

Checklist of Aquatic Oligochaetes Species in Tigris–Euphrates River basin

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Abstract:

A total of 60 species of aquatic oligochaetes were identified in different sites within Tigris-Euphrates basin / Iraq, including River Tigris, River Euphrates, Southern marshes (Al-Haweiza , Al-Hammar and Al-Chebaiesh) , Shatt Al-Germa, and Shatt Al-Arab. In River Euphrates 39 species were identified, 40 species from River Tigris and 32 species from Shatt-Al-Arab and southern marshes.

The identified species were classified as four species of Family Aeolosomatidae, 54 species of Naididae (31 Naidinae , 8 Pristininae and 15 Tubificid worms), one species of each of Lumbriculidae (*Lumbriculus variegates*) and Lumbricidae (*Eiseiella tetraedra*).

Among Aeolosomatidae , *Aelosoma aquaternarium*, *A. Liedyi*, *A. variegatum* and *A. hemprichi*, in which, *A. variegatum* was the most frequent species, found in Euphrates river.

Naidinae community were represented by five species of genus *Chaetogaster*, two species of each of *Paranais*, *Slavina*, & *Stylaria*, four species of *Allonais* , and seven species of each of *Dero* and *Nais*, in addition to *Stephensoniana trivandrana*, *Specaria josinae* and *Ophidonais serpentina*. *Nais variabilis* was the most abundant and frequent species in River Tigris while *Stylaria lacustris* & *Ophidonais serpentina* are abundant in River Euphrates . Species of Pristininae were representative by four species of genus *Pristina* and three species of genus *pristinella*, among them *Priatina longiseta* is the most abundant species.

Tubificid worms, *Branchiura sowerbyi* and *Limnodrilus hoffmeisteri* were the most frequent and abundant species in the surface sediments of Iraqi waters. Beside *L. hoffmeisteri* , other five species of *Limnodrilus*, two species of *Potomothrix*, and a single species of *Tubifex tubifex* , *Embolocephalus velutinus*, *Aulodrilus piguetia*, *Psammoryctides moravicus* and *Rhyacodrilus coccineus* were recorded.

Key words: Aquatic Oligochaetes; Tigris; Euphrates River basin

Introduction:

Oligochaeta is a subclass of Class Clitellata, Phylum Annelida, They are predominantly an aquatic and terrestrial class,. The aquatic oligochaetes are placed in two superorders, Megadrili., which are relatively large worms related to earthworms, and Microdrili are mostly smaller, thin-bodied worms without any close terrestrial relatives.

About 1700 valid species of aquatic oligochaetes are known to date, ; of

these about 1,100 are freshwater. The most diverse group is the Tubificidae with more than 1,000 described species including 582 being considered as freshwater inhabitants. More than 60 species of megadriles are also considered aquatic [1]. Three families in the orders Tubificida and Lumbriculida are common in freshwater, the Naididae, Lumbriculidae, and Enchytraeidae, in addition to the minor families,

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Pavidrilidae; Dorydrillidae; Phreodrilidae and Propappidae. Species of Family Aeolosomatidae, may be treated as a separate class, *Aphanononeura* [2], which are relatively very small and transparent, characterize by the presence of hair chaetae in both dorsal and ventral bundles, ciliated prostomium and coloured epidermal glands with oil droplets. Septa between segments mostly absent [3].

Aquatic oligochaetes are usually small, ranging from 1mm to a few centimeters in length and represent about a third of almost all valid species described to date, in addition, 4 of the 14 described megadriles families include species that occur in aquatic habitats. The microdriles are comprise 13 families which are fully aquatic, with the exception of the primarily terrestrial family Enchytraeidae. Four families in the orders Tubificida and Lumbriculida are common in freshwater, the Naididae, Lumbriculidae, and Enchytraeidae, in addition to the minor families, Pavidrilidae; Dorydrillidae; Phreodrilidae and Propappidae.

Naidid worms have been previously treated as a separate family Naididae [3&4], but both morphological and molecular characters [5] support the premise that all members of the former clitellate family Naididae are phylogenetically nested within the former family Tubificidae. For this reason, Erès & Gustavsson [6] had proposed that these taxa together should be regarded as a single family to avoid this paraphyly of Tubificidae suggesting that all Niadides were classified as members of Tubificidae. Erès *et al.* [7] submitted an application to the ICZN commission requesting to use its power to give precedence to Tubificidae, Vejdovsky 1876 over Naididae, Ehrenberg 1828. but the members of ICZN voted

against it according to the International Code of Zoological Nomenclature, priority principles, since, the family-group name Naididae is older than Tubificidae. [8]. The new family Naididae comprise two groups of worms, the naidid worms, and tubifid naidid worms

Naidid worms are characterized by the presence of needle chaetae accompanied with hair chaetae in the dorsal bundles [3;4 & 9]. Timm & Grimm [10] indicated that *Homochaeta*, although formally a valid species, might not exist in the nature. The original description of the nominal genus *Homochaeta*, Bretscher, 1896, based on different immature Naididae or Tubificidae. No type of material existed while all subsequent material proved to be misidentified. *Neonais* were considered as a doubtful genus resemble *Uncinaiis* by Brinkhurst & Jameison [3].

According to [3], species of subfamily Pristininae were regarded as one genus (*Pristina*), of family Naididae, while [4] excluded *Pristina* from family Naididae and assigned it to new family Pristinidae as recommended by [12], with two subgenera, *Pristina* (pristine) include 21 species with proboscis & *Pristinella*, with 7 species, without proboscis. In the members of this subfamily, the dorsal bundles start in II as in tubificid worm, so for this reason, Envall [12] classified them with subfamily Rhyacodrilinae.

Tubificid worms, probably are the best known of the freshwater oligochaetes. They are most commonly found in soft sediments rich in organic matter, and several species characteristically live in sites that receive organic pollution. Like all aquatic oligochaetes, tubificids respire cutaneously, but a unique feature of this family is that some species can tolerate anoxic conditions. This group

consist of subfamilies , Tubificinae , Rhyacodrilinae, Phallogrilinae ,Limnodriloidinae, and Telmatodrilinae [8].

Enchytraeids are semi-aquatic worms, common in marginal aquatic habitats as marshes, small streams, springs, and interstitial waters along the margins of streams, and they are found occasionally in the sediments of lakes and rivers as well [4].

Species of family Lumbriculidae has rather uniform external appearance, but with highly diverse internal anatomy, particularly the reproductive system. Some of the commonest species have also reliable external characters, whereas others can be identified only on the basis of internal details [3].

Sampling techniques

Sampling freshwater oligochaetes for identification in Iraq is recommended during The period from February to John , where the most individuals are sexually mature. Tubificid , Lumbriculidae and other oligochaetes which live in the sediments can be collected with other macroinvertebrates when sampling freshwater zoobenthos, using varies net or bottom sampler, grabs or dredges. Large worms can easily sorted from sieving residue, in the field by spreading the sediment on a white tray. A magnification hand lens may be convenient for this purpose. The smaller micobenthos form, like Naidi worms, can get lost in macroscopical sorting , but they are well visible under a low power dissecting microscope. Small part of sediment, together with aquatic plants placed in small aquarium, supplied with oxygen by small air pump. The settled sediment on the floor of aquarium can be collected with care by fine dropper and transfere to petridish of 10 cm. diameter, then the worms can be sorted carefully under dissecting microscope . Enchytraeidae and other small

oligochaetes, may be obtained by using the wet-funnel method recommended by [13]

Preservation and Mounting

Identification of some oligochaetes is most effective alive, so that the worm is easily detected through its movement and when all tissues are more or less transparent and the internal organs can be easily observed, especially for Enchytraeidae , which should be studied a live ever possible as they have not too many external identification characters [4]. Worms can be easily anesthetized by drops of carbonized drinking water.

The worms may be killed and preserved in 70% alcohol . Some species such as *Branchiura sowerbyi* and other , tend to fragments in alcohol, so this must be narcotized in 5% magnesium chloride before preservation [14]. Preserved worms stored in 70% alcohol or, 4% formalin. In temporary mount , glycerin can used as a clearing media [13 &4]. It is reasonable to soak worms in glycerin for several hours or days before mounting under a cover slide. As glycerin makes the worm soft , and so it is possible to flattened them by exerting slight pressure on the cover slides. For better exposition of setae and some other details, Amman's lactophenol was recommended by [14], in which phenol (carbolic acid) and lactic acid added to glycerol. The worms should be covered with cover slip and left in this fluid at least for several hours before examination.

For permanent preparation , Amman's lactophenol can be replaced by polyvinyl lactophenol [14], When this has dried sufficiently the preparation should be ringed, preferably by glyceel. Permanent mount can be also made by Canada balsam or other synthetic resin [15] , Balsam makes chaetae even slightly transparent, on

the other hand , several internal organs can be well visible.

Identification Criteria

The megadrilus worms, or the earthworms , can be identified without any mounting . Mature specimens of Glossoscolecidae and Lumbricidae , may be identified using only a low-power stereoscopic microscope.

Naididae species are easy to identified by their external morphological characters such as chaetae , proboscis, presence of dermal papillae and gills. The chaetae are considered as a very important feature for the identification of genera and species , including the segment on which dorsal chaetae commence, the number of chaetae per bundle, relative sizes of teeth of bifid chaetae, and presence or absence of hair chaetae. Dorsal setae of Pristininae and Tubificinae always beginning from II while in species of Naidinae the dorsal chaetae beginning in segments further than II (usually IV, V or VI). Hair setae present or absent in Tubificid worms, accordingly, their presence is useful in identifying species, but not genus. Their number generally range from 1-5 per bundle. There is neither Proboscis nor eyes in tubificid species. [3 & 4].

Setae present in most species of Enchytraeidae, but may be entirely absent in genus *Achaeta* . setal follicles are found in some species of *Achaeta* as ovoid or spherical structures, which are believed to occupy the site of former setae [13]. All other Enchytraeid species are characterized by the presence of short, simple pointed in variable shape , number, and arrangement. They may be sigmoid, slightly sigmoid, straight or irregularly bent They may be arranged in unilateral fan-like bundles , or in

symmetrical bundles, with or without nodules [3 & 4].

Species of family Lumbriculidae has rather uniform external appearance , their setae two per bundle, beginning from II, sigmoid and nodulated , no hair setae or modified genital setae. Setae may be simple pointed as in *Rhynchelmis limosella* , or bifid with short or reduced upper tooth. The angle between upper and lower tooth is useful for identifying species. In *Lumbriculus variegates*, the upper tooth diverging at about 30⁰ , where in *Styrodrilus heringianus* , with tiny upper tooth almost parallel to lower one , seldom some anterior setae also simple pointed [3 & 4].

Result and Discussion:

A total of 62 species were recorded by many investigators in Tigris-Euphrates basin in Iraq, 39 species in River Tigris; 41 species in River Euphrates and 34 species in southern marshes and Shutt al-Arab (Table 1). Four species of Aelosomatidae were recorded, including *Aeolosoma aquaternarium*, and *A. Leidyi* recorded by [16] While *A.variegatum* and *A. hemprichi* by [17] in River Euphrates. A total of 54 species of Family Naididae were recorded in Iraq (31 Naidinae, 8 Pristininae & 15 tubificid worms), in addition to *Lumbriculus variegates* and *Eiseniella tetraedra* (Table 1), by many investigators [18; 19 ;20; 21;22; 23, 24; 25; 26, 27; 28; 29]. The most abundant species in Iraqi water are *Nais variabilis*, *Stylaria lucastris* (Naidinae), *Pristina longiseta* (Pristininae) , *Branchiura sowerbyi* and *Limnodrilus hoffmeisteri* (Tubificid worms) .

Table (1): Aquatic Oligochaete species from Tigris-Euphrates basin/ Iraq

Family & Subfamily	species	R . Euphrates.	R. Tigris	Southern marshes & shutt al-Arab
Aeolosomatidae	<i>Aeolosoma aquaternarium</i> Piguët, 1906	-	+	-
	A. <i>Leidyi</i> Cragin, 1887	-	+	-
	A. <i>Variegatum</i> Vojdovsky 1884	+	-	-
	A. <i>hemprichi</i> Ehrenberg 1828	+	-	-
Naididae Naidinae	<i>Chaetogaster cristallinus</i> Vojdovsky,1883	-	+	-
	<i>C.limnaei</i> von Baer, 1827	+	+	+
	<i>C.langi</i> Bretscher, 1896	-	+	-
	<i>C.diastraphus</i> (Gruithuisen, 1828)	+	+	-
	<i>C.diaphanus</i> (Gruithuisen, 1828)	-	+	-
	<i>Paranais litoralis</i> (Müller,1784)	+	-	+
	<i>P. frici</i> Hrabe,1941	+	-	+
	<i>Stephensoniana trivandrana</i> (Aiyer,1926)	+	-	-
	<i>Ophidonais serpentina</i> (Müller,1773)	+	+	-
	<i>Slavina appendiculata</i> d`Udekem, 1885	+	+	+
	<i>S. isochaeta</i> Cernovitov, 1939	+	+	-
	<i>Specaria josinae</i> (Vojdovsky,1883)	+	-	-
	<i>Stylaria lacustris</i> (Linnaeus, 1767)	+	+	+
	<i>S.fossularis</i> Leidy, 1852	+	+	+
	<i>Dero (Dero) digitata</i> (Müller,1773)	-	+	+
	<i>D. dorsalis</i> Forroniere, 1899	-	+	+
	<i>D. obtusa</i> d`Udekem, 1855	-	+	+
	<i>D. nivea</i> Aiyer,1929	+	-	+
	<i>D. evelinae</i> Marcus,1943	+	-	-
	<i>Dero (Aulophorus)furcata</i> (Müller,1773)	+	-	+
	<i>D(A) indicus</i> Naidu, 1962	+	-	-
	<i>Allonais inaequalis</i> (Stephenson, 1911)	+	+	-
	<i>A. gwaliorsis</i>	-	-	+
	<i>A. pectinata</i> (Stephenson, 1910)	-	-	+
	<i>Nais variabilis</i> Piguët, 1906	+	+	+
	<i>N. elinguis</i> Müller,1773	+	+	+
	<i>N.Stolci</i> (Hrabe, 1981)	+	+	-
	<i>N.pardalis</i> Piguët, 1906	+	+	+
	<i>N. simplex</i> Piguët, 1906	+	+	-
	<i>N.pseudobtusa</i> Piguët, 1906	+	+	-
	<i>N. communis</i> Piguët, 1906	-	+	+
	Naididae Pristininae	<i>Pristina longiseta</i> Ehrenberg, 1828	+	+
<i>P. macrochaeta</i> Stephenson . 1931		-	-	+
<i>P. aequiseta</i> Bourne, 1891		+	+	+
<i>P. foreli</i> Piguët, 1906		+	+	-
<i>P. proboscida</i> Beddard, 1896			+	-
<i>Pristinella osborni</i> (Walton, 1906)		+	-	+
<i>P. sima</i> (Marcus, 1944)		+	-	+
<i>P. jenkiniae</i> (Stephenson, 1931)		-	+	-
Naididae , Tubificid worms	<i>Embolocephalus velutinus</i> (Grube, 1879)	-	-	+
	<i>Aulodrilus pigueti</i> Kowalewski, 1914	+	-	+
	<i>Branchiura sowerbyi</i> (Beddard, 1892)	+	+	+
	<i>Psammoryctides moravicus</i> (Hrabe, 1934)		+	-
	<i>Peloscolex tenuis</i> Hrabe, 1931	+		-
	<i>Tubifex tubifex</i> (Müller,1774)	+	+	+
	<i>Potamothrix hammoniensis</i> (Michaelsen, 1901)	+	+	-
	<i>P. bavaricus</i> (Oschmann. 1913)		+	-
	<i>Rhyacodrilus coccineus</i> (Vojdovsky, 1875)	+	+	-
	<i>Limnodrilus hoffmeisteri</i> Claparède, 1862	+	+	+
	<i>L. claparadeanus</i> Ratzel, 1868	+	+	+
	<i>L. maumeensis</i> Brinkhurst and Cook, 1966	-	-	+
	<i>L. silvani</i> Eisen, 1879	-	+	-
	<i>L. udekemianus</i> Claparède, 1862	-	+	-
	<i>L. profundicola</i> (Verrill, 1871)	+	+	+
Lumbriculidae	<i>Lumbriculus variegates</i>	-	-	+
Lumbricidae	<i>Eiseniella tetraedra</i> (Savigny, 1826)	+	+	+
	No. species	39	40	32

(+; presnt, - ; not present)

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قائمة بانواع قليلة الاهلاب المائية في حوض دجلة والفرات

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الخلاصة:

شخص 60 نوع من قليلة الاهلاب المائية في مواقع مختلفة من حوض نهري دجلة والفرات شملت نهر دجلة و نهر الفرات والاهوار الجنوبية (الحويزة الحمار والجبايش) وشط الكرمة وشط العرب. شخصت 39 نوع في نهر الفرات و 40 نوع في نهر دجلة و 32 نوع من شط العرب والاهوار الجنوبية. صنفت الانواع المشخصة الى اربعة انواع للعائلة Aeolosomatidae و 54 نوع للعائلة Naididae (31 نوع الى تحت العائلة Naidinae و 8 انواع الى تحت العائلة Pristininae و 15 الى الديدان الانبوبية) ، اضافة الى نوع واحد لكل من العائلة Lumbriculidae (*Lumbriculus variegates*) و العائلة Lumbricidae (*Eiseiella tetraedra*).

ومن العائلة Aeolosomatidae سجلت الانواع *Aelosoma aquaternarium* و *A. Liedyi* و *A. variegatum* ، وقد سجل النوع *A. variegatum* النوع الاكثر تردد من بين العيات ووجد في نهر الفرات.

مثل مجتمع تحت العائلة Naidinae باربعة انواع تابعة للجنس *Chaetogaster* ونوعين من كل الاجناس *Paranais* و *Slavina* و *Stylaria* و اربعة انواع من الجنس *Allonais* و سبعة انواع من كل من الاجناس *Nais* و *Dero* اضافة الى الانواع *Stephensoniana trivandrana* و *Specaria josinae* و *Ophidonais serpentina* . كان النوع *Nais variabilis* هو الاكثر وفرة وتردد في نهر دجلة ، بينما كان النوعين *Stylaria lacustris* و *Ophidonais serpentina* هي الاكثر وفرة في نهر الفرات. مثلت تحت العائلة Pristininae بارعة انواع من الجنس *Pristina* a وثلاثة انواع من النوع *Pristinella* ، ومن بينها كان النوع *Priatina longiseta* هو الاكثر وفرة.

وفيما يخص الديدان الانبوبية كان النوعان *Branchiura sowerbyi* و *Limnodrilus hoffmeisteri* هما الاكثر وفرة وتردد في المسطحات المائية العراقية . والى جانب النوع *L. hoffmeisteri* سجلت خمسة انواع اخرى تابعة للجنس *Limnodrilus* ونوعين من الجنس *Potomothrix* والانواع المفردة *Tubifex tubifex* و *Psammoryctides moravicus* و *Aulodrilus piguetia* و *Embolocephalus velutinus* و *Rhyacodrilus coccineus*.