

یازدهمین کنگره ملی سراسری  
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**Introduction to Poduromorpha (Entognatha: Collembola) fauna from Hezarjirib forests (Neka, Mazandaran) with new records of species**

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**Abstract**

Soil is a complex environment colonized by an extreme diversity of organisms. Soil organisms collectively referred to as soil biota include soil viruses, bacteria, actinomycetes, fungi, protozoa, nematodes, mites, Collembola and other microarthropods. One of the most important soil biota are Collembola which are present in large numbers in virtually any soil. The springtails are widespread small to tiny arthropods in soil ecosystem. They play important roles in the circulation of soil materials, development of soil, formation of soil micro-structure, improvement of soil physical and chemical properties, and the maintenance of soil living community. The diversity, community structure, and species composition of springtails in the soil reflect the status of soil quality and contamination. The main effect of Collembola on decomposition and “soil respiration” is through feeding on fungal hyphae. At certain densities of Collembola, grazing of mycorrhizae on roots can stimulate growth of the symbiont and improve plant growth. In other situations, Collembola may reduce disease by consuming pest fungi. Selective grazing by springtails may be an important factor limiting the distribution of certain species of basidiomycete fungi in the field. However, many of these effects are density-dependent, and too little information is available for quantifying accurately the specific contribution of Collembola to “indirect” or “catalytic” decomposition. Nevertheless, the influence of springtails on decomposition and nutrient availability must be significant in many ecosystems. To extend faunistic investigations on Iranian Collembola, several samplings from leaf litter and soil in different localities were collected in the Hezarjirib forests of Neka in Mazandaran province, during 2020-2021. The samples were extracted by Berlese funnel and springtails specimens were identified by taxonomic keys. Results showed 10 species belongs to seven genera and four families.

**Keywords:** Hezarjirib, Collembola, new record, Mazandaran

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## Introduction

the Collembola belongs to a class of arthropods that are morphologically similar to insects in gross body structure, but different in the lack of a hard exoskeleton and wings, in the presence of internal mouthparts and in possessing, primitively, only a few simple eyes on each side of the head and a jumping organ located ventrally. These differences make their collection and treatment taxonomically often quite different from invertebrates (Greenslade, 2007). Collembola can be considered good candidates to be included as biodiversity indicators among soil fauna in an “indicator shopping basket” (Stork, 1995). Not only are they well represented in the soil system in terms of diversity, but they also respond to a variety of environmental and ecological factors, like changes in soil chemistry, microhabitat configuration, and forestry and agricultural practices (Hopkin, 1997). The class Collembola is contained of four order Poduromorpha, Entomobryomorpha, Symphypleona and Neelipleona (Deharveng, 2004). 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 and then the study of Collembola was expanded by some faunal research in the different parts of Iran ( Yosefi *et al.*, 2015, Shayanmehr *et al.*, 2020, Yahyapour *et al.*, 2020a, Yahyapour *et al.*, 2020b, Yahyapour *et al.*, 2021a, Yahyapour *et al.*, 2021b).

## Material and Methods

Soil and leaf litter samples were collected during 2020-2021 from Hezarjirib forests in Mazandaran province by Arash Bakhshi. Geographical data of the sampling sites were obtained by GPS receiver (Fig. 1) Samples were transferred to the laboratory of Sari Agricultural Sciences and Natural Resources University, Mazandaran. After extraction by Tullgren funnels, Collembola specimens were isolated for further study. The specimens, some of which were cleared in Nesbit’s solution, were mounted on Hoyer’s medium to make microscopic slides, after which they were identified to genera and species levels using valid keys. Microscopic slides and specimens preserved in alcohol are maintained in the laboratory of the University.

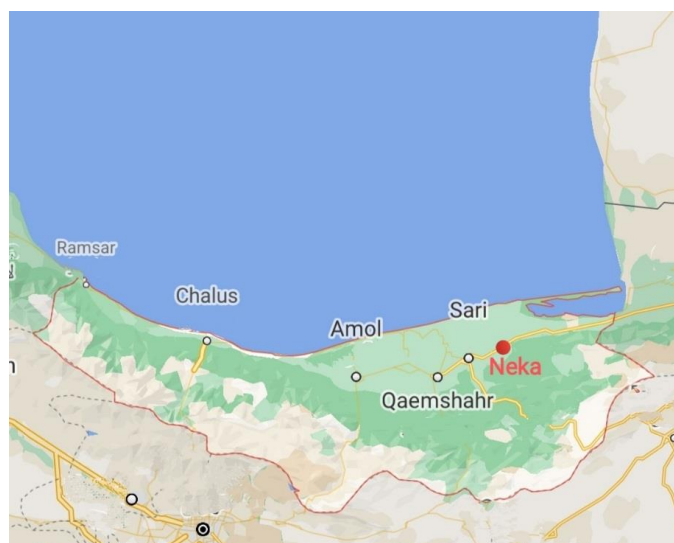


Figure 1 The map of the Neka county

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## Results

In the present study, 10 species from four different families were collected and identified which all recorded for the first time from Mazandaran.

## Taxonomic part

Order poduromorpha

Family Neanuridae

Subfamily Neanurinae

## Genus Deutonura Cassagnau, 1979

### 1. *Deutonura persica* Smolis *et al.*, 2018

**Materials examined:** Iran, four specimens, Mazandaran province, Neka, Kamshi village, Hezarjirib forests, leaf litter, 28-May-2021, 36°31'59" N, E 53°33'44" E, 856 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** The species, *D. decolorata* (Gama & Gisin, 1964) was collected from soil and leaf litter in Mazandaran by Cox (1982) but later the species *D. persica* Smolis *et al.*, 2018 was collected and described as new species from Moss on tree, Leaf litter, dead wood in a hole of Persian ironwood in Mazandaran/ Neka, Hezarjarib forest by Smolis *et al.*, (2018).

**Distribution in the world:** So far only known from the type locality in Mazandaran province, Northern Iran Smolis *et al.*, (2018).

## Genus Endonura Cassagnau, 1979

### 2. *Endonura agnieska* Smolis & Skarżyński, 2020

**Material examined:** Iran, two specimens, Mazandaran province, Neka, Sekile sahra village, Hezarjirib forests, soil and leaf litter, 27-May-2021, 36°35'18" N, E 53°25'38" E, 440 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** This species was collected from tree holes and leaves in Mazandaran, Nashtarud, Kiasar, by Smolis *et al.* (2020). The species is recorded for the first time from Neka county.

**Distribution in the world:** So far only known from the type locality in Mazandaran province, Northern Iran

### 3. *Endonura ceratolabralis* Smolis *et al.*, 2016

**Material examined:** Iran, one specimens, Mazandaran province, Neka, Kamshi village, Hezarjirib forests, Leaf litter, 27-May-2021, 36°31'59" N, E 53°33'44" E, 856 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

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**Distribution in Iran:** This species was collected from leaf litter in oak forest in Kermanshah / Osmane vand by Smolis et al., (2018). This species is recorded for first time from Mazandaran province.

**Distribution in the world:** So far only known from the type locality in kermanshah province, western Iran.

**Genus *Cryptonura* Cassagnau, 1979**

4. *Crptonura anthrenoidea* (Ellis, 1976)

**Material examined:** Iran, one specimens, Mazandaran province, Neka, Sekile sahra village, Hezarjirib forests, soil and leaf litter, 27-May-2021, 36°35'18" N, E 53°25'38" E, 440 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** This species was recorded from soil and leaf litter in Mazandaran/Behshahr (Yahyapour, 2022 press). This species is recorded for first time from Neka county.

**Distribution in the world:** Iceland

**Family Hypogastruridae Börner, 1906**

**Genus *Ceratophysella* Börner, 1932**

5. *Ceratophysella denticulata* (Gisin, 1949)

**Material examined:** Iran, one specimens, Mazandaran, Neka, Sika village Hezarjirib forests, leaf litter, 27-May-2021, 36°24'16" N, E 53°33'0.047" E, 1022 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** This common species was collected from soil and leaf litter in Central, Mazandaran / Sari, Guilan, East Azarbaijan, West Azarbaijan, Zanjan, Kermanshah, Noor, Savadkooh, Babol, Kerman, Mahan, Golestan, Golestan National Park and Neka (Shayanmehr et al. 2020)

**Distribution in the world:** Cosmopolitan (Fjellberg, 1998, Thibaud et al, 2004)

6. *Ceratophysella stercoraria* (Stach, 1963)

**Material examined:** Iran, 16 specimens, Mazandaran, Neka, Sika village Hezarjirib forests, leaf litter, 27-May-2021, 36°24'16" N, E 53°33'0.047" E, 1022 m a.s.l., five specimens Mazandaran province, Neka, Sekile sahra village, Hezarjirib forests, soil and leaf litter, 28-May-2021, 36°35'18" N, E 53°25'38" E, 440 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** The species is common in soil and leaf liter in Kermanshah, Kohgiluyeh and Boyer-Ahmad, Tehran, Mazandaran, Kerman, Golestan, Golestan National Park, Lorestan and Neka (Shayanmehr et al., 2020)

**Distribution in the world:** Bulgaria, Russia, Ukraine, partly Middle Asia (Thibaud et al. 2004)

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Family Onychiuridae

Subfamily Onychiurinae

Genus *Heteraphorura* Bagnall, 1948

7. *Heteraphorura iranica* Kaprus et al., 2017

**Materials examined:** Iran, four specimens, Mazandaran, Neka, Sika village Hezarjirib forests, leaf litter, 27-May-2021, 36°24'16" N, E 53°33'0.047" E, 1022 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** This species was collected from Soil and leaf litter under oak and horn beam trees in Kermanshah/Chahar zebar-e-oliya; Osmanevar; Cheshmehsorkh; Paveh; Shabankareh; Mazandaran/Nowshahr, Kajour, Lashkenar; Babolsar, Bahnamir; Sari, Semeskandeh forest; Neka Golestan/Gorgan, Alangdarreh forest; Kordkuy, Imam Reza forest; Golestan National Park by (Shayanmehr et al., 2020 and Yahyapour, 2020a).

**Distribution in the world:** Iran (Shayanmehr et al., 2020 and Yahyapour, 2020a).

Genus *Protaphorura* Absolon, 1901

8. *Protaphorura golestanica* Kaprus et al., 2017

**Materials examined:** Iran, seven specimens, Mazandaran province, Neka, Ghormaraz village, Hezarjirib forests, soil and leaf litter, 09-April-2021, 36°35'52" N, 53°24'13" E, 346 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** This species was collected from soil and leaf litter under horn beam in Golestan, Gorgan region, Alangdarreh forest; Kordkuy, Imam Reza forest; Golestan National Park and Neka by Kaprus' et al., (2017), Khanahmadi (2018).

**Distribution in the world:** So far only known from the type locality in Golestan and Mazandaran province, Northern Iran.

9. *Protaphorura levantina* (Christiansen, 1956)

**Distribution in Iran:** Already recorded in the Iranian provinces of Golestan, Kermanshah and Mazandaran (Shayanmehr et al. 2020 and Yahyapour et al., 2022 press). This species is recorded first time from Neka county.

**Distribution in the world:** Lebanon and Syria (Christiansen, 1957)

Family Odontellidae

Genus *Superodontella* Stach 1949

10. *Superodontella lamellifera* (Axelson, 1903)



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**Materials examined:** Iran, one specimens, Mazandaran province, Neka, Kamshi village, Hezarjirib forests, Leaf litter, 27-May-2021, 36°31'59" N, E 53°33'44" E), 856 m a.s.l., A. Bakhshi leg. (Deposited in Sari University of Agricultural Sciences and Natural Resources).

**Distribution in Iran:** This species was collected from soil in East Azarbaijan, Mazandaran / Sari and Neka by Cox (1982).

**Distribution in the world:** Cosmopolitan (Fjellberg, 1998)

## Discussion

Collembola are among the most abundant and divers soil microarthropads in virtually and habitat, but in particular in forest soils, specially old-growth forest (Hopkin 1997, Addison et al., 2003). The hezarjirib forest as a part of the hyrcanian forest represent an old-growth forest. In the present study, the faunistic of collembola in the forest was investigated for the first time. Samples collected from leaf litter and soil in different localities. In sum, 10 species from Poduromorpha were reported from Hezarjirib forests (Neka, Mazandaran). In total, four species are recorded for the first time from Neka county in Mazandaran province. Species including *Endonura agnieska*, *Endonura ceratolabralis*, *Cryptonura anthrenoides* (Neanuridae), and *Protaphorura levantina* (Onuchiuridae). To data six species of *Endonura* have been recorded from Iran (Shayanmehr et al., 2020): *Endonura ceratolabralis*, *Endonura dentifera*, *Endonura dictyaeta*, *Endonura longirostris*, *Endonura paracentaura* and *Endonura persica*. Only two species of *Cryptonura* (Shayanmehr et al., 2020): *Cryptonura persica* and *Cryptonura maxima* and 12 species of *Protaphorura* (Shayanmehr et al., 2020): *Protaphorura aurantica*, *Protaphorura bicampata*, *Protaphorura cancellata*, *Protaphorura fimata*, *Protaphorura golestonica*, *Protaphorura gisini*, *Protaphorura levantina*, *Protaphorura ombrophila*, *Protaphorura persica*, *Protaphorura quadriocellata*, *Protaphorura sakatoi* and *Protaphorura salsa*.

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