

# A faunistic study on Entomobyridae (Collembola) in Kermanshah (Iran)

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KAHRARIAN, M., VAFAEI-SHOUSHTARI, R., SOLEYMANNEZHADYAN, E., SHAYAN MEHR, M., JORDANA, R. & SHAMS, B.: *A faunistic study on Entomobyridae (Collembola) in Kermanshah (Iran)*.

**Abstract:** In this study, we have investigated Entomobyridae fauna in different regions of Kermanshah during 2012. Totally 10 species, 5 genera, 3 subfamilies were found. The specimens were extracted by Berlese funnel from soil, leaf litter and grassland. 1 genera and 6 species, are new records for Iranian fauna. The general and Iranian distributions beside of short morphological information on species according to JORDANA (2012) were given.

**Keywords:** Collembola, Entomobyridae, Iran, Kermanshah.

## Introduction

Collembola are one of most abundant soil animals in most terrestrial ecosystems. Among Collembola, Entomobyridae species are easily recognized by an enlarged fourth abdominal segment and well developed furcula. Some species in this family may be heavily scaled and can be very colorful.

Iranian Collembola fauna were not investigated in many parts of Iran. Recently, some researchers have studied the biodiversity of springtails locally (MORAVVEJ et. al., 2007; NEMATOLLAHI et. al., 2009, YAHYAPOUR 2012, KAHRARIAN et. al., 2012 and 2013, DAGHIGHI 2012). 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 from different regions of Kermanshah.

## Materials and methods

This study was carried out during the period of April to September 2012 in Kermanshah region. Samples were collected from the surface layer of soil, leaf litter and grassland. The species were extracted by Berlese funnel and fixed in 75% ethanol. Terminology for the description follows that given in FJELLBERG (1998, 2007) and some of them were sent to Dr. Rafael Jordana for identification to species level.

## Results and discussion

A total of 11 species of Collembola belonging to 3 subfamilies and 5 genera were collected and identified from Kermanshah by this research. The information of collected species is presented in Table 1. The species, *Entomobrya mesopotamica*, *E. schoetti*, *E. nigrocincta*, *Pseudosinella baghdadica*, *Heteromurus sexoculatus* and genera *Drepanura* are new for Iranian fauna. Also all of recorded species by this study are recorded for the first time from Kermanshah province.

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

Species	Subfamily	Location	Date	Habitat	Altitude (m)
<i>Entomobrya mesopotamica</i> Rusek, 1981	Entomobryinae	Sarabe-bid	May, 2012	Walnut	1890
		Sorkh	June, 2012	Apple	2244
		Gahvareh			
<i>Entomobrya schoetti</i> Stach, 1922	Entomobryinae	Gahvareh	June, 2012	Apple	2244
<i>Entomobrya nigrocincta</i> Denis, 1923	Entomobryinae	Qal'eh	May, 2012	Elm	2302
		Harasam	June, 2012	Buttwnwood (chenar)	2602
		Char Zebar			
<i>Pseudosinella baghdadica</i> Rusek, 1981	Lepidocyrtinae	Derkah	May, 2012	Walnut andCherry	1911
		Harsin	June, 2012	Walnut	1543
		Satar	May, 2012	Apricots	1696
		Quri Qal'eh	April, 2012	Walnut	1624
		Tamark	June, 2012	Walnut	1208
		Gerdeh Now	May, 2012	Straw	1039
<i>Heteromurus sexoculatus</i> Brown, 1926	Orcheselinae	Char Zebar	June, 2012	Buttwnwood (chenar)	2602
<i>Drepanura</i> sp. Schött, 1891:19	Entomobryinae	Parviz Khan	May, 2012	Straw	1169

**Subfamily: Lepidocyrtinae*****Pseudosinella octopunctata* Borner, 1901**

*Material examined:* 5 specimens, Sahneh, Derkah, Walnut and Cherry, (N34°27.654/E 047°40.700/1911 m a.s.l) May, 2012. 5 specimens, Sonqor, Khaneghah-e-Sofla, Buttonwood (Chenar), (N034°51.397/E 047°30.942/1800 m a.s.l) May, 2012. 9 specimens, Gilan-e-Gharb, Kaseh Garan, Oak, (N034°05.167/E 046°01.941/1621 m a.s.l) May, 2012. 8 specimens, Sar-e-pol-e- Zahab, Patagh, Berry, (N34°24.863/E 046°00.076/1451 m a.s.l) May, 2012. 1 specimen, Sar-e-pol-e- Zahab, Qareh Bolagh, Eucalyptus, (N34°28.583/E 045°49.344/1070 m a.s.l) May, 2012. 2 specimens, Sar-e-pol-e- Zahab, Rijab, Plum, (N34°28.423/E 045°58.524/2041 m a.s.l) August, 2012. 1 specimen, Qasr-e-shirin, Parviz khan, Straw, (N 34°33.151/E 045°35.144/1169 m a.s.l) May, 2012. 3 specimens, Kangavar, Ghoreh Jil, Walnut, (N34°28.830/E 047°55.756/1503 m a.s.l) May, 2012. 1 specimen, Sahneh, Samangan-e-Olya, Walnut, (N 34°26.856/E 047°33.404/2076 m a.s.l) May, 2012. 8 specimens, Paveh, Shahu, Walnut, (N34°56.352/E 046°27.471/1663 m a.s.l) May, 2012. 5 specimens, Harsin, Harsin, Buttonwood (chenar), (N34°16.001/E 047°34.593/1534 m a.s.l) June, 2012. 11 specimen, Kermanshah, Sarab-e-Nilufar, Cedar, (N34°24.584/E 046°50.973/2367 m a.s.l) May, 2012. 2 specimens, Gahvareh, Kand-e-Rashid Khan, Walnut and Plum, (N34°25.127/E 046°28.247/2061 m a.s.l) June, 2012. 8 specimens, Eslamabad-e-gharb, Qal'eh Harasam, Elm, (N33°51.399/E 046°50.868/2302 m a.s.l) May, 2012. 1 specimen, Tazeh abad, Sia Tahir, Oak, (N34°45.452/E 046°12.046/1294 m a.s.l) April, 2012. 4 specimens, Javanrud, Safi Abad, Walnut, (N34°47.663/E 046°31.229/898 m a.s.l) April, 2012. 2 specimens, Javanrud, Kani Gavhar, Grassland, (N34°46.799/E 046°25.983/1330 m a.s.l) April, 2012. 11 specimen, Sonqor, Satar, Apricots, (N34°49.394/E 047°27.429/1696 m a.s.l) May, 2012. 2 specimens, Kermanshah, char zabar, Buttonwood (chenar), (N34°14.484/E 046°41.583/2602 m a.s.l) June, 2012. 11 specimen, Sonqor, Kartoeej, Apple, (N34°37.242/E 047°16.935/1770 m a.s.l) May, 2012. 2 specimens, Harsin, Tamark, Walnut, (N34°15.738/E 047°39.032/1208 m a.s.l) June, 2012. 15 specimens, Tazeh abad, Gerdeh Now, Straw, (N34°43.022/E 045°48.202/1039 m a.s.l) May, 2012. 4 specimens, Eslamabad-e-gharb, Sia Khor, Oak, Grassland, September, 2012. 1 specimen, Sar-e-pol-e- Zahab, Habibvand, Wheat, (N34°25. 938/E 045°56.730/1454 m a.s.l) September, 2012.

*Distribution:* This species was Cosmopolitan. In Iran this species was recorded from Central, Mazandaran, Gilan, E. Azarbaijan, W. (Cox 1982).

*Description:* Body size up to 1.1 mm. Color white, with diffuse bluish grey pigment on antennae and dorsal and ventral side of head, body with scattered brownish red pigment. Ocelli 4+4, set on square eye-spot. Maxillary outer lobe with 3 sublobal hairs and a small spine. Head with both macrochaetae S and T present. Trichobothrial microsetae all slim and smooth, also on third abdomen segment. Segment 4 of abdomen with 3+3 macrochaetae in the median field. Setae of the trichobothrial fields smooth, except one. Claws narrow, with small paired inner teeth, posterior slightly larger and more distal than anterior. Lateral teeth small, set beyond middle of unguis. Unguiculus narrow lanecolate, without distinct teeth (FJELLBERG 2007).

**Subfamily: Lepidocyrtinae*****Pseudosinella baghdadica* Rusek, 1981**

*Material examined:* 1 specimen, Sahneh, Derkah, Walnut and Cherry, (N34°27.654/E 047°40.700/1911 m a.s.l) May, 2012. 3 specimens, Harsin, Harsin, Walnut (N34°16.001/E 047°34.593/1543 m a.s.l) June, 2012. 2 specimens, Harsin, Harsin, Buttonwood (chenar) (N 34°16.001/E 047°34.593/1543 m a.s.l) June, 2012. 1 specimen, Sonqor, Satar,

Apricots, (N34°49.394/E 047°27.429/1696 m a.s.l) May, 2012. 5 specimens, Paveh, Quri Qal'eh, Walnut, (N34°53.902/E 046°30.048/1624 m a.s.l) April, 2012. 15 specimens, Harsin, Tamark, Walnut, (N34°15.738/E 047°39.032/1208 m a.s.l) June, 2012. 1 specimen, Tazeh abad, Gerdeh Now, Straw, (N34°43.022/E 045°48.202/1039 m a.s.l) May, 2012.

*Description:* Maximum length up to 0.79 mm (0.61 to 0.79). in the head R1, R2, R3 S, T, P Mc present, Eyes 2+2, Labium M1 (M2)-EL1L2, r absent and all setae ciliated macrochaeta, Thorax I 1 Mc, Th II 0 Mc, Abd II pABQq (3 Mc), Abd IV with 1+2 Mc and without supplementary setae. Claw with 4 teeth, 2 basal with short wing shape, empodium serrated in the external edge.

### **Subfamily: Entomobryinae**

#### ***Entomobrya lindbergi* Stach, 1960**

*Material examined:* 4 specimens, Sahneh, Derkah, Walnut and Cherry, (N34°27.654/E 047°40.700/1911 m a.s.l) May, 2012. 1 specimen, Harsin, Harsin, Walnut, (N34°16.001/E 047°34.593/1543 m a.s.l) June, 2012. 8 specimens, Kermanshah, Sarab-e-Nilufar, Cedar, (N34°24.584/E 046°50.973/2367 m a.s.l) May, 2012.

*Distribution:* This species was recorded from Afghanistan, Egypt, UAE, Yemen. In Iran, this species was recorded from Gilan/Rasht (DAGHIGHI 2012) and Tehran (MORAVVEJ 2003).

*Description:* Body length up to 2-3 mm excluding antennae, according to Stach (1963). Body color pattern is as long strip in lateral side. Head: antennal length 1039  $\mu$ m, 2-3 times the length of the head, Ant IV with bilobed apical vesicle. Relative length of Ant I/II/III/IV = 1.5/3/2.7/3.3.4 labral papillae wrinkled or with some projections. 8 Ommatidium. Length ratio of Abd IV/III < 4.

Claw with 4 teeth on internal edge: first pair at 50% distance from base of claw, and 2 unpaired teeth, first one at 75% distance from base and the most distal one minute. Dorsal tooth basal. Empodium spike-like, with smooth external edge on leg III. Furca length 900  $\mu$ m. Manubrial plate with 3-5 chaetae and 2 psp. Mucro with 2 teeth, antero-apical tooth bigger than the apical one. Mucronal spine present (JORDANA 2012).

### **Subfamily: Entomobryinae**

#### ***Entomobrya mesopotamica* Rusek, 1981**

*Material examined:* 1 specimen, Sahneh, Sarab-e-Bid Sorkh, Walnut, (N 34°26.641/E 047°46.900/1890 m a.s.l) May, 2012. 4 specimens, Gahvareh, Gahvareh, Apple, (N 34°19.370/E 046°26.164/2244 m a.s.l) June, 2012.

*Distribution:* This species was recorded from Baghdad, Al Jadriyah. In Iran this species was recorded for the first time.

*Description:* Body length up to 1.6 mm excluding antennae according to original description. Body colour pattern as in Fig. 1. Head: Antennal length 590  $\mu$ m, 2-3 times the length of the head, Ant IV with a simple apical vesicle. Relative length of Ant I/II/III/IV = 1/2.4/2.2/3.4 labral papillae with a chaeta-like projection. 8 Ommatidium. Length ratio of Abd IV/III > 4.

Claw with 4 teeth on internal edge: first pair at 45% distance from base of claw, and 2 unpaired teeth, first one at 71% distance from base and the most distal one minute. Dorsal tooth approximately at the level of internal pair of teeth. Empodium spike-like, with smooth external edge on leg III. Furca length 590  $\mu$ m. Manubrial plate with 4 chaetae and 2 psp. Mucro with 2 teeth, antero-apical tooth smaller than the apical one. Mucronal spine present (JORDANA 2012).

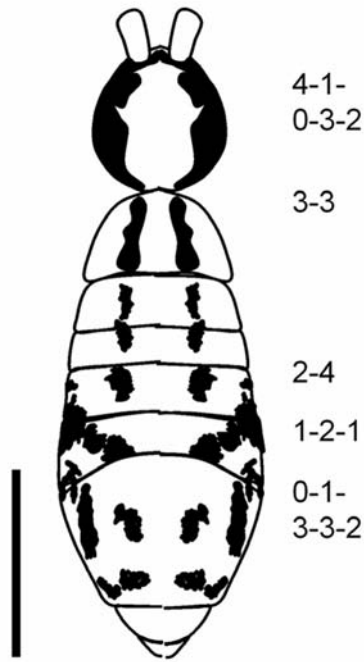


Fig. 1: Body colour pattern in *Entomobrya mesopotamica* (JORDANA 2012)

**Subfamily: Entomobryinae**

***Entomobrya schoetti* Stach, 1922**

*Material examined:* 1 specimen, Gahvareh, Gahvareh, Apple, (N 34°19.370/E 046°26.164/2244 m a.s.l) June, 2012.

*Distribution:* This species was recorded from all over Europe. In Iran this species was recorded for the first time.

*Description:* Body length up to 2 mm excluding antennae, according to Jordana and Baquero, 1999. Pattern color is very variable, from white to dark. Head: Antennal length 981  $\mu$ m, 2-3 times the length of the head, Ant IV with bilobed apical vesicle. Relative length of Ant I/II/III/IV = 1/1.8/1.6/2.0.4 labral papillae wrinkled or with some projections. 8 Ommatidium. Length ratio of Abd IV/III < 4.

Claw with 4 teeth on internal edge: first pair at 40% distance from base of claw, and 2 unpaired teeth, first one at 65% distance from base and the most distal one minute. Dorsal tooth basal. Empodium spike-like, with smooth external edge on leg III. Furca length 797  $\mu$ m. Manubrial plate with 4 chaetae and 2 pseudopora. Mucro with 2 teeth, subapical tooth in size similar to the apical one. Mucronal spine present (JORDANA 2012).

**Subfamily: Orcheselinae**

***Heteromurus major* Moniez, 1889**

*Material examined:* 3 specimens, Kermanshah, Chalabeh, Oak, April, 2012. 1 specimen, Harsin, Harsin, Walnut, (N 34°16.001/E 047°34.593/1543 m a.s.l) June, 2012. 1

specimen, Paveh, Shahu, Walnut, (N 34°56.352/E 046°27.471/1663 m a.s.l) May, 2012. 4 specimens, Harsin, Harsin, Buttonwood (chenar), (N 34°16.001/E 047°34.593/1534 m a.s.l) June, 2012. 5 specimens, Harsin, Chaqa Kabud, Apricots, (N 34°16.611/E 047°28.812/1419 m a.s.l) June, 2012. 1 specimen, Ravansar, Borhan-od-din, Grassland, (N 34°46.799/E 046°25.983/1330 m a.s.l) April, 2012. 8 specimens, Kermanshah, Char Zabar, Buttonwood (chenar), (N 34°14.484/E 046°41.583/2602 m a.s.l) June, 2012. 4 specimens, Paveh, Quri Qal'eh, Walnut, (N 34°53.902/E 046°30.048/1624 m a.s.l) April, 2012. 11 specimen, Harsin, Tamark, Walnut, (N 34°15.738/E 047°39.032/1208 m a.s.l) June, 2012.

*Distribution:* Widely distributed, In Iran this species was recorded from Central, Mazandaran, Gilan, E. Azarbaijan (COX 1982), Mazandaran /Sari (YAHYAPOUR 2012), Gilan/Rasht (DAGHIGHI 2012).

*Description:* Length up to 3.0 mm, generally up to 2.5 mm. Coloration variable. Typical pattern composed of pigment distributed throughout antennae (more conspicuous on Ant 3-5), anterior and lateral portions of head, anterior 1/3 of mesonotum, lateral margins of Thorax 2, Abdomen 1, and throughout legs, especially on femora and tibiotarsi. Light pigment sometimes along borders of body segments. Lighter and darker individuals, as well as all intergrades, may occur sympatrically. Antennae about 0.4 lengths of head and body combined. Eyes 8&8 on dark patches. Labral papillae absent (YAHYAPOUR 2012).

#### **Subfamily: Orcheselinae**

*Heteromurus nitidus* Templeton, 1835

*Material examined:* 1 specimen, Harsin, Harsin, Walnut, (N 34°16.001/E 047°34.593/1543 m a.s.l) June, 2012.

*Distribution:* This species is Cosmopolitan. In Iran this species was recorded from Mazandaran and Gilan (COX 1982).

*Description:* Body size up to 2.0 mm. white or with diffuse reddish pigment on body and under the 1+1 ocelli. Head and body with blunt finely striate scales which are also present on antennae, legs and furca. Maxillary lamellae not fused, individual lamellae distinct. Maxillary outer lobe with simple palp, 3 sublobal hairs and a spinule. All setae of the mouth region, frontoclypeal field and ventral side of head are smooth. Manubrium with about 10+10 smooth dorsal setae, dens with one dorsal smooth seta near base. Lower and flaps with two smooth macrochaetae. Ventromanubrial thickening with 2-3 small teeth. Tibiotarsi with a double row of smooth setae on the inner side. Apical tenent hair short, pointed. Claws with a pair of small subequal inner teeth set in the middle of unguis ventral edge, sometimes with a weak distal tooth in distal 1/3. Lateral teeth small, set near base. Unguiculus with a ventral tooth (FJELLBERG 2007).

#### **Subfamily: Entomobryinae**

*Entomobrya handschini* Stach, 1922

*Material examined:* 4 specimens, Harsin, Harsin, Apricots, (N 34°16.611/E 047°28.812/1419 m a.s.l) June, 2012. 3 specimens, Kermanshah, Sarab-e-Nilufar, Cedar, (N 34°24.584/E 046°50.973/2367 m a.s.l) May, 2012.

*Distribution:* This species was recorded from Slovakia, Austria, Bulgaria, Greece, Hungary, Poland, West Ukraine, Georgia, and Turkey. In Iran this species was recorded from Tehran (MORAVVEJ 2003).

*Description:* Body length up 2.3 mm excluding antennae. Head: Antennal length 1015 µm (up to 1200 µm in Iranian specimens), 2-3 times the length of the head, Ant IV with

three-lobed apical vesicle. Relative length of Ant I/II/III/IV = 1/2.3/2.3/2.5. 4 labral papillae with a chaeta-like projection. 8 Ommatidium. Length ratio of Abd IV/III>4.

Claw with 4 teeth on internal edge: first pair at 48% distance from base of claw, and 2 unpaired teeth, first one at 74% distance from base and the most distal one minute. Dorsal tooth approximately at the level of internal pair of teeth. Empodium spike-like, with smooth external edge on leg III. Furca length 950  $\mu\text{m}$ . Manubrial plate with 4 chaetae and 2 psp. Mucro with 2 teeth, subapical tooth in size similar to the apical one. Mucronal spine present (JORDANA 2012).

#### **Subfamily: Entomobryinae**

##### ***Entomobrya nigrocincta* Denis, 1923**

*Material examined:* 13 specimens, Eslamabad-e-gharb, Qal'eh Harasam, Elm, (N 33°51.399/E 046°50.868/2302 m a.s.l) May, 2012. 6 specimens, Kermanshah, Char Zebar, Buttonwood (chenar), (N 34°14.484/E 046°41.583/2602 m a.s.l) June, 2012.

*Distribution:* This species was recorded from South Europe around the Mediterranean Sea, Slovakia, Hungary, Bulgaria, France, Georgia, Egypt, Turkey, Romania, Spain, Serbia, Greece, Azores, and Morocco. In Iran this species is recorded for the first time.

*Description:* Body length up to 1.5 mm excluding antennae according to original description. Body colour pattern with sexual dimorphism. Head: Antennal length 1000  $\mu\text{m}$ , 2-3 times the length of the head, Ant IV with a simple apical vesicle. Relative length of Ant I/II/III/IV = 1.7/2.7/2.5/2.8. 4 labral papillae wrinkled or with some projections. 8 Ommatidium, GH smaller than EF. Length ratio of Abd IV/III>4.

Claw with 4 teeth on internal edge: first pair at 55% distance from base of claw, and 2 unpaired teeth, first one at 80% distance from base and the most distal one minute. Dorsal tooth approximately at the level of internal pair of teeth. Empodium spike-like, with smooth external edge on leg III. Furca length 650  $\mu\text{m}$ . Manubrial plate with 4 chaetae and 2 pseudopora. Mucro with 2 teeth, subapical tooth in size similar to the apical one. Mucronal spine present (JORDANA 2012).

#### **Subfamily: Orcheselinae**

##### ***Heteromurus sexoculatus* Brown, 1926**

*Material examined:* 1 specimen, Kermanshah, Char Zebar, Buttonwood (chenar), (N 34°14.484/E 046°41.583/2602 m a.s.l) June, 2012.

*Distribution:* In Iran this species was recorded from mazandaran (COX 1982).

*Description:* length to 2.1 mm. pigment restricted to eye patches. Antennae not over 0.4 lengths of head and body combined. Eyes 3 & 3 on characteristic patches. Labial papillae absent. Chaetotax of labial triangle variable. Posterior row with 2-4 setae, all of which may be smooth or ciliated. Differentiated seta of outer labial papilla as in figure 16. Setae on venter of head smooth except for few ciliated setae ventro-laterally on head. Tibiotarsi without smooth setae. Ungues tri- or quadri-dentate.

Claws with small outer tooth (not mentioned in original description). Tenent hair apically lanceolate or clavate. Manubrium dorsally with at least 4 pairs of smooth erect setae. Base of dentes dorsally with 1 pair of these setae. Mucro with basal spine (MUTT 1980).

#### **Subfamily: Entomobryinae**

##### ***Drepanura* sp. Schött, 1891:19**

*Material examined:* 1 specimen, Qasr-e-shirin, Parviz Khan, Straw, (N 34°33.151/E 045°35.144/1169 m a.s.l) May, 2012.

*Description:* *Drepanura* genus is similar to *Entomobrya*. The apical vesicle of Ant IV

is always simple and slightly displaced from the apex. The labral papillae are poorly developed, and the external differentiated chaeta of the labium is about as thick as the remaining chaetae. Mucro falcate and with basal spine. Th II with some stout mac on anterior part (mane). General aspect of habitus and colour as *Entomobrya*. 29 species have been described around the world, in all continents, 13 of which are present in the Palaearctic (MUTT 1980).

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