

SOME ASPECTS REGARDING THE DISTRIBUTION OF TULLBERGIIDAE BAGNALL, 1935 (COLLEMBOLA: ONYCHIUROIDEA) FROM THE REPUBLIC OF MOLDOVA

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Abstract. The present paper includes some aspect of distribution of 14 species from 6 genera belonging to the family Tullbergiidae recorded in the collembolan fauna of the Republic of Moldova. The list of Collembola species from the country is completed with two genera and species *Jevania weinerae* and *Karlstejnina rusekiana*. The major part of the identified species – 12 have a wide geographical distribution, while in the case of two species, it was completed the knowledge of zoogeographical distribution.

Keywords: Collembola, distribution, ecology, Republic of Moldova.

Rezumat. Unele aspecte privind distribuția speciilor de Tullbergiidae BAGNALL, 1935 (Collembola: Onychiuroidea) din Republica Moldova. În lucrare se prezintă distribuția și ecologia a 14 specii de colembole ce fac parte din 6 genuri ale familiei Tullbergiidae din fauna Republicii Moldova. Lista speciilor de colembole din țară este completată cu 2 genuri și 2 specii *Jevania weinerae* și *Karlstejnina rusekiana*. Majoritatea speciilor identificate – 12, au o răspândire zoogeografică largă, iar pentru două cunoașterea arealului de distribuție a fost completată.

Cuvinte cheie: Collembola, distribuție, ecologie, Republica Moldova.

INTRODUCTION

The members of the family Tullbergiidae are similar and have typical characters of soil Collembola: small body size, without a trace of pigmentation, absence of eyes and furca (RUSEK, 1978). They are the best adapted to euedaphic environment. The detailed comparative study started by RUSEK in 1974 revealed a mixture of not only different species, but also new genera that have been discovered especially among the smaller Tullbergiidae. Since then several new Tullbergiidae have been described using new taxonomical criteria such as structure of the antennal organ III, as well as the postantennal organ, chaetotaxy of body and anal valve, shortened legs etc. As a result of this investigation the first volume of Palaearctic Collembola, Tullberginae published in 1994 includes 30 genera of this subfamily.

During the study of the collembolan fauna from the Republic of Moldova thanks to the Moldavian – Polish academic exchange program – 14 species from 6 genera of the family Tullbergiidae were recorded. Among them, two genera and two species *Jevania weinerae* RUSEK, 1978 and *Karlstejnina rusekiana* WEINER, 1983 are new for the Republic of Moldova.

MATERIAL AND METHOD

Samples of moss, soil, and litter were collected from the different forest types, forest plantations, orchards, meadows, banks of the Prut and the Dniester Rivers, shores of lakes and calcareous rock in 26 localities of the Republic of Moldova during 2005-2010. Specimens were extracted by flotation method and fixed in 80% ethyl alcohol. Collembola were identified according to ZIMDARS & DUNGER, 1994 and some taxonomic studies by RUSEK, 1971, 1982, WEINER, 1983. The slides collection is stored in the Entomological Museum of the Institute of Zoology of ASM.

List of habitats, localities with abbreviations:

Forest (F). State Nature Reserves “Codri Tigheci” and “Plaiul Fagului”; natural deciduous forest from the localities Gîrbovăț and Stejăreni; *Robinia pseudoacacia* plantation from locality Alava and *Pinus* plantation from the locality Cociulia;

Petrophyte forest (C) and calcareous canyon on the bank of the Dniester River from the localities Butuceni, Orheiul Vechi, Lalova, Saharna, Țîpova and Mărcăuți;

Wetlands (W) of the Prut River and shores of Manta Lake from the localities Brăneștii, Cahul, Cîșlița Prut, Manta, Leușeni and Roșu;

Bank (B) of the Middle and Lower Dniester River from the localities Cocieri, Crocmaz, Grădinița, Gura Bîcului, Iagorlîc and Răscăeți;

Orchards (O). Apple and plum orchards from the localities Holercani and Sipoteni.

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RESULTS AND DISCUSSIONS

As a result of the investigation, 14 species of Collembola from the family Tullbergiidae belonging to 6 genera (*Doutnacia*, *Jevania*, *Karlstejnina*, *Mesaphorura*, *Metaphorura* and *Stenaphorura*) were found. The list of Collembola species from the Republic of Moldova is completed with two new species. The Table 1 includes the list of species, the abbreviations of habitats for comparative analyses and zoogeographical distribution.

Table 1. Habitats and zoogeographical distribution of the studied Collembola species.
 Tabel 1. Distribuția biotopică și zoogeografică a speciilor de colembole studiate.

No.	Genera and species	Habitats	Zoogeographical distribution
	Genus <i>Doutnacia</i> RUSEK, 1974		
1.	<i>Doutnacia xerophila</i> RUSEK, 1974	F, C, O	South and Middle Europe
	*Genus <i>Jevania</i> RUSEK, 1978		
2.	* <i>Jevania weinerae</i> RUSEK, 1978	C	Austria, Hungary, Poland, Republic of Moldova.
	*Genus <i>Karlstejnia</i> RUSEK, 1974		
3.	* <i>Karlstejnia rusekiana</i> WEINER, 1983	F	Poland, Ukraine, Slovak Republic, Republic of Moldova
	Genus <i>Mesaphorura</i> BÖRNER, 1901		
4.	<i>Mesaphorura critica</i> ELLIS, 1976	F, C, W, O, B	Widely distributed
5.	<i>Mesaphorura hylophila</i> RUSEK, 1982	F, C, W, O, B	Widely distributed
6.	<i>Mesaphorura italica</i> RUSEK, 1971	C, B, O	Europe, Iraq
7.	<i>Mesaphorura jarmilae</i> RUSEK, 1982	F	Europe
8.	<i>Mesaphorura krausbaueri</i> BÖRNER, 1901	F, C, W, O, B	Palaeartic
9.	<i>Mesaphorura macrochaeta</i> RUSEK, 1976	B	Cosmopolitan
10.	<i>Mesaphorura sylvatica</i> (RUSEK, 1971)	W, B, O	Holarctic
11.	<i>Mesaphorura yosii</i> (RUSEK, 1967)	W, B, O	Holarctic
	Genus <i>Metaphorura</i> STACH, 1954		
12.	<i>Metaphorura affinis</i> (BÖRNER, 1902)	F, C, W, O, B	Palaeartic
	Genus <i>Stenaphorura</i> ABSOLON, 1900		
13.	<i>Stenaphorura denisi</i> (BAGNALL, 1935)	B	Europe
14.	<i>Stenaphorura quadrispina</i> (BÖRNER, 1901)	B	Euro-Mediterranean

Genera and species marked with asterisk (*) are new for the Republic of Moldova.

In spite of a large spectrum of habitats included in this study, only 14 species from the family Tullbergiidae have been found in the Republic of Moldova till now. Most of them have been found in different localities, but there are some species with preference to one type of habitats. According to Table, 1 both species from the genus *Stenaphorura* – *S. denisi*, *S. quadrispina* and *Mesaphorura macrochaeta* occur in the open habitat and have been found only on the meadow near the bank of the Prut River downstream.

The species *Mesaphorura jarmilae* and *Karlstejnia rusekiana* have been extracted from the soil of natural deciduous forest, while *Jevania weinerae* prefers calcareous soil.

The list of species and some aspects of distribution and ecology for the species from the family Tullbergiidae collected in the fauna of the Republic of Moldova (including GPS parameters of localities and sex of specimens only for two new found species) are given below:

***Doutnacia xerophila* RUSEK, 1974**

Material: 1 exemplar (ex.), 22.VI.2005, calcareous soil, loc. Butuceni; 2 ex., 01.V.2005, forest soil, loc. Stejăreni; 1 ex., 10.IV.2006, moss on the tree trunk, Plaiul Fagului; 1 ex., 03.V.2006, soil, bank of lake, loc. Iagorlîc; 1 ex., 10.V.2007, forest soil, Plaiul Fagului; 1 ex., 14.XII.2007, forest soil, Plaiul Fagului; 4 ex., 29.II.2008, soil, apple orchard, loc. Sipoteni; 4 ex., 22.IV.2008, calcareous soil, loc. Butuceni; 1 ex., 17.VI.2008, forest soil, Codri Tigheci; 1 ex., 30.III.2010, calcareous litter, loc. Țipova; 1 ex., 09. VI. 2010, soil, plum orchard, loc. Holercani.

***Jevania weinerae* RUSEK, 1978**

Material: 2 ♀♀ and 1 juv. collected 13. XI.2009, litter on calcareous soil, loc. Lalova (N 47° 34', E 28° 59').

***Karlstejnia rusekiana* WEINER, 1983**

Material: 1 ♂ and 1 juv., 10.VII.2007, forest litter, Plaiul Fagului (N 47°18', E 28° 04').

***Mesaphorura critica* ELLIS, 1976**

Material: 1 ex., 14.IX.2005, soil, shores of Manta Lake; 1 ex., 10.IV.2006, moss and 3 ex., 10. V. 2007, forest soil, Plaiul Fagului; 7 ex., 24.VII.2006, sand, bank of the Dniester River, loc. Coicieri; 4 ex., 20.II.2007, forest soil, loc. Gîrbovăt; 2 ex., 06.XI.2007, soil, *Pseudoacacia* plantation, loc. Alava; 2 ex., 13.XI.2009, calcareous soil, loc. Lalova; 2 ex., 14.XII.2007, forest soil, Plaiul Fagului; 2 ex., 22.IV.2008, moss on calcareous soil, loc. Butuceni; 1 ex., 30.III.2010, calcareous soil, loc. Țipova; 2 ex., 17.V.2010, soil, loc. Mărcăuți; 3 ex., 09.VI.2010, soil, plum orchard, loc. Holercani.

***Mesaphorura hylophila* (RUSEK, 1971)**

Material: 3 ex., 01.V.2005, forest soil, loc. Stejăreni; 17 ex., 21.VIII.2005, forest soil, Lărguța; 4 ex., 10.IV.2006, moss and 1 ex., 22.VI.2007, forest soil, Plaiul Fagului; 3 ex., 03.V.2006, soil, *Salix* plantation, loc. Iagorlîc; 1 ex., 14.XII.2007, forest soil, Plaiul Fagului; 16 ex., 29.II.2008, wet meadow, Plaiul Fagului; 30.III.2010, calcareous soil, loc. Țipova.

Mesaphorura italica RUSEK, 1971

Material: 1 ex., 25.VI.2005, calcareous litter, loc. Țipova; 6 ex., 25.VI.2006, sand, bank of the Prut River, loc. Gurgiulești; 1 ex., 20.X.2007, calcareous litter, loc. Orheiul Vechi; 4 ex., 09.VI.2010, soil, plum orchard, loc. Holercani.

Mesaphorura jarmilae RUSEK, 1982

Material: 3 ex., 19.IV.2007, forest soil, Plaiul Fagului; 4 ex., 14.XII.2007, forest soil, Plaiul Fagului.

Mesaphorura krausbaueri BÖRNER, 1901

Material: 27 ex., 15.VII.2005, bank of the Dniester River, loc. Gura Bîcului; 11 ex., 05.VIII.2005, *Pinus* plantation, loc. Cociulia; 3 ex., 02.V.2006, soil, bank of the Dniester River; 4 ex., 10.IV.2006, moss on tree trunk, Plaiul Fagului; 16 ex., 14.XII.2007, wet meadow, Plaiul Fagului; 16.X.2008, forest soil, loc. Gădinița; 3 ex., 13.XI.2009, calcareous soil, loc. Lalova; 1 ex., 30.III.2010, calcareous soil, loc. Țipova; 3 ex., 22.IV.2010, calcareous litter, loc. Saharna.

Mesaphorura macrochaeta RUSEK, 1976

Material: numerous specimens, 13.IX.2005, soil, bank of the Prut River, loc. Cîșlița Prut; 2 ex., 14.IX.2005, bank of Prut River, loc. Cahul; 2 ex., 03.V.2006, soil, *Salix* plantation, shore of lake, loc. Iagorlic.

Mesaphorura sylvatica (RUSEK, 1971)

Material: 2 ex., 15.VII.2005, soil, bank of the Dniester River, loc. Gura Bîcului; 2 ex., 30.III.2010, calcareous soil, loc. Țipova; 3 ex., 09.VI.2010, soil, plum orchard, loc. Holercani.

Mesaphorura yosii (RUSEK, 1967)

Material: 12 ex., 11.VII.2005, soil, shore of Manta Lake; 2 ex., 14.IX.2005, soil, bank of the Dniester River, loc. Cahul; 3 ex., 29.II.2008, soil, apple orchard, loc. Sipoteni; 6 ex., 30.III.2010, calcareous soil, loc. Țipova.

Metaphorura affinis (BÖRNER, 1902)

Material: 2 ex., 19.IV.2005, soil, *Robinia* plantation, loc. Inești; 2 ex., 05.VIII.2005, soil, *Robinia* plantation, loc. Lărguța; 13 ex., 11.VII.2005, soil, shore of Manta Lake; 3 ex., 14.IX.2005, soil, shore of Manta Lake; 4 ex., 03.V.2006, soil, *Salix* plantation, shore of lake, loc. Iagorlic; 19 ex., 13.X.2007, wet meadow, Plaiul Fagului; 9 ex., 20.IX.2007, forest soil, loc. Gîrbovăț; 2 ex., 06.XI.2007, soil, *Robinia* plantation, loc. Alava; 3 ex., 29.II.2008, soil, apple orchard, loc. Sipoteni; 3 ex., 20.VIII.2008, forest soil, loc. Crocmaz; 5 ex., 30.X.2008, wet meadow, loc. Gădinița; 6 ex., 06.XI.2008, wet meadow, loc. Gădinița; 1 ex., 13.XI.2009, calcareous soil, loc. Lalova.

Stenaphorura denisi (BAGNALL, 1935)

Material: 1 ex., 24.VI.2006, soil, bank of the Prut River, loc. Manta; 5 ex., 11.V.2006, soil, bank of the Prut River, loc. Leuseni; 4 ex., 11.X.2006, soil, bank of the Prut River, loc. Brănești.

Stenaphorura quadrispina (BÖRNER, 1901)

Material: 4 ex., 16.IV.2000, soil, *Salix* plantation, bank of the Prut River, loc. Roșu.

The most common species collected in the different habitats in the Republic of Moldova are *Doutnacia xerophila*, *Metaphorura affinis*, *M. critica*, *M. hylophila* and *M. krausbaueri*. These species have been extracted from the soil and litter of the forest, banks of the river, calcareous soils and meadows.

The species *Mesaphorura sylvatica*, *M. yosii*, *M. italica* and *M. macrochaeta* have been observed especially in the open habitat such as calcareous soil along the canyon of the Dniester River, apple or plum orchards, shores of Manta Lake and banks of the Dniester or the Prut Rivers.

Only a few specimens of four species *Jevania weinerae*, *Mesaphorura jarmilae* and *Karlstejnina rusekiana* have been recorded in the forest soil of State Nature Reserve Plaiul Fagului and *Stenaphorura quadrispina* – in the soil of the *Salix* plantation on the bank of the Prut River downstream, being very rare.

Jevania weinerae have been described from Pieniny Mountains (Poland), in the soil samples from an older forest near the Dunajec River. Then the specimens of this species have been recorded in Austria and Hungary.

Karlstejnina rusekiana have been described from Ojców National Park (Poland), in the Carpathian beech and humid oak-hornbeam forest. The species have been also cited from Slovak Republic and Ukraine.

The zoogeographical distribution of species revealed that the most part of them have large occurrence: 3 species are widely distributed or cosmopolitan, 2 – Holarctic, 2 – Palearctic, 4 – European, 1 – Euro-Mediterranean distribution. Two species have been found till now only in Central European countries like Austria, Poland, Ukraine, and Slovak Republic.

CONCLUSIONS

In spite of a large spectrum of habitats included in the study only 14 species from 6 genera of the family Tullbergiidae were recorded in the collembolan fauna on the Republic of Moldova. The list of Collembola species from the Republic of Moldova are completed with two new genera and species *Jevania weinrae* and *Karlstejnina rusekiana*. The most part of the studied species – 12 have large occurrence and for two species the area of zoogeographical distribution were expanded.

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