygen levels, high level of BOD5 and organic materials also [8] study the ecology, distribution and biodiversity of aquatic invertebrates in Tigris River near Al- Durah power plant (DPP), southern Baghdad and identified five taxa of Oligochaeta and showed that the a *Limnodrils hoffmeisteri* was abundant in both up of and below DPP effluents and study [9] which recorded three new species (*Aulodrilus pigueti*; *Embolacephalus velutinus*; and *Limnodrilus profundicola*) belonging to the family Tubificid (Oligochaeta) of Al Hawiezah marshes also [6] who identified twelve species of mud worms belonging to the under family Tubificinae in the Tigris River and some of the water bodies in Baghdad and showed that the *Limnodrilus hoffmeisteri*, was the dominant species in Tigris River while other species were recorded between few to rare and [10] studied Oligochaeta in waters of the Tigris River in Baghdad region and reported some species of Naididae and Aeolosomatidae associated with aquatic plants also added [11] to the Iraqi fauna four new species belonging to the Naidid family isolated from the surface layer of sediment and submerged plants in the Shatt al-Arab River and[12] revealed the presence of eight species of subfamily Naidinae, which are consider as new records for Iraq in aquatic macrophyta of Euphrates River at Al-Mussayab city, southwest Baghdad. The present study is the first on the Oligochaeta community in the Al- Hilla River and objective of this

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study was to find out about the quantitative and qualitative composition of the Oligochaeta in addition to the effect of some physical and chemical factors on these worms .

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Materials and Methods

Study Site

The Euphrates River in the middle region of Iraq after crossing Al-Hindiya Barrage branched into two rivers which are Al-Hilla River and Al- Hindia River. The length of this river about 103 km and the gradient 7 cm to each 1 km overall [13] it passed Al- Hilla city in addition many towns and villages in the province of Babylon and flow into the riverbed many liquid contaminants from domestic ,agriculture and industries sewage. The great importance of this river returning to being the only source of drinking water for the residents of the Al- Hilla city , moreover to use water river for irrigation, recreation, disposal of sewage, and fishing , This study was conducted in Al- Hilla River during the period from June 2014 to May 2015 at three selected sites along River (Fig - 1)

Site 1: located in the sinjar region north of Al- Hilla city which characterized by decrease vegetation and low discharge into river in this site

Site 2: Located in the Al- Hilla city which characterized by the absence of vegetation and increased flow of industrial and domestic waste into river in this site

Site 3 : located in Al-Hashymiya region south of Al-Hilla city which characterized by dense vegetation and little or no flow of pollutants into the river in this site

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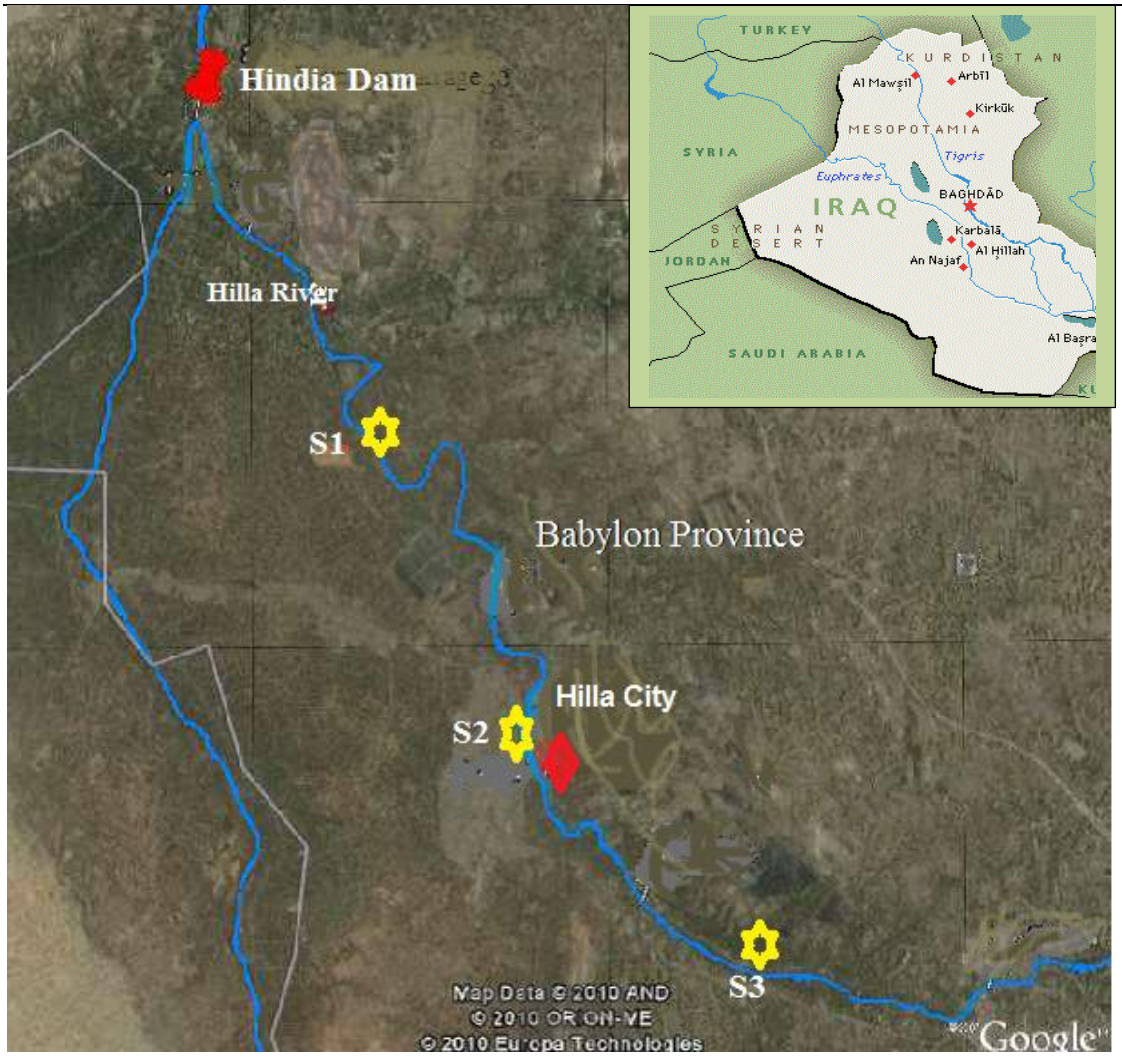

(Figure- 1) Map of the study area showing sampling sites

The water samples were taken monthly, the water temperature is measured using a thermometer mercurial, pH was measured using pH-Meter, also the conductivity meter to measuring electrical conductivity and this values were converted to salinity values ppt by the following formula [14] salinity(‰) = (ECµsemin/cm)x0.00064, The azide modification of Winkler method used to determine Dissolved oxygen (DO) values, and Biochemical oxygen demand (BOD5) values were determined at the same method, but after placing the samples in an incubator for five days, the Organic material was calculated according to [15] finally to know soil texture used sieves method depending on the [16].

The soil samples were taken monthly from the sediment by using Ekman dredge (15X15cm),the samples were collected in plastic containers and washed with water river and also passed through sieves 500 , 250 and 100 micron mesh size, the worms were preserved in formalin solution (4%) and taken to the laboratory for isolation, some large sizes worms can be scanned and isolated under an optical microscope, while small worms were mounted in glycerin and identified to the species level under a light microscope based on [17;18;19] The results were defined by the number of individuals in a square meter (Ind./m^2). The worms density calculated to each species in every sites and the relative

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abundance index based on the equation Relative density (RD) = NA/N *100, NA=Total number of species individuals N=Number of all species individuals..

Shannon – Weiner Diversity Index (H) Values were calculated monthly for all sit according to the [20] H= -∑ *ni* /N Ln *ni* /N. As: *ni*= The number of individuals species .*N*= The total number of individuals and the result expressed as the unit bit / Ind.

For statistical analysis ANOVA test was used ($P < 0.05$) to detect significant differences between sampling sites and months, Pearson's correlation analysis was performed to evaluate the correlation between physico-chemical factors, in addition to evaluate the correlation between physico-chemical factors and Oligochaeta density ($P < 0.05$).

Discussion and Results

Table (1) Some Physical and chemical properties of the samples.

parameter	S1	S2	S3
Water Temperature (^{o}C)	10-23	11-23	11-24
Salinity (‰)	0.65-0.85	0.79-0.98	0.66-0.94
pH	7.73-8.12	6.21-7.78	7.44-8.22
Dissolved Oxygen(mg/L)	6.21-11.93	5.53-9.45	6.44-10.97
Biological Oxygen Demand (mg/L)	1.45-2.22	3.45- 4.67	2.11-2.79
Sediment organic Matter(%)	1.11-2.85	2.50- 4.30	1.20-3.70

Table(2): The Sediments texture

Site	Clay %	Silt%	Sand %	Sediments texture
Site1	20	13	67	Sandy
Site2	40	19	14	Sandy Clay
Site3	13	12	57	Sandy

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Table (3): Correlation coefficient values (r) between the studied factors and density of Oligochaeta in the Al-Hilla River

factor	Water temperature	Salinity	pH	DO	BOD5	Organic Matter	Oligo Density
Water temperature	1	0.32	0.16	- 0.63*	0.64*	0.43	0.77*
Salinity		1	0.39	- 0.43	0.28	0.22	0.39
pH			1	- 0.26	0.16	0.27	0.12
DO				1	- 0.78*	- 0.68*	- 0.65*
BOD5					1	0.77*	0.75*
Organic Matter						1	0.79 *
Oligo Density							1

* Significant level 0.05

The results showed clear changes in the values of some physical and chemical properties measured during current study, the water temperature recorded highest values 24^{o}C in July2014 and the lowest value10 ^{o}C in January 2015 at site 3,1 receptively as shown in Table (1)The results of statistical analysis showed, there were no significant differences between the study sites($P>0.05$) also recorded positive significant correlation between the water temperature and the BOD5 (r=0.64, <0.05)while negative significant correlation with dissolved oxygen(r=-0.63, ,P <0.05) as shown in Table (3).

The salinity recorded the highest values 0.98 ppt in August 2014 and the lowest value 0.65 ppt in February 2015 at site 2,1 receptively as shown in Table (1) the highest values of salinity recorded in the summer may be due to the high temperature which leads to increased solubility of salts and thus increase its concentration in water, as well as to increased evaporation process, also recorded high values of salinity in the site 2 was probably due to that this site is located within the city of Al- Hilla, and affected a lot of domestic and industrial waste which contains many soluble salts [21].

pH recorded highest value 8.22 in May2015 and the lowest value 6.21 in February 2015 at site 3,2 receptively as shown in Table (1) this indicated alkaline which is a common features in Iraqi inland water[22]The highest values of pH recorded in spring may be attributed to the increasing density of phytoplankton and consumption of CO_2 gas in photosynthesis process, while low values in winter can be due to the role of low temperature in increase the solubility of carbon dioxide gas in the water [23].

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Dissolved oxygen recorded highest values of 10.93 mg/ L in March 2015 and lowest value 5.53 mg / L in July 2014 at site 1,2 receptively as shown in Table (1) The high values appeared in the spring may be due to high photosynthesis process of algae and aquatic plants also to the low temperature caused an increase in the solubility of this gas [24] while low values in summer due to high level of decomposition organic waste and this is supported by recorded higher values of BOD5 during that period also corresponds with the results of statistical analysis, which recorded a negative a significant correlation between dissolved oxygen and each of the water temperature and BOD5 (r= -0.63,p=-0.78,P<0.05) receptively as shown in Table (3) The observed relatively low in dissolved oxygen concentration at the site 2 compared with sites 1 and3, receptively the result has been affected this site by organic matter raised from adjacent areas that consume dissolved oxygen as a result of microbiological decomposition [25].

The BOD5 observed in the current study range between the highest value 4.67 mg / L in July2014 and the low values1.45 mg / L in December 2014 at site 2,1 receptively as shown in Table (1) that may be due to higher water temperature causing increasing decomposition rate of organic matter leading to increasing amount of dissolved oxygen consumer [26] which supported by the positive a significant correlation between BOD5 and water temperature also the results of statistical analysis showed significant differences between the study sites(P <0.05).

The percentage organic matter values range between the highest values 4.30 (%) in June 2014 at site 2 and the lowest values 1.11(%) in February 2015 at the site 1 as shown in Table (1) the results of statistical analysis, shows the presence of the significant differences between the study sites (P<0.05) also showed positive significant correlation between the percentage of organic matter and each of the water temperature, BOD5 and salinity (r=0.75,r=0.77,r=0.62,P <0.05) receptively and a negative significant correlation with dissolved oxygen (r=0.66, P <0.05) as shown in Table (3) finally the results show that the nature of the bottom was sandy at site 1 sandy clay at site 2 and sandy at site as shown in Table (2).

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Table (4): Aquatic Oligochaeta distribution and Relative abundant frequencies at study sites, the percentage, as follows: > 70%: Dominant Species, 70% -40%: Abundant species, 10% - 40%: Less abundant species, < 10%: Rare species.

Family	Scientific name	S1	S2	S3
Aeolosomatidae	*Aeolosoma aquaternarium*	La	-	R
	A. leidyi	R	La	R
Tubificidae	*Limnodrilus hoffmeisteri*	D	D	D
	L. claparedianus	R	-	-
	L. udekimianus	R	-	-
	L. profundicola	R	-	R
	Tubifex tubifex	D	D	D
	T. bergi	R	-	-
	Peloscolex feroxand	A	A	A
	Branchuira sowerbyi	La	D	D
Naididae	*Dero digitata*	R	R	R
	Dero cooperi	R	-	-
	D. sawayai	A	R	La
	D. furcatus	R	-	-
	Nais elinguis		R	R
	Pristina aequiseta	R	-	La
	Pristina longiseta	R	La	La
Lumbriculidae	*Stylodrilus herringianus*	R	-	-
	Lumbriculus variagatus	-	R	R
Lumbricidae	*Eiseniella tetrahydra*	-	R	R

The Oligochaeta density values in the current study ranged between the highest values1480 (Ind./m^2) in July 2014 at Site 2 and lower values 120 (Ind./m^2) in February 2015 at the Site 1 (Fig - 2) the results of statistical analysis, showed found significant differences between the sites (P <0.05) also positive significant relationship between worms density with each of the water temperature,BOD5 and the percentage of organic matter(r =0.77, r=0.75,r =0.79,P <0.05) receptively and negative significant relationship with dissolved oxygen (r = - 0.65 ,P <0.05) as

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shown in Table (3). This values less much than [27] which found density of Oligochaetes was ranging between 5111 ind. / m^2 at Al-Chibayish and Al-Hammar Marshes to 16800 Ind. / m^2 at Al-Haweizah Marsh and also less than study [28] which recorded density of Oligochaetes was ranging between 920 Ind. / m^2 to 4600 Ind. / m^2.

The greatest density of Oligochaete was observed during summer and spring months may be attributed to effect of high temperature in increased breed and reproduce of aquatic Oligochaetes [27] this agreement with our study which recorded present positive significant relationship between worms density and water temperature in addition the high water temperature lead to increased food availability which due to that in through warm seasons increased micro-organisms activity thus rapid decomposition rates of organic matter [29] this also agreement with our study which recorded higher values of organic matter at this period, also this consistent with [30] he noted that the dominant small groups of Oligochaeta in the summer as a result of accelerated young growth in the beginning of the breeding season due to favorable conditions, especially temperature, abundance of nutrients and organic substances in addition lack of adult worms because of deaths individuals with post-breeding.

As well as the high density of Oligochaete was observed during warm months may be due to the effect of temperature on other environmental factors, especially dissolved oxygen because of most Oligochaeta species can be prevalent in aquatic environments contain a low-oxygen availability [31] This also consistent with [32] he referred to this group favor live and remain dominant in the regions with high organic pollution due to availability of food moreover they have ability to living in environments with low dissolved oxygen, the our study agreement with study [28] which recorded high density of Oligochaetes in July.

The low density in winter may be due to the low temperature in addition to the density of Oligochaetes directly affected by the environmental conditions especially organic matter, which recorded low values in winter, besides the presence of predators and competitors such as Polychaeta worms.

The recording huge density at site 2 may be due to the abundance of organic matter in sediments at this site which are represents important a source of food for these worms[33] this agreement with our study which recorded higher values of organic matter at this period also this agreement with [34]which referred to the dominance of some species of Oligochaeta in water organically contaminated may be due to lack of competition and abundant food supply associated with tolerance of low oxygen status as well as this agreement with [35] which emphasized that the organic materials important factor affecting population density regardless of other chemical and physical factors. this agreement with our study which recorded higher values of organic matter at this period,

In the result of this study were recorded, 20 species of Oligochaeta, Table (4) these species belonged to 5 families and 11 genus ,the family of Tubificidae was represented by 8 species, Naididae was represented with 7 species, Aeolosomatidae and Lumbriculidae with only two species while Lumbricidae represented by one species .The number of

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Oligochaete species recorded in the present study higher than that recorded by [27] 19 species but less than [28] 26 species. The distribution of this species in sites was in the site1 represented by 17 species , following site 3 was represented 14 and the site 2 was represented by only 11 species ,the differentiation in number species between site may be due to the nature of the bottom which determinant community structure because of the invertebrates prefer the bottom, which helps it to repair or remove themselves for the purpose of capture and escape from predators, also to the differences in composition, and abundance of Oligochaete diversity, were dependent on different in physical factors(i.e. temperature and flow velocity) chemical water (i.e organic content in the bottom) and biotic factors(algae or moss cover , predators and competitors [35].

In current study the family Tubificidae recorded higher density among other families ranging between higher value 850 (Ind./m^2) in June 2014 at site 2 to lower value 50 (Ind./m^2) in February 2015 at site 1 (fig -3).The higher density in summer that may be due to high temperature that is one of the important environmental factors that affect in the physical and chemical properties of water bodies, which in turn affects the speed of growth and reproduction of Tubificidae, this agreement with [36] he pointed that Tubificidae family increases with increasing temperatures, lack of oxygen , pH ranges (2.7 to 7.7) and slow or medium flow. The high density of Tubificidae at site 2 may be due to availability of food[37] this agreement with [35] referred to the Tubificidae found with high abundance in the streams rich with organic matter and some their species showed a significant positive correlation with bottom texture and he explained that the high density of Tubificidae in the regions where have heavy organic pollution and low-oxygen levels may be attributed to two reasons: first the availability of food and second increase living space created by the exclusion of competitors as well as ,this is agreement with[38] which found a positive relationship between Tubificidae and organic substances in Diwaniyah River and Dagharah river.

In present study family Tubificidae represented by 8 species belong to 4 genus and these species distribution in site was the site1 represented by 8 species, following this site 3 was represented 5 and the sites 2 was represented by only 4 species. Among Tubificidae the genus *Limnodrilus* was represented by 4 species following genus *Tubifex* was represented by 2 species while genus *Branchuira* and *Peloscolex* were represented by only one species Table (4).

The second family Naididae is one of the most important group of aquatic Oligochaeta and comprised of 22 known genus [39] this family in current study was recorded higher density value 225 (Ind./m^2) in March 2015 at site 3 to lower value 30 (Ind./m^2) in January 2015 at site 2 (fig - 4). The recorded higher density value with the blooming of algae and aquatic plants in spring season may due to the many species of this family appear to be herbivorous and another species deepened on the microorganisms associated with the plant and detritus as major food source [34] also this is consistent with [40] which reported that Naididae includes a group of common small aquatic worms primarily freshwater inhabitants and found among aquatic plants , algae and in coarse sediments of streams, ponds and slow moving rivers**,** similar observation was reported in waters

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of the Tigris River in Baghdad region by [10] which recorded some species of Naididae and Aeolosomatidae associated with aquatic plants.

The family Naididae found at high densities when Tubificidae density is low although, it has the ability to coexist with Tubificidae [41] This knowledge is Similar with the results of the current study, which recorded high values for this family in the months when recorded low densities of family Tubificidae also this is consistent with the results of [42] who reported that the lack of vegetation causes an increase of Naididae individuals more than the Tubificidae individuals this perhaps main reason for high densities at site 3 which is characterized by dense vegetation and low density in the site 2 which is distinguished by a lacks vegetation.

In present study family Naididae represented by 7 species belong to 3 genus and these species distribution in site was the site1 represented by 6 species, following this site 3 was represented 5 and the sites 2 was represented by only 3 species. Among Naididae the genus *Dero* was represented by 4 species following genus *Pristina* was represented by 2 species while genus *Nais* were represented by only one species Table (4).

According to Relative abundance index valuse Table (4) the species *Limnodrilus hoffmeisteri*, *Tubifex tubifex* and *Branchuira sowerbyi* were appeared as dominate species, this dominance has been mentioned in many of local and international studies and this may be due to several reasons, including that these species dominant in environments with heavy pollution, this agree with [43] who mentioned that *T.tubifex* dominant or even predominant in areas with heavy organic pollution because of these conditions make these environments difficult to live for other species also noticed [18] that in polluted environments *T.tubifex* presence in high density and associated with *L. hoffmeisteri* and this knowledge is consistent with our findings in present study which recorded association *T.tubifex with L. hoffmeisteri* in all sites which can be considered evidence of pollution in Al-Hilla river that is in line with the results of a study[31]which indicated that the abundance of two species *T.tubifex* and *L.hoffmeisteri*, with high densities in sediments of Diwaniya river evidence to contamination, also we can be concluded that the Al- Hilla river organically polluted and this corresponds with [35] which indicated that *L. hoffmeisteri*, widely used as an indicator to organic pollution and the presence of *L.hoffmeisteri, L. claparedianus* and *T.tubifex* in higher density may indicate a probable organic enrichment in the area.

Also The warm waters of the Al-Hilla River may be another reason for the dominance of these species which due to increased productivity of these species with high temperatures and this agree with [44] which noted that the productivity of the specie *B. sowerbyi* reach to higher rate when the temperature (21-29) ^{0}C and the population density become double again in the period for 1.5 weeks at temperature 25 ^{0}C as well as [45] has demonstrated that there is a direct correlation between the temperature with the density and diversity of the species *T. tubifex* and he noting presence of small groups with few percentages in the winter because of this conditions are not suitable for the production and put of eggs. Moreover the low oxygen content in water of Al- Hilla river may be another reason for the dominance of these species, this line with [46] he found that the average age in

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worms *T. tubifex* increasing in the environments with low oxygen content also [47] noted that these worms are located at the bottom of rivers because they are characterized by their ability to carry oxygen deficiency.This also corresponds to what is observed by the [48] which noted the *L. hoffmesteri* and *T.tubifex* have ability to presence in the organic pollution areas that contain a proportion of low-lying of dissolved oxygen, also [49] pointed during the their study of the River Aydin in Turkey that the *T. tubifex* and *L. hoffmesteri* passing by in a high proportion of sites with low oxygen concentration and *L. hoffmesteri* found a higher rate than *T. tubifex* also showed [7] the worms *B. sowerbyi* have the ability to carry a wide range of temperatures and low levels of oxygen also [45] reported that the *B. sowerbyi* live in an environment characterized by high salinity , low depth ,bottom of a muddy- sandy and a heterogeneous percentage of organic material .Also [40] pointed to negative relationship between the dissolved oxygen concentration and Tubificidae density.

The Shannon-Wiener Diversity Index values varied between(1.122- 1.964) bit/Ind. at S1 in April 2015 and September 2014 respectively, (0.551 - 1.941) at S2 in July 2014 and October 2014 respectively and(0.965-2.125) bit/Ind.at S3 in June 2014 and march 2015 respectively (fig - 5)The lowest values were recorded in the present study at all sites due to poor water quality of the river that allows to high abundance of pollution-tolerant Oligochaets (*Branchuira sowerbyi*, *Limnodrilus* spp. and *Tubifex tubifex*.) in other hand these conditions(characterized by low dissolved oxygen and high nutrient concentrations) might be limiting for many other species [50] moreover the nature of the bottom determine the nature of the species, due to that species are not affected so much "change factors water, but their presence is depended on the nature of the sediment at the bottom this agreement with [51] which noted that the each family of the Tubificidae families live in a certain depth and noted that the family Enchytraeidae be close to the surface constantly because she could hardly anaerobic conditions ,the family Tubificidae they are deeply (6-4) cm because they are more resilient to the anaerobic conditions while Lambriculidae family and the Naididae family central location between the two families.

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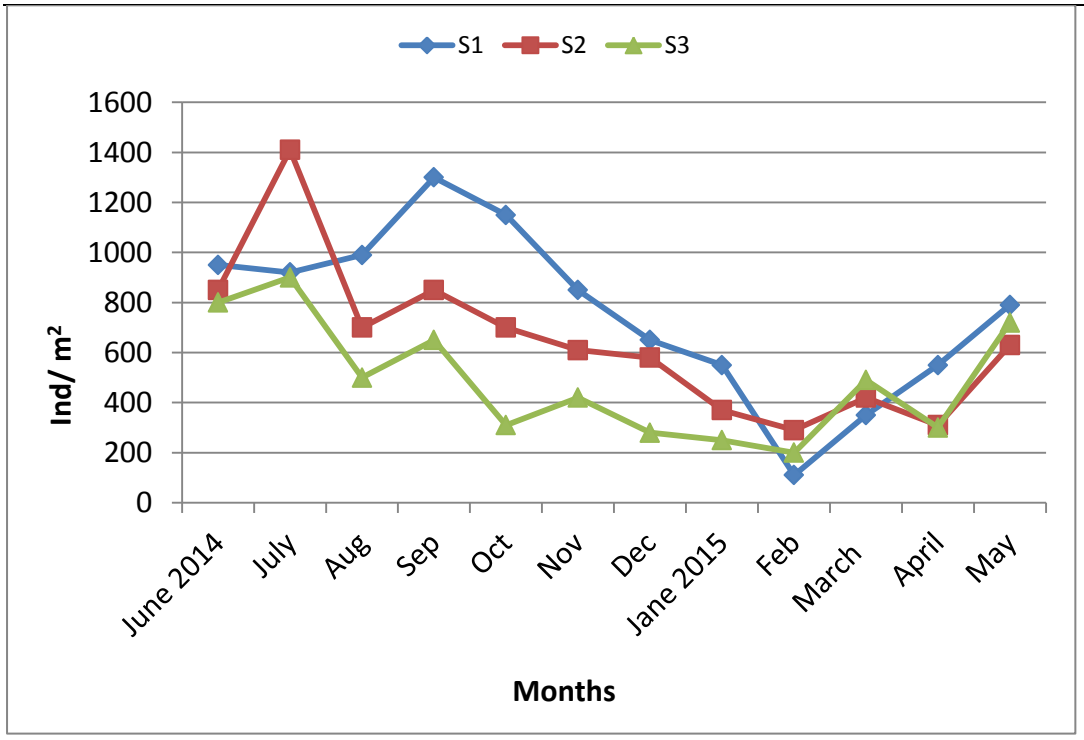
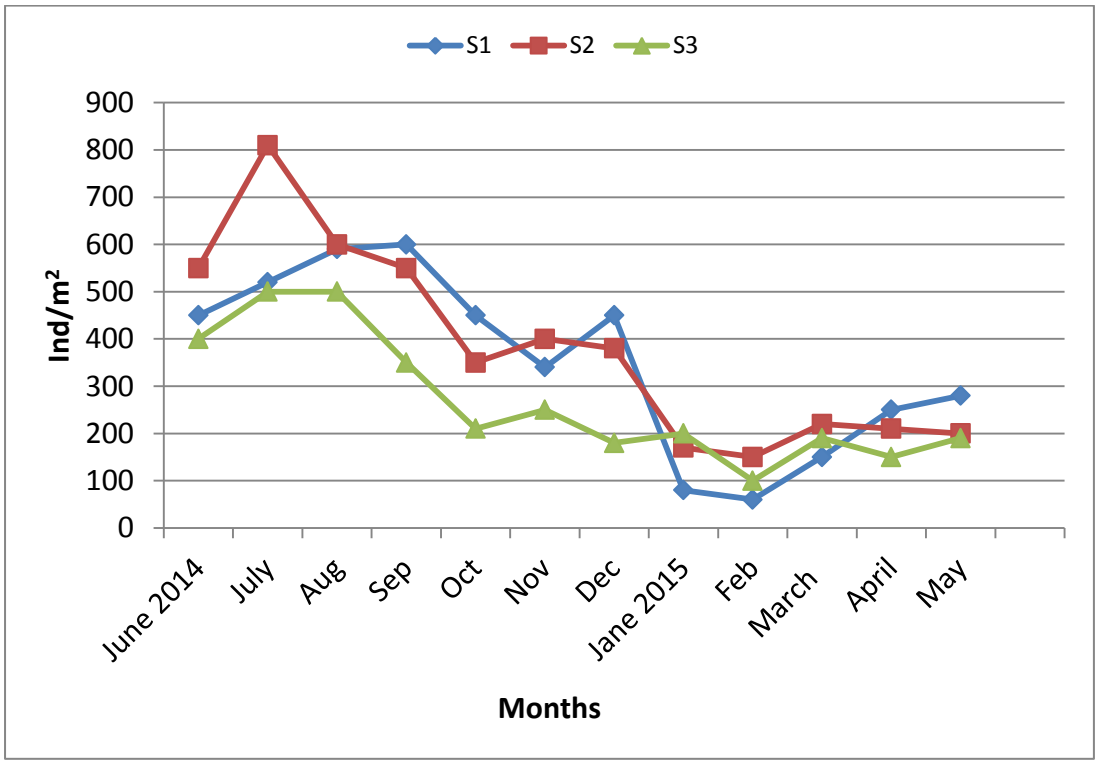


Monthly variation of Oligochaeta density in Al- Hilla River) Fig. 2(



Monthly variation of family Tubificidae density in Al- Hilla River) Fig. 3(

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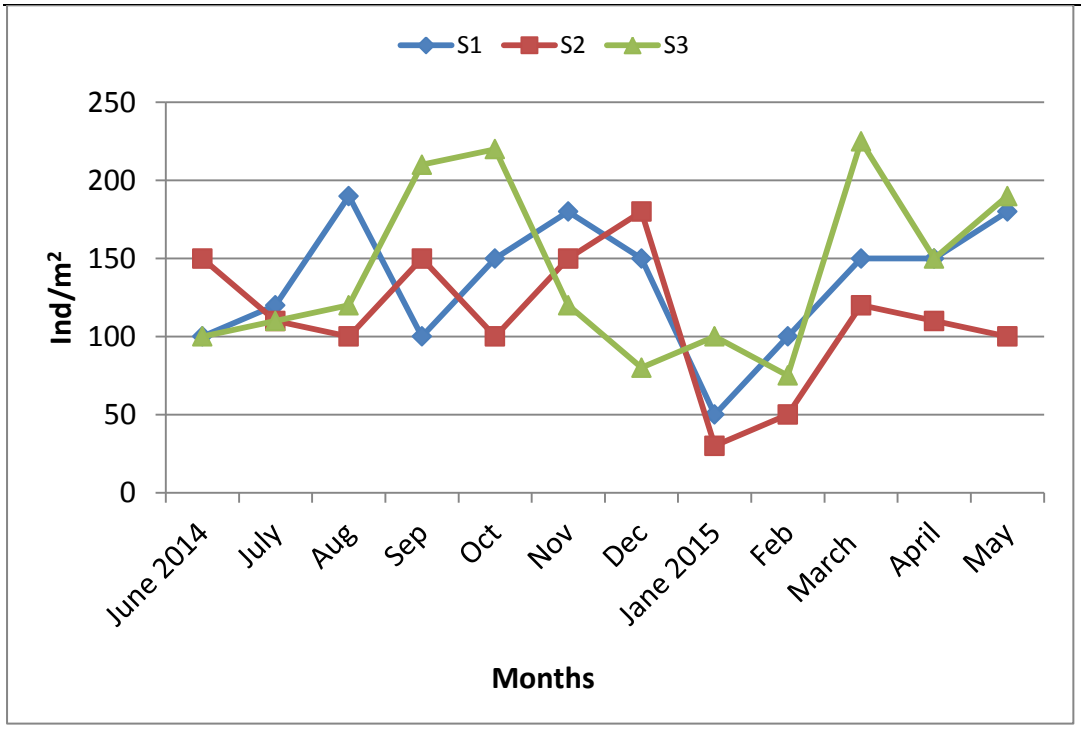
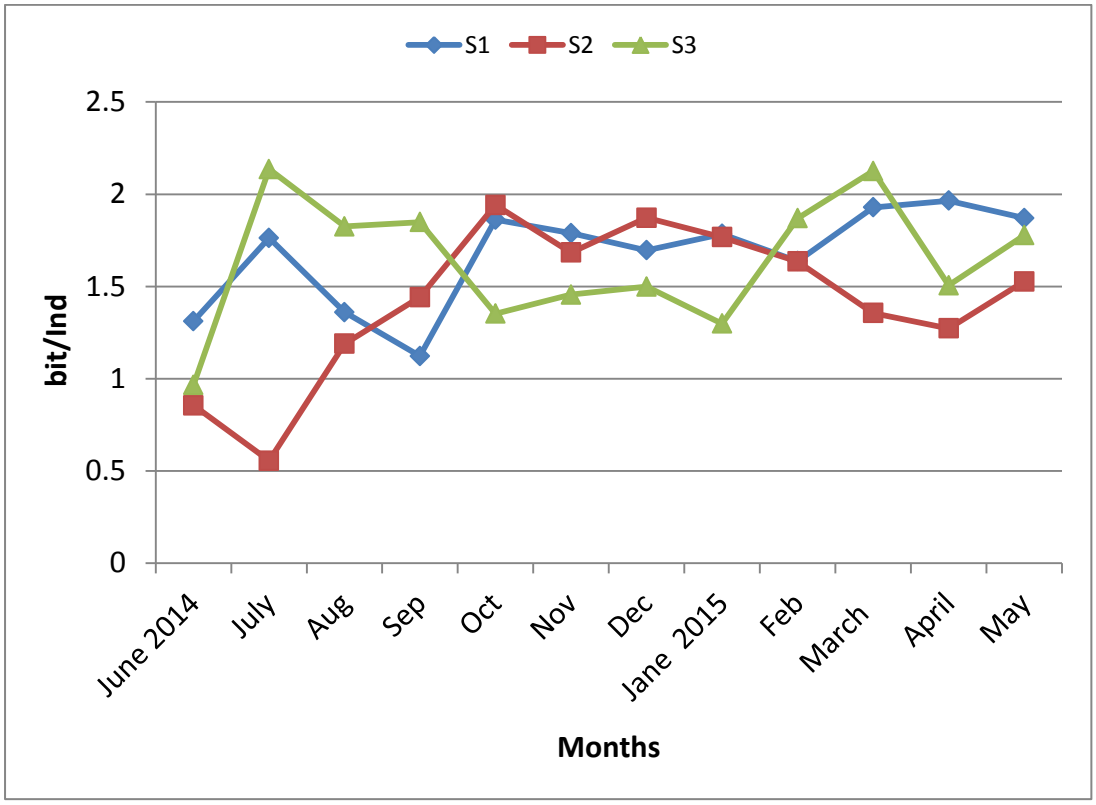


Monthly variation of family Naididae density in Al- Hilla River) Fig. 4(



(Fig. 5) Monthly of Shannon – Weiner Diversity Index (H) Values of oligochaeta in the Al-Hilla river

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تأثير بعض العوامل الفزيائية والكيمائية على الديدان الحلقية (قليلة الاهلاب) المائية في نهر الحلة /العراق

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الخلاصة:

أجريت هذه الدراسة للتعرف على تأثير بعض العوامل البيئية على التكوين النوعي والكمي للديدان الحلقية قليلة الاهلاب المائية في رواسب نهر الحلة .جمعت العينات شهريا من ثلاثة مواقع في نهر الحلة للفترة من حزيران 2014 الى نيسان2015 وتم قياس 7 عوامل فيزيائية وكيمائية (درجة حرارة المياه ،الملوحة ،الاس الهيدروجيني ،الاكسجين المذاب ،المتطلب الحيوي للأوكسجين ،النسبة المئوية للمادة العضوية ونسجه تربة القاع) وكانت القيم الدنيا والعليا لدرجة حرارة الماء درجة مئوية، الملوحة نسبة مئوية، الاس الهيدروجيني، الاوكسجين المذاب ملغم/ لتر والمتطلب الحيوي للأوكسجين ملغم/ لتر كالاتي : (24 – 10 :0.65-0.98: .:8.22- 6.21 : 5.53-11.93 و4.67 -1.45) على التوالي والنسبة المئوية للمواد العضوية (4.30 -1.11) وطبيعة القاع مزيجية من الرمل والطين والغرين مع وجود نسبة من الاحجار الصغيرة وخاصة في الموقع رقم 2

سجلت النتائج 20 نوعا من الديدان الحلقية قليلة الاهلاب تعود الى 5 عوائل و 11 جنس بضمنها 8 انواع من عائلةTubificidae و7 من عائلة Naididae و 2 نوع من عائلة Aeolosomatidae و2 نوع من عائلة Lumbriculidae ونوع واحد من عائلة Lumbriculidae .

بينت النتائج ان اعلى قيمة لكثافة الديدان قليلة الاهلاب كانت 1480 فرد/ م^2 في شهر تموز 2014 واقل قيمة كانت فرد/ م^2 120 في شهر شباط 2015 وأظهرت هذه القيم ارتباط معنويا (موجب وسالب) مع بعض العوامل المدروسة فقد أشارت إلى ارتباط معنوي موجب مع كل من درجة حرارة الماء، والمتطلب الحيوي للأوكسجين ونسبة المادة العضوية (r = 0.77، r = 0.75، r = 0.79، P <0.05) على التوالي و ارتباط معنوي سالب مع الأكسجين المذاب (r = - 0.65، P <0.05).

في الدراسة الحالية سجلت عائلة Tubificidae كثافة أعلى من بين العوائل الأخرى فقد تراوحت من القيمة الأعلى 850 (فرد / م ^{2}) في حزيران 2014 إلى واقل قيمة 50 (فرد / م ^{2}) في شباط 2015 , بينما سجلت العائلة الثانية Naididae قيم للكثافة تراوحت من أعلى قيمة 225 (فرد / م ^{2}) في اذار 2015 واقل قيمة 30 (فرد / م ^{2}) في كانون الثاني 2015

اظهرت نتائج و تبعا لمؤشر الوفرة النسبية ان الانواع *Limnodrilus hoffmeisteri, Tubifex tubifex* *Branchuira sowerbyi* ظهرت كأنواع سائدة بينما ظهرت الانواع الاخرى بين قليل الوفرة ونادر ماعدا النوع *Peloscolex feroxand* الذي كان وفيرا في جميع المواقع والنوع *Dero sawayai* كان وفيرا في الموقع الاول فقط ، كما بينت النتائج ان اعلى للتنوع الاحيائي حسب دليل شانون - ويفر كانت (.125) فرد/ بت في شهر تشرين الاول 2014 واقل قيمة وكانت (0.551) فرد/ بت سجلت في شهر تموز 2014

كلمات مفتاحية: الديدان الحلقية ، قليلة الاهلاب ، نهر الحلة

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