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Additional records for Iranian Collembola (Hexapoda: Entognatha) fauna from Tehran province

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Qazi, F. & Shayanmehr, M.: *Additional records for Iranian Collembola (Hexapoda: Entognatha) fauna from Tehran province.*
Abstract: In this study, the genus of *Triacanthella* Schäffer, 1897 and the species *Triacanthella intermedia* (Dunger and Zivadinovic, 1984) report for the first time for Iranian fauna. Additionally, the species *Ceratophysella stercoraria* (Stach, 1963), *Hypogastrura vernalis* (Carl, 1901), *Hypogastrura manubrialis* (Tullberg, 1869), *Orthonychiurus* cf. *folsomi* (Schaffer, 1900), *Folsomides parvalus* (Stach, 1922), *Folsomia penicula* (Bagnall, 1939), *Entomobrya lindbergi* (Stach, 1960), *Pseudosinella octopunctata* (Boerner, 1901), *Heteromurus major* (Moniez, 1889) and *Cyphoderus albinus* (Nicolet, 1842) were identified for the first time from Tehran province. The specimens were extracted by Berlese funnel from soil and leaf litter or were caught by pitfall traps.

Keywords: Collembola, Fuana, Berlese funnel, Iran, Tehran.

Introduction

Collembola is concluding one of the oldest groups of Arthropoda (Rapoport 1971). Collembola are as representatives of soil faunal diversity (Cassagne et al. 2003) and play a main role in nutrient cycle, analysis of organic matter and soil establishment; regulation of fungal populations; organizing relation with mycorhizae; bacteria colonization and all basic features in the functioning of forest ecosystems (Visser et al. 1981, Warnock et al. 1982, Faber 1992, Bardgett et al. 1998, Gange 2000, Cassagne et al. 2003, Kumssa et al. 2004). The variety of collembolan species are influenced by many sights of the soil such as pH, aeration, organic matter combination, nutrient, humus type, vegetation covering and the physical characteristics of the soil (Oliveira 1993, Salomon et al. 2004, Cole et al. 2005). The richness of native species is exclusively susceptible to environmental disorder and forest substitute, many species are non-native (Deharveng 1996). All of these characteristics suggest the emphasis of Collembola as ecological indicators of environmental quality (Huhta et al. 1967, Hole 1981, Faber 1992, Oliveira 1993, Detsis et al., 2000, Cassagne et al., 2003). Studies about these cute creators are obsolete in many parts of Iran. The first record of springtails in Iran was made by Farahbakhsh (1961) who described species *Sminthurus viridis* Linnaeus, 1758 from wheat and alfalfa fields in southern Iran. Cox (1982) described 70 species from

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northern, western and central provinces of Iran. Recently, some researchers have studied the biodiversity of springtails locally (MORAVVE et al. 2007, NEMATOLLAHI et al. 2009, YAHYAPOUR 2012, KAHRARIAN et al., 2012, DAGHIGHI 2012). SHAYANMEHR et al. (2013) prepared a checklist of Iranian Collembola which includes 116 species belonging to 18 families and 51 genera. YOOSEFI LAFOORAKI and SHAYANMEHR (2013) found a new genus and eight new species for Iran from Mazandaran province. YOOSEFI LAFOORAKI and SHAYANMEHR (2014) recorded a new genus and three new species of order Neelipleona for Iran. KAHRARIAN et al. (2014) reported 10 species of Entomobriydae from Kermanshah province.

Material and methods

Species were collected from Tehran region during 2013-2014. Tehran province is the capital of Iran, located on the southern slope of the Alborz Mountains. The specimens were collected in two ways. Some of them were caught by pitfall traps and majority of specimens were extracted from soil, leaf litter and moss by Berlese funnel. The specimens were collected from different habitats. They were preserved in 85% alcohol and then cleared in potassium hydroxide (KOH) for 3-5 minutes that depends on the pigmentation of the specimen. They fixed on the Hoyer medium for preparing microscopic slides. Then were observed using a phase contrast microscope and identified by identification keys.

Results

Assembled of eleven species of Collembola belonging to four families were collected and identified from Iran. The information on prepared species is introduced in Table 1. The genus *Triacanthella* and the species, *T. intermedia* (Dunger & Zivadinovic, 1984) is new for Iranian fauna. Also *Hypogastrura vernalis* (Carl, 1901), *Hypogastrura manubrialis* (Tullberg, 1869), *Ceratophysella stercoraria* (Stach, 1963), *Folsomia penicula* (Bagnall, 1939), *Folsomides parvalus* (Stach, 1922), *Entomobrya lindbergi* (Stach, 1960), *Pseudosinella octopunctata* (Boerner, 1901), *Heteromurus major* (Moniez, 1889), *Cyphoderus albinus* (Nicolet, 1842), *Orthonychiurus* cf. *folsomi* (Schaffer, 1900) are recorded for the first time from Tehran province.

Taxonomic descriptions

Ceratophysella stercoraria (Stach, 1963) Family: ***Hypogastruridae***

Material examined: 5 specimens, Tehran, Forest park of Kuhsar, in leaf litter andsoil, 15 February 2013.

Description: size 1.5 mm in famales, 1.3 mm in males. Colour of the body spotted brownish-violet, paler ventrally. Granulation strong, especially on two last abdominal terga. The middle of abdominal tergum 5 between setae there is a strongly granulated, semicircular swelling of variable size which is slightly protruded beyond hind margin of tergum. Body hairs moderately long, finely serrated, macrochaetae well differentiated, sensilla comparatively long. Ocelli 8 + 8. PAO (post antennal organ) about 2.5-3 times larger than ocelli, with 4 lobes of which the anterior pair larger than the posterior.

Table 1. Information on eleven new species recorded from Tehran province (Iran)

Species	Location	Date	Habitat	Coordinate	Altitude (m)	Identified by
Triacanthella intermedia (Dunger & Zivadinovic, 1984)	Tehran, Forest park of Kuhsar	2/22/ 2013	Soil, Leaf litter	35° 45′ N 51° 33′ E	1496	Dariusz Skarzynski
Ceratophysella stercoraria (Stach, 1963)	Tehran, Forest park of Kuhsar	2/15/ 2013	Soil	35° 45′ N 51° 33′ E	1496	Dariusz Skarzynski
Hypogastrura vernalis (Carl, 1901)	Tehran, Forest park Pardisan	4/5/ 2013	Soil	35° 45′ N 51° 37′ E	1425	Dariusz Skarzynski
Hypogastrura manubrialis (Tullberg, 1869)	Tehran, Forest park Pardisan	4/5/ 2013	Soil, Leaf litter	35° 45′ N 51° 37′ E	1425	Dariusz Skarzynski
Folsomides parvalus (Stach, 1922)	Tehran, Forest park Kuhsar	2/15/ 2013	Soil (*Morus* sp.), Leaf litter	35° 45′ N 51° 33′ E	1496	Masoumeh Shayanmehr
Folsomia penicula (Bagnall, 1939)	Tehran, Forest park Kuhsar	2/15/ 2013	Soil (*Quercus* sp.)	35° 45′ N 51° 33′ E	1496	Masoumeh Shayanmehr
Entomobrya lindbergi (Stach, 1960)	Tehran, Islam Shahr, farm	5/21/ 2014	Soil (*Alnus* sp. and *Ulmus* sp.)	35° 33′ N 51° 14′ E	1072	Masoumeh Shayanmehr
Pseudosinella octopunctata (Boerner, 1901)	Tehran, Northwest Mountains	2/22/ 2013	Soil, Leaf litter	35° 46′ N 51° 18′ E	1636	Masoumeh Shayanmehr
Heteromurus major (Moniez, 1889)	Shahriyar, farm	7/11/ 2013	Soil, Leaf litter	35° 39′ N 51° 03′ E	1162	Masoumeh Shayanmehr
Cyphoderus albinus (Nicolet, 1842)	Tehran, Forest park Kuhsar	2/18/ 2013	Soil (*Platanus* sp.)	35° 45′ N 51° 33′ E	1496	Masoumeh Shayanmehr
Orthonychiurus cf. *folsomi* (Schaffer, 1900)	Tehran, Bahar park	4/15/ 2013	Leaf litter	35° 45′ N 51° 18′ E	1463	Igor Kaprus

Labrum with 4-5 setae and 4 prelabral setae. Tibiotarsi 1-3 with 19, 19, 18 setae. Tibiotarsal tenent hairs distinctly shorter than claws and acuminate. Claws with distinct inner tooth and two pairs of weak lateral teeth. Empodium appendage with broad basal lamella and apical filament reaching middle of inner unguis. Ventral tube with 4 + 4 setae. Retinaculum with 4 + 4 teeth. Furca fully developed. Dens with uniform granulation and 7 setae (2 subapical on inner side are thicker than others). Mucro typical for the denticulate group. Dens two times longer than mucro. Anal spines long (= claws 3), curved and inserted on high papillae (SKARZYNSKI 2000).

Hypogastrura manubrialis (Tullberg, 1869) Family: ***Hypogastruridae***

Material examined: 11 specimens, Tehran, Forest park of Pardisan,soil and leaf litter, 5 April 2013.

Description: Body size 1.5 mm. color grayish or redish blue of variable intensity. PAO with 4 subequal lobes, each with a secondary projecting lobe. In maxilla lam.6 only with marginal ciliation and apex of lam.1 fan-shaped with two rows of delicate ciliation which appear to be composed of bundles with 2-5 filaments in each. Ant.1 with 7 setae. Ant.3 organ simple, without additional spines. Ant.4 with about 10 curved sensilla. Apical bulb simple or weakly lobed at tip. Body hairs short and fine, uniform. Macrochaetae not developed. Largest setae slightly serrate. Integument with fine granules uniform. Anal spines short and straight. Retinaculum with 4+4 teeth. Dens with 7

dorsal setae, about 2.0-2.5 time as long as mucro which is elongate with a narrow dorsal lamella. Tibiotarsi with a single tenent hair, which is weakly clavate. Claws with an inner tooth lateral teeth indistinct. Unguiculus without basal lamella, reaching middle of unguis (FJELLBERG 1998).

Hypogastrura vernalis (Carl, 1901) Family: ***Hypogastruridae***
Material examined: In high density, Tehran, Forest park Pardisan, soil, 5 April 2013.

Description: Size 1.2 mm, color dark bluish-red. Post antennal organ with 4 slightly irregular lobes, a little larger than an ocellus. Lamella1 with 2 fan-shaped rows of cilia at apex, shaft with some coarse denticles near base in addition to a bundle of stiff filaments projecting towards the space behind the three maxillary teeth (tooth-brush). Antenna 1 with 7 setae. Antenna 3 organ simple, without additional spines. Antenna With simple apical bulb and 6-7 curved sensilla which are only slightly thicker than other antennal setae. Body hairs short, uniform, rather thick, distinctly serrate. Macrochaetae not developed. Body integument with fine, uniform granulation. Anal spines short, straight, as long as their basal papillae. Retinaculum with 4+4 teeth. Dorsal side of dens with 7 setae and tubercles which become enlarged towards apex. Mucro characteristic, with a plug-shaped tip and a large, angular dorsal lamella. Tibiotarsi with one clavate tenent hair. Claws with distinct inner tooth, lateral teeth present. Unguiculus reaching slightly beyond inner tooth of unguis, with broad basal lamella (FJELLBERG 1998).

Orthonychiurus cf. ***folsomi*** (Schaffer, 1900) Family: ***Onychiuridae***
Material examined: In high density, Tehran, Bahar Park, leaf litter, 5 April 2013.

Description: Size 1.3-1.7. Color white. PAO with compound vesicles in narrow arrangement Ps.oc.d.: 32/022/33342. Ps.oc.v.:3/000/11(0-1)1. Nt.3 organ with 4 papillae, 2rods and 2 sensory clubs which are smooth with one longitudinal rib.

Pseudosinella octopunctata (Borner, 1901) Family: ***Entomobryidae***
Material examined: 6 specimens, Tehran, Bahar Park, soil and leaf litter, 22 February 2013.

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 laneceolate, without distinct teeth (FJELLBERG 2007).

Entomobrya lindbergi (Stach, 1960) Family: ***Entomobryida***
Material examined: In high density, Islam Shahr, farm, soil, 21 April 2014.

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 μm, 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 μm. Manubrial plate with 3-5 chaetae and 2 psp. Mucro with 2 teeth, anteroapical tooth bigger than the apical one. Mucronal spine present (JORDANA 2012).

Heteromurus major (Moniez, 1889) Family: ***Entomobryidae***
Material examined: 4 specimense, Shahriyar, soil, 21 June 2013.

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 ⅓ 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).

Folsomides parvalus (Stach, 1922) Family: ***Isotomidae***
Material examined: 30 specimens, Forest park Kuhsar, Soil, 15 February 2013.

Description: Body shape very long and tubular, size up to 0.9 mm. Abdomen, segments 5-6 prolonged. Post antennal organ narrow elongate. Ocelli 2+2. White, dark spots only under the ocelli. Macrochaetae well developed, also on anterior abdominal segments. Lower two pairs of sensilla on abdomen, segment 5 not thicker than upper pairs. The upper segment 4 sensillum set close to the macrochaetae. Retinaculum with 3+3 teeth, no setae. Furca with long and slender dens which has only 3 dorsal setae, no ventral. Mucro with two teeth. Only females are seen (FJELBERG 2007).

Folsomia penicula (Bagnall, 1939) Family: ***Isotomidae***
Material examined: 30 specimens, Forest park Kuhsar, Soil, 15 February 2013.

Description: Size 1.6 mm. colour whitish with a spotted black pigmentation scattered all over body, eye-spots distinct body slender, cylindrical. Ocelli 2+2,but posterior pair small. PAO narrow, slightly longer than width of ant.1. Ventral side of ant.1 with two apical and one basal microsensilla, dorsal side with two. Ant.2 with a setaseous lateroapical sensillum and two basal (ventra/dorsal) microsensilla. Ant.3 in lateroapical position with aspine like sensillum only. Ant.4 with 4-5 slightly thickenened curved sensilla. Prelabral setae 4. Head with 4+4 postlabial setae. Microsensilla on th.2-abd.3 distributed as 11/111. Upper macrosensilla on abd.1-3 in mid-tergal position. Thorax without ventral setae. Ventral tube with 5+5 distal and 6-7 posterior setae. Claws with a pair of lateral teeth near base, unguiculus only half as long as inner edge of claw. Manubrium with 15-20 anterior setae, 3+3 in apical rows. Dense with 4 posterior setae (FJELBERG 2007).

Cyphoderus albinus (Nicolet, 1842) Family: ***Cyphoderidae***
Material examined: 30 specimens, Forest Park Kuhsar, soil, 18 February 2013.

Description: Body size 1.6 mm. White, eyes absent. Body shaped flattened, broad. Sides of thorax 2-3 roof like flattened, hiding bases of legs. Thin transparent scales are

present on dorsal side of head and body, including legs, two basal segments of antennae and ventral side of dens. Antennae about 2.5 as long as head diagonal. Antennae 1 with 7-8 ventral and 3 dorsal (at Antennae 3 organ inconspicuous, with small apical sensilla and guards. Antennae 2-3 with a short, triangular spin like sensillum in mid-ventral position. Antennae 4 has a short club-shaped subapical organ. Labrum with 4/554 smooth setae, two setae of the mid-row stronger than others. Labral edge unmodified. Frontoclypeal field with 4+5 setae, of which the posterior 5 are ciliated. Labial palps with a normal papillary complex, with proximal setae. Papilla E with 4 guards. Basal fields with 4 median and 5 lateral setae. Maxillary palp simple, sublobal hairs absent. Maxilla with 3-toothed capitulum and a fused pad-shaped lamellary complex which is not easily interpreted. Tip of longest lamella reaches beyond capitulate teeth. Top of head with 1+1 long trichobothria. Haed with 3+3 postlabial setae. Thorax and abdomen with macrochaetae and ciliated setae only along sides, not on dorsal disc. Mesothorax with a row of short, spin-like setae along anterior edge. Ventral tube with 2+2 long anterior setae, 2+2 short distal and 6-7 posterior setae of which three are longer than others. Retinaculum with 4+4 teeth and one setae. Coxal parts of mid-legs with 2-3 particularly strong macrochaetae. Claws slender, apically expended, unguis with a long needle-like basal tooth on the back side, inner edge with a small subapical tooth. Unguiculus with a strong, wing-like ventral tooth. Trochanteral organ of last leg V-shaped, with about 10 setae. Manubrium with a differentiated cover of dorsal ciliate setae, in particular the 3+3 lateral macrochaetae in distal half are distinct. Dens dorsally with double rows in a single row of 4 ciliate macrochaetae. Proximal part with 3 setae, of which one is smooth. Ventral side of dens with many hyaline scales. Mucro elongate, almost half as long as dens, with two apical teeth (FJELLBERG 2007).

Discussion

The genus *Triacanthella* and the species *T. intermedia* are recorded for the first time from Iran. *Hypogastrura vernalis* is recorded from Tehran province for the first time. It was reported before from Kohgiluyeh and Boyer Ahmad (FALAHATI et al. 2012) and Mazandaran YOOSEFI LAFOORAKI and SHAYANMEHR 2013). *Hypogastrura manubrialis* is recorded from Tehran for the first time. It was reported before from Central, Mazandaran, E. Azarbaijan, W. Azarbaijan, Zanjan provinces by COX (1982) and Kohgiluyeh and Boyer Ahmad province by FALAHATI et al (2012). *Ceratophysella stercoraria* is recorded from Tehran for the first time. It was reported before from province Kermanshah by KAHRARIAN et al. (2012) and Kohgiluyeh and Boyer Ahmad by FALAHATI (et al., 2012). *Folsomia penicula* is new for Tehran province. It was reported previously from Central Mazandaran, E. Azarbaijan, W. Azarbaijan, Golestan and Gilan provinces (COX 1982, FALAHATI et al., 2013, DAGHIGHI 2012). *Folsomides parvalus* is new for Tehran. It was reported before from Central, Mazandaran, Gilan, E. Azarbaijan, W. Azarbaijan and Kermanshah provinces (COX 1982, DAGHIGHI 2012, YAHYAPOUR 2012, KAHRARIAN et al. 2012).

Also *Entomobrya lindbergi* was reported before from Tehran province by MORAVVEJ et al. (2007). *Pseudosinella octopunctata* is reported for Tehran province for the first time. It was reported before from Central, Mazandaran, Gilan, E. Azarbaijan, W. Azarbaijan, Zanjan provinces by COX (1982) and Mazandaran/Sari by YAHYAPOUR (2012). *Heteromurus major* is recorded from Tehran for the first time. It was reported before from Central, Mazandaran, Gilan, E. Azarbaijan and Gilan provinces (COX 1982;

DAGHIGHI 2012, YAHYAPOUR 2012). *Cyphoderus albinus* is recorded from Tehran for the first time. It was recorded before from Gilan province by DAGHIGHI (2012). *Orthonychiurus folsomi* is recorded from Tehran for the first time. It was reported before from Mazandaran/Sari by YAHYAPOUR (2012).

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