

# First faunistic study of Diplura in north of Iran with records of two species of *Campodea* (Campodeidae)

Saeed Azadbakhsh & Jamasb Nozari

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The hexapod fauna of Iran is still very incompletely known. The current study is the first report of dipluran species from Iran. Our studies and sampling were done in two northern provinces Mazandaran and Alburz during March to August 2012. Forty-five specimens of this order were collected. All the specimens were identified as *Campodea* (*Dicampa*) *sprovierii* Silvestri, 1932 or *Campodea* (*Campodea*) *fragilis* Meinert, 1865 (Campodeidae). Both the species are reported from Iran for the first time.

S. Azadbakhsh & J. Nozari, Department of Plant Protection, University of Tehran, Karaj, Iran; Corresponding author's email: Azadbakhsh@live.com

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## 1. Introduction

The order Diplura commonly known as diplurans or “two-pronged bristletails” are wingless arthropods in the superclass Hexapoda and has about 800 described species (Allen 1994). They have no eyes and their small body is soft and unpigmented, but some species of the genus *Japyx* Haliday are bigger and may reach the length of 50 mm. The species of this order can be easily recognized by one pair of caudal filaments called cerci. Cerci are mostly long and filamentous but in Japygidae they are short and forceps-like.

Dipluran species are mostly found in moist soil such as under leaf litter or among humus, and feed on a variety of live prey and dead matter. The members of the family Campodeidae, with more than 450 species in 50 genera, are the largest family of Diplura (Meinert 1865). These insects are easily recognized by short and thick body with long and filamentous cerci which are roughly as long as the antennae. They are pale and mostly 2–7 mm long.

There are no data about the diversity and distribution of diplurans in Iran. Rahmani and Mayvan (2004) just mentioned the order Diplura in a faunistic study on soil-dwelling arthropods of Iran, without any information about the species diversity. The aim of the current study is to shed light on the species diversity of Campodeidae family in north of Iran, particularly in the Mazandaran province.

## 2. Materials and methods

The specimens were collected by hand from the north of Iran, particularly from the different parts of the province Mazandaran and one site in the province Alburz, from March 2012 to August 2012.

Mazandaran province is located between 35°47' to 36°35'N and 50°34' to 54°10'E, covering an area of 23,833 km<sup>2</sup> (1.46% of Iranian area). Mazandaran province is geographically divided into two parts: the coastal plains and the moun-



Fig. 1. NowShahr, Khirood Forest, Mazandaran province (36°35' 42.9"N, 51°31'24.4"E), deciduous forest, small torrent, 18.IX.2012. Photo: S. Azadbakhsh.

tainous areas. The Elburz Mountain Range surrounds the coastal strip and the plains of the Caspian Sea. The province enjoys a moderate, subtropical climate with an average temperature of 25 °C in summer and about 8 °C in winter. Although snow may fall heavily in the mountains in winter, it rarely falls at the sea level. The vegetation of this area consists of forests, grasslands and steppe. The Caspian Hyrcanian mixed forests, being 40 million years old, cover parts of five provinces of Iran from east to west including: North Khorasan, Golestan, Mazandaran, Gilan and Ardabil. The annual rainfall ranges from 900 mm (35 in) in the east (Golestan province) to 1,600 mm (63 in) in the west (Gilan province). In the forests in general, hardwood or deciduous trees such as oaks, hornbeams, alders, ashes, chestnuts, boxwoods, maples, lindens, elms and beeches are dominant and extend to an altitude of some 1,800 m. From 1,800 to 2,500 m a.s.l. softwood or evergreen trees appears. Above 2,500 m a.s.l. the conditions are limited for trees, and instead of forests, grassland vegetation (similar to alpine meadows in Europe) is found.

Alburz province has the shared border with Mazandaran province in the north and is located between 35°28' to 36°30' N and 50°10' to 51°30' E, covering an area of 5,800 km<sup>2</sup>. Alburz province is geographically divided into two parts, i.e. desert and semi-desert climate in south and

mountainous areas in north. The latter areas have moderate climate in summer and cold and snowy winter. The annual rainfall of this province is between 250–300 mm, mostly occurring in the mountainous areas.

For collecting diplurans we chose localities (about 20) with humid humus soil in different habitats, like plains, farms and forests, from east to west of Mazandaran province. In each locality, diplurans were searched for at least c. 2–3 hours by one of the authors (S. A.), or a longer time in localities where diplurans were found. Diplurans were searched for haphazardly between bushes, under stones, among leaf litter, under fallen tree trunks and in any microhabitats that might be appropriate for diplurans. Finally, in western Mazandaran province some diplurans were found in 3 localities (Chalus, Nowshahr and Ramsar). The localities in Chalus and Nowshahr were forests with humid soil all over the year. The dipluran specimens were found under stones and trunks and among leaf litter. In Ramsar, some specimens were found under stones near a river of a plain on a mountain. With more rain in the western localities where diplurans were found, the soil was moister all over or most of the year and the soil had more humus compared to the localities in the eastern parts of the province where diplurans were not found.

In Alburz province, diplurans were searched

Fig. 2. Ramsar, Javaher Deh, Mazandaran province (36°51'27.0"N, 50°30'57.6"E), shrubs with single deciduous trees, 13.VIII.2012. Photo: S. Azadbakhsh.



for in just one locality. They were found among leaf litter near the irrigation system in an old garden with trees, such as pines, oaks and apples. This garden is located in the College of Agriculture and Natural Resources of the University of Tehran near the Karaj river and it is one of the oldest gardens in that area. The climate of the area, along mountainside, is moderate in summer and somewhat cold and snowy in winter.

The collected specimens were preserved in 70% ethanol, and sent to Prof. Alberto Sendra (Valencia, Spain) for species identification.

### 3. Results

In the present study, 45 specimens of one genus and two subgenera in Campodeidae were found and identified. The species *Campodea (Dicampa) sprovierii* Silvestri, 1932 and *Campodea (Campodea) fragilis* Meinert, 1865 are new records for Iran.

#### 3.1. *Campodea (Dicampa) sprovierii*

*Material examined.* 1♂, 2♀ (adult), Chalus, Mazandaran province, northern Iran, 36°36' 36.1"N, 51°24'30.4"E, 420 m, 4.VIII.2012, S. Azadbakhsh leg; 4♂, 9♀ (adults), same data as above but 66 m a.s.l., 20.IX.2012, S. Azadbakhsh leg; 2♂, 3♀ (adults), Nowshahr (Fig. 1), Mazandaran province, northern Iran, 36°35' 26.8"N, 51°28'58.1"E, 40 m, 7.V.2012, S. Azadbakhsh

leg; 2♀ (adults), Ramsar, Mazandaran province, northern Iran, 36°53' 30.3"N, 50°33'33.4"E, 600 m, 15.VI.2012, S. Azadbakhsh leg; 6♂, 9♀ (adults), Karaj, Alburz province, northern Iran, 35°48'25.9"N, 50°59'56.9"E, 1,100 m, 8.VI.2012, S. Azadbakhsh leg.

*Distribution.* This species is common in many habitats in eastern Mediterranean region. It is known in several Aegean islands and the Peloponnese Peninsula (Silvestri 1932, Wygodzinsky 1941), at the Carpathians, the Balkan and the Anatolian Peninsula (Rusek 1965, Sendra *et al.* 2010) as well as in Romania (Ionescu 1951).

#### 3.2 *Campodea (Campodea) fragilis*

*Material examined.* 2♂ (adults), Chalus, Mazandaran province, northern Iran, 36°36' 36.1"N, 51°24'30.4"E, 420 m, 4.VIII.2012, S. Azadbakhsh leg; 3♂, 1♀ (adults), Ramsar (Fig. 2), Mazandaran province, northern Iran, 36°53' 30.3"N, 50°33'33.4"E, 800 m, 15.VI.2012, S. Azadbakhsh leg.

*Distribution.* This species has been known from Greece in some localities from Achaea (Peloponnese) and Ithaca Island (Conde, 1984) as well as in the Anatolian plateau in Turkey (Sendra 2010).

### 4. Conclusions

Iranian faunistic studies of soil-dwelling arthropods are very limited in number. Moreover, most

of them just mention the order Diplura without identifying and reporting any species. In this study, 45 dipluran specimens belonging to 2 species were collected and identified. They are both new records for Iranian fauna.

Besides Iran, information on diplurans is incomplete also for most surrounding countries, except for the Anatolian plateau in Turkey where the fauna of Campodeidae is more thoroughly known, comprising 23 species (Sendra *et al.* 2010). The eastern region of the Anatolian plateau joins to Caucasus, Zagros Mountains and Iranian plateau. Therefore, we can expect quite a few more species of this family to exist in Iran. Iranian fauna of Campodeidae may be rather similar to that of the Anatolian plateau, e.g. both the species found in this study are also known from the Anatolian plateau.

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