

Far Eastern Entomologist

Дальневосточный энтомолог

Journal published by Far East Branch
of the Russian Entomological Society
and Laboratory of Entomology,
Institute of Biology and Soil Science,
Vladivostok

Number 298: 1-10 ISSN 1026-051X August 2015

hppt/ urn:lsid:zoobank.org:pub: A2BAF128-DD33-42AE-9EC6-AFFD55E386F4

NEW ADDITIONS TO FAUNA AND A CHECKLIST OF THE ORDER PODUROMORPHA (COLLEMBOLA) OF MAZANDARAN PROVINCE, IRAN

E. Yoosefi Lafooraki[1)], M. Shayanmehr[2*)]

1) Sari University of Agricultural Sciences and Natural Resources, Mazandaran province, Iran. E-mail: eyoosefi@ymail.com

*2) Department of Plant Protection, Faculty of Crop Sciences, Sari University of Agricultural Sciences and Natural Resources, Mazandaran province, Iran. *Corresponding author, E-mail: shayanm30@yahoo.com*

A survey on Poduromorpha fauna of Mazandaran province were done in 2011–2013. Recognition of collembolan species led to finding four genera and one species new for Iranian fauna. Family Odontellidae and genus *Cryptonura* Cassagnau, 1979 are recorded for the first time from Mazandaran province. Consequently, the number of taxa of the order Poduromorpha in Iran is raised to 44 species and 29 genera. A list of 33 species in 19 genera and five families of Poduromorpha known from Mazandaran province is given.

KEY WORDS: Collembola, Poduromorpha, fauna, new records, Mazandaran province, Iran.

Е. Ёсефи Лафураки, М. Шаянмехр. Дополнения к фауне и список видов отряда Poduromorpha (Collembola) провинции Мазандаран, Иран // Дальневосточный энтомолог. 2015. N 298. С. 1-10.

В иранской провинции Мазандаран в 2011–2013 гг. проведено изучение коллембол отряда Poduromorpha. Определение собранного материала позволило

впервые указать для фауны Ирана 4 рода и один вид, а для провинции Мазандаран – семейство Odontellidae и 1 род. В результате список отмеченных из Ирана коллембол этого отряда возрос до 44 видов из 29 родов, а из провинции Мазандаран – до 33 видов из 19 родов и 5 семейств.

Отдел защиты растений, Сари университет сельскохозяйственных наук и природных ресурсов, провинция Мазандаран, Иран.

INTRODUCTION

Totally, 132 species, 63 genera and 18 families of Collembola have been reported from Iran by different researchers, beside them 58 species, 35 genera and 12 families are known from Mazandaran province (Yahyapour & Shayanmehr, 2011; Kahrarian *et al*., 2012; Smolis *et al*., 2012; Shayanmehr *et al*., 2013; Yoosefi Lafooraki & Shayanmehr, 2013; Alijani, 2014, Bakhshi *et al*., 2014; Kahrarian *et al*., 2014; Qazi & Shayanmehr, 2014; Yoosefi Lafooraki & Shayanmehr, 2014a; Yoosefi Lafooraki & Shayanmehr, 2014b, Mehrafrooz Mayvan *et al*., 2015).

Poduromorpha are elongate and cylindrical springtails with a clearly segmented body. They are usually pigmented, many are white and most of the others are from blue to red (D'haese, 2013). The first reports of order Poduromorpha in Iran were carried out by Cox (1982). She reported 32 species from six provinces of Iran. Shayanmehr *et al*. (2013) published a checklist of Iranian springtails which includes 43 species of Poduromorpha. In this list 16 species, 11 genera and 4 families of the order Poduromorpha are recorded from Mazandaran province. The updated checklist of Poduromorpha of Mazandaran province (Northern Iran) is given below. It is based on published information and collected material.

MATERIAL AND METHODS

To carry out the present study, soil, leaf litter and dead wood were collected from various regions of Mazandaran province in 2011–2013. The collembolan specimens were extracted by Tullgren funnel and preserved in 75–80% alcohol. Some samples were mounted on Hoyer medium due to preparing microscopic slides. Preliminary identification was done using Fjellberg (2007). For final recognition, some samples were sent to Dr. Kaprus (Ukraine), Dr. Skarzynski (Poland) and Dr. Deharveng (France). The collection of specimens including microscopic slides and alcohol preserved specimens is kept in Entomology Laboratory of Sari University of Agricultural Sciences and Natural Resources.

LIST OF PODUROMORPHA FROM MAZANDARAN PROVINCE

A total of 24 species, 20 genera and 5 families of Poduromorpha known from Mazandaran province are listed alphabetically below. New for province or to Iran taxa are asterisked (*) and short description is given for them.

Family Hypogastruridae

Genus *Ceratophysella* Börner, 1932

***Ceratophysella denticulata* (Gisin, 1949)**

DISTRIBUTION. Iran: Mazandaran (Sari, Noor, Savadkooh) (Cox, 1982; Yahyapour, 2012), Gilan, Zanjan, Central, East and West Azerbaijan (Cox, 1982). – Cosmopolitan.

***Ceratophysella stercoraria* (Stach, 1963)**

DISTRIBUTION. Iran: Kermanshah (Kahrarian, *et al*., 2012), Kohgiluyeh & Boyer-Ahmad (Falahati *et al*., 2012). – Afghanestan, Poland, Bulgaria, Ukraine.

Genus *Hypogastrura* Bourlet, 1839

***Hypogastrura manubrialis* (Tullberg, 1869)**

DISTRIBUTION. Iran: Gilan, Zanjan, Central, East and West Azerbaijan, Mazandaran (Cox, 1982), Kohgiluyeh & Boyer-Ahmad (Falahati *et al*., 2012). – Cosmopolitan.

***Hypogastrura tullbergi* (Schäffer, 1900)**

DISTRIBUTION. Iran: Mazandaran, Gilan (Cox, 1982). – Circumpolar species. Russia (Thibaud *et al.,* 2004), Norway (Fejellberg, 1980), Canada (Addison, 1981).

***Hypogastrura vernalis* (Carl, 1901)**

DISTRIBUTION. Iran: Kohgiluyeh & Boyer-Ahmad (Falahati *et al*., 2012), Mazandaran (Yoosefi Lafooraki & Shayanmehr, 2013). – Cosmopolitan.

Genus *Triacanthella* Schäffer, 1897

***Triacanthella intermedia* Dunger et Zivadinovic, 1984**

MATERIAL EXAMINED: Juybar, 40°36´N, 52°59´E; 2 m; Leaf litter; 24 January 2014, (Col. E. Yoosefi Lafooraki).

DISTRIBUTION. Iran: Tehran (Qazi & Shayanmehr, 2014), Mazandaran (Babol) (Alijani, 2014). – Eurasia, Mediterranean region.

Genus *Xenylla* Nicolet, 1842

***Xenylla maritima* Tullberg, 1869**

DISTRIBUTION. Iran: Gilan, East and West Azerbaijan (Cox, 1982). – Cosmopolitan.

***Xenylla welchi* Folsom, 1916**

DISTRIBUTION. Iran: Mazandaran (Sari) (Yahyapour, 2012), Kohgiluyeh & Boyer-Ahmad (Falahati *et al*., 2012). – Cosmopolitan.

Family Neanuridae

Genus *Bilobella* Caroli, 1912

***Bilobella aurantiaca* (Caroli, 1912)**

DISTRIBUTION. Iran: Mazandaran, Central, Gilan and East Azerbaijan (Cox, 1982). – Widely spread all over the west part of Mediterranean area.

*Genus *Cryptonura* Cassagnau, 1979

DESCRIPTION. 2+2 eyes; head with a non-cross arrangement of chaetae Di and De; head with tubercles Di and De separate and abdomen five with tubercles Di separate (Smolis *et al*., 2012).

COMPOSITION. Genus consists of five species distributed in Palaearctic region. One undeterminated species is found in Iran. Two species *C. persica* and *C. maxima* were recorded from Golestan province, Iran (Smolis *et al.,* 2012).

***Cryptonura* sp.**

MATERIAL EXAMINED. Sari, Zare wildlife refuge; 36°33´N, 53°08´E; 95 m; Leaf litter; 20 April 2012 (Col. E. Yoosefi Lafooraki).

Genus *Deutonura* Cassagnau, 1979

***Deutonura decolorata* (Gama et Gisin, 1964)**

DISTRIBUTION. Iran: Mazandaran (Cox, 1982). – Palearctic region.

***Deutonura* sp.**

MATERIAL EXAMINED. Noor, Royan, Kodirsar; 36°26´N, 51°49´E; 1700 m; Leaf litter under oak; 9 January 2013; Noor, Royan; 36°20´N, 51°53´E; 1237 m; Leaf litter; 1 March 2013 (Col. E. Yoosefi Lafooraki).

*Genus *Endonura* Cassagnau, 1979

DESCRIPTION. It differs from *Cryptonura* and *Deutonura* in fused tubercles Di on abdominal tergum five and separate tubercles Di, De on head, respectively (Pomorski & Skarzynski, 2000).

COMPOSITION. Genus consists of 27 species in Palaearctic and Nearctic regions (Smolis & Kaprus, 2003). Two undeterminated species are found in Iran.

***Endonura* sp. 1**

MATERIAL EXAMINED. Savadkooh, Alasht, Serin village; 36°03´N, 52°53´E; 1940 m; Moss; 15 September 2012; Noor, Royan; 36°20´N, 51°53´E; 1237 m; Leaf litter; 2 March 2013; Noor, Royan, Kodirsar; 36°26´N, 51°49´E; 1700 m; Leaf litter under oak, 9 January 2013; Nowshahr; 36°38´N, 51°29´E; -5 m; Leaf litter; 23 October 2012 (Col. E. Yoosefi Lafooraki).

***Endonura* sp. 2**

MATERIAL EXAMINED. Noor, Sisangan wildlife refuge; 36°28´N, 51° 49´E; 830 m; Leaf litter; 3 February 2013 (Col. E. Yoosefi Lafooraki).

Genus *Neanura* MacGillivray, 1893

***Neanura muscorum* (Templeton, 1835)**

DISTRIBUTION. Iran: Mazandaran (Sari) (Cox, 1982; Yahyapour, 2012), Gilan, Zanjan (Cox, 1982). – Cosmopolitan.

Genus *Persanura* Mehrafrooz Mayvan et al., 2015

***Persanura hyrcanica* Mehrafrooz Mayvan et al., 2015**

DISTRIBUTION. Iran: Mazandaran (Sari) (Mehrafrooz Mayvan *et al*., 2015).

***Genus *Vitronura* Yosii, 1969**

DESCRIPTION. *Neanura*-like Collembola, body pale yellow to red in life and white in alcohol. With reduced *Neanura*-type mouthparts. Antennal tubercles isolated form frontal tubercle in head. Organ of antenna three flanked by 2 guard setae. Tuberculation of post cephalic tergites (Di, De, DL, L), with some of them fused. Tubercles are well individualized and distinct in living specimens. Tergites of abdomen five with 2+2 tubercles (De+Di, DL and L tubercle migrated ventrally) or more rarely 1+1+1 (Di tubercles merged at midline). Di sometimes vestigial on abdomen four. Most species have 2 or 3 pairs of eyes (Gao *et al*., 2012).

COMPOSITION. Genus consists of 18 species distributed in Europe, North America, East Africa, Malaysia, and Brazil (Gao *et al*., 2012). One undeterminated species is found in Iran.

***Vitronura* sp.**

MATERIAL EXAMINED. Sari, Soleyman-Tange dam; 36°14´N, 53°15´E; 572 m; Leaf litter; 17 March 2013 (Col. E. Yoosefi Lafooraki).

*Family Odontellidae

DESCRIPTION. Maxillary palp sometimes present, maxillary head simple, without lamellae. Maxillary fulcrum and stipes directly connected without a cardo. Mandibles present. Claws often with unguiculus present, furca present.

*Genus *Odontella* Schäffer, 1897

DESCRIPTION. With an exserted sac ventrally between third and fourth antennal segments. Mucro with two intermediate lamellae or teeth. Dens with 3–7 dorsal setae.

COMPOSITION. Genus consists of 28 species distributed in Mediterranean region, South Africa, Australia, New Zealand, South America, and Antarctica. One undeterminated species is found in Iran.

Odontella sp.

MATERIAL EXAMINED. Behshahr, Abbas-abd forest, 36°40´N, 53°32´E; 349 m; Dead wood; 28 March 2103 (Col. E. Yoosefi Lafooraki).

Family Onychiuridae

*Genus *Heteraphorura* Bagnall, 1948

DESCRIPTION. Chaetotaxy on terga consists of one kind of setae: all setae apically pointed; furca reduced to a small area of fine granulation with 4 setulae arranged in one row or an arch located in a middle part of fourth sternum; vesicles in postantennal organ three kinds (simple, bilobed or multilobed) located perpendicularly or obliquely to the long axis of the organ.

COMPOSITION. Genus consists of 16 species distributed in Europe, Mediterranean region, Asia, and North America (Arbea, 2014). One undeterminated species is found in Iran.

Heteraphorura sp.

MATERIAL EXAMINED. Noor, Sisangan wildlife refuge; 36°28´N, 51°49´E; 830 m; Leaf litter; 24 December 2012; Nowshahr (Kojur, Lashkenar); 36°28´N, 52°28´E; 2202 m; Leaf litter; 23 October 2012; Babolsar (Bahnamir); 36°39´N, 52°45´E; -16 m; Soil; 12 November 2012 (Col. E. Yoosefi Lafooraki).

Genus *Hymenaphorura* Gervais, 1841

Hymenaphorura sibirica (Tullberg, 1876)

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982). – Arctic region (Norway and Russia).

Genus *Onychiuroides* Bagnall, 1948

***Onychiuroides granulosus* (Stach, 1930)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982). – Europe, Central Asia, Mediterranean region.

***Onychiuroides pseudogranulosus* (Gisin, 1951)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982). – Europe, Mediterranean region.

Genus *Orthonychiurus* Stach, 1954

***Orthonychiurus folsomi* (Schäffer, 1900)**

DISTRIBUTION. Iran: Mazandaran (Sari) (Yahyapour, 2011). – Europe, Central Asia, Japan, Mediterranean region, North America, Australia.

***Orthonychiurus rectopapillatus* (Stach, 1933)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982). – Europe, Central Asia, Mediterranean region.

Genus *Protaphorura* Absolon, 1901

****Protaphorura sakatoi* (Yosii, 1966)**

MATERIAL EXAMINED. Noor, Sisangan wildlife refuge; 36°28´N, 51°49´E; 830 m; Leaf litter; 4 January 2013; Nowshahr (Kojur, Lashkenar); 36°28´N, 52°28´E; 2202 m; Leaf litter; 29 October 2012 (Col. E. Yoosefi Lafooraki).

DESCRIPTION. Claws without or rarely with very small denticle. Dorsal pseudocellar formula 43/022/33343. Subcoxael of first, second and third pair of legs with 1,0,00 pseudocelli respectively (Kaprus & Pomorski, 2008).

DISTRIBUTION. Palearctic. Here this species is recorded from Iran for the first time.

***Protaphorura bicampata* (Gisin, 1956)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982). – Palearctic region.

***Protaphorura fimata* (Gisin, 1952)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982), Isfahan, (Yoosefi Lafooraki & Shayanmehr, 2013). – Palearctic region.

***Protaphorura quadriocellata* (Gisin, 1947)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Central, Zanjan, East and West Azerbaijan (Cox, 1982). – Palearctic region.

***Protaphorura* sp.**

MATERIAL EXAMINED. Savadkooh, Pole-Sefid, Esas village; 36°06′N, 52°04′E; 1007 m; Soil; 26 April 2013 (Col. E. Yoosefi Lafooraki).

Genus *Thalassaphorura* Bagnall, 1949

***Thalassaphorura encarpata* (Denis, 1931)**

DISTRIBUTION. Iran: Mazandaran (Sari) (Yoosefi Lafooraki & Shayanmehr, 2013). – Cosmopolitan.

MATERIAL EXAMINED. Sari; N 36°35′, E 53°03′; 19 m; Leaf litter under walnut; 12 November 2012; Mahmood-abad; 36°37′N, 52°15′E; -24 m; Soil and leaf litter under poplar; 12 November 2012; Amol; 36°31′N, 52°19′E; 34 m; Soil and leaf litter under poplar, 12 November 2012; Noor, Sisangan wildlife refuge; 36°28′N, 51°49′E; 830 m; Leaf litter; 4 January 2013; Babolsar (Bahnamir); 36°39′N, 52°45′E; -16; Soil; 12 November 2012; Qaemshahr; 36°28′N, 52°52′E; 42 m; Soil under date-plum and common fig; 13 April 2012 (Col. E. Yoosefi Lafooraki).

Family Tullbergiidae

Genus *Mesaphorura* Börner, 1901

***Mesaphorura krausbaueri* (Börner, 1901)**

DISTRIBUTION. Iran: Mazandaran, Gilan, Zanjan, East and West Azerbaijan (Cox, 1982). – Widely distributed, probably cosmopolitan.

Genus *Tullbergia* Lubbock, 1876

***Tullbergia simplex* Gisin, 1958**

DISTRIBUTION. Iran: Mazandaran (Savadkooh) (Yoosefi Laooraki & Shayanmehr, 2013). – Holarctic region.

DISCUSSION

Thus, the genera *Endonura* (Neanuridae), *Vitronura* (Neanuridae); *Odontella* (Odontellidae) and *Heteraphorura* (Onychiuridae) and *Protaphorura sakatoi* (Onychiuridae) are recorded for the first time from Iran. Therefore, the number of Collembola of Iran reaches to 67 genera and 133 species. Family Odontellidae and

genus *Cryptonura* (Neanuridae) are new for Mazandaran Province and the number of Collembola known from this province go up to 40 genera and 59 species.

ACKNOWLEDGEMENTS

We thank Dr. Louis Deharveng (France), Dr. Darius Skarzynski (Poland) and Dr. Igor Kaprus (Ukraine) for confirming the identification of species.

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