

## FIRST REPORT OF THREE KNOWN SPECIES OF THE GENUS *AULOLAIMUS* (NEMATODA: AULOLAIMIDAE) FROM IRAN

Sh. Moslehi<sup>1</sup>, G. Niknam<sup>1</sup> and M. Ashrafi

Nematology Laboratory, Department of Plant Protection, Faculty of Agriculture, University of Tabriz, Tabriz, Iran

**Summary.** Three known species of the genus *Aulolaimus*, namely *A. oxycephalus* Meyl, 1954, *A. mowbitius* (Yeates, 1967) Jairajpuri *et* Hooper, 1968 and *A. nannocephalus* Andrassy, 1972, collected from soil samples taken from Arasbaran forests, East-Azarbaijan province and Urmia, West-Azarbaijan province, Iran, are reported herein. The Iranian populations of the three species reported agree with the original and re-descriptions although some morphometric differences were observed. This is the first record of occurrence of the genus and its species from the country.

**Key words:** Description, free-living nematodes, morphology, systematics.

The genus *Aulolaimus* was first described by de Man (1880). Jairajpuri and Hooper (1968) synonymized *Pandurinema* Timm, 1957 with *Aulolaimus*. Based on the literature, the genus *Aulolaimus* includes fourteen valid species (Holovachov *et al.*, 2007). The morphology and systematics of *Aulolaimus* are poorly known, but Holovachov *et al.* (2007) provided a comprehensive re-evaluation of the phylogeny of the genus based on morphological data. These authors reviewed the position and placement of the genus in different families proposed by many authors. Finally, they agreed with the inclusion of the genus in the family Aulolaimidae Jairajpuri *et* Hooper, 1968. Holterman *et al.* (2008), based on SSU rDNA phylogeny, suggested that the only representative of Plectida, *A. oxycephalus* Meyl, 1954, in their study clusters together with *Isolaimium* Cobb, 1920 (Isolaimida) among the Monhysterida and Araeolaimida dominated clades. The sister relationship between *Aulolaimus* and *Isolaimium* is also supported by some morphological features. A spindle-like body with narrow head and tail region, distinct longitudinal ridges on the cuticle surface and a panduriform muscular basal bulb of the pharynx are the main characteristics that separate *Aulolaimus* from similar genera.

The status of the genus and its species have not been studied in Iran and this is the first report of its species from the country.

### MATERIALS AND METHODS

A number of soil samples were collected during 2004-2008 from Arasbaran forests, East-Azarbaijan province and Urmia, West-Azarbaijan province, Iran. The soil samples were processed and the nematodes ex-

tracted using the modified Jenkins (1964) method and then fixed and transferred to anhydrous glycerin according to De Grisse (1969). Permanent microscope slides were prepared and the nematodes studied. Measurements were taken with an Olympus BX-41 light microscope provided with a drawing tube. Digital microphotographs were captured with a DP50 digital camera attached to the microscope. Drawings were made using CorelDRAW<sup>®</sup> 12 and 7.0 ME Adobe<sup>®</sup> Photoshop<sup>®</sup> softwares.

### DESCRIPTION

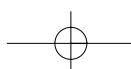
#### *AULOLAIMUS OXYCEPHALUS* Meyl, 1954 (Table I, Figs 1 and 2)

*Measurements.* See Table I.

*Female.* Body straight or slightly curved ventrally upon heat fixation, sharply narrowing at the anterior and posterior ends. Head region 2.5-4.0  $\mu\text{m}$  in diameter, with a small constriction appearing slightly offset, cervical region without any annulations. Amphids indistinct. Cuticle with 60-68 longitudinal ridges of equal size. Pharynx composed of a long narrow tube leading into expanded part. Pharynx length 100-117.5  $\mu\text{m}$  with a panduriform basal bulb comprising 40-50% of the entire pharynx length. Nerve ring encircling the anterior half of basal bulb, 60-73  $\mu\text{m}$  from anterior end. Hemizonid just posterior to nerve ring. Gonads paired, reflexed, vagina with spherical ventro-sub-lateral pieces, median pieces with thick walls, vulval opening pore-like. Tail conical and body content extending almost to anterior half of tail, the hyaline part occupying the posterior one-fifth of tail length.

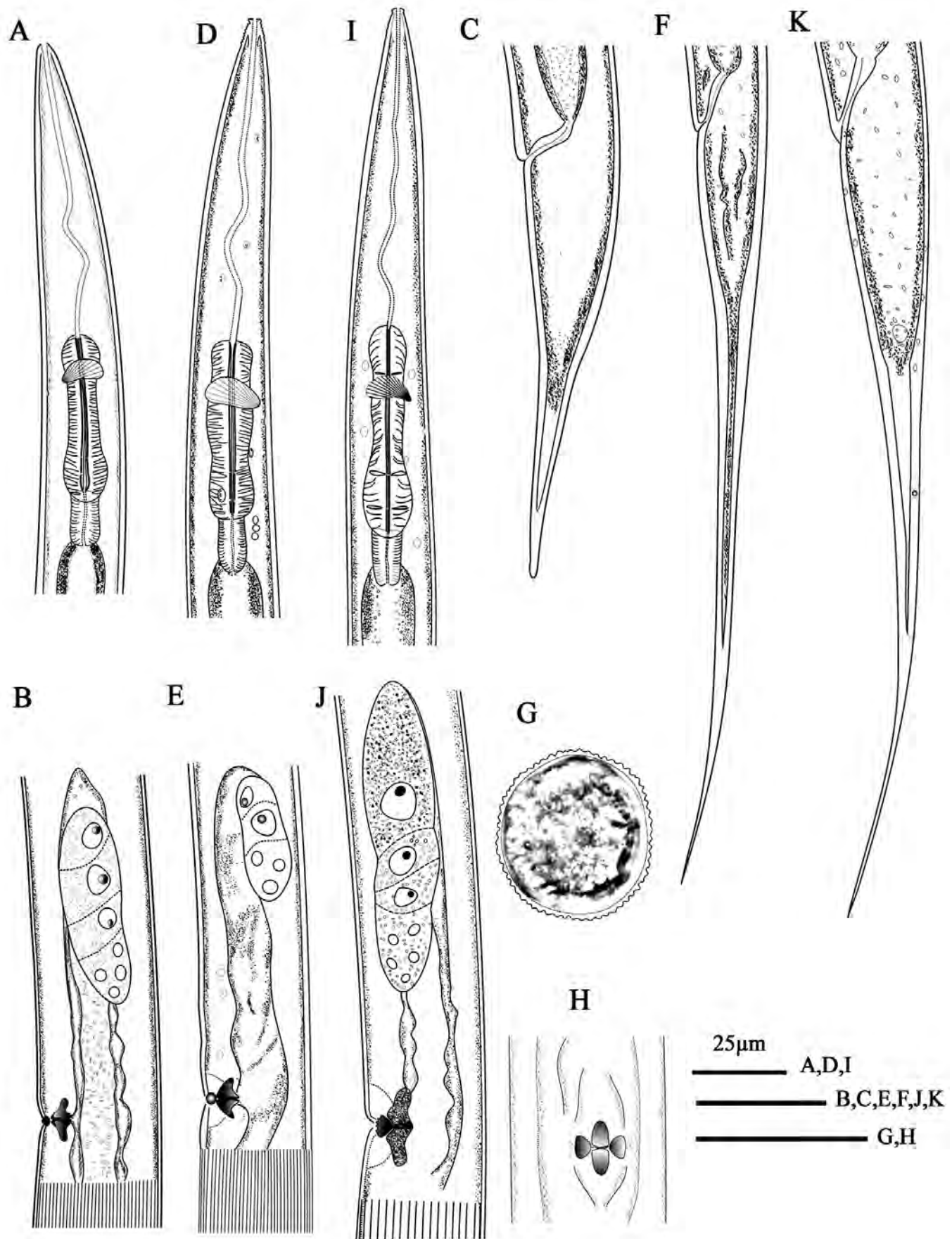
*Male.* Not found.

<sup>1</sup> Corresponding author: g\_niknam@tabrizu.ac.ir

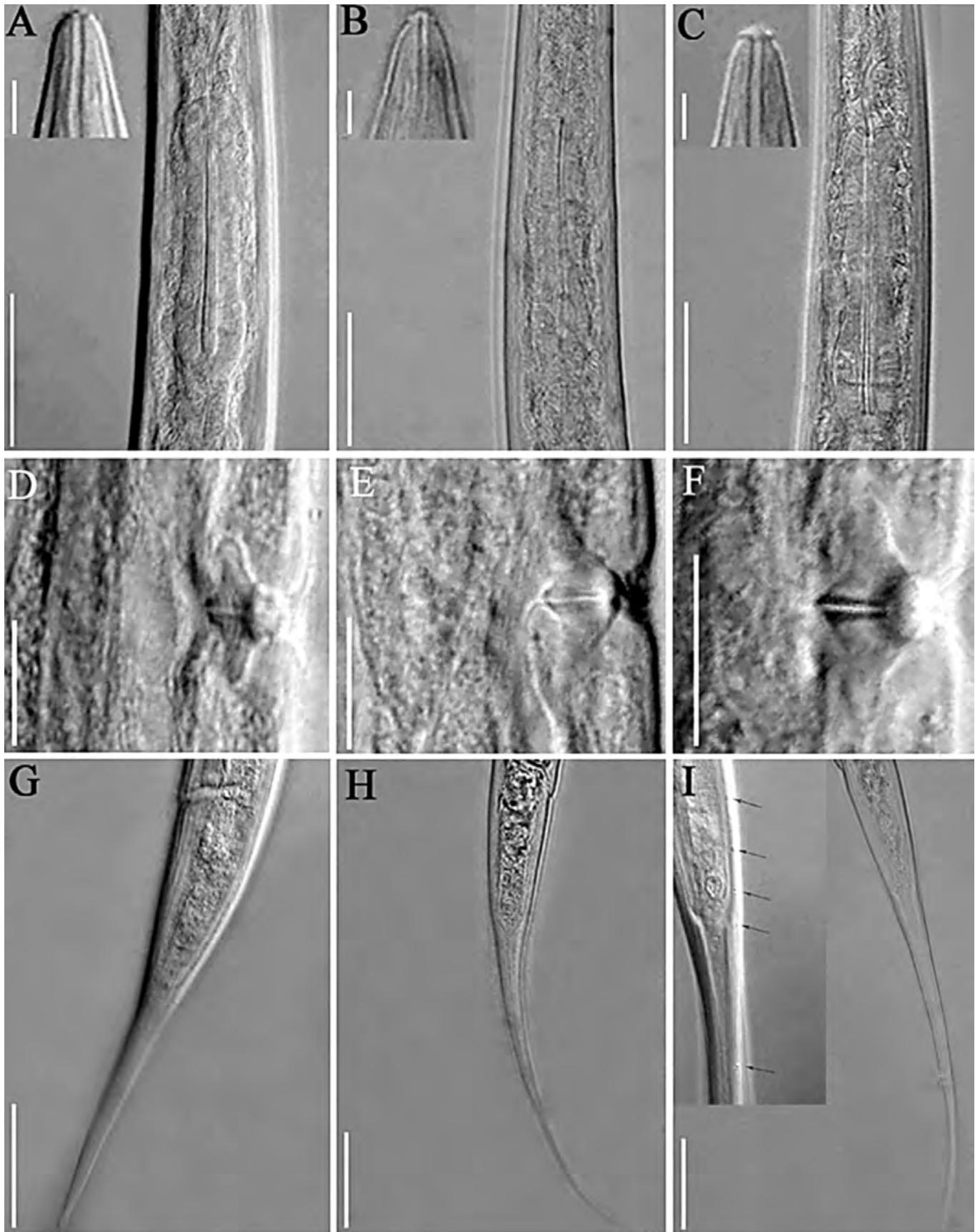


**Table I.** Morphometric data of *Aulolaimus oxycephalus*, *A. mowbitius* and *A. nannocephalus* from Iran in comparison with those in Holovachov (2007) (all measurements in  $\mu\text{m}$ )

Character	<i>A. oxycephalus</i>		<i>A. mowbitius</i>		<i>A. nannocephalus</i>	
	Holovachov (2007)	Iran	Holovachov (2007)	Iran	Holovachov (2007)	Iran
n	-	4 ♀	-	6 ♀	-	5 ♀
L	470-835	547 ± 24.5 (524-581)	700-1060	634.5 ± 80.5 (520-762)	759-962	802.5 ± 63.5 (725-887.5)
a	25-40	23.5 ± 1.0 (23.0-25.0)	31-45	31.0 ± 3.4 (27.5-36.0)	25-42	33.0 ± 1.6 (31.0-35.0)
b	4.1-7.2	5.0 ± 0.2 (4.5-5.0)	6.6-9	5.5 ± 0.5 (4.5-6.0)	5.5-7.1	6.0 ± 0.3 (5.0-6.5)
c	4.2-11.2	7.0 ± 0.1 (6.5-7.0)	5.5-9.9	5.0 ± 0.4 (4.5-6.0)	4.4-6.2	5.5 ± 0.8 (5.0-7.0)
c'	ca 5.5	4.5 ± 0.6 (3.5-5.0)	5.6-10.2	8.0 ± 1.1 (6.0-9.0)	7.5-12	8.5 ± 1.4 (6.0-10.0)
V	47-56	54.5 ± 0.5 (53.5-55.0)	44-52	50.5 ± 2.8 (46.5-53.0)	44-53	51.0 ± 2.5 (48.5-55.0)
Pharynx length	-	111.5 ± 8.1 (100-117.5)	-	119.5 ± 14.1 (102.5-137.5)	125-157	130.5 ± 6.2 (121-134.5)
Bulb length	-	50.5 ± 6.3 (47.0-58.0)	-	52.0 ± 4.5 (45.5-58.0)	49-68	51.0 ± 2.6 (48.0-53.0)
Nerve ring	-	66.5 ± 6.5 (60.0-73.0)	-	90.5 ± 10.4 (81.0-106)	87-117	87.5 ± 2.5 (85.0-90.0)
Tail length	-	81.5 ± 2.9 (79.0-85.5)	-	120.5 ± 15.2 (94.0-134.5)	141-199	151.5 ± 28.1 (106-174.5)
Body content in tail	1/2-2/3	~ 1/2	-	~ 3/4	<1/3	~ 1/5-1/4
Ridges	50	60-68	50	60-64	34-40	37-40



**Fig. 1.** *Aulolaimus oxycephalus*, A: Anterior end; B: Female genital system; C: Posterior end. *A. mowbitius*, D: Anterior end; E: Female genital system; F: Posterior end; G: Cross section of pharynx region; H: Ventral view of vagina. *A. nannocephalus*, I: Anterior end; J: Female genital system; K: Posterior end.



**Fig. 2.** *Aulolaimus oxycephalus*, A: Anterior end; D: Vaginal sclerotization; G: Tail region. *A. mowbitius*, B: Anterior end; E: Vaginal sclerotization; H: Tail region. *A. nannocephalus*, C: Anterior end; F: Vaginal sclerotization; I: Tail region, body pores (arrows). (Scale bars: A, B, C, G, H, I = 25  $\mu$ m; D, E, F = 10  $\mu$ m; inserts in A, B, C = 5  $\mu$ m).

*Locality and habitat.* The population was collected during 2005-2007 at Ola (N38°39', E46°52') region of Arasbaran forests, north-west Iran.

*Remarks.* Based on the description of *A. oxycephalus* given by Jairajpuri and Hooper (1968) and the measurements cited by Holovachov *et al.* (2007), our population differs from the reference one in having smaller *c'* value (3.5-5.0 *vs* 5.0-8.0) and more longitudinal ridges (60-68 *vs* 50).

**AULOLAIMUS MOWHITIUS**  
(Yeates, 1967) Jairajpuri *et* Hooper, 1968  
(Table I, Figs 1 and 2)

*Measurements.* See Table I.

*Female.* Body straight upon fixation, narrow at anterior and posterior ends. Lip region narrow, slightly offset, with distinct striations in cervical region. Amphids not observed. Cuticle bearing 60-64 longitudinal ridges of equal size. Pharynx 102.5-137.5  $\mu\text{m}$  long, with a cuticularised tube, leading to a panduriform basal bulb that occupies 40-48% of the entire pharynx length. Nerve ring in the anterior half of basal bulb, 81-106  $\mu\text{m}$  from anterior end of body. Hemizonid prominent, just behind the nerve ring. Gonads paired, opposed, reflexed. Vulva cuticularised, as a transverse slit in ventral view, ventro-sub-lateral pieces of vagina oval to spherical, median pieces well developed with thick walls. Tail tapering, conical in shape, with body contents filling about 70% of total length of tail.

*Male.* Not found.

*Locality and habitat.* The population was collected during 2009 from Dizaj Tekye village (N37°25', E45°10'), Urmia, north-west Iran.

*Remarks.* The population of *A. mowhiti* described here is similar to the original description of *A. mowhiti* (Yeates, 1967), but there are two main differences from the original description and the measurements provided by Holovachov *et al.* (2007). The *b* value of our population is smaller (4.5-6.0 *vs* 6.5-9.0) compared to that in the mentioned articles, and the number of longitudinal cuticular ridges in our population is greater (60-64 *vs* 50).

**AULOLAIMUS NANNOCEPHALUS**  
Andrassy, 1972  
(Table I, Figs 1 and 2)

*Measurements.* See Table I.

*Female.* Body slender, sharply narrowing at anterior and posterior ends. Cuticle with distinct annulation in anterior region of the body and with about 37-40 longitudinal ridges, equal in size. Amphids indistinct. Body

pores present, most distinct along the anterior one-fourth of tail. Oesophageal muscular panduriform bulb comprising 40% of the entire pharynx length. Nerve ring surrounding anterior part of basal bulb at a distance of 85-90  $\mu\text{m}$  from anterior end. Hemizonid posterior to nerve ring, 96  $\mu\text{m}$  from anterior end of body. Reproductive system amphidelphic, spermatheca absent. Vagina relatively short, composed of two symmetrical median pieces and two oval ventro-sub-lateral pieces. Tail flagelliform, usually straight. Body content extending only to the anterior one-fifth of the tail, and the hyaline part occupying about one-fourth of tail.

*Male.* Not found.

*Locality and habitat.* The population was collected during 2005-2007 from Qale Joshan (N38°49', E46°43') region of Arasbaran forests, north-west Iran.

*Remarks.* This population is similar to the re-description of *A. nannocephalus* by Holovachov *et al.* (2007), but the amphids are indistinct in the present specimens.

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