

New Records of Twelve species of Oligochaeta (Naididae and Aeolosomatidae) from the Southern Iraqi Marshes, Iraq

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Abstract

Oligochaete worms were collected from 4 sites at Al-Swaib marshes, southern Iraq, during October 2010 to March 2011. A total of one aeolosomatid species (*Aeolosoma leidy* Cragin, 1887) and 11 naidid species (*Pristina sima* (Marcus, 1944), *Pristina osborni* (Walton, 1906), *Dero (Aulophorus) furcatus* (Müller, 1773), *Dero (Dero) digitata* (Müller, 1773), *Dero (Dero) nivea* Aiyer, 1929, *Slavina appendiculata* d'Udekem, 1855, *Nais pardalis* Piguët, 1906, *Nais variabilis* Piguët, 1906, *Nais communis* Piguët, 1906, *Allonais gwaliorensis* (Stephenson, 1920), *Allonais pectinata* (Stephenson, 1910) were recorded for the first time from Iraq. The results indicate that there is high number of species of oligochaetes in the Iraqi limnic environment, in which these species are finding the favorable conditions for live.

Keywords: Oligochaeta, Naididae, Aeolosomatidae, Marshes, Southern Iraq.

1. Introduction

Oligochaetes classification depends on some external morphological features, among these; the color of the body, number of segment, size and body appendages or on the anatomy of digestive and reproduction systems as well as some features concerning their movement pattern and habitat nature (Harman, 1980). Brinkhurst and Jamieson (1971) distinguished the family Naididae from other Tubificoidae families based on reproduction, body length, shape of setae and site of male pores. Family Aeolosomatidae includes worms of small length; they possess a ventrally ciliated prostomium and small number of segments (Brinkhurst and Jamieson, 1971)

In Iraq, limited studies concerning the Oligochaeta have been conducted. Al-Lami *et al.* (1998) recorded the annual densities for some species of Aeolosomatidae, Lumbricidae, Enchytraeidea, Naididae, Tubificidae and Lumbriculidae. Jaweir (2011) recorded three new tubificid species (*Aulodrilus pigueti*; *Embolacephalus velutinus*; and *Limnodrilus profundicola*) from Al-Hawiezah Marsh southern Iraq.

Five naidid species were recorded Basrah marshes, southern Iraq (Al-Abbad, 2009; Al-Abbad, 2010; and Al-Abbad and Al-Mayah, 2010). Moreover, several publications described the Oligochaeta of Turkey (Balik *et al.*, 2004; Yildiz and Balik, 2006; Yildiz and Balik, 2010).

The objectives of the present study are to record species of Oligochaeta in southern Iraqi waters.

2. Materials and Methods

From October 2010 to March 2011, a total of 110 oligochaete worms were collected from 4 sites at Al-Swaib marshes: Site 1 (55° 30' 68,18"N 29° 47' 43 27E); Site 2 (55° 30' 15,31"N 29° 47' 48,29E); Site 3 (56° 30' 13,10"N 29° 47' 43,06E) and Site 4 (56° 30' 01,18"N 29° 47' 55,02E). The oligochaetes were collected among bryophytes, other submerged plants and the surface layer of mud. In the field, the materials were passed through 250 and 75 µm mesh size sieves. In the laboratory, live samples were examined and illustrated by digital camera, then preserved in 4% formalin. Specimens were mounted for examination in a glycerin, covered with a cover slip and left in this fluid for several hours before examination. Identification was based on Brinkhurst and Jamieson (1971). Photographs for live and fixed specimens were taken by a digital camera mounted on Olympus microscope. The setae of fixed specimens were drawn by the aid of Camera Lucida.

3. Results

The present study made records of 12 species of oligochaetes for the first time in Iraq. These species were isolated from a total of 77 individuals of oligochaetes, five specimens were *Aeolosoma leidy* Cragin, 1887, of the family Aeolosomatidae. The rest of specimens were belonging to the family Naididae (11 species): *Pristina sima* (Marcus, 1944), *Pristina osborni* (Walton, 1906), *Dero (Aulophorus) furcatus* (Müller, 1773), *Dero (Dero)*

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digitata (Müller, 1773), *Dero* (*Dero*) *nivea* Aiyer, 1929, *Slavina appendiculata* d'Udekem, 1855, *Nais pardalis* Piguët, 1906, *Nais variabilis* Piguët, 1906, *Nais communis* Piguët, 1906, *Allonais gwaliorensis* (Stephenson, 1920), *Allonais pectinata* (Stephenson, 1910), furthermore to the previously recorded species *Pristina longiseta* Ehrenberg, 1828 and *Pristina proboscidea* Baddard, 1896. Table (1) shows the occurrence of the species identified at Al-Swaib marshes during study period.

Table 1. The occurrence of Oligochaetes species at the study period of Al-Swaib marshes southern of Iraq

Family	species	Study period					
		Oct. 2010	Nov.	Dec.	Jan. 2011	Feb.	Mar.
Aeolosomatidae	<i>Aeolosoma leidyi</i>	+	-	-	-	+	-
Naididae	<i>Pristina longiseta</i>	+	+	+	-	+	+
	<i>Pristina proboscidea</i>	+	+	+	-	-	+
	<i>Pristina sima</i>	+	-	+	-	-	+
	<i>Pristina osborni</i>	+	+	+	-	-	-
	<i>Dero</i> (<i>Aulophorus</i>) <i>furcatus</i>	-	-	+	-	+	+
	<i>Dero</i> (<i>Dero</i>) <i>digitata</i>	-	+	+	-	-	+
	<i>Dero</i> (<i>Dero</i>) <i>nivea</i>	-		+	-	-	+
	<i>Slavina appendiculata</i>	-	+	-	-	+	-
	<i>Nais pardalis</i>	-	+	+	-	-	+
	<i>Nais variabilis</i>	-	+	+	-	+	-

Aeolosoma leidy Cragin, 1887

Diagnosis: Small olive worms. Body consists of about 11-13 segments. Prostomium is the widest region of the body (Fig. 1a). Septa are absent. Body segments bearing bundles of two types of smooth simple pointed tip setae, long flexible and short stiff sigmoid setae; each bundle have 2-4 setae. The sigmoid setae are slightly sickle shaped and present in all bundles (Fig. 1b, 5a).

Measurements: Body length ranged from 1.03-1.5 mm in length, and 130 to 195 μ m in width (n = 5). The long setae range in length between 162 and 200 μ m. The sigmoid setae range in length from 50-68 μ m.

Remarks: Brinkhurst and Jamieson (1971) reported measurements of specimens as follow: length 1.5-3 mm, width 120-170 μ m, length of setae 90-180 μ m and length of sigmoid setae 45-70 μ m. The Iraqi specimens seem to be shorter and wider than those recorded by Brinkhurst and Jamieson (1971). Members of the genus *Aeolosoma* are cosmopolitan, present in fresh water and brackish water, less often terrestrial, and the species *A. leidy* reported from America, France and Netherlands (Brinkhurst and Jamieson, 1971).

Pristina sima (Marcus, 1944)

Diagnosis: The worms are naked, transparent, and the body consists of 31-51 segments. Prostomium without proboscis. Eyes are absent (Fig. 2c). Dorsal setal bundles beginning in segment II consisting of 1-2 smooth hairs and

1-2 pectinate needles (with 2-3 intermediate teeth) with distal nodulus (Fig. 2d, 5f). Ventral setae bifurcated, 3-4 per bundle, those of anterior segments are longer than those which follow. The upper tooth in the first five segments is equal or slightly longer and thinner than the lower ones compared with the upper and lower teeth of the rest of segments which are of equal length. Nodulus median in segment II, distal in the following segments (Fig. 5c-e).

Measurements: Body length is 2.9-3.9 mm long, 0.24-0.3 mm wide (n= 8). Hairs are 175-230 μ m long, needles are 50-75 μ m long. Ventral setae of segment II-V are 62-80 μ m long while the following setae ranged between 50 and 60 μ m in length.

Remarks: Our specimens have length and number of hairs and needles per dorsal bundles more than those of specimens reported by Brinkhurst and Jamieson (1971). Species of the genus *Pristina* are cosmopolitan, and *Pristina sima* was recorded from different countries such as Brazil (Brinkhurst and Jamieson, 1971) and from Turkey (Yildiz *et al.*, 2007).

Pristina osborni (Walton, 1906)

Diagnosis: Bbody is naked, transparent and consists of 22-27 segments. Prostomium without proboscis. Eyes are absent (Fig. 1e). Dorsal setal bundles start in segments II, consisting of one smooth hair and one bifid needle. Needles with short diverging teeth and distal weak nodulus (Fig. 1f, 5i). Ventral setae are bifurcated, 4 per bundle in the anterior segments, 3 per bundle in the middle segments, and 1-2 per bundle in the posterior ones (in the last five segments), with upper and lower teeth of equal length, nodulus proximal in the anterior segments and distal in the middle and posterior segments (Fig. 5g-h).

Measurements: Body length 2.5-3 mm, width 0.2-0.3 mm (n= 3). Hairs 175-188 μ m in length; needles 45-50 μ m in length. Ventral setae 38-75 μ m long.

Remarks: The Iraqi specimens are larger than those reported by Brinkhurst and Jamieson (1971), but specimens from the two areas have distal nodulus in the needle setae, proximal in segment II, and distal in the follow segments. *Pristina osborni* was also recorded from India, Brazil, North America, Africa (Brinkhurst and Jamieson, 1971) and Turkey (Capraz and Arslan, 2005).

Dero (*Aulophorus*) *furcatus* (Müller, 1773)

Diagnosis: Body consists of 19-42 segments, yellowish to transparent in color. Prostomium short and conical (Fig. 2a). Bundles of dorsal setae starts in segment V and onwards and consists of one smooth hair and one curved bifid needle. Needles of the upper tooth slightly shorter than the lower one, nodulus distal (Fig. 2b, 5l).

Ventral setae begin in segment II, and consist of 4 per bundle, except in the last two segments, where 2 setae per bundle are present. Ventral setae of segments II-IV have a different shape from those of on rest of segments, with the upper tooth longer than the lower and of with equal thickness, from segment V the upper tooth slightly shorter and thinner. Nodulus median in segments II-V, and at 1/3 the distance from the distal end in the rest of segments (Fig. 5j-k). Anus opens into branchial fossa. Branchial fossa with parallel palps and 3 pairs of gills.

Measurements: Body length 1.3-6.7 mm long, 0.1- 0.17 mm wide (n= 14). Hairs are 110-137 μ m long, needles are

20-81 μm long. Ventral setae are 30-150 μm long. Palps of branchial fossa are 0.2-0.36 mm long.

Remarks: Brinkhurst and Jamieson (1971) reported a length of 6-20 mm; numbers of segments 35-82, ventral setae of segments II-IV were 2-5 per bundle with the upper tooth longer than the lower. Branchial fossa with 3 or 4 pairs of gills. The present specimens are shorter and have fewer segments than those reported by Brinkhurst and Jamieson (1971). The characters of ventral setae and branchial fossa are apparently similar. The genus *Dero* is cosmopolitan (Brinkhurst and Jamieson, 1971), Capraz and Arslan (2005) recorded *Aulophorus furcatus* from Turkey.

Dero (Dero) digitata (Müller, 1773)

Diagnosis: Body consists of 34-39 segments, yellowish to transparent in colour. Eyes are absent. Prostomium short and conical (Fig. 2c). Dorsal setal bundles begin in segment V onwards, consisting of one smooth hair and one curved bifid needle. Needles with upper and lower fine teeth of equal length, nodulus at 1/3 the distance from the distal end or more proximally (Fig. 2d, 6d). Ventral setae are 4 per bundle, somewhat of bifurcated crotchets, and those of segments II-V have a different shape from those of the rest, with the upper tooth longer than the lower and of equal thickness, whereas in the followed segments they become equal in length and slightly thinner, while in the posterior segments they become slightly shorter and of equal thickness. Nodulus of ventral setae gradually shifted from proximal to distal in segments II-XX (Fig. 6a-c). Anus opens into branchial fossa. Branchial fossa not prolonged, containing 4 pairs of gills.

Measurements : Body length 3.7-4.9 mm and about 0.2 mm in width (n= 5). Hairs are 100-130 μm long, needles are 25-40 μm long. Ventral setae are 60-70 μm long.

Remarks: The length of the specimens reported by Brinkhurst and Jamieson (1971) are 6-32 mm, with 20-105 segments, dorsal setae from segment VI, needles with the upper tooth 1-2 times as long as the lower one, ventral setae in segments II-V are longer than the rest, with nodulus proximal, the rest of segments with 2-5 per bundle and have distal nodulus, and the upper tooth hardly longer than the lower. The present specimens are shorter, and differ from those of Brinkhurst and Jamieson (1971) in several features, such as the dorsal setae which are starting from segment V, needles with equal fine teeth, posterior ventral setae with upper tooth shorter than the lower. The other features are seemingly similar. *Dero digitata* is cosmopolitan (Brinkhurst and Jamieson, 1971) and recorded from different localities such Turkey (Capraz and Arslan, 2005; Yildiz *et al.*, 2007).

Dero (Dero) nivea Aiyer, 1929

Diagnosis: Worms consist of 34-37 segments. Body is yellowish to transparent in colour. Eyes are absent. Prostomium is short and conical, the branchial fossa prolonged posteriorly (Fig 2e.). Dorsal setal bundles start in segment VI onwards, consisting of one smooth hair and one weakly curved bifid needle. The needles with fine teeth and of equal length (Fig. 2f, 6g). Ventral setal bundles consist of 4 bifurcated crotchet setae in segments II-V, compared with 3 per bundle in the posterior segments. Ventral setae in segments II-V are different from those of the rest of segments, with the upper tooth twice as long as the lower, while posteriorly the teeth are

of about equal length and the lower teeth slightly thicker, or the upper teeth slightly shorter than the lower ones. Nodulus of ventral setae gradually shifted from proximal in segments II-V to distal region after segment VI (Fig. 6e-f). Anus opens into branchial fossa. Branchial fossa prolonged posteriorly, containing 2 or 3 pairs of gills (Fig. 2e).

Measurements : The range of length of the worms were 3.6-3.9 mm, and the width 0.35 mm (n= 9). Hairs 175-212 μm long, needles 50-67 μm long. The anterior ventral setae (II-V) are 88 μm long compared with 55-75 μm of posterior.

Remarks: The present specimens have body length and number of segments agree with the ranges of length (2.5-10 mm) and number of segments (23-45) given for this species by Brinkhurst and Jamieson (1971). They reported 4 ventral setae per bundle as opposed to 4 per bundle in the anterior segments and 3 per bundle in the posterior segments in the present specimens. They also reported equal length of teeth in all segments after segment V as opposed to the present specimens in which the upper tooth is shorter than the lower one in some posterior segments. *Dero nivea* was recorded from Europe, Asia, America, Africa and Australia (Brinkhurst and Jamieson, 1971), Gorni and Alves (2008) reported the species from Brazil.

Slavina appendiculata d'Udekem, 1855

Diagnosis: Body is stout, consists of 30 segments. Eyes are present (Fig. 3a-b). Dorsal setal bundles of segment VI, consists of one smooth stout hair and one simple pointed needle. Hairs setae of segment VI are elongated (Fig. 3b). Ventral setae are bifurcated crotchets, beginning in segment II; 3 per bundle in segments II and VI, 2 per bundle in other segments. Ventral setae with upper and lower teeth of equal length, the lower tooth of segments II-V is thicker than the upper. Nodulus at 1/3 the distance from proximal end in segments II-V, and more proximal in the rest of segments (Fig. 6h-i).

Measurements: Body length 2.4 mm, 0.2-0.35 in width (n= 2). Hairs of segment VI are 388 μm long, compared with 184-296 μm in the rest of segments. Needles are about 50 μm long. Ventral setae of segments II-V are 100-125 μm long, compared with 90-100 μm in the following segments.

Remarks: Body length, number of segments, number of ventral and dorsal setae per bundle and nodulus site on ventral setae is close to those reported by Brinkhurst and Jamieson (1971). The present specimens are characterized by the presence of upper and lower teeth of equal length in the ventral setae compared with slightly longer upper teeth than the lower ones in those of Brinkhurst and Jamieson (1971). *Slavina appendiculata* was reported from Europe, North and South America, South and East Asia, Africa, New Zealand (Brinkhurst and Jamieson, 1971) and Brazil (Alves *et al.*, 2006).

Nais pardalis Pignet, 1906

Diagnosis: Worms are yellow, body consists of 18 segments, eyes are present (Fig. 3c). Dorsal setae beginning in segment VI onwards, the bundles consist of one smooth hair, and one needle with a fine, parallel and equal teeth and weak a median nodulus (Fig. 6m). Ventral setal bundles composed of 5 setae in segments II-III, 4 setae in the rest of segments. Ventral setae of segments II-V with median nodulus and upper tooth as long as the

lower one or slightly longer (Fig. 6k), whereas in the followed segments the nodulus at 1/3 the distance from the distal end and the upper tooth is slightly longer than the lower in the other ventral setae. Ventral setae of segment VI and several followed segments are thickened (Fig. 3d, 6l).

Measurements: Body length 1.9 mm, 0.2-0.28 mm in width (n= 3). Hairs are 100 µm in length, needles are 25 µm in length. Ventral setae of segment II are 80 µm long, compared to 63-75 µm long in the rest of segments. The ventral setae are 1.5 times thicker than the other setae.

Remarks: Arslan and Sahin (2003) gave diagnostic features of *Nais pardalis* from Turkey. Examined specimens are with shorter setae (ventral and dorsal) and shorter upper teeth in the anterior and posterior ventral setae compared with the Turkish specimens, however, the nodulus of the anterior and posterior ventral setae have the same site in both the specimens of both localities. The genus *Nais* is cosmopolitan and the species *N. pardalis* is distribute in Europe, Asia, North and South America (Brinkhurst and Jamieson, 1971) and was reported from Turkey (Capraz and Arslan, 2005; and Yildiz *et al.*, 2007). *Nais variabilis* Piguët, 1906

Diagnosis: Yellow to transparent in colour. Eyes are present (Fig. 3e). Body consists of 28-40 segments. Dorsal setae begin in segment VI. Hairs and needles are 1 per bundle, needles are bifid with a median weak nodulus and fine teeth (Fig. 3f, 7c). Ventral setae are 4-5 per bundle, those of segments II-V with upper teeth longer than the lower, median nodulus and teeth are of equal length, nodulus at 1/3 the distance from distal end of the ventral setae in the following segments (Fig. 7a-b). Stomach abruptly widening.

Measurements: Body length 2.8-3.8 mm, and 0.2-0.28 mm in width (n= 3). Hairs 125-137 µm in length, the needles about 37 µm in length. Ventral setae 88-100 µm in length.

Remarks: The Iraqi specimens have longer body and shorter needles than the Turkish specimens (see Arslan and Sahin, 2003). However, Arslan and Sahin (2003) recorded higher number of setae per dorsal bundles (1-2 of each hair and needle) and higher distal nodulus in needles compared with 1:1 hair and needle per bundle and median nodulus in needles in the present specimens. Smith (1984) reported features of the specimens from Washington, such as the number of setae per dorsal bundle (1 needle and 1 hair) and the length of ventral setae in segments VI-posterior (88-110 µm) which resemble those of the Iraqi specimens. Also there are others differences such the presence of longer hairs (150-280 µm) and needles (54-60 µm) in the specimens from Washington. *N. variabilis* is cosmopolitan, found also in brackish water (Brinkhurst and Jamieson, 1971), and was reported from different region like Washington (Smith, 1984) and Turkey (Capraz and Arslan, 2005; and Yildiz *et al.*, 2007).

Nais communis Piguët, 1906

Diagnosis: Worm are yellow, body consists of 15-27 segments, eyes are present (Fig. 4a). Dorsal setal bundle beginning in segment VI onwards, composed of hair and bifid needle (Fig. 4b, 7f), 1 per bundle. Needle setae are with divergent fine teeth. Ventral setae are 4 per bundle, the setae in segment II are longer than those in the rest of

segments, with equal teeth or the upper teeth slightly longer than the lower, and always the upper tooth is thinner, with a median nodulus. Setae of the following segments with teeth of equal length, nodulus are distal (Fig. d-e). The stomach is slowly widening.

Measurements: Body length 1.4-2.8 mm, 0.18-0.2 mm in width (n= 6). Hairs 120-140 µm in length. Needles 37.5-45 µm in length. Ventral setae of segment II are 89 µm in length compared with 75 µm in the other segments.

Remarks: Hairs and needles of the present specimens are shorter than those reported by Smith (1984). However, he noticed the presence of more ventral setae and more needles per bundle (4-6, and 2, respectively) than reported by the present study. The eyes are present in all Iraqi specimens, whereas in some of Washington's specimens the eyes are absent (Smith, 1984). *N. communis* is cosmopolitan, found also in brackish water (Brinkhurst and Jamieson, 1971), also reported from Washington (Smith, 1984), Brazil (Alves *et al.*, 2006; and Gorni and Alves, 2008) and Turkey (Capraz and Arslan, 2005; and Yildiz *et al.*, 2007).

Allonais gwaliorensis (Stephenson, 1920)

Diagnosis: Body consists of 24-49 segments. Eyes are absent. Prostomium with rounded tip, without a proboscis (Fig. 4c). Dorsal setae bundle starts from segment VI, with 1-2 smooth hair setae and 1-2 bifid needle setae. Needle teeth fairly narrow, upper tooth is slightly longer than the lower ones, nodulus slightly distal (Fig 4d, 7i). Ventral setae usually 3-5 per bundle. Anterior ventral setae of segments II-VI with upper tooth slightly longer than the lower or of equal length in some specimens, with median nodulus, median and posterior ventral setae with upper tooth as long as the lower one, with nodulus at 1/3 the distance from the distal end (Fig. 7g-h).

Measurements: Body length 2.4-4.3 mm, 0.15-0.17 mm in width (n= 14). Hairs 68-125 µm and needles 25-43 µm in length. Ventral setae of segment II 55-62 µm in length, while of segments III- posterior are 45-50 µm in length.

Remarks: Most of the present specimens are shorter than those reported by Brinkhurst and Jamieson (1971), but the latter had a wider range of ventral setae per bundle (3-5 in segments II-V, and 4-6 in the rest segments) than the present specimens (3-5 in every segment), and the nodulus of the ventral setae are at the same sites in the examined specimens. *A. gwaliorensis* was recorded from Asia and Africa (Brinkhurst and Jamieson, 1971) and Turkey (Yildiz *et al.*, 2007).

Allonais pectinata (Stephenson, 1910)

Diagnosis: Body consists of 32-48 segments. Eyes are absent. Prostomium short and conical, without a proboscis (Fig. 4e). Dorsal setae bundle starts from segment VI onwards, with 1-2 smooth hair setae and 1-2 needle setae. No elongated hair seta present, needle teeth equal in length, with 2-3 intermediate teeth (pectinate), nodulus slightly distal (Fig. 4f, 7l). Ventral setae are bifurcated crotchets, 3-4 per bundle. Anterior ventral setae with the upper teeth slightly longer than the lower or equal in length, whereas the upper teeth of the posterior setae are of equal length. Nodulus is present in the median (Fig. 7j-k).

Measurements: Body length 2.2-4.2 mm, and 0.14-0.3 mm in width (n= 5). Hairs 163-175 µm and needles 25-38 µm in length. Ventral setae 25-53 µm in length.

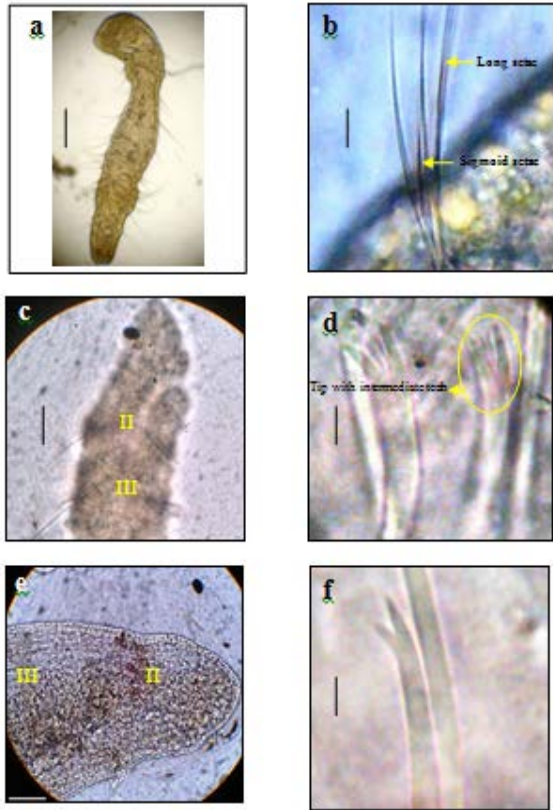


Figure 1. *Aelosoma liedyi* a- general view of the body, b- setal bundle. *Pristina sima* c- Anterior end of the body, d- dorsal bundle. *Pristina osborni* e- Anterior end of the body, f- dorsal bundle. Scale: a 160 μ m; b 17 μ m; c 90 μ m; d 3.5 μ m; e 57 μ m; f 3.7 μ m.

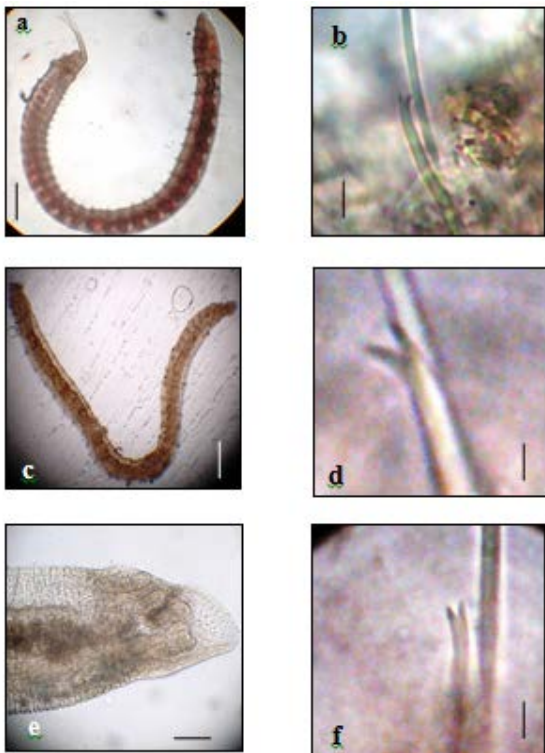


Figure 2. *Aulophorus furcatus* a- general view of the body, b- dorsal bundle. *Dero digitata* c- general view of the body, d- dorsal bundle. *Dero nevia* e- posterior end of the body, f- dorsal bundle. Scale: a 200 μ m; b 5 μ m; c 270 μ m; d 2.5 μ m; e 87 μ m; f 5 μ m.

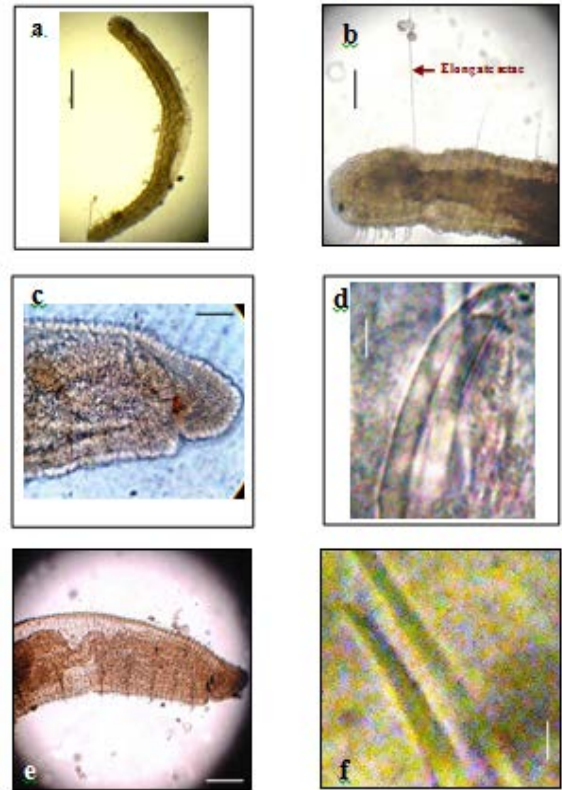


Figure 3. *Slavina appendiculata* a- general view of the body, b- Anterior end of the body. *Nais pardalis* c- Anterior end of the body, d- ventral bundle of seg. VI. *Nais variabilis* e- Anterior end of the body, f- dorsal bundle. Scale: a 310 μ m; b 97 μ m; c 58 μ m; d 4 μ m; e 110 μ m; f 2.2 μ m.

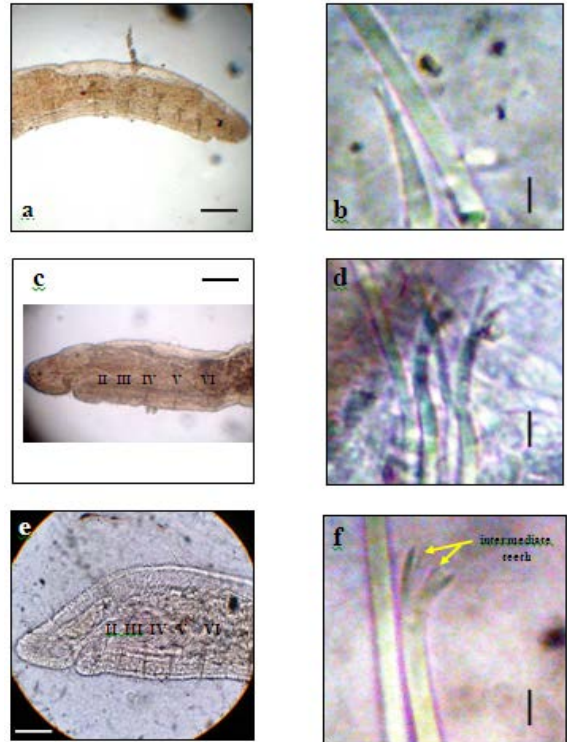


Figure 4. *Nais communis* a- general view of the body, b- dorsal bundle. *Allonais gwaliorensis* c- Anterior end of the body, d- dorsal bundle. *Allonais pectinata* e- Anterior end of the body, f- dorsal bundle. Scale: a 110 μ m; b 3.5 μ m; c 84 μ m; d 3 μ m; e 59 μ m; f 2.7 μ m.

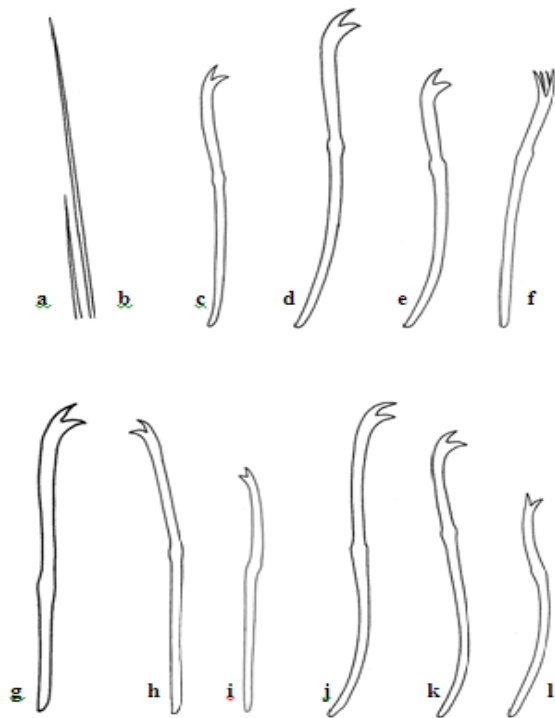


Figure 5. *Aeolosoma liedyi*. a- sigmoid setae, b- long setae. *Pristina sima*. c- ventral setae in segment II, d- ventral setae in segment V, e- posterior ventral setae, f- needle setae. *Pristina osborni*. g- ventral setae in segment II, h- median ventral setae, i- needle setae. *Dero (Aulophorus) furcatus*. j- ventral setae in segment II, k- ventral setae in segment VI, l- needle setae. Scale: a, j, k 15 μm ; b 20 μm ; c, d, f 8.5 μm ; e 7.7 μm ; g 8.2 μm ; h 7 μm ; i 6.8 μm ; l 12 μm .

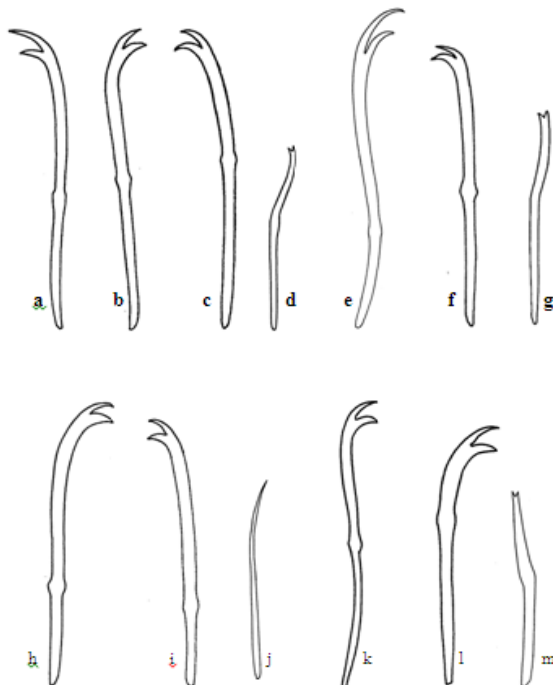


Figure 6. *Dero (Dero) digitata*. a- ventral setae in segments II-V, b- median ventral setae, c- posterior ventral setae, d- needle setae. *Dero (Dero) nevai*. e- ventral setae in segment II, f- ventral setae in VI, g- needle setae. *Slavina appendiculata*. h- ventral setae in segments II-V, i- posterior ventral setae, j- needle setae. *Nais pardalis*. k- ventral setae in segment II, l- ventral setae in segment VI, m- needle setae. Scale: a-c 7.8 μm ; d 7 μm ; e, g, k, l 10.1 μm ; f, j 9.1 μm ; h 15 μm ; i 13 μm ; m 4.7 μm .

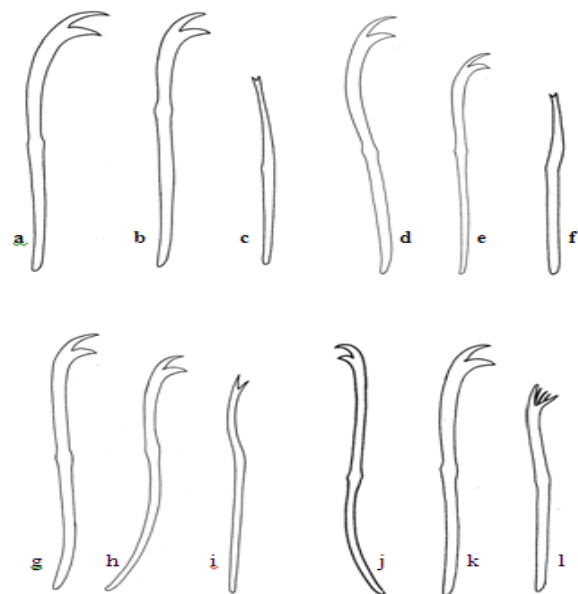


Figure 7. *Nais variabilis*. a- ventral setae in segment II, b- posterior ventral setae, c- needle setae. *Nais communis*. d- ventral setae in segment II, e- posterior ventral setae, f- needle setae. *Allonais gwaliorensis*. g- anterior ventral setae, h- posterior ventral setae, i- needle setae. *Allonais pectinata*. j- anterior ventral setae, k- posterior ventral setae, l- needle setae. Scale: a 11.5 μm ; b 11 μm ; c, h, j 6.1 μm ; d, e 10.6 μm ; f, g 6.8 μm ; i, k, l 4.5 μm .

Remarks: Brinkhurst and Jamieson (1971) reported measurements of the body length of 1.5-8 mm and intermediate teeth of needles (1-5) and ventral setae at segments V-posterior (2-7 per bundle) which are different from those in the present specimens. In both examined specimens, the length percentage of teeth of the ventral setae are resembling each other, but some of the anterior setae of the Iraqi specimens with the upper tooth are slightly longer than the lower ones. *A. pectinata* is present in Asia, Africa and Australia (Brinkhurst and Jamieson, 1971).

4. Discussion

Morphometric measurements (ex. the lengths of the body and seta and number of segments) of the Iraqi specimens have shown some differences from those measured elsewhere in the world. These variations are common in oligochaetes, and suspected to be due to locality differences. Harbe (1938) and Sperber (1948) emphasized that these variations in length and number of segments occurred even within the same species. Al-Abbad (2009) recorded varied number of body segments in *Chaetogaster limnaei* from Iraq. On the other hand, the setae of the Iraqi specimens have average length and numbers differ from those recorded by Smith (1984) from the United States. Smith (1984) also recorded varied measurements of setae of *C. limnaei* between specimens taken from Washington and those from Colorado. These variations are common in the family Naididae and there are many examples reflecting this matter. For instance, Sperber (1948) recorded 8-21 segments of the body of *C. longi*. Therefore, the identification of the same species depends on a limit of body length and number of segments; this indicates that these general variations may

have systematic importance (Brinkhurst and Jamieson, 1971).

There are many examples on the variations of the body features according to changes in the habitat, for instance Loden and Harman (1980) reported on morphological variations in genera like *Dero*, *Nais* and *Pristina*. They placed *P. aequiseta* in an artificial habitat, the giant seta of the posterior zooid was not formed, and hence should be recognized as *P. foreli*, but if it is returned to full strength habitat water, the posterior zooid under the new regimen produces the giant seta.

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