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New additions to Iranian Collembola (Entognatha: Hexapoda) from Ilam Province (western Iran)

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Abstract: Three species of springtails were identified as new records for Iranian fauna from Ilam Province, western Iran: *Hemisotoma quadrioculatus* (Martynova, 1967), *Isotoma anglicana* Lubbock, 1862 (Isotomidae), and *Metaphorura riozoi* Castaño-Meneses, Palacios-Vargas & Traser, 2000 (Tullbergiidae). Brief information for each species about material examined, ecology, illustrations, and distribution is given.

Key words: Collembola, new records, Ilam, Iran

Springtails, are one of the largest groups of modern hexapods that are no longer considered to be insects (Collembola, Protura, and Diplura) (Gillott, 2005). There are about 8600 described species worldwide (Bellinger et al., 1996–2016), but until January of 2013, only 112 species had been reported in Iran (Shayanmeh et al., 2013). However, this number continues to increase as more species, mostly from northern Iran, have been recently reported (Daghighi et al., 2013; Yahyapour and Shayanmeh, 2013; Qazi and Shayanmeh, 2014; Yoosefi-Lafooraki and Shayanmeh, 2014a, 2014b, 2014c, 2015a, 2015b; Alijani et al., 2015; Mehrafrooz-Mayvan et al., 2015). Meanwhile, the number of Collembolan species in Asia, as well as in countries neighboring Iran, is not clear. There are no reliable checklists of species for most of these countries. The only checklist known for Collembola in Turkey also suggests that the fauna of Collembola in this country is poorly known (Sevgili and Özata, 2014; Özata et al., 2016). Ilam Province is one of the 31 provinces of Iran and borders Iraq. Although this city is surrounded by the Zagros Mountains, its climate is also affected by deserts in the west and south. This region presents a highly variable annual weather profile. Heavy showers or snow in the winter and dusty, brutally hot, dry weather in the summer are normal for this region (meteorological information for Ilam: <http://www.irimo.ir>). The different climatology and habitat diversity of Ilam Province compared to

Mazandaran Province (northern Iran, with deciduous temperate rainforest) makes the study of the Collembola fauna in this province interesting.

Collembola specimens were collected from the surface layer of soil and leaf litter in different localities of Ilam Province (33°38'N, 46°26'E), western Iran, during the years 2014–2015. The soil samples were retained in white plastic boxes and transferred to the laboratory. Specimens were extracted from soil and leaf litter by Berlese funnel with a 60-W bulb lamp (until the soil was dried), and preserved in 75% ethanol. The pigmented samples were cleared in KOH, and their important taxonomic structures were made visible. After preparing slides with Hoyer medium, the specimens were identified. All specimens and slides are deposited in the Department of Plant Protection of Sari University of Agricultural Sciences and Natural Resources, and in the collection of the Department of Plant Protection, College of Agriculture, Ilam University, Iran (ILAMU).

In the present study, some species from different families were collected and identified, 3 of which are new records for Iran: *Metaphorura riozoi*, *Hemisotoma quadrioculata*, and *Isotoma anglicana*.

Metaphorura riozoi Castaño-Meneses, Palacios-Vargas & Traser, 2000 (Family Tullbergiidae) (Figure 1)

Material studied. IRAN, 9 specimens, Ilam Province: soil and leaf litter under cypress trees (*Cupressus* spp.),

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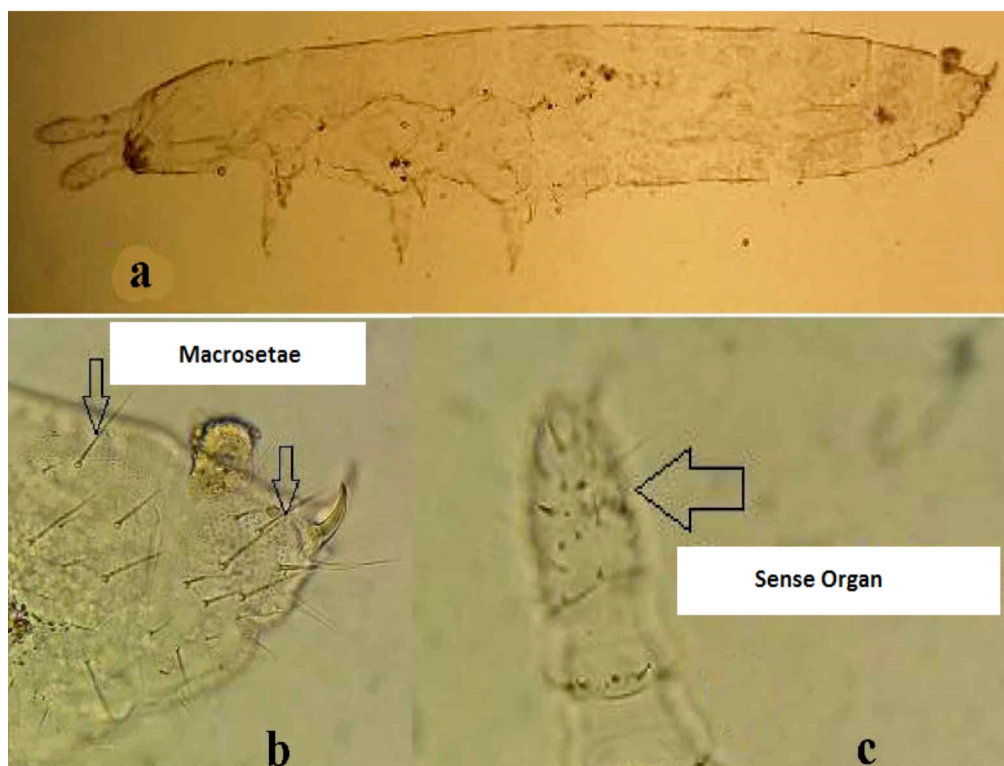


Figure 1. *Metaphorura riozoi* (a): Adult; (b): Macroseta on dorsal and lateral body; (c): Postantennal organ (PAO) and sensilla on antennae 3 and 4.

Ilam University (33°45'6.806"N, 46°22'49.648"E, alt. 1395 m), Ilam, September 2015; soil and leaf litter under oak trees (*Quercus brantii*), Gachan Mountain (33°38'43.08"N, 46°29'9.96"E, alt. 2330 m), Ilam, July 2014, leg. M. Mirab-Balou.

Ecology: The species was recorded for the first time from the soil of a meadow in Hungary (Castano-Meneses et al., 2000), and no information about its ecology is available.

Distribution: Central Europe, Hungary (Castano-Meneses et al., 2000; Dunger and Schlitt, 2011).

***Hemisotoma quadrioculatus* Martynova, 1967 (Family Isotomidae) (Figure 2)**

Material studied. IRAN, 16 specimens, Ilam Province: soil under oak trees (*Quercus brantii*), Arghavan Forest Park (33°38'57.694"N, 46°26'54.900"E, alt. 1517 m), Ilam, May 2014, leg. M. Mirab-Balou.

Ecology: The species was recorded for the first time from soil inside cracks in rocks in Tajikistan (Potapov, 2001), and no information about its ecology is available.

Distribution: Middle Asia, Tajikistan, Ganzhino, Aruk-Tau Range (Potapov, 2001).

Remarks. The species was recorded as *Cryptopygus quadrioculatus* in the Isotomidae key written by Potapov (2001), but the genus *Cryptopygus* Willem, 1902 was

changed to *Hemisotoma* Börner, 1903 according to Rusek (2000) (Shayanmehr et al., 2013). It belongs to the thermophiles group (Potapov, 2001).

***Isotoma anglicana* Lubbock, 1862 (Family Isotomidae) (Figure 3)**

Material studied. IRAN: More than 20 specimens, Ilam Province: soil and leaf litter under Scotch pine (*Pinus* spp.), Dalab Forest Park (33°40'20"N, 46°20'56"E, alt. 2650 m), Ilam, March 2014, July 2015; soil under oak trees (*Quercus brantii*), Arghavan Forest Park (33°38'57.694"N, 46°26'54.900"E, alt. 1517 m), Ilam, March 2014; soil and leaf litter under cypress trees (*Cupressus* spp.), Ilam University (33°45'6.806"N, 46°22'49.648"E, alt. 1395 m), Ilam, September 2015; soil under rose flowers (*Rosa* spp.), Ilam University, Ilam, August 2015; soil and leaf litter under oak trees (*Quercus brantii*), Gachan Mountain (33°38'43.08"N, 46°29'9.96"E, alt. 2330 m), Ilam, February 2014, leg. M. Mirab-Balou.

Ecology: Generally eurytopic species with a high preference for open biotopes. It prefers damp and cold habitats. In central Europe, it is common in different open sites under arable management. It is a dominant species in sugar beet fields in Poland. In recultivation sites of an opencast lignite mine in Germany, this species is common during the first stage of succession. Frequent in urban soils

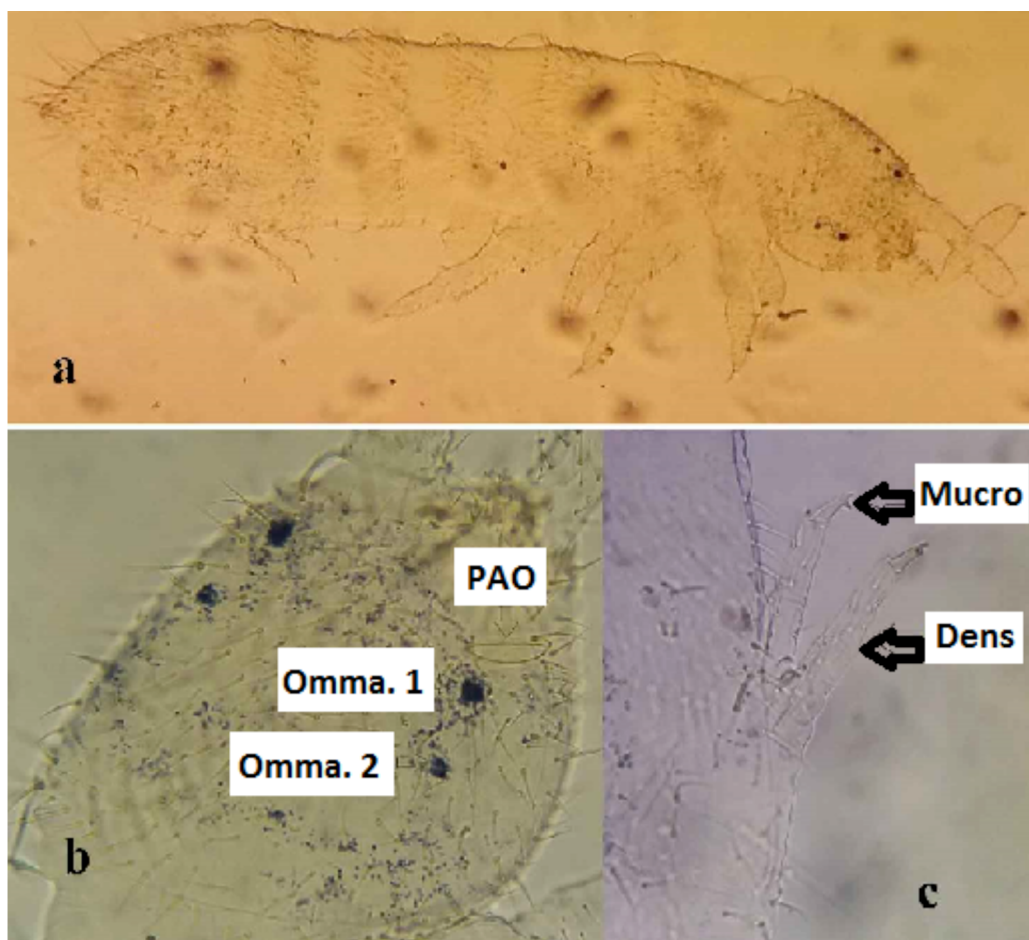


Figure 2. *Hemisotoma quadrioculatus* (a): General characters; (b): With 2+2 Ommatidia and postantennal organ (PAO) constricted; (c): Mucro with 2 teeth.

under single trees in Moscow. It shows a positive reaction to Cd- and Zn-rich sewage sludge. The species has a 1-year life cycle with a population peak in spring (Potapov, 2001).

Distribution: Europe (central and northern), Arctic, Russia, Turkmenia, Tajikistan (Potapov, 2001).

Remarks. *Isotoma anglicana* and *I. viridis* are similar, but they can be reliably separated by examining the manubrial teeth. *I. viridis* has a single pair of teeth on the thickened apical edge of the manubrium, whereas *I. anglicana* has 2 pairs of manubrial teeth. *I. anglicana* is more bluish-gray/brown in color than *I. viridis*, which

tends to be more greenish, but this is not entirely reliable. Many of the literature records for *I. viridis* probably refer to *I. anglicana*, which is undoubtedly widespread and common. The 2 species are sometimes found together in the same sample (Hopkin, 2007).

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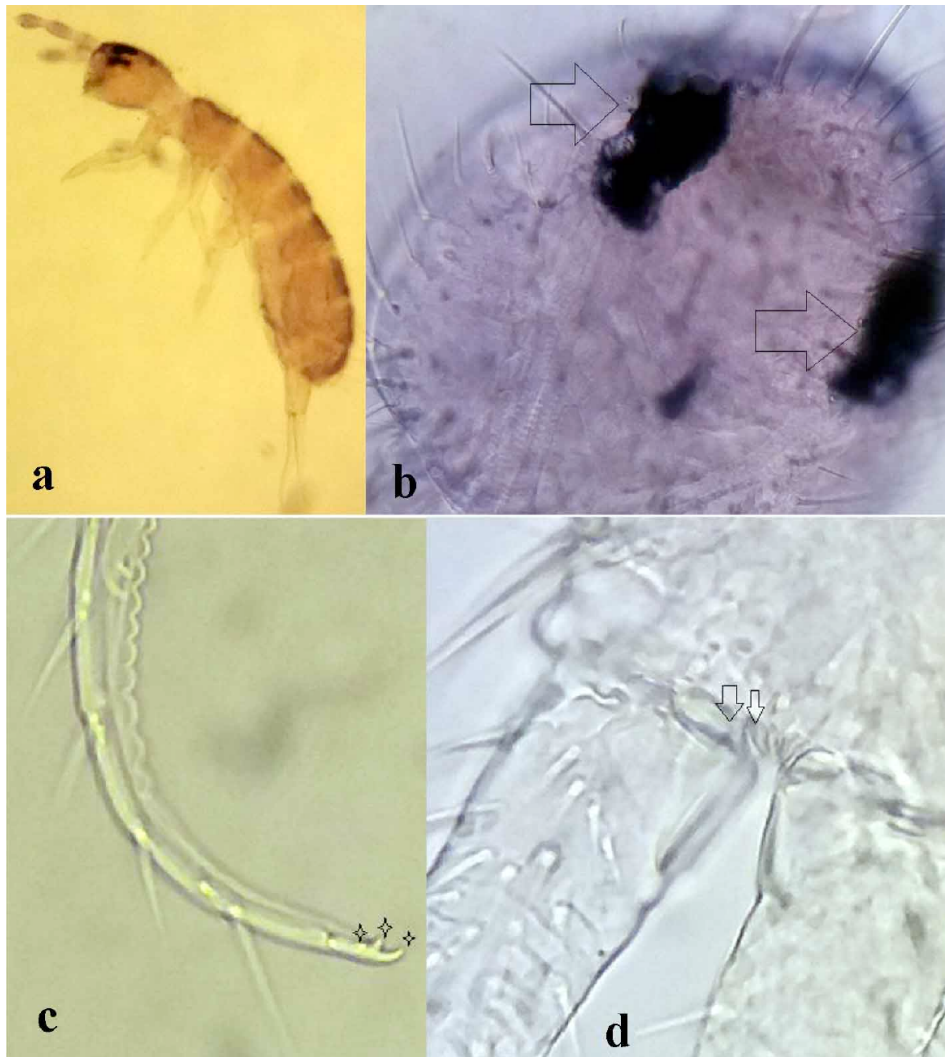


Figure 3. *Isotoma anglicana* (a): General characters; (b): With 8+8 Ommatidia; (c): Mucro tridentate; (d): 2 pairs of manubrial teeth.

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