

## A STUDY OF AQUATIC OLIGOCHAETES COMMUNITY IN THE UPPER PART OF AL- ABBASYIA RIVER / MIDDIE OF IRAQ

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### ABSTRACT

In the current study aquatic oligochaetes worms were collected monthly from five sites along AL- Abbasyia river / Al-Najaf province, South Iraq for a period between February 2018 to January 2019. Physical and chemical parameters for river water were examined which include: Air and Water temperature, pH ,Electrical conductivity ,Salinity, Dissolved oxygen , Biological oxygen demand and Sediment texture. The results showed a number of 5039 individuals of aquatic Oligochaeta were identified as three families Naididae ,Lumbriculdae and Enchytraeidae .Two species of Naididae *Allonais pectinata* (Stephenson, 1910) and *Dero (Dero) dorsalis* Forroniere, 1899 are considered as a new records in Euphrates River . Results showed the site S4 was highest number of worms site, 1323 worms of 17 species were found, while the lowest number of 579 individuals of 11 species were recorded in S2. J-card index for similarity showed that the highest similarity was between site S2 and site S3. Temporally, the highest individual numbers were recorded during September, while in April the lowest individual's number was recorded.

**Keywords:** freshwater worms community , naididae lumbriculdae enchytraeidae

الامين وجوير

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دراسة لمجتمع الديدان قليلة الاهلاب Oligochaetes المائية في الجزء العلوي من نهر العباسية اوسط العراق

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الباحث

قسم علوم الحياة , كلية العلوم للبنات , جامعة بغداد , بغداد , العراق

المستخلص

في هذه الدراسة جمعت الديدان الحلقية المائية قليلة الاهلاب oligochaetes شهريا من خمس محطات منشرة على نهر العباسية /محافظة النجف ,جنوب العراق خلال المدة من شباط 2018 لغاية كانون الثاني 2019. تم قياس بعض المعايير الفيزيائية والكيميائية لماء النهر والتي تضمنت درجة حرارة الهواء والماء والاس الهيدروجيني و التوصيلية الكهربائية والملوحة تراكيز الاوكسجين المذاب والمتطلب الحيوي للأوكسجين ونسجة الراسب .اظهرت النتائج جمع وتشخيص 5039 فردا من الديدان قليلة الاهلاب المائية تعود الى ثلاث عوائل Naididae و Lumbriculdae و Enchytraeidae. اظهرت النتائج تسجيل جديد للنوعين (*Allonais pectinata* (Stephenson 1910) و *Dero (Dero) dorsalis* Forroniere 1899 في نهر الفرات. اظهر الموقع رقم 4 اعلى عدد من الديدان بلغ 1323 فردا , توزعت على 17 نوع ,بينما كان اقل عدد من الديدان 579 فردا في الموقع رقم 2 وتوزع على 11 نوع .وفيما يخص نتائج دليل التشابه -J card سجل اعلى تشابه بالأنواع بين الموقعين رقم 2 و3. زمانيا كان شهر ايلول هو الاوفر في اعداد الديدان اما شهر نيسان فكان الاقل عددا

الكلمات المفتاحية: مجتمع ديدان المياه العذبة , naididae , lumbriculdae , enchytraeidae .

## INTRODUCTION

Al-Abbasyia river is one of the branches of Euphrates River, about five kilometer after AL-Kifil city at the south of Iraq. It passes through Babil and Al-Najaf provinces to wide spaces of farmlands, and there is a barrage on it known as AL-Abbasyia Barrage which was created in 1984 (8,28). Oligochaeta are considered as a subclass of class Clitellata, Phylum Annelida . They are placed in two superorders, Megadrili and Microdrili. Megadrili are relatively large worms such as the earthworms, while microdrili are mostly smaller, with thin body, and all are aquatic without any terrestrial relatives. This groups of benthic invertebrates considered as one of the most important groups of aquatic habitat as a good fish food (24), and for water assessment (27, 33). Aquatic oligochaetes are usually small, ranging from 1mm to a few centimeters in length and represent about third of almost valid species described to date. About 1700 valid species of aquatic oligochaetes are known to date, of these about 1,100 are freshwater. The most specious group is the Tubificid worms , with over than 1,000 described species including 582 being consider as freshwater inhabitants (25). They are most commonly found in soft sediments rich in organic matter, and several species characteristically live in sites that receive organic pollution. Some of them have an ability to resist some types of pollutants, and used as a bio-indicators (31). Like all aquatic oligochaetes, tubificids respire cutaneously, but a unique feature of this family is that some species can tolerate anoxic conditions. Most tubificids are deposit feeders, subsisting on organic detritus and its associated microflora. A few species of the tubificid worms reproduce predominantly by fragmentation (e.g., *Aulodrilus* spp. and *Tasserkidrilus harmani*), but most are sexually reproducing hermaphrodites. Previously, these worms were grouped in a separate family – Family Tubificidae, - ( 9), but a phylogenetic analysis based on 18S rDNA sequences indicated its phylogenetically nested with the Naidid worms of Family Naididae (11). Accordingly, these two taxa were regarded as a single Family Naididae , and regarding the previous family Tubificidae as many

subfamilies including Tubificinae, Rhyacodrilinae, phallogrilinae , Limnodrilinae, and Telmatodrilinae Naidid worms are a group of small transparent worms, usually less than 2cm long, common in both running and standing water ecosystems, found in the sediment or within the aquatic macrophyta and filamentous algae (17) and other aquatic organisms, such as sponges (12, 19) and gastropoda (13,20). This group, have many sub families including the previous family Niadidae as subfamily Naidinae and subfamily Pristininae . Members of the Naidid worms are characterize by their paratomic asexual reproduction to form a chain of many zooids (23). Many investigators in Iraq referred to the community of aquatic oligochaetes worms in different Iraqi water bodies (2, 3, 4 ,6, 7, 21, 22, 26). Jaweir (18) refers to the recording of 54 species of aquatic Oligochaeta in different Iraqi surface water( 31 Naidinae, 8 pristininae, and 15 Tubificinae). Another studies used the aquatic oligochaetes as a bioindicator to the pollution in the water (5,15,16). The diversity and abundance of aquatic oligochaeta in this river are the goal of this study, in addition to study their special and temporal distribution.

## MATERIALS AND METHODS

Sediment and aquatic plants samples were collected monthly from each study sites as in( Table 1) and (Figure1) as three replicates for each site, during the period from February 2018 to January 2019, by using an Ekman grab 15X15cm with a total area of 225 cm<sup>2</sup> Just 1 m from river edge. Three replicates of each sample were collected in suitable size plastic containers filled with river water. Air and water temperature was measured in the field using thermometers. Water samples were also collected monthly for chemical analysis according to (1) Air and Water temperature were measured by using a mercury thermometer , pH and Electrical conductivity EC.  $\mu\text{s}/\text{cm}^2$  were measured by ( HACH HQD) multi-meter device , salinity was measured by:  $S\% = (14.87 - Ec) / 1859.08$ . Dissolved Oxygen DO. was measured by Winkler's modified method with the Biological Oxygen Demand BOD5. The sediment texture was analysis chemically by the hydrometer method in the central laboratory in the college of science /

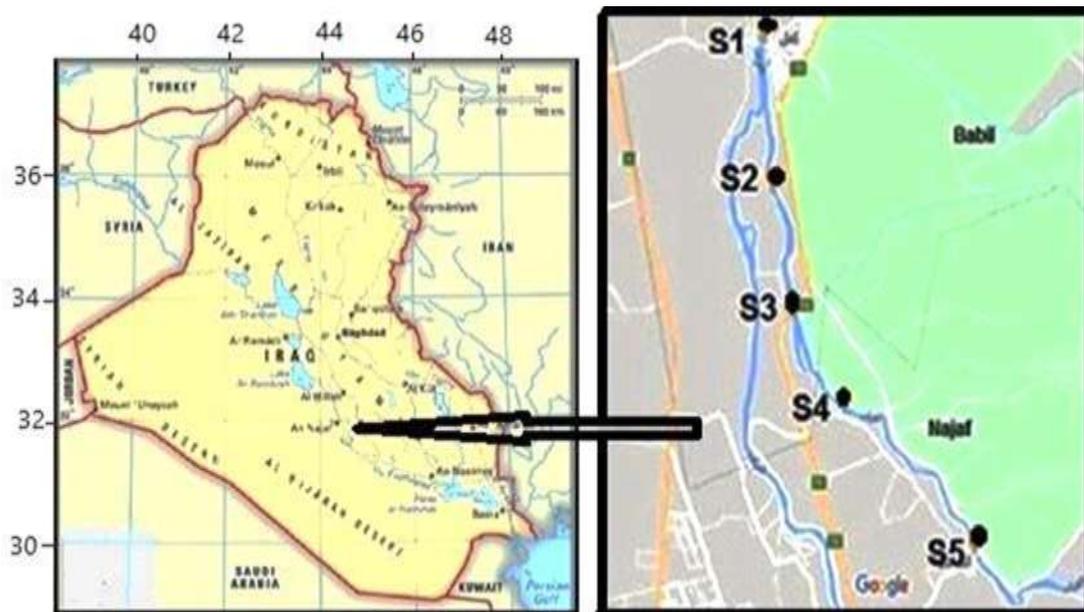
Baghdad university. By calculating the percent of finer and using the volume distribution curve the sediment texture type diagnosis. Aquatic oligochaetes worms were collected and examined from sediment and aquatic plants using 6.4X objective lens of dissecting microscope (WILD M38). A temporary slides of aquatic oligochaetes worms were prepared for identification according to ( 21), and Identify to species level according to (9,32). The number of each species then recorded for each samples. The percentage of each species and its frequency in the samples were

calculated. J-cared Index of Similarity were calculated according to(30).

**Table 1. Study sites coordinates and description from**

Site number	Coordinates
S1	32°13'26.15"N , 44°21'46.40"E
S2	32°10'55.08"N , 44°21'56.04"E
S3	32°08'47.01"N , 44°22'29.07"E
S4	32°07'11.09"N , 44°23'43.07"E
S5	32°04'46.01"N , 44°26'56.09"E

<https://maps.google.com>



**Figure 1. Map of the study sites**

<https://maps.google.com>

**RESULTS AND DISCUSSTION**

Table 2) shows the maximum , minimum and the average values of the physical-chemical parameters for all study sites. Air and water temperature averages range between 30.3-30.9 & 21-21.6 °C respectively, whereby the least degree was recorded in February and the highest in August ; pH averages were ranged between 7-7.5 while EC, averages were about 990.8-1101.5 µs/cm<sup>2</sup>. Salinity averages were ranged between 0.5-0.6%. DO averages were between 7.4-8.9 mg/l and BOD<sub>5</sub> averages were

between 2.4-3.3mg/l. Algal blooming was spotted in April because of Eutrophication and water levels decrease due to low water provide in this month resulting in negative ecological results, this explain the high values in EC and BOD<sub>5</sub> while the lowest value of DO was recorded in April, because of the algal death, molt and aggregation of the organic maters (29). The results of the chemical analysis of sediment showed that the sediment type was often sandy-silt in all of the study sites (Table 3)

**Table 2. Maximum , minimum and the average values of environmental factors in study sites during the period from February 2018 to January 2019**

	S1	S2	S3	S4	S5
Air temperature C°	(17.8-44.4) 30.5	(17.9-43) 30.3	(18-43) 30.3	(18.5-43) 30.6	(18.7-44.9) 30.9
Water temperature C°	(10.5-27.9) 21	(10.2-28) 21.1	(11.3-28.5) 21.6	(10.9-27.9) 21.4	(11-21.5) 21.6
pH	(6.2-8) 7	(6.2-7.8) 7	(6.9-8.1) 7.4	(7.4-8) 7.5	(7-8) 7
Electrical conductivity EC µs/cm²	(710-2247) 1093	(720-2261) 1101.5	(692-1273) 997.2	(693-1268) 992.5	(702-1267) 990.8
Salinity%	(0.4-1.4) 0.6	(0.4-1.4) 0.6	(0.4-0.7) 0.5	(0.4-0.7) 0.5	(0.4- 0.7) 0.5
Dissolved oxygen DO mg/l	(2.5-9.5) 7.6	(2.8-9.9) 7.9	(5.2- 9) 7.4	(6.5-10.7) 8.9	(6.3-10.7) 8.7
Biological oxygen demand BOD <sub>5</sub> mg/l	(2.2-5.9) 2.8	(2.1- 7.7) 3.3	(2.1-3.2) 2.4	(2.1-3.2) 2.4	(2.1- 3.5) 2.7

**Table 3 . The percentages of the Sediment texture during the study period**

Texture	Study sites				
	S1	S2	S3	S4	S5
Sand	42	40	54	48	36
Silt	32.5	32	35	31	35
Clay	25.5	28	11	21	29
Sediment type	Sandy- silt				

(Table 4) illustrates the identified species, the number of individuals and the occurrence frequency for each species in all sites during the study period. A number of 5039 individuals of aquatic oligochaetes were sorted and identified as 22 species . *Branchiura sowerbyi* was recorded the highest individual number of 1279 ,followed by *Stylaria lacustris* which was recorded 1035 individuals. Both *Aulodrilus pigueti* and *Dero ( Dero) dorsalis* demonstrated the lowest number, which were 5 and 9 individuals respectively.( Figure 2) shows that the subfamily Naidinae recorded the highest percentages of 54% among collected oligochaetes worms, followed by Tubificid worms with 39%, while only few individuals of Prisitinae 3%, Lumbriculidae 3% and Enchytreidae 1% were recorded. Among worms of subfamily Naidinae, *Stylaria lacustris* recorded the highest percentage of 38% followed by *Nias spp*, and *Ophidonais serpentina* with percentages of 25 and 20% respectively. The lowest percentage of 1% was recorded by *Slavina appendiculata* ( Figure 3). *Allonais pectinata* (Stephenson, 1910) and *Dero (Dero) dorsalis* Forroniere, 1899 were

recorded in this study in site S4 and site S1 respectively , and they are considered as a new records in Euphrates River sediment. (14) referred to the preference of *Stylaria lacustris* to the vegetation cover on water and it can also be found in sandy- silt sediment and in the detritus on the edges of lakes and rivers throughout the year and since the type of the sediment texture in this study was sandy-silt this is also explain the high number of them . Some species of Naidid worms such as *O. serpentina* seem to be have a seasonal fluctuation (17, 21). *Branchiura sowerbyi* represented the higher percentages of 63% of the total tubificid worms, followed by *Limnodrilus hoffmeisteri* 32%, in addition to *L. claparedeianus* 3% *L. udekimianus* 2% , and few individuals of *A. pigueti*, which represents a percentage of less than 1% ( Figure 4). Ducrot(10) referred to the tolerant of *Branchiura sowerbyi* for different ecological pressure and organic matters, so they are preferably presence on the edge of the rivers and, this explain their high individuals number. Spatially, The highest individuals number of 1323 and 17 species were recorded

in site S4, while the lowest individual number of 579 was recorded and identified as 11 species were recorded in S2 , (Table 4 ). This site was described as an agriculture site compared to the other study sites, so it is expected that the agriculture drainage involve pesticides and fertilizers were raised in this site. Xiao-Long (34) said that the agriculture area with its agriculture wastes that resulting from irrigation and soil washing give rise to pollution and this an acceptable reason to reduce the numbers of species or diversity in this site. (Table 5) illustrates the J-card Index of Similarity. Results showed that the values

were ranged between(42.8-71.4) the highest value was between site S2 and siteS3 which were most similar in species because these two sites were close distance . the lowest value was between site S3and site S4,this can be explained due to the effect of the dam on site S4 . (Figure 5) illustrates the monthly fluctuation of the oligochaetes species. The highest individuals number of 1090 was recorded in September ,while, the lowest Number of 244 was recorded in April, this is because the decrease in river water supplies that came from the AL-Hindiya dam in that time of the year.

**Table 4. The Numbers of different species of the aquatic oligochaetes in study sites, with percentage and frequency percentage of each species**

Taxa	Species	S1	S2	S3	S4	S5	Total	frequencies %
subfamily Naidinae	<i>Allonais inaequalis</i> (Stephenson, 1911)	0	0	18	0	0	18	20
	<i>Allonais pectinata</i> (Stephenson, 1910)	0	0	0	29	0	29	20
	<i>Chaetogaster limnaei</i> Von Baer, 1827	61	101	67	9	37	275	100
	<i>Dero</i> ( <i>Aulophorus</i> ) <i>furcate</i> (Müller,1773)	0	0	0	17	18	35	40
	<i>Dero</i> ( <i>Dero</i> ) <i>dorsalis</i> Forroniere, 1899	9	0	0	0	0	9	20
	<i>Dero</i> ( <i>Dero</i> ) <i>digitata</i> (Müller,1773)	0	7	0	17	30	54	60
	<i>Nais simplex</i> Piguët, 1906	117	31	41	85	187	461	100
	<i>N. elinguis</i> Müller,1773	0	30	36	89	0	155	60
	<i>N. variabilis</i> Piguët, 1906	16	0	0	58	0	74	40
	<i>Ophidonais serpentina</i> (Müller,1773)	43	33	126	188	140	530	100
	<i>Slavina appendiculata</i> d`Udekem, 1885	0	0	33	0	0	33	20
	<i>Stephinsoniana trivandran</i> a ( Aiyer,1926)	0	0	0	12	0	12	20
	<i>Stylaria lacustris</i> ( Linnaeus, 1767)	196	167	229	233	210	1035	100
subfamily Pristininae	<i>pristena aequiseta</i> Bourne, 1891	8	0	9	0	10	27	60
	<i>Pristena longiseta</i> Ehrenberg, 1828	12	12	25	14	40	103	100
	<i>Aulodrilus piguet</i> Kowalewski, 1914	5	0	0	0	0	5	20
Subfamily Tubificinae	<i>Limnodrilus.claparedeianus</i> Ratzel, 1868	13	11	10	19	8	61	100
	<i>L. hoffmeisteri</i> Claparède, 1862	165	71	124	140	114	614	100
	<i>L. udekemianus</i> Claparède, 1862	4	3	4	16	6	33	100
subfamily Rhyncocylidae	<i>Branchiura sowerbyi</i> ( Beddard 1892)	272	113	239	200	455	1279	100
	<i>Lumbriculus variegatus</i> family:Lumbriculidae	0	0	0	139	0	139	20
	<i>Enchytraeus</i> sp .family:Enchytraeidae	0	0	0	58	0	58	20
	<b>Total</b>	<b>921</b>	<b>579</b>	<b>961</b>	<b>1323</b>	<b>1255</b>	<b>5039</b>	
	<b>No. of species</b>	<b>13</b>	<b>11</b>	<b>13</b>	<b>17</b>	<b>12</b>		

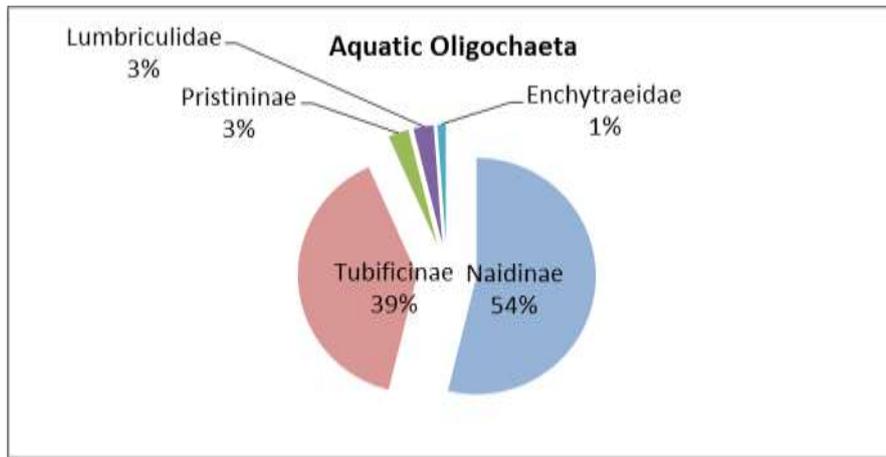


Figure2. Percentages of different groups of aquatic oligochaete

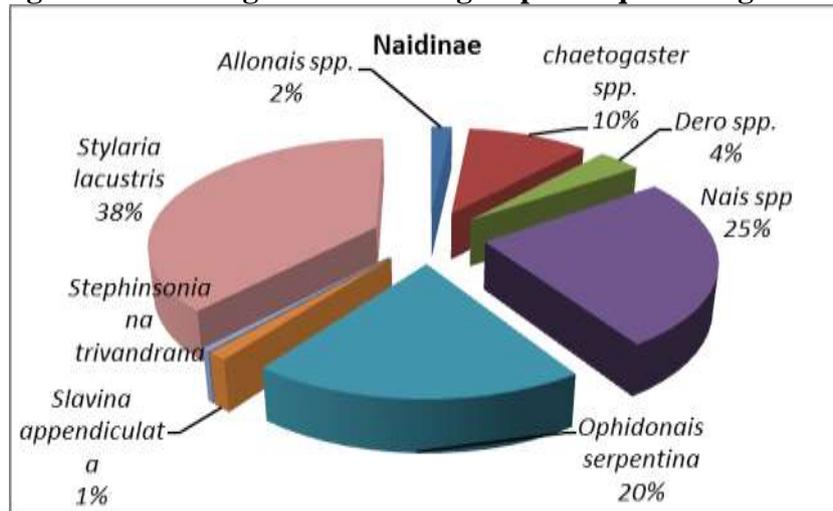


Figure3. Percentages of different species of Subfamily Naidinae

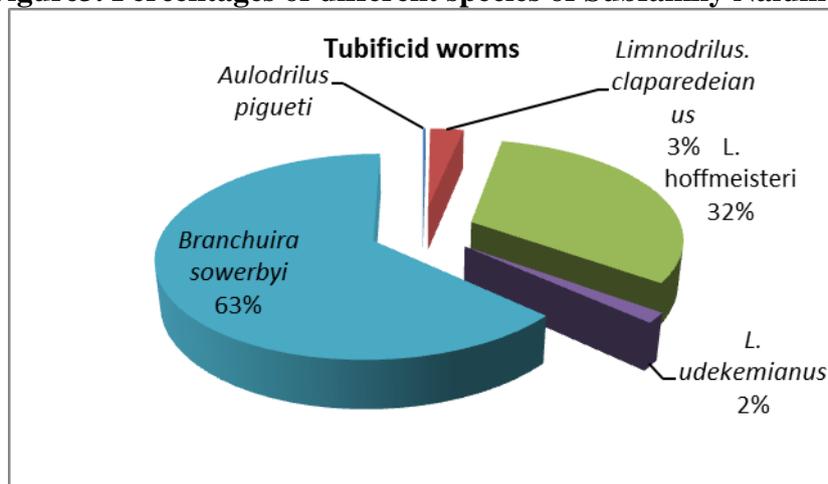
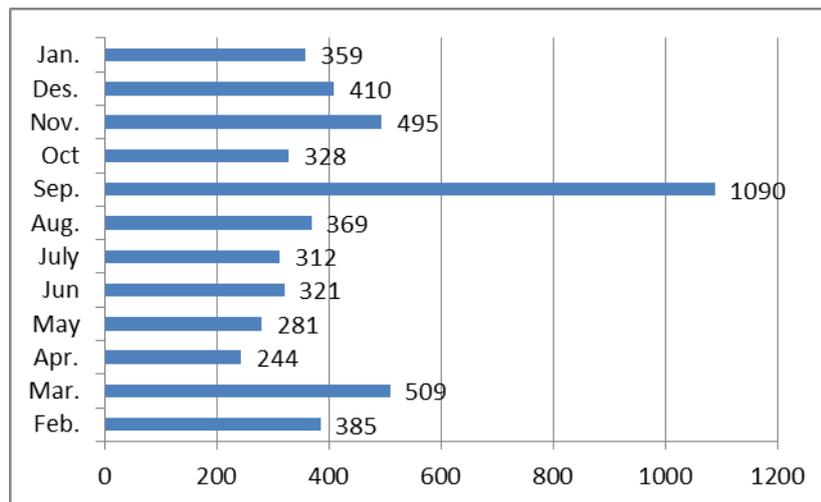


Figure4. Percentages of different species of Tubificid worms

Table 5. J-card index of similarity between the study sits

Sites	S2	S3	S4	S5
S1	60	52	50	66.6
S2		71.4	64.7	62.5
S3			42.8	66.6
S4				61.1



**Figure5. Monthly fluctuation of the total numbers of Aquatic Oligochaeta in all study sites**

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