

# Tullbergiidae fauna (Collembola) in Kermanshah province (Iran) with addition of new records

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KAHRARIAN, M., VAFAEI-SHOUSHTARI, R., SOLEIMANNEJADIAN, E., SHAYANMEHR, M., & SHAMS-ESFANABAD, B.: *Tullbergiidae fauna (Collembola) in Kermanshah province (Iran) with addition of new records.*

**Abstract:** In this study, the fauna of Tullbergiidae was investigated in different regions of Kermanshah province during 2012-2014. The specimens were collected from the surface layer of soil and leaf litter. Totally 6 species and 3 genera were found. The species *Metaphorura denisi* (Bagnall, 1935), *M. macrochaeta* (Rusek, 1976), *M. italica* (Thibaud, 1996), *M. hylophila* (Rusek, 1982) and *Fissuraphorura duplex* (Lucianez & Simon, 1992) are new for the fauna of Iran; it is also the first time that the genera *Fissuraphorura* (Rusek, 1991) is reported for the fauna of Iran. More ever the species *Fissuraphorura duplex* is reported for the first time from Asia.

**Keywords:** new genera, new species, Iranian fauna.

## Introduction

Collembola are one of most abundant soil animals in most terrestrial ecosystems. Among Collembola, Tullbergiidae is one of the smallest collembolan family and easily recognized by very small size (0.4-1.5 mm except *Tullbergia antarctica* Lubbock, 1876 which is 3-4 mm), without pigmentation, eyes and furcula (PALACIOS-VARGAS & SALAZAR- MARTINEZ 2014). The body chaetotaxy of the taxa are very similar, and the main differences among the genera are the sense organ structure of antennal organ III, and the chaetotaxy of the antennal segment IV. The type and number of the pseudocelli and the shape and number of vesicles of postantennal organ are important in identification of species and genera level (PALACIOS-VARGAS & CATALAN 2013).

Although Tullbergiidae has a total of 32 genera and 216 species in the world (BELLINGER et al. 2013); but only 7 species in 4 genera are known from Iran (COX 1982, YOOSEFI-LAFOORAKI & SHAYANMEHR 2013, SHAYANMEHR et al. 2013 and FALAHATI et al. 2013). These species have been found in Iranian localities such as Central part, Mazandaran, Gilan, E. Azarbaijan, Zanjan, a part of Kermanshah province and Kohgiluyeh associated whit soils with high organic matter content. The lack of studies in other parts of the country could explain their absence in other Iranian locations.

The first study on Tullbergiidae was carried out by COX (1982). He listed Collembola fauna (70 species belonging to 30 genera in 5 families) from the northwestern and central north provinces of the country, which 3 species of them were belonging to Tullbergiidae (COX 1982). After that, other Iranian researchers have just added a few species (3 species and one genus) of this family to the Collembolan fauna of Iran (DAGHIGHI 2012, FALAHATI et al. 2013 and GHARAMANINEZHAD et al. 2013).

Kermanshah is one of Iranian province which located in the middle of the western part of Iran. The preliminary investigation on springtails in Kermanshah was made by KAHRARIAN et al. (2012). They reported 6 families, 15 genera and 9 species which none of them belonged to Tullbergiidae. Data on the Kermanshah fauna of Tullbergiidae are scarce. Prior to this work, only GHARAMANINEZHAD et al. (2013) have studied on this family and reported *Metaphorura affinis* for fauna of Kermanshah (GHARAMANINEZHAD et al. 2013).

## Material and methods

This study was carried out during 2012-2014. All specimens were collected from a total of 10 sites ranging in elevation from 566 m to 2302 m a.s.l. from the surface layer of soil and leaf litter (Table 1). The samples were retained in white plastic boxes and transferred to the Lab. The species were extracted by Berlese funnel, fixed in 75% ethanol and cleared in a Nesbitt solution and mounted on slides with Hoyer medium. FJELLBERG's terminology (1998, 2007) was applied for preliminary description and confirmed by Dr. Igor Kaprus.

*Abbreviations:* Ant. = antennal segment; Abd. = abdominal segment; PAO = postantennal organ; PSO= pseudocelli; Th. = thoracic tergite.

**Table 1: Information on the identified species from Kermanshah provinces (Iran)**

Species	County/area/Village	N	E	Elevation
<i>Metaphorura denisi</i>	Osmancvand / Patat village	33°57.746'	047°18.723'	1955
	Sar-e-pol-e- Zahab/ Patagh	34°25.773'	046°00.136'	1034
	Chahar zebar-e-oliya	34°13.134'	046°40.074'	1592
	Paveh/Shabank areh village	34°52.978'	046°30.760'	1632
	Sar-e-pol-e-Zahab/Ghalshshahin	34°25.590'	045°54.346'	566
	Sar-e-pol-e-Zahab/Sorkkeh Direh	34°23.560'	046°03.191'	1290
<i>Metaphorura affinis</i>	Chahar zebar-e-oliya	34°13.134'	046°40.074'	1592
	Sar-e-pol-e- Zahab/ Patagh	34°25.773'	046°00.136'	1034
	Paveh/Shabank areh village	34°52.978'	046°30.760'	1632
<i>Mesaphorura macrochaeta</i>	Sar-e-pol-e- Zahab/ Patagh	34°25.773'	046°00.136'	1034
	Paveh/Shabank areh village	34°52.978'	046°30.760'	1632
	Eslamabad-e-gharb/Harasam	33°51.399'	046°50.868'	2302
<i>Mesaphorura italica</i>	Sar-e-pol-e- Zahab/ Patagh	34°25.773'	046°00.136'	1034
	Chahar zebar-e-oliya	34°13.134'	046°40.074'	1592
<i>Mesaphorura hylophila</i>	Eslamabad-e-gharb/Harasam	33°51.399'	046°50.868'	2302
<i>Fissuraphorura duplex</i>	Osmancvand/Cheshmeh Sorkh	33°58.319'	047°18.018'	1913

## Results and Discussion

A total of 6 species of Tullbergiidae belonging to 3 genera were identified from Kermanshah by this research. The information of collected species is presented in Table 1. The species *Metaphorura denisi* (Bagnall, 1935), *M. macrochaeta* (Rusek, 1976), *M. italica* (Thibaud, 1996), *M. hylophila* (Rusek, 1982) and *Fissuraphorura duplex* (Lucianez & Simon, 1992) are new for the fauna of Iran; it is also the first time that the genera *Fissuraphorura* (Rusek, 1991) is collected and reported for the fauna of Iran.

### Remarks on collected species

Genus: *Metaphorura* Stach, 1954

#### *Metaphorura affinis* (Stach, 1954)

*Examined material:* 19 exx, soil and leaf litter under Oak trees (*Quercus infectoria*), Shabankareh village, Paveh County, April, November, 2013 and January, 2014; 17 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Chahar zebare-oliya area, Kermanshah county, December, 2013 and March, 2014; 1 ex, soil and leaf litter under Oak trees (*Q. infectoria*), Patagh area, Sar-e-pol-e-Zahab county, March, 2014.

A common species of the Palearctic region. *M. affinis* has been reported previously from Iran (COX 1982, DAGHIGHI 2012, GHARAMANI NEZHAD et al. 2013). *M. affinis* is a relatively large member of the subfamily Tullbergiinae. The species is white, blind and possesses an elliptical post-antennal organ with about 20 to 25 simple lobes. There is a tiny needle-shaped empodium on the foot. The most characteristic feature is the presence of a small conical projection on the sixth abdominal segment (abd.6) ventral to the two anal spines (<http://ws1.roehampton.ac.uk/collembola>).

#### *Metaphorura denisi* (Bagnall, 1935)

*Examined material:* 35 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Osmaneavand area (Patat and Abran village), Kermanshah county, December, 2013 and January 2014; 34 exx, soil and leaf litter under Willow tree (*Salix* sp.), Ghaleh Shahin area, Sar-e-pol-e-Zahab County, April, 2014; 18 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Patagh area, Sar-e-pol-e-Zahab county, January and March, 2014; 7 exx, soil and leaf litter under walnut trees (*Juglans regia*), Sorkkeh direh village, Sar-e-pol-e-Zahab County, January, 2014; 6 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Chahar zebare-oliya area, Kermanshah county, November, 2013 and March, 2014; 5 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Shabankareh village, Paveh County, April, November, 2013 and January, 2014.

It represents the first record of this species in Iran. It is very similar to *M. affinis* but can be recognized by pseudocellar formula. In *M. affinis* pseudocellar formula is 11/111/11111 whilst in *M. denisi* it is 11/122/22221 (FJELLBERG 1998).

#### *Mesaphorura macrochaeta* (Rusek, 1976)

*Examined material:* 40 exx, soil and leaf litter under walnut trees (*J. regia*), Sorkkeh direh village, Sar-e-pol-e-Zahab County, January, 2014; 2 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Shabankareh village, Paveh County, November, 2013 and January, 2014; 1 ex, soil and leaf litter under Elm trees (*Ulmus* spp.), Harasam village, Eslam abad-e-Gharb County, March, 2014.

A cosmopolitan species but it is the first record of this species in Iran. *M. macrochaeta* can be recognized by the five setae in tibiotarsal 'B' ring, seta  $a_2$  present on th.3, distance between  $p_1$  setae on abd.4 shorter than the distance between the  $p_2$  setae, seta  $m_0$  on abd.4 absent, 3+3 short setae on abd.5 between the long  $a_4$  setae and anal setae  $l_2$

present this latter character is the only discernible difference from *M. krausbaueri* in which anal setae  $l_2$  are absent. The PSO formula of *M. macrochaeta* is 11/011/10011 (<http://www.stevehopkin.co.uk>).

***Mesaphorura italica*** (Thibaud, 1996)

*Examined material:* 43 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Patagh area, Sar-e-pol-e-Zahab county, January and March, 2014; 14 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Chahar zebar-e-oliya area, Kermanshah county, November, 2013 and March 2014.

A common species of the Palearctic region (FJELLBERG 1998). In Iran this species is reported for the first time. *M. italica* is similar to other species of *Mesaphoura*, but can be recognized by present of  $m_5$  in abd. IV and position of pseudocelli on th.2 (between  $p_5$ - $m_5$ ) (FJELLBERG 1998).

***Mesaphorura hylophila*** (Rusek, 1982)

*Examined material:* 14 exx, soil and leaf litter under Elm trees (*Ulmus* spp.), Harasam village, Eslam abad-e-Gharb County, March, 2014.

Widely distributed and Palearctic. It is the first citation of this species in Iran. *M. hylophila* differs from other species by absence of seta  $a_2$  on th.3 (FJELLBERG 1998). Other character is present of pseudocelli on th.2 between  $p_5$ - $m_5$  (similar to *M. italica*), and seta  $m_4$  absent on abd.4.

Genus: ***Fissuraphorura*** (Rusek, 1991)

It is the first citation of this genus in Iran. In this study one species of this genus is known. The anal spines are simple in this genus. Body pigmentation is absent. Distal end of tibiotarsi without clavate setae or seldom with few weakly developed ones. First thoracic segment with 1 + 1 pseudocelli. Fourth antennal segment without extreme large apical papilla. Postantennal organ with 6-8 coffee-bean-like vesicles in 2 rows. Sense organ of third antennal segment in adults with 2-3 greatly thickened dorsal sensory clubs. Sixth abdominal segment without midventral projection also without dorsolateral spines in front of posterior anal spines (<http://www.Collembolan.org>).

***Fissuraphorura duplex*** (Lucianez & Simon, 1992)

*Examined material:* 4 exx, soil and leaf litter under Oak trees (*Q. infectoria*), Osmanevarand area (Cheshmeh Sorkh village), Kermanshah county, January 2014.

It is the first citation of this species in Iran and Asia. Body length about 1 mm. granulation relatively fine, somewhat coarser on the head and Abd V+VI. Ant shorter than head diagonal. Ant IV with 5 thickened sensilla (a-e) two sensory rods (f, g) and a ventro-apical papilla. Ant III O as typical for the genus. PAO elongate with a superficial furrow. Pseudocelli of adults with 3-6 stripes in the center. Tibiotarsi without spatulate hairs. Claw without teeth, empodial appendage rudimentary. VT with 7+7 setae (DUNGER & SCHLITT 2011)

### Key to genera and species of Tullbergiidae in Kermanshah province (Iran)

1. Sixth abdominal segment with midventral projection - best seen in ventral view, number of anal spines two, Dorsum of sixth abdominal segment without supplementary spines Genus *Metaphorura* ..... 5
  - Sixth abdominal segment without midventral projection ..... 2
2. Sense organ of third antennal segment with 3 sense clubs, sixth abdominal segment dorsally smooth except for crescentic ridges at anterior border, PAO elongated, with 18-68 vesicles in 2-3 rows Genus *Mesaphorura* ..... 3
  - Sense organ of third antennal segment with 2 sense clubs, sixth abdominal segment with 1 + 1 dorsolateral spines in front of posterior anal spines, PAO with 6-8 long oval vesicles in 2 rows, first to third abdominal segment with 2 + 2 pseudocelli each, (Genus *Fissuraphorura*) ..... *Fissuraphorura duplex*
3. Abd. IV seta p1 is microseta, abd. V seta a2 is as long as a1, mesothorax medial pseudocelli between p5-m5; abd. VI seta l2' absent, metathorax seta a2 present, abd. IV seta m5 present ..... *Mesaphorura italica*
  - Abd. IV seta p1 is macroseta, ..... 4
4. Abd. V seta a2 is as long as a1, mesothorax medial pseudocelli between p3-p4, abd. IV seta m5 present, metathorax seta a2 present, abd. VI seta l2' present in the anal lobe ..... *Mesaphorura macrochaeta*
  - Abd. V seta a2 absent, mesothorax medial pseudocelli between p5-m5; abd. IV seta m5 absent; abd. VI seta l2' absent, metathorax seta a2 absent; abd. IV seta m4 absent ..... *Mesaphorura hylophila*
5. Pseudocellar formula 11/111/11111 ..... *Metaphorura affinis*
  - Pseudocellar formula 11/122/22221 ..... *Metaphorura denisi*

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