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A checklist of Iranian Collembola with six new records from family Isotomidae (Collembola: Isotomidae)

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Abstract

The fauna of Isotomidae (Collembola: Entomobryomorpha) was studied in Guilan province, Northern Iran. A total of 11 springtail species belonging to 8 genera from the family Isotomidae were collected and identified, of which six species, *Isotomurus punctiferus* YOSSEI, *Cryptopygus thermophilus* (AXELON), *proisotoma tenella* (REUTER), *Folsomides parvulus* STACH, *Folsomides angularis* (AXELON) and *Anurophorus coiffaiti* Cassagnau and Delamare, are newly recorded from Iran. A checklist is also provided for Iranian Collembola.

Key words: Collembola, Entomobryomorpha, Fauna, Isotomidae, Guilan, Iran.

Zusammenfassung

Die Fauna der Isotomidae (Collembola: Entomobryomorpha) der Provinz Guilan, Nord Iran, wurde studiert. Festgestellt wurden 11 Arten in 8 Genera der Familie Isotomidae, von denen 6 Arten: *Isotomurus punctiferus* YOSSEI, *Cryptopygus thermophilus* (AXELON), *proisotoma tenella* (REUTER), *Folsomides parvulus* STACH, *Folsomides angularis* (AXELON) und *Anurophorus coiffaiti* CASSAGNAU and DELAMARE, als neu für den Iran festgestellt werden konnten. Weiters wird eine Checkliste der iranischen Collembolen angefügt.

Introduction

The springtails fauna of Iran has poorly been studied. Up to now, 84 springtail species (Arthropoda: Collembola) have been reported in Iran (GARDENEHIRE 1959; COX 1982; MORAVVEJ 2003; FALAHATI HOSSEIN ABAD et al. 2011; YAHYAPOOR et al. 2011). These species belong to four orders (Table 1).

Springtails are small arthropods (0.25-9 mm in body length) belonging to the phylum Arthropoda. The members of the family Isotomidae are recognized by their slender body with an abundant cover of setae. Scales are never present. Abdominal segment 4 not or only slightly longer than segment 3. Prothorax without dorsal setae. An unlobed roundish or elongate postantennal organ is usually present (absent in some species). Most species have a long and well-developed furca, but the furca may also be completely or partly reduced. The family has traditionally been divided into three subfamilies: Anurophorinae, Proisotominae and Isotominae (STACH 1947). GISIN's (1960) concept of Isotominae covers the three above subfamilies. POTAPOV (2001), in the most recent survey on the family Proisotominae, proposed a new subfamily Pachyotominae and redefined Anurophorinae and kept the classical concept of Isotominae. Still the distinctions between the two latter subfamilies are not clear, with some genera or groups of species falling in between. Recently the subfamilies are left out, awaiting further phylogenetic analysis using new molecular methods in addition to traditional morphology. POTAPOV (2001) has reviewed the Palaearctic species of the family Isotomidae (FJELLBERG 2007).

Because of the importance of springtails in different concepts of biology, faunal study of them is essential and need to be elucidated.

Materials and methods

A faunal study on Collembola was carried out in Guilan Province, Northern Iran during 2009-2011. Soil samples were collected from fields, gardens, forests and parks. Springtails were extracted from soil samples by Berlese funnel. Specimens were cleared in lactophenol, Nesbitt and Mark Andre fluids and mounted on microscopic slides using Hoyer's medium. The springtails were identified by the relevant taxonomic keys and papers. Some specimens were sent to Dr. Mikhail Potapov (Zoology and Ecology Department, Faculty of Biology and Chemistry, Moscow State, Pedagogical University Russia) for confirmation. The voucher material which comprises slide mounted specimens are deposited in the Department of Plant Protection at University of Guilan, Rasht, Iran.

Results

In the current study 11 springtail species belonging to 8 genera from the family Isotomidae were reported from Guilan province, Northern Iran. Six species are new records for Collembola fauna of Iran. A checklist is also provided for known species of

Iranian Collembola. Detailed information of eleven Isotomidae species with six new species for Iran Collombela fauna are presented as below:

Table 1: Checklist of Iranian springtails (Arthropoda: Collembola).

number	order	species	references
1	Poduromorpha	<i>Ceratophysella gibbosa</i> (BAGNALL 1940)	MORAVVEJ 2003
2	Poduromorpha	<i>Hypogastrura manubrialis</i> (TULLBERG 1869)	COX 1982
3	Poduromorpha	<i>Hypogastrura tullbergi</i> (SCHÄFFER 1900)	COX 1982
4	Poduromorpha	<i>Hypogastrura denticulata</i> (BAGNALL 1941)	COX 1982
5	Poduromorpha	<i>Willemia anophthalma</i> BÖRNER 1901	COX 1982
6	Poduromorpha	<i>Xenylla humicola</i> (FABRICIUS 1780)	COX, 1982
7	Poduromorpha	<i>Xenylla maritime</i> TULLBERG 1869	COX 1982
8	Poduromorpha	<i>Brachystomella parvula</i> (SCHÄFFER 1896)	COX 1982
9	Poduromorpha	<i>Brachystomella nubila</i> GISIN 1957	COX 1982
10	Poduromorpha	<i>Friesia mirabilis</i> (TULLBERG 1871)	COX 1982
11	Poduromorpha	<i>Neanura echinata</i> (KOS 1941)	COX 1982
12	Poduromorpha	<i>Neanura muscorum</i> (TEMPLETON 1835)	COX 1982
13	Poduromorpha	<i>Neanura decolorata</i> GISIN 1953	COX 1982
14	Poduromorpha	<i>Neanura aurantiaca</i> CAROLI 1912	COX 1982
15	Poduromorpha	<i>Anurida ellipsoides</i> STACH 1949	COX, 1982
16	Poduromorpha	<i>Anurida sensillata</i> GISIN 1953	COX 1982
17	Poduromorpha	<i>Anurida thalassophila</i> (BAGNALL 1939)	COX 1982
18	Poduromorpha	<i>Pseudachorutes dubius</i> KRAUSBAUER 1898	COX 1982
19	Poduromorpha	<i>Pseudachorutes parvulus</i> BÖRNER 1901	COX 1982
20	Poduromorpha	<i>Pseudachorutes subcrassus</i> TULLBERG 1871	COX 1982
21	Poduromorpha	<i>Xenyllodes bayeri</i> KSEMAN 1935	COX 1982
22	Poduromorpha	<i>Xenyllodes lamellifera</i> (AXELSON 1903)	COX 1982
23	Poduromorpha	<i>Onychiurus bicampatus</i> GISIN 1956	COX 1982
24	Poduromorpha	<i>Onychiurus fimatus</i> GISIN 1952	COX 1982
25	Poduromorpha	<i>Onychiurus quadriocellatus</i> GISIN 1947	COX 1982
26	Poduromorpha	<i>Onychiurus sibiricus</i> (TULLBERG 1876)	COX 1982
27	Poduromorpha	<i>Onychiurus rectapapillatus</i> STACH 1933	COX 1982
28	Poduromorpha	<i>Onychiurus pseudogranulosus</i> GISIN 1951	COX 1982
29	Poduromorpha	<i>Onychiurus granulosus</i> STACH 1930	COX 1982
30	Poduromorpha	<i>Tulbergia krausbaueri</i> (BÖRNER 1901)	COX 1982
31	Poduromorpha	<i>Tulbergia callipygosa</i> BÖRNER 1902	COX 1982

number	order	species	references
32	Poduromorpha	<i>Tulbergia affinis</i> BÖRNER 1902	COX 1982
33	Entomobryomorpha	<i>Cyphoderus ambigua</i> CHRISTIANSEN 1957	COX 1982
34	Entomobryomorpha	<i>Entomobrya corticalis</i> (NICOLET 1841)	COX 1982
35	Entomobryomorpha	<i>Entomobrya langinosus</i> (NICOLET 1841)	COX 1982
36	Entomobryomorpha	<i>Entomobrya handscini</i> STACH 1930	MORAVVEJ 2003
37	Entomobryomorpha	<i>Entomobrya unostrigata</i> STACH 1922	MORAVVEJ 2003
38	Entomobryomorpha	<i>Entomobrya lindbergi</i> STACH 1960	MORAVVEJ 2003
39	Entomobryomorpha	<i>Entomobrya atrocincta</i> SCHÖTT 1897	YAHYAPOOR et al. 2011
40	Entomobryomorpha	<i>Entomobrya multifasciata</i> (TULLBERG 1871)	YAHYAPOOR et al. 2011
41	Entomobryomorpha	<i>Sinella curviseta</i> BROOK 1889	MORAVVEJ 2003
42	Entomobryomorpha	<i>Lepidocyrtus cyaneus</i> TULLBERG 1871	COX 1982
43	Entomobryomorpha	<i>Lepidocyrtus lanuginosus</i> (GMELIN 1788)	COX 1982
44	Entomobryomorpha	<i>Lepidocyrtus ruber</i> SCHÖTT 1902	COX 1982
45	Entomobryomorpha	<i>Pseudosinella duodecimpunctata</i> DENIS 1931	COX 1982
46	Entomobryomorpha	<i>Pseudosinella octopunctata</i> BÖRNER 1901	COX 1982
47	Entomobryomorpha	<i>Pseudosinella imparipunctata</i> GISIN 1953	COX 1982
48	Entomobryomorpha	<i>Seira domestica</i> (NICOLET 1841)	YAHYAPOOR et al. 2011
49	Entomobryomorpha	<i>Heteromurus major</i> (MONIEZ 1889)	COX 1982
50	Entomobryomorpha	<i>Heteromurus sexoculatus</i> BROWN 1926	COX 1982
51	Entomobryomorpha	<i>Heteromurus nitidus</i> (TEMPLETON 1835)	COX 1982
52	Entomobryomorpha	<i>Cryptopygus ponticus</i> (STACH 1947)	MORAVVEJ 2003
53	Entomobryomorpha	<i>Folsomia quadrioculata</i> (TULLBERG 1871)	COX 1982
54	Entomobryomorpha	<i>Folsomia multisetata</i> STACH 1947	COX 1982
55	Entomobryomorpha	<i>Folsomia brevifurca</i> (BAGNALL 1949)	COX 1982
56	Entomobryomorpha	<i>Folsomia fimetaria</i> (LINNAEUS 1758)	COX 1982
57	Entomobryomorpha	<i>Folsomia listeri</i> BAGNALL 1939	COX 1982
58	Entomobryomorpha	<i>Folsomia candida</i> (WILLEM 1902)	COX 1982
59	Entomobryomorpha	<i>Folsomia similes</i> BAGNALL 1939	MORAVVEJ 2003
60	Entomobryomorpha	<i>Folsomia penicula</i> BAGNALL 1939	FALAHATI HOSSEIN ABAD et al. 2011
61	Entomobryomorpha	<i>Folsomides parvulus</i> STACH 1947	COX 1982
62	Entomobryomorpha	<i>Isotomiella minor</i> (SCHÄFFER 1896)	COX 1982

number	order	species	references
63	Entomobryomorpha	<i>Proisotoma schoetti</i> (DALLA TORRE 1895)	COX 1982
64	Entomobryomorpha	<i>Proisotoma minuta</i> (TULLBERG 1871)	COX 1982
65	Entomobryomorpha	<i>Proisotoma subminuta</i> DENIS 1931	MORAVVEJ 2003
66	Entomobryomorpha	<i>Isotoma notabilis</i> SCHÄFFER 1896	COX 1982
67	Entomobryomorpha	<i>Isotoma viridis</i> BOURLET 1839	COX 1982
68	Entomobryomorpha	<i>Isotoma olivacea</i> TULLBERG 1871	COX 1982
69	Entomobryomorpha	<i>Isotomurus palustris</i> (MÜLLER 1776)	COX 1982
70	Entomobryomorpha	<i>Isotomurus maculatus</i> (SCHÄFFER 1896)	FALAHATI HOSSEIN ABAD et al. 2011
71	Entomobryomorpha	<i>Parisotoma notabilis</i> (SCHÄFFER 1896)	MORAVVEJ 2003
72	Entomobryomorpha	<i>Isotomina pontica</i> STACH 1947	COX 1982
73	Entomobryomorpha	<i>Isotomina orientalis</i> STACH 1947	COX 1982
74	Entomobryomorpha	<i>Isotomina thermophila</i> (AXELSON 1947)	COX 1982
75	Entomobryomorpha	<i>Tomocerus minor</i> (LUBBOCK 1862)	COX 1982
76	Entomobryomorpha	<i>Tomocerus vulgaris</i> (TULLBERG 1871)	COX 1982
77	Neelipleona	<i>Neelus murinus</i> FOLSOM 1896	COX 1982
78	Symphyleona	<i>Arrhopalites caecus</i> (TULLBERG 1871)	COX 1982
79	Symphyleona	<i>Dicyrtoma minuta</i> (FABRICIUS 1783)	COX 1982
80	Symphyleona	<i>Sminthurinus elegans</i> (FITCH 1863)	COX 1982
81	Symphyleona	<i>Sminthurinus bimaculatus</i> (AXELSON 1902)	COX 1982
82	Symphyleona	<i>Sminthurus viridis</i> (LINNAEUS 1758)	GARDENEHIRE 1959
83	Symphyleona	<i>Sminthurides pumilis</i> (KRAUSBAUER 1898)	COX 1982
84	Symphyleona	<i>Sminthurides malmgreni</i> (TULLBERG 1876)	COX 1982

***Folsomia penicula* BAGNALL 1939**

Material examined: Iran, Guilan province: Rasht, Saravan, 60 m, 37°08'14.19"N, 49°39'50.56"E, October 2009; Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, July 2010. Collected by E. Daghighi.

Distribution: England, Iran, Palaearctic zone (FJELLBERG 2007; HOPKIN 1997).

***Folsomia similis* BAGNALL 1939**

Material examined: Iran, Guilan province: Rasht, 4 m, 37°16'51"N, 49°34'59"E, April 2010; Kuchesfahan, -1 m, 37°16'42"N, 49°46'22"E, September 2010. Collected by E. Daghighi.

Distribution: England, France, Germany, Iran, Japan, Mexico, North America, Poland, Russia, Slovakia, Switzerland, Yugoslavia (POTAPOV 2002).

***Isotomurus punctiferus* YOSHI 1963**

Material examined: Iran, Guilan province: Rasht, University of Guilan, 27 m, 37°11'55.03"N, 49°38'33.58" E, November 2009. Collected by E. Daghighi.

Distribution: Afghanistan (YOSSI 1963).

***Cryptopygus thermophilus* (AXELON 1900)**

Material examined: Iran, Guilan province: Rasht, University of Guilan, 27 m, 37°11'55.03"N, 49°38'33.58"E, November 2009; Rasht, 4 m, 37°16'51"N, 49°34'59"E, July 2010; Kuchesfahan, -1 m, 37°16'42"N, 49°46'22"E, September 2010; Khoshk-e Bijar, -14 m, 37°22'29"N, 49°45'27"E, September 2010; Pirbazar, -23 m, 37°20'21.01"N, 49°33'15.99"E, September 2010; Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, April 2011. Collected by E. Daghighi.

Distribution: China, England, Japan, Russia, Scandinavia (Finland, Norway, Sweden) (FJELLBERG 2007; HOPKIN 1997; POTAPOV 2002).

***Parisotoma notabilis* (SCHÄFFER 1896)**

Material examined: Iran, Guilan province: Rasht, 4 m, 37°16'51"N, 49°34'59"E, March 2010; Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, July 2010; University of Guilan, 27 m, 37°11'55.03"N, 49°38'33.58"E, November 2009. Collected by E. Daghighi.

Distribution: England, Iran, Russia, Scandinavia (Finland, Norway, Sweden) (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997).

***Proisotoma tenella* (REUTER 1895)**

Material examined: Iran, Guilan province: Rasht, Pasikhan, -3 m, 37°16'21.83"N, 49°28'02.46"E, August 2010; Kuchesfahan, -1 m, 37°16'42"N, 49°46'22"E, May 2011. Collected by E. Daghighi.

Distribution: England, Russia, Scandinavia (Finland, Norway, Sweden) (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997).

***Proisotoma subminuta* DENIS 1931**

Material examined: Iran, Guilan province: Rasht, Khomam, -18 m, 37°23'21"N, 49°39'30"E, August 2010. Collected by E. Daghighi.

Distribution: England, Iran, Russia, Scandinavia (Finland, Norway, Sweden) (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997).

***Isotomiella minor* (SCHÄFFER 1896)**

Material examined: Iran, Guilan province: Rasht, Saravan, 60 m, 37°07'41.08"N, 49°39'57.32"E, October 2009; Rasht, 4 m, 37°16'51"N, 49°34'59"E, March 2010; Sangar, Shahrestan, 27 m, 37°09'71"N, 49°41'54"E, April 2011.

Distribution: Iran, Mexico, North of Africa, North America, Urasia (FJELLBERG 2007).

***Folsomides parvulus* STACH 1922**

Material examined: Iran, Guilan province: Rasht, 4 m, 37°16'51"N, 49°34'59"E, July 2010. Collected by E. Daghighi.

Distribution: America, Armenia, Canada, England, Kazakhstan, Norway, Russia, Ukraine (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997; POTAPOV 2002).

***Folsomides angularis* (AXELON 1905)**

Material examined: Iran, Guilan province: Rasht, Sangar, Shahrestan, 27 m, 37°09'71"N, 49°41'54"E, April 2011. Collected by E. Daghighi.

Distribution: England, France, Poland, Portugal, Russia, Scandinavia (Finland, Norway, Sweden), Ukraine (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997; POTAPOV 2002).

***Anurophorus coiffaiti* CASSAGNAU & DELAMARE 1955**

Material examined: Iran, Guilan province: Rasht, Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, April 2011; Kuchesfahan, Lulaman, -3 m, 37°15'17.07"N, 49°49'00.15"E, May 2011. Collected by E. Daghighi.

Distribution: Armenia, Lebanon, Syria (CHRISTIANSEN 1958; POTAPOV & STEBAEVA 1990).

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