

NEW DATA ON TWO INTERESTING DORYLAIMS (NEMATODA, DORYLAIMIDA) FROM IRAN

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Summary. Two interesting known dorylaims, namely *Crassolabium rhopalocercum* and *Axonchium (Syncheilaxonchium) nairi*, collected in soil of natural areas from northern Iran, were studied in depth, including detailed descriptions, a table of measurements and LM pictures. An emended diagnosis is provided for *Crassolabium rhopalocercum* since new relevant characters were observed, especially the presence of a well developed dorsal cell mass at the level of the cardia as well as some features of the female genital system. Iranian material was compared to previously known populations. *Axonchium (S.) nairi* is reported for the first time outside Europe. Iranian specimens are very similar to those described from the former Yugoslavia and differ from other European populations in their smaller general size; thus, this species may be formed of two groups of populations. Both of the species referred to above are recorded for the first time from Iran.

Key words: *Axonchium (Syncheilaxonchium) nairi*, *Crassolabium rhopalocercum*, description, morphology, taxonomy.

Dorylaims, the members of the order Dorylaimida Pearse, 1942, are an interesting group of soil and freshwater nematodes. Their abundance and diversity are comparatively high in natural areas, but decrease significantly in disturbed habitats, which is why they are regarded as good bioindicators of soil health (quality). Dorylaimid taxa are mainly free-living forms, often considered to be omnivorous and/or predators, and certainly play important roles in the food webs of the habitats they live in. They are distributed worldwide, although the fauna of many territories or regions is poorly known or remains almost unexplored.

There is no long tradition of the study of dorylaims in Iran, although several relevant contributions (Jairajpuri *et al.*, 1998; Fadaei, 2003; Fadaei *et al.*, 2003; for a brief compilation see also Pedram *et al.*, 2011) have appeared during the last 15 years, supporting the idea that the Iranian dorylaimid fauna is of great interest. During a nematological survey conducted in natural areas of northern Iran, a few specimens of two dorylaimid species were collected and their study revealed new data about them, which are presented below.

MATERIALS AND METHODS

Nematodes were extracted from soil samples by Baermann's (1917) funnel technique and Jenkins' (1964) centrifugation method. They were fixed in hot, 4% formaldehyde solution and processed to anhydrous

glycerine according to De Grisse (1969). Observations were made and measurements were taken using a Zeiss Standard 20 light microscope, and photographs were taken with a Nikon Eclipse 80i light microscope provided with differential interference contrast optics (DIC) and a Nikon Digital Sight DS-U1 camera.

DESCRIPTIONS

CRASSOLABIUM RHOPALOCERCUM (de Man, 1876) Peña-Santiago *et* Ciobanu, 2008 (Table I, Fig. 1)

Measurements. See Table I.

Female. Slender nematodes of medium size, 1.56-1.65 mm long. Body cylindrical, tapering towards the anterior end and visibly thickened at the posterior end. Habitus slightly curved ventrad upon fixation, adopting an open 'C' shape. Cuticle with fine but distinct transverse striation, more perceptible at the level of the tail; it is 2.5 µm thick in the anterior region, 3.5-4.0 µm at mid-body and 5.5 µm on the dorsal side of the tail. Lateral chord rather narrow, 5.0-7.0 µm wide at mid-body, occupying up to one-fifth (11-16%) of mid-body diameter; lateral, gland-like bodies (see remarks), if present, not perceptible in the specimens examined. Lip region rounded to very slightly angular, almost continuous with adjacent body, 3.0-3.3 times as broad as high and *ca* one-fourth (26%) of body diameter at neck base; lips amalgamated; labial and cephalic papillae very weakly protruding. Amphid fovea cup-shaped, its opening oc-

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cupying 7.0 μm or three-fifths (61%) of lip region diameter. Odontostyle robust, as thick as the cuticle at its level, 1.3-1.5 times the lip region diameter long, 6.2-7.0 times as long as wide and 0.99-1.02% of body length; aperture 7.5-8.0 μm , occupying up to one-half (46-48%) of total length. Guiding ring thin, simple, somewhat plicate, at 7-9 μm or 0.6 times the lip region diameter from anterior end. Odontophore rod-like, 1.5-1.7 times the odontostyle length. Pharynx consisting of a slender but muscular anterior portion, enlarging gradually; basal expansion 7.5-7.9 times as long as broad, 4.2-4.5 times longer than body diameter at neck base, and occupying about half (48-50%) of total neck length; pharyngeal gland nuclei obscure in the specimens examined. Cardia rounded conoid, 10-12 \times 16 μm , enveloped by intestinal tissue; a well perceptible, ring-like structure surrounds the junction between pharyngeal base and cardia, and a dorsal cellular mass about 40 μm long is present at the level of and behind the cardia. Genital system didelphic-amphidelphic, with both branches equally developed, the anterior 139-175 μm long or 9-11% of total body length, the posterior 105-165 μm

long or 7-10% of body length. Ovary reflexed, large, reaching and surpassing the sphincter level; the anterior ovary 108-175 μm , the posterior 93-152 μm long; oocytes arranged first in several rows and then in a single row. Oviduct joining ovary subterminally, 61-89 μm or 1.4-2.0 body diameters long, and consisting of a tubular part and a moderately developed *pars dilatata*. A sphincter separates the oviduct from the uterus. Uterus simple, 29-37 μm long or 0.7-0.8 times as long as corresponding body diameter. Vagina 23-27 μm long, extending inwards one-half to three-fifths (52-60%) of the corresponding body diameter; *pars proximalis* shorter than wide, 15-17 \times 16-21 μm , with convergent walls and surrounded by weak, circular musculature; *pars refringens* with (in lateral view) two small pieces, measuring 1.5 \times 4.0 μm and with a combined width of 9-12 μm ; *pars distalis* 4-5 μm long. Vulva an almost equatorial transverse slit, with a depression or small cavity of body surface behind it. Pre-rectum 1.6-2.7 times, rectum almost equal (1.0-1.1 times) to the anal body width. Posterior body region, in front of tail, visibly swollen or clavate. Tail short and rounded; terminal cuticle 8-9 μm or 36-

Table I. Morphometric data of *Crassolabium rhopalocercum* (de Man, 1876) Peña-Santiago *et* Ciobanu, 2011 and *Axonchium (Syncheilaxonchium) nairi* Altherr, 1974 (Coomans *et* Nair, 1975). Measurements in μm (except L, in mm).

Species:	<i>Crassolabium rhopalocercum</i>	<i>Axonchium (Syncheilaxonchium) nairi</i>	
Habitat:	Persian Ironwood tree	Persian Ironwood tree	
Locality:	Ghaemshahr	Ghaemshahr	
N :	4 ♀♀	5 ♀♀	4 ♂♂
L	1.6±0.04 (1.56-1.65)	2.06±0.05 (2.00-2.13)	2.01±0.01 (2.00-2.03)
a	39.9±6.9 (35-48)	38.9±4.4 (32-43)	39.6±7.2 (35-50)
b	3.9±0.1 (3.7-4.1)	2.9±0.2 (2.8-3.2)	3.1±0.3 (2.9-3.4)
c	77.8±9.6 (71-92)	98.4±5.9 (91-105)	97.1±4.0 (92-101)
c'	0.7±0.05 (0.6-0.7)	0.6±0.1 (0.5-0.6)	0.7±0.1 (0.6-0.8)
V/T	51±0.5 (50-51)	50±1 (49-51)	74 (n = 1)
Lip region diameter	12±1 (11-13)	8.1±1 (7.0-9.5)	9
Odontostyle length	17.7±1.2 (16-19)	7.8±0.5 (7-8)	7.1±0.2 (7.0-7.5)
Odontophore length	26.2±1.5 (25-28)	13.9±0.9 (13-15)	12.4±0.9 (11-13)
Neck length	411±18.7 (395-438)	697±30.4 (644-722)	658.0±47.1 (588-690)
Pharynx expansion length	198.3±4.1 (195-203)	491.2±29.9 (439-515)	449.3±39.1 (391-472)
Body diameter at:			
neck base	51.7±17 (40-77)	55.0±6.9 (49-66)	55.3±9.6 (41-61)
mid-body	49±16.7 (34-73)	53.4±7.4 (47-66)	52±8.5 (40-58)
anus/cloaca aperture	31±3.4 (29-35)	33.6±2.9 (30-38)	31±1.4 (29-32)
Pre-rectum length	61±14 (51-77)	141.5±17 (128-165)	164.6±0.5 (164-165)
Rectum/cloaca length	33.3±1.1 (32-34)	39.5±1.3 (38-41)	42.3±1.5 (40-43)
Tail length	21±2.1 (18-23)	21.0±1.2 (19-22)	20.7±0.9 (20-22)
Spicules length	-	-	48.8±0.5 (48-49)
Ventromedian supplements	-	-	6-7

39% of tail length; caudal pores as two pairs, one sub-dorsal the other lateral.

Male. Unknown.

Diagnosis (emended from Peña-Santiago and Ciobanu, 2011): body 1.36-2.10 mm long, lip region continuous or offset by weak depression and 11-14 μm wide, odontostyle 15-20 μm long or 1.3-1.5 times as long as lip region diameter, neck 368-438 μm long, pharyngeal expansion 195-203 μm long or about one-half (48-50%) of total neck length, dorsal cellular mass pre-

sent at cardia level, female genital system didelphic-amphidelphic, uterus very short (29-37 μm long or 0.7-0.8 times as long as corresponding body diameter), *pars refringens vaginae* present but poorly developed, $V = 44-51$, posterior body region visibly swollen or clavate, tail hemispheroid (18-23 μm , $c = 68-120$, $c' = 0.7-0.8$), and male unknown.

Habitat and locality. Ghaemshahr, Province of Mazandaran, Iran, where it was collected in the rhizosphere of a Persian ironwood tree [*Parrotia persica* (DC.) C.A. Mey.].

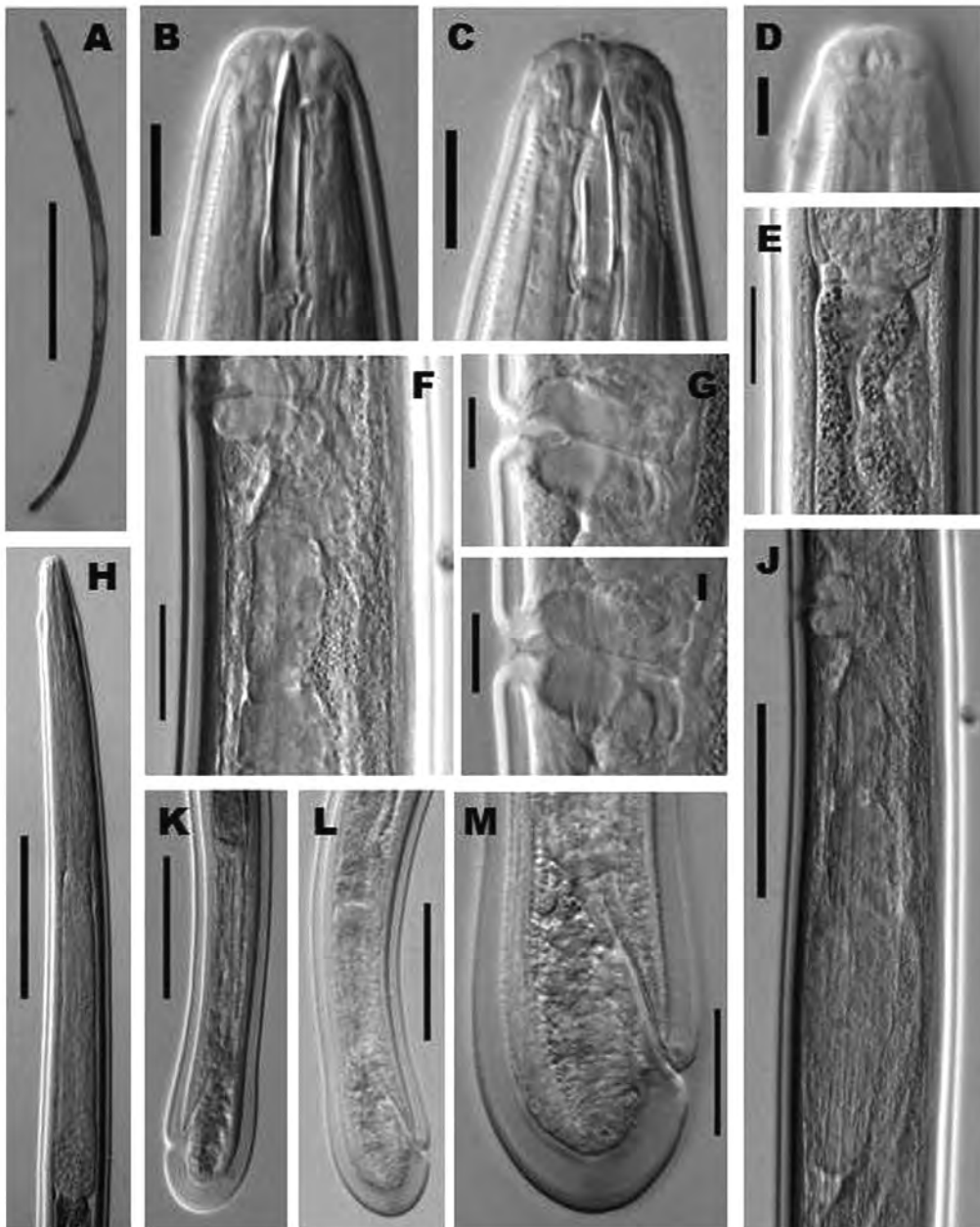


Fig. 1. *Crassolabium rhopalocercum* female. A: Entire. B, C: Anterior region in median view. C, D: Lip region in lateral, surface view. E: Pharyngo-intestinal junction showing dorsal cellular mass. F: Uterus. G, I: Vagina. J: Posterior genital branch. K, L: Posterior body region. M: Caudal region. (Scale bars: A = 500 μm ; B, C, G, I = 10 μm ; D = 5 μm ; E, F, M = 20 μm ; H = 100 μm ; J-L = 50 μm).

Remarks. *Crassolabium rhopalocercum* is one of the most frequently reported species in the genus, having been recorded from nineteen territories or countries, always in the Northern Hemisphere (*cf.* Peña-Santiago and Ciobanu, 2011). It is easily recognisable by the peculiar morphology of its female tail, distinctly swollen at the posterior part of body (Fig. 1K, L), indeed an unusual feature in *Crassolabium*. Nevertheless, available descriptions of this taxon were quite poor in details, lacking relevant features to characterize it with accuracy. For instance, the morphology of the female genital system, the presence of a dorsal cellular mass at the pharyngo-intestinal junction, and many morphometrics,

which are herein provided and illustrated by LM pictures.

The above description of the four Iranian females fits well the data of known populations (see compendium by Peña-Santiago and Ciobanu, 2011), but some differences have been also noted, such as lip region slightly narrower (*vs* 13-14 μm , after Loof, 1999), presence of a dorsal cellular mass at cardia level (*vs* previously not reported) and absence of lateral, glandular organs along the entire body (*vs* presence of these organs after Yeates, 1970). Further studies will reveal whether or not these differences are due to geographical variations of the species.

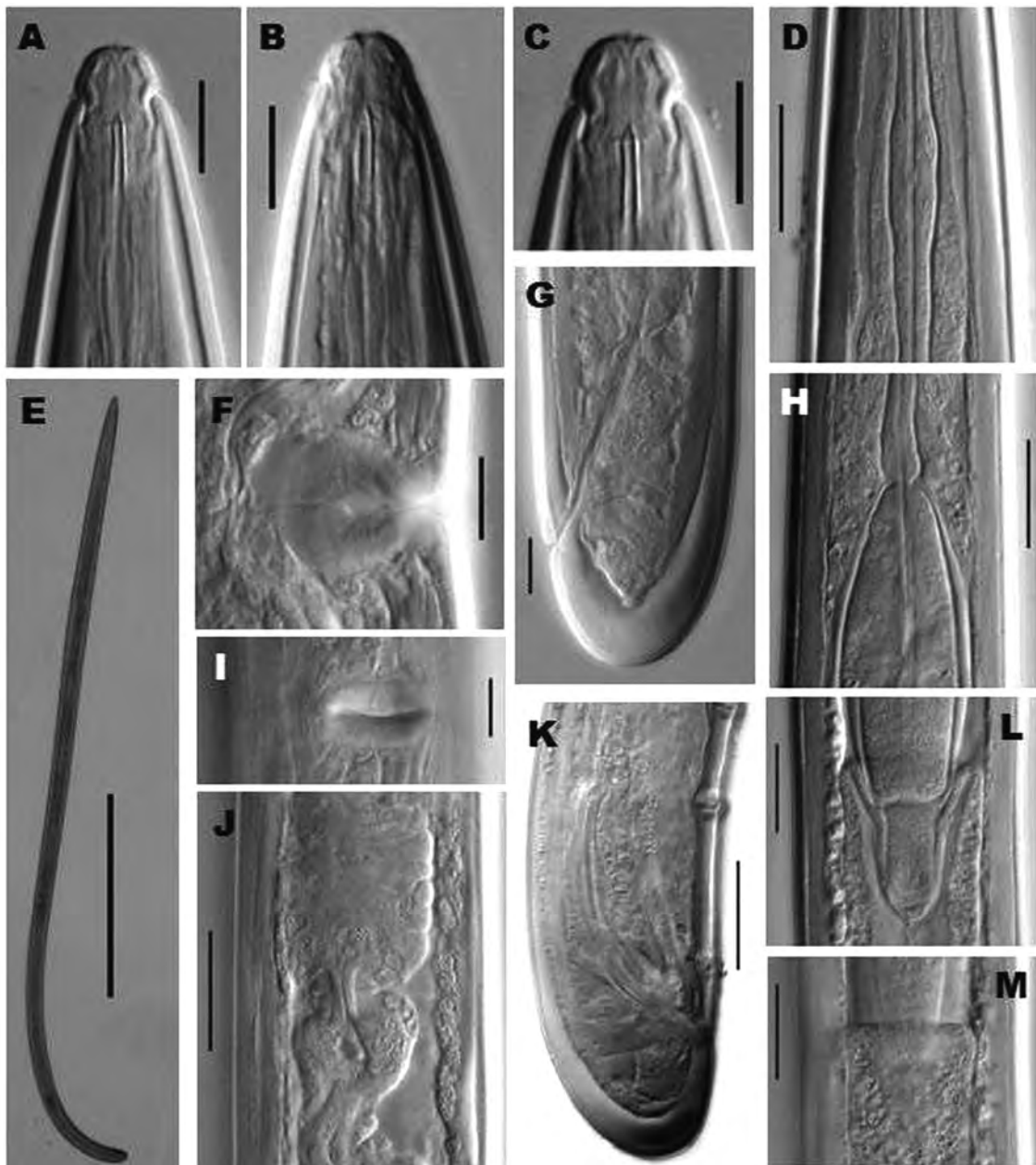


Fig. 2. *Axonchium* (*Syncheilaxonchium*) *nairi*. A-C: Anterior region in median view. D: Spindle-shaped, pharyngeal thickening behind the odontophore base. E: Male, entire. F: Vagina. G: Female, posterior body region. H: Junction between pharyngeal sections. I: Vulva in ventral view. J: Oviduct-uterus junction. K: Male, posterior body region. L, M: Pharyngo-intestinal junction. (Scale bars: A-C, F, G, I = 10 μm ; D, H, J-M = 20 μm ; E = 500 μm).

AXONCHIUM (SYNCHEILAXONCHIUM) NAIRI
Altherr, 1974 (Coomans *et Nair*, 1975)
 (Table I, Fig. 2)

Measurements. See Table I.

Adult. Very slender nematodes of medium size, 2.00-2.13 mm long. Body cylindrical, tapering towards the anterior end since the caudal region is short and rounded. Habitus nearly straight upon fixation, but curved ventrad at posterior body region in J-shaped males. Cuticle with fine but distinct transverse striation, more perceptible at level of tail; it is 1.5 μm thick in anterior region, 2.5-3.5 μm at mid-body and 6.0-8.5 μm on dorsal side of tail. Lateral chord 13 μm wide or about one-fourth (28%) of mid-body diameter in female, narrower, 3 μm or one-tenth (8%) of body diameter, in male; small gland-like bodies may be present along the body. Lip region rounded to slightly truncate anteriorly, almost continuous with adjacent body, 1.9-2.3 times as broad as high and *ca* one-fifth (18-22%) of body diameter at neck base; lips amalgamated; labial and cephalic papillae very low, not disturbing the labial contour. Amphid fovea not observed in lateral view. Cheilostom a truncate cone, lacking any differentiation. Odontostyle small, somewhat fusiform, as thick as the cuticle at its level, shorter (0.7-0.8 times) than lip region diameter, 5.0-5.6 times as long as wide and 0.33-0.38% of body length; aperture 1.5-2.5 μm , occupying one-fifth to one-third (25-33%) of total length. Guide ring thin, simple, at 7-9 μm or 0.8-0.9 times the lip region diameter from anterior end. Odontophore rod-like, 1.7-1.9 times the odontostyle length. Pharynx consisting of a slender and weakly muscular anterior portion, which is separated from the basal expansion by a distinct constriction, and with a well developed, spindle-shaped thickening containing valve-like structures, situated at 92-93 μm from anterior end; basal expansion 21-27 times as long as broad, 9-11 times longer than body diameter at neck base, and occupying more than two-thirds (67-70%) of total neck length; a very distinct spiral muscular sheath, with nearly straight muscular bands, envelopes the whole basal expansion. Cardia tongue-like, 10-12 \times 23-25 μm , surrounded by intestinal tissue which also envelopes the base of the pharyngeal expansion.

Female. Genital system monodelphic-opisthodelphic. Anterior branch 163-191 μm long or 8-9% of body length, and consisting of a uterine sac 123-151 μm long containing sperm, probably a weak sphincter and a solid mass 40 μm long representing rudiments of oviduct and/or ovary. Posterior branch well developed, 225-277 μm long or 11-14% of total body length: ovary reflexed, 151-194 μm long, with oocytes arranged first in several rows and then in single row; oviduct joining ovary subterminally, 118-167 μm or 2.3-3.6 body diameters in length, and consisting of a tubular part and a moderately developed *pars dilatata*. A sphincter separates the

oviduct and uterus. Uterus long, convoluted in the specimens examined, probably tripartite since a spherical portion is observed close to the sphincter. Vagina 25 μm long, extending inwards one-half (53%) of the corresponding body diameter; *pars proximalis* shorter than wide, 12-14 \times 16 μm , with convergent walls and surrounded by moderately developed, circular musculature; *pars distalis* 8 μm long. Vulva an almost equatorial transverse slit, 17 μm long. Pre-rectum 3.8-5.2, rectum 1.3 anal body diameters long. Tail short and rounded to hemispheroid; terminal cuticle 10-11 μm or about one-half (48-52%) of tail length; caudal pores as two pairs, one sub-dorsal, the other lateral.

Male. Genital system diorchic, with opposite testes. In addition to the ad-cloacal pair, situated at 14 μm from the cloacal aperture, there is a series of six ventro-median supplements 18-34 μm apart, the posteriormost of which is situated at 29 μm from the ad-cloacal pair, lying within the range of the spicules. Spicules dorylaimoid, curved ventrad, 5.8 times as long as wide and 1.6 times the anal body diameter long. Lateral guiding pieces 18 μm long or about six times as long as wide. Tail short and rounded, slightly straighter ventrad.

Locality and habitat. Ghaemshahr, province of Mazandaran, northern Iran, where it was collected from the rhizosphere of a Persian ironwood tree (*Parrotia persica*).

Remarks. Altherr (1974) originally described this species from Germany. Nair (1975) provided a very detailed description and fine line illustrations after studying material from Germany, the Netherlands and the former Yugoslavia, including type specimens. This, then, is the first report of the species outside Europe.

Iranian nematodes fit very well with those examined by Nair (*op. cit.*), especially the specimens from the former Yugoslavia, which differ in general size (L = 1.70-2.20 mm, five females and two males) from those from Germany (L = 2.40-2.63 mm, one female and three males) and the Netherlands (L = 2.39-2.81 mm, 11 females and five males). Two groups of populations, differing in their general size, may thus form part of this species.

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