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**Introduction of eighteen species of springtails
(Arthropoda: Collembola)
from Guilan Province with three new records for Iran**

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Abstract

A Faunal study of springtails in Guilan Province, Northern Iran was conducted during 2009-2011. A total of 18 springtail species belonging to two orders (Entomobryomorpha and Symphypleona), three families (Isotomidae, Entomobryidae and Kattianidae) and 14 genera were collected and identified. Among them three species, *Pseudosinella alba* (PACKARD 1873), *Willowsia nigromaculata* LUBBOCK 1873, *Mesentotoma subdollfusi* (DENIS 1924) are newly recorded from Iran.

Key words: Collembola, fauna, Entomobryidae, Isotomidae, Kattianidae, Guilan, Iran.

Zusammenfassung

Die Faunistischen Untersuchung der Springschwänze der Provinz Guilan, Nord Iran, erfolgte in den Jahren 2009-2011. Insgesamt wurden 18 Arten der Springschwänze festgestellt und bestimmt, welche zwei Ordnungen (Entomobryomorpha und Symphypleona), drei Familien (Isotomidae, Entomobryidae und Kattianidae) und 14 Gattungen angehören. Unter ihnen befinden sich drei Arten, *Pseudosinella alba* (PACKARD 1873), *Willowsia nigromaculata* LUBBOCK 1873, *Mesentotoma subdollfusi* (DENIS 1924) die neu für die Fauna des Iran sind.

Introduction

The Collembola fauna of Iran is not well known because of the lack of specialists and systematic surveys. Eighty-four springtail species (Arthropoda: Collembola) have been reported so far from Iran (GARDENEHIRE 1959; COX 1982; MORAVVEJ 2003; FALAHATI et al. 2011; YAHYAPOOR et al. 2011). By this study, the total number of Collembola of Iran increased to 93 species (DAGHIGHI et al. 2013).

The Collembola are small wingless hexapodous arthropods with distinct head, one pair of antennae, six abdominal segments, lacking true compound eyes, and with a ventral tube and often with a ventral jumping organ or furcula. Most consider them to be a separate class, but they were most commonly placed in the class Insecta subclass Apterygota. Collembola are found in all soil habitats, but they are most abundant and common in the litter layer. In desert regions they are limited to protected moist areas. They are extremely abundant in cold climates, and their proportion of the soil fauna increases as the annual temperature diminishes. Most genera are extremely widespread; however, there are a number of primarily arctic forms and a small number of thermophilic genera, largely of tropical origin [CHRISTIANSEN 1990]. Most of the Collembola feed on decaying plant materials, fungi and bacteria. Some terrestrial acarids are the predator of Collembola and in this case Collembola is a part of their food chain. Just a few species are known as pest in greenhouses, alfalfa farms and center of mushroom nursery [GERSON et al. 2003].

The springtails fauna of Iran has poorly been studied. Because of the importance of springtails in different concepts of biology, faunal study of them is essential and need to be elucidated.

Gilan Province is one of the 31 provinces of Iran. It covers an area of 14,042 km² and located in the north of Iran between the latitude 37°16'38.64"N and the longitude 49°35'20.4"E. It lies along the Caspian Sea, just west of the province of Mazandaran, east of the province of Ardabil, north of the provinces of Zanjan and Qazvin. Gilan has a humid subtropical climate with a large margin the heaviest rainfall in Iran: reaching as high as 1,900 millimetres (75 in) in the southwestern coast and generally around 1,400 millimetres (55 in). The Alborz range provides further diversity to the land in addition to the Caspian coasts. The coastline is cooler and attracts large numbers of domestic and international tourists. Large parts of the province are mountainous, green and forested. The coastal plain along the Caspian Sea is similar to that of Mazandaran, mainly used for rice paddies. Rasht is the capital of Guilan province that is located in the center of Guilan province between the latitude 37°16'51"N and longitude 49°34'59"E.

Materials and methods

A faunal study on Collembola was carried out in Guilan Province, 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 medium. The springtails were identified by the relevant taxonomic keys and papers. Some species were sent to foreign specialists as Dr. Mikhail Potapov (Zoology

and Ecology Department, Faculty of Biology and Chemistry, Moscow state, Pedagogical University, Russia); Professor Rafael Jordana (Department of Zoology and Ecology, University of Navarra, Pamplona, Spain) and Dr. Betsch (Muséum National d'Histoire Naturelle (MNHN), Department Ecology and Management of Biodiversity, Brunoy, France) 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 18 springtail species belonging to two orders (Entomobryomorpha and Symphypleona), three families (Isotomidae, Entomobryidae and Kattianidae) and 14 genera were reported from Guilan province, Iran. Detailed information of eighteen species with three new species for Iran Collembola fauna are presented as below:

Order Entomobryomorpha

Family Isotomidae

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, former Yugoslavia (POTAPOV 2002).

Isotomurus punctiferus YOSII 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 (YOSII 1963).

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

M a t e r i a l e x a m i n e d : 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.

D i s t r i b u t i o n : China, England, Japan, Russia, Scandinavia (Finland, Norway, Sweden) (FJELLBERG 2007; HOPKIN 1997; POTAPOV 2002).

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

M a t e r i a l e x a m i n e d : 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.

D i s t r i b u t i o n : England, Iran, Russia, Scandinavia (Finland, Norway, Sweden) (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997).

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

M a t e r i a l e x a m i n e d : 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.

D i s t r i b u t i o n : England, Russia, Scandinavia (Finland, Norway, Sweden) (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997).

***Proisotoma subminuta* DENIS 1931**

M a t e r i a l e x a m i n e d : Iran, Guilan province: Rasht, Khomam, -18 m, 37°23'21"N, 49°39'30"E, August 2010. Collected by E. Daghighi.

D i s t r i b u t i o n : England, Iran, Russia, Scandinavia (Finland, Norway, Sweden) (BEI-BIENKO 1967; FJELLBERG 2007; HOPKIN 1997).

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

M a t e r i a l e x a m i n e d : 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.

D i s t r i b u t i o n : Iran, Mexico, North of Africa, North America, Urasia (FJELLBERG 2007).

***Folsomides parvulus* Stach 1922**

M a t e r i a l e x a m i n e d : 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).

Family Entomobryidae

***Pseudosinella alba* (PACKARD 1873)**

Material examined: Iran, Guilan province: Rasht, 4 m, 37°16'51"N, 49°34'59"E, July 2010; Saravan, 60 m, 37°08'14.19"N, 49°39'50.56"E, October 2009; Khomam, -18 m, 37°23'21"N, 49°39'30"E, April 2011; Lasht-e Nesha, -14 m, 37°21'75"N, 49°51'42"E, May 2011; Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, April 2011; Aqa Seyyed Sharif, 30 m, 37°11'01.04"N, 49°30'57.42"E, April 2011; Sangar, Eslamabad, 35 m, 37°09'55.55"N, 49°41'56.97"E, April 2011; Khomam, Chapar Khaneh, -22 m, 37°25'28.13"N, 49°38'40.44"E, April 2011; Kuchesfahan, Lulaman, -3 m, 37°15'17.07"N, 49°49'00.15"E, May 2011.

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

***Seira domestica* (NICOLET 1841)**

Material examined: Iran, Guilan province: Rasht, Saravan, 60 m, 37°08'14.19"N, 49°39'50.56"E, April 2011; Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, July 2010; Rasht, 4 m, 37°16'51"N, 49°34'59"E, August 2010; Kuchesfahan, -1 m, 37°16'42"N, 49°46'22"E, September 2010; Pirbazar, -23 m, 37°20'21.01"N, 49°33'15.99"E, September 2010; Sangar, Talem Seshanbeh, 31 m, 37°10'56.10"N, 49°39'49.87"E, September 2010; Lasht-e Nesha, Zibakenar, -23 m, 37°26'01.96"N, 49°52'50.73"E, May 2011.

Distribution: England, Iran, Russia (BEI-BIENKO 1967; HOPKIN 1997).

***Willowsia nigromaculata* LUBBOCK 1873**

Material examined: Iran, Guilan province: Rasht, Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, July 2010; Sangar, Talem Seshanbeh, 27 m, 37°10'56.10"N, 49°39'49.87"E, September 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; Khomam, -18 m, 37°23'21"N, 49°39'30"E, April 2011; Kuchesfahan, -1 m, 37°16'42"N, 49°46'22"E, September 2010; Saravan, 60 m, 37°08'14.19"N, 49°39'50.56"E, April 2011; Khomam, Chapar Khaneh, -22 m, 37°25'81"N, 49°38'57"E, April 2011; Lasht-e Nesha, -14 m, 37°21'75"N, 49°51'42"E, May 2011; University of Guilan, 27 m, 37°11'55.03"N, 49°38'33.58"E, July 2010.

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

***Mesentotoma subdolfusi* (DENIS 1924)**

Material examined: Iran, Guilan province: Rasht, Aqa Seyyed Sharif, 30 m, 37°11'01.04"N, 49°30'57.42"E, April 2011.

Distribution: England (HOPKIN 1997).

***Entomobrya lindbergi* STACH 1960**

Material examined: Iran, Guilan province: Rasht, Khomam, Chapar Khaneh, -22 m, 37°25'81"N, 49°38'57"E, April 2011; Khoshk-e Bijar, -14 m, 37°22'29"N, 49°45'27"E, September 2010; Lakanshahr, 20 m, 37°12'33.27"N, 49°35'36.84"E, July 2010.

Distribution: Afghanistan, Egypt, Iran.

***Heteromurus major* MONIEZ 1889**

Material examined: Iran, Guilan province: Rasht, Emamzadeh Hashem, 107 m, 37°01'33.89"N, 49°37'44.62"E, July 2010.

Distribution: Algeria, Austria, Bulgaria, Chile, Czech Republic, France, Germany, Greece, Hungary, Iran, Italy, Mexico, Russia, Palestine, Portugal, Spain, Switzerland, former Yugoslavia (MARI MUTT 1980).

Order S y m p h y p l e o n a

Family K a t t i a n i d a e

***Sminthurinus aureus* (LUBBOCK 1862)**

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, April 2010; Sangar, 27 m, 37°11'16"N, 49°40'17"E, August 2010; Khoshk-e Bijar, -14 m, 37°22'29"N, 49°45'27"E, September 2010; Sangar, Shahrestan, 27 m, 37°09'71"N, 49°41'54"E, April 2011; Pasikhan, -3 m, 37°15'32.49"N, 49°28'23.80"E, September 2010; Saravan, 60 m, 37°08'14.19"N, 49°39'50.56"E, May 2011.

Distribution: Russia, England, Palaearctic area (BEI-BIENKO 1967; HOPKIN 1997).

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