

First report of *Anurophorus silvaticus* (Collembola: Isotomidae) for Iran

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Species of *Anurophorus* Nicolet, 1842 (Collembola: Isotomidae) mostly occur in forest habitats. They are usually dark in colors and characterised by absence of furca. During 2018, a survey was conducted for Collembola in Mazandaran province (Northern Iran). Some Isotomidae specimens were extracted from soil, moss and decaying wood samples using Tullgren funnel. Among the collected samples from family Isotomidae some specimens of *Anurophorus silvaticus* Potapov & Stebaeva, 1990 were also identified. The species is reported for the first time from Iran. We provide the description, including photos of *A. silvaticus* based on the Iranian material.

Key words: *Anurophorinae*, biodiversity, Hyrcanian forest, Mazandaran.

INTRODUCTION

In Iran, the Isotomidae with 19 genera and 54 species have the highest number of species (Shayanmehr *et al.*, 2013, 2019; Potapov *et al.*, 2015; Arba & Kahrarian, 2015; Yoosefi Lafooraki & Shayanmehr, 2014; Kahrarian *et al.*, 2015).

The genus *Anurophorus* Nicolet, 1842 includes xerophilic and mostly forest species occurring in different microhabitats including mosses and lichens on tree trunks and rocks or in dry coniferous litter (Potapov, 2001). All members of the genus have lost their furca and they have an apical bulb on forth antennal segment and tenent hairs on tibiotarsi (Potapov, 2001). Of this genus, there are 53 species known in the world, of which 26 species belong to the Caspian Sea adjacent countries (Bellinger *et al.*, 1996-2019). Only two species including *A. voiffaiti* Cassagnau & Delamare, 1955 and *A. septentrionalis* Palisia, 1966 were reported from Iran (Daghighi *et al.*, 2013; Falahati *et al.*, 2013; Kahrarian *et al.*, 2015; Mohammadi Nodehaki & Shayanmehr, 2019). Some specimens of *Anurophorus* were also collected by different Iranian collectors from Mazandaran and Golestan provinces in Iran but the species remained unknown (Yoosefi Lafooraki & Shayanmehr, 2014; Hosseini *et al.*, 2016).

In order to contribute to the knowledge of Isotomidae family in Iran, a taxonomical study was made in southern part of Caspian Sea. In the present paper we provide the description of *A. silvaticus* based on the Iranian material and morphological differences between this species and a small number of allied species are tabulated.

MATERIAL AND METHODS

Sampling was done in Mazandaran province, Northern Iran in 2018. The specimens were extracted from moss on tree trunks by Tullgren funnel and preserved in ethanol. For checking chaetotaxy of abdominal segments of specimens in genus *Anurophorus*, the specimens were mounted on ventral side in microscopic slides. Collected specimens were cleared in Nesbitt and mounted on microscopic slides using Hoyer's medium. Taxonomic keys provided by Potapov (2001) were used. All materials are deposited in the collection of Entomology lab in Department of Plant Protection, Faculty of Agricultural Sciences, University of Guilan, Rasht and Sari University of Agricultural Sciences and Natural Resources (SANRU), Sari, Iran. The following abbreviations are used: Abd.–abdominal segment; Ant.–antennal segments; Cl.–claw; Emp.–Empodium; mm–millimeter; Omma.–ommatidium; PAO.–post antennal organ; Th.–Thorax; Tita.–Tibiotarsi.

RESULTS

Family: Isotomidae

Subfamily: Anurophorinae

***Anurophorus silvaticus* Potapov & Stebaeva, 1990**

Description of Iranian specimens: Body length without antennal segments about 1.2 mm. Dark grey. Ant. I with one ventrolateral sensillum (Fig. 1-a). Ant. III with 2-3 additional sensillae. Ant. IV with slightly divided apical bulb (Fig. 1-b). With 8+8 Omma., two of them smaller and hardly visible. PAO. 2 times as long as the Omma. PAO. length to Ant. I width ratio: 0.4. Cl. without inner tooth. The ratio of length of Emp. to length of the inner edge of Cl. is 2:5. Tita. with 2, 3, 3 blunt dorsal tenent hairs. Macrochaetotaxy: 1,1/0,0,0,0. Sensillar formula: 2,2/1,1,1,2,4. Ventral chaetom: Th. I-III with 0+0, 0+0, 4+4 medial setae (Fig. 1-c), Abd. III with 4 anterior and 24 posterior setae (Fig. 1-d).

Material examined: Mazandaran, Behshahr, Abbas-Abad forest, moss on tree, decaying wood and soil (N 36°39'15", E 53°36'02"), 15.6.2018, (n=47); Qaemshahr, Jadeh-Nezami forest, soil (N 36°23'24", E 53°50'07"), 18.6.2018; (n=18); Savadkooh, Lafoor forest, moss on tree (N 36°16'52", E 52°47'36"), 22.6.2018, (n=9).

Distribution: Russia, Caucasus, Azerbaijan (Potapov, 2001).

DISCUSSION

Species of *cuspidatus*-group are characterised by presence of additional sens. on dorsal side of Ant. III and more than 12 ventromedial setae on tenacular area of Abd. III. Main differences between *Anurophorus silvaticus* and other species of *cuspidatus*-group are summarized in Table 1. They differ from each other by the number of Omma., sensillar chaetotaxy, tenent hairs shape and ratio of Emp. length to inner edge of Cl. III. *A. silvaticus* is closely related to *A. racovitzai* Denis, 1932 which can be separated by the different sensillar chaetotaxy (3,3/2,2,2,2 in *A. racovitzai* and 2,2/1,1,1,2,4 in *A. silvaticus*). *A. silvaticus* is also similar to *A. coiffaiti* Cassagnau & Delamare, 1955 and *A. cuspidatus* (Stach, 1922) which can be separated by the different shape of tenent hairs (pointed in *A. silvaticus* and clavate in *A. coiffaiti* and *A. cuspidatus*). Also, ratio of Emp. length to inner edge of Cl. III. is 2:5, 1:2 and 2:3-3:4 in *A. silvaticus*, *A. coiffaiti* and *A. cuspidatus*, respectively (Table 1).

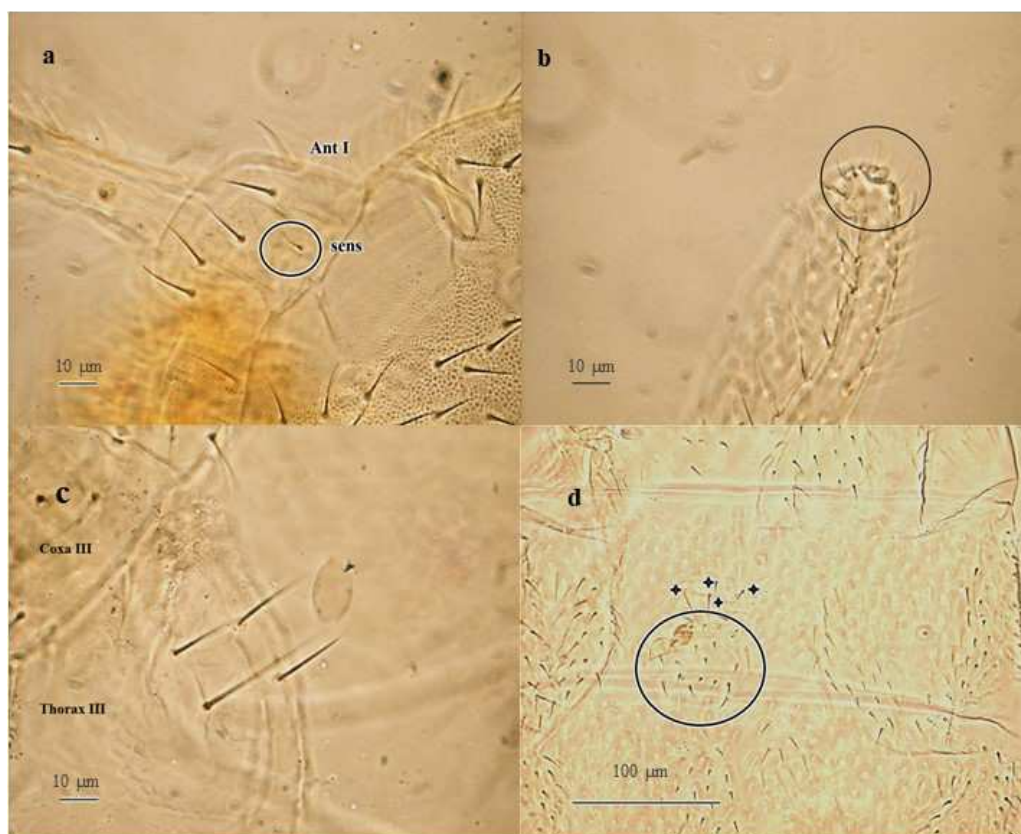


FIGURE 1. *Anurophorus silvaticus* Potapov & Stebaeva, 1990. (a) Ventrolateral sensillum (sens) on antennal segment I (Ant. I); (b) Apical bulb on antennal segment IV; (c) Thorax III with 4+4 setae on ventral side; (d) Tenacular area on ventral side of abdominal segment III with 4 anterior (shown by star) and 24 posterior setae (inside the circle). Abbreviations: sens: sensillum, Ant.: antennae.

TABLE 1. Characters comparison between *Anurophorus silvaticus* Potapov & Stebaeva, 1990 and some *Anurophorus* species belonging to *cuspidatus*-group.

Species	Number of Omma.	Tenent hairs on Tita (P: pointed; C: clavate)	Emp. length/ inner edge of Cl. III	Number of sensillae on Th. II/III	Number of sensillae on Abd. I/II/III/IV/V
<i>Anurophorus silvaticus</i>	8+8	P	2/5	2/2	1/1/1/2/4
<i>A. coiffaiti</i>	8+8	C	1/2	2/2	1/1/1/2/4
<i>A. cuspidatus</i>	8+8	C	2/3-3/4	2/2	1/1/1/2/4
<i>A. racovitzai</i>	8+8	P	2/5	3/3	2/2/2/2/?

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