UDK: 595.44(497.735)
Received: 12.02.2022
Accepted: 16.09.2022
Original scientific paper

Acta Musei Macedonici Scientiarum Naturalium, 2022, Vol. 25, pp: 59-66
ISSN: 0583-4988 (printed version)
ISSN: 2545-4587 (on-line version)
Available on-line at: www.acta.musmacscinat.mk

Contribution to the knowledge of Araneae (Arachnida) in Maleshevo, North Macedonia

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Abstract
A total of 58 species from 16 families (Agelenidae – 1; Araneidae – 1; Clubionidae – 1; Dictynidae – 1; Gnaphosidae – 15; Linyphiidae – 2; Liocranidae – 3; Lycosidae – 15; Miturgidae – 2; Philodromidae – 4; Phrurolithidae – 1; Pisauridae – 1; Salticidae – 1; Theridiidae – 5; Thomisidae – 4; Zodariidae – 1) were recorded from 3 localities in Maleshevo, North Macedonia. Two of the recorded species are new for the Macedonian fauna: *Lathys humilis* (Blackwall, 1855) and *Episinus maculipes* Cavanna, 1876. Both of them are widely distributed in Europe as well as in other parts of the world. Most probably their distribution is not isolated in Maleshevo and these species are distributed in other Macedonian regions as well. The spiders are classified in 14 zoogeographic categories belonging to 4 chorotypes (widely distributed, European, Mediterranean and endemics). The widely distributed species are dominant (63.79%), followed by the European (31.03%), Mediterranean (3.45%) and endemic species (1.72%).

Key words: Balkan Peninsula, new faunistic records, spiders

Introduction

There is a lack of faunistic research in the Republic of North Macedonia. Hristovski et al. (2015) present the most thorough review on the faunistic research on Araneae in Macedonia listing total number of 767 species, with 9 of them being local endemics. With the work of Deltshev & Wang (2016) who published one, and Komnenov (2017, 2020) who published 29 new species, the total number for Macedonians araneofauna reached 797 species. However, lack of research is especially true for Maleshevo, which is quite unknown from an arachnological point of view. The only arachnological papers concerning this region is the faunistic paper given by Komnenov (2020).

The number of spider species in North Macedonia is relatively high when compared to other Balkan countries: Bulgaria - 1046 (Deltshev and Blagoev 2001, Naumova et al. 2017, Blagoev et al. 2018), Greece - 856 (Bosmans and Chatzaki 2005), Serbia - 750 (Deltshev et al. 2003, Grbić et al. 2021), Albania – 335 (Deltshev et al. 2011) and Kosovo -159 (Geci and Naumova,. 2021).

In this study, we offer faunistic data on the araneofauna of three adjacent habitats near Smojmirovo village, Maleshevo, including two new records for the fauna of North Macedonia.

Study area

This survey was conducted in Maleshevo, a high-altitude region (average height 900 m a.s.l.) located in the eastern part of the Republic of North Macedonia. According Melovski et al. (2013), this region is surrounded by Vlaina Planina Mt. on the northeast, Maleshevski Planini Mts. on the east, south and west, Plachkovica Mt. on the west and Bejaz Tepe on the north. The terrain is hilly, with minor or larger flat regions where agriculture is a major source of income for the locals. Traditional forestry as well has long history in this region. Climate is continental.

The study area comprises of three adjacent habitats near Smojmirovo village (Fig 1.):

L1 – Maleshevo, Smojmirovo village, (41.741952° 22.853008°), temperate continental *Pinus sylvestris* forest.

L2 – Maleshevo, Smojmirovo village, (41.742439° 22.853743°), temperate *Juniperus communis* scrub, ecotone.

L3 – Maleshevo, Smojmirovo village, (41.742320° 22.855120°), open area presented of low steppic scrub (*Achillea millefolium, Ononis spinosa, Galium verum* and *Hypericum perforatum*).

Figure 1. Three adjacent habitats in the study area of Maleshevo

Material and methods

The araneofauna was collected using pitfall traps only. The traps were made of 300 ml plastic cups with a diameter of 85 mm. At each locality, five pitfall traps were placed along a transect line (40 m long). The distance between each trap was 10 m. The material was preserved in a formalin-vinegar solution (1:7) and was collected monthly (01.04 – 30.08.2014). The identification of spiders was based on keys developed by Heimer & Nentwig (1991) and Nentwig et al. (2022), as well as comparison material from the second author's personal collection.

Data on general distribution was taken from the World Spider Catalog (2022), while zoogeographic classification was made according Stefanovska et al. (2008), Deltshev et al. (2011, 2013) and Komnenov (2014, 2017). The material is deposited in the National Collection of Invertebrates at the Institute of Biology, Faculty of Natural Sciences and Mathematics in Skopje.

The spiders of Maleshevo region are classified into 14 zoogeographic categories, grouped into 4 chorological complexes (Fig. 2):

Widely distributed: Holarctic (HOL), Palearctic (PAL), W-Palearctic (WPA), Euro-Asian (EURA), Europe-Central Asian (ECA), Europe-Middle Asian (EMA), Mediterranean-Central Asian (MCA), Mediterranean-Middle Asian (MMA), Euro-Siberian (EUS);

European (EUR): European (EUR), Euro-Caucasian (EKA), S-European (SEU);

Mediterranean: Ponto-E-Mediterranean (PEM);

Endemics: Balkan endemic (BP).

Results

A total of 58 species from 16 families were registered (Agelenidae – 1; Araneidae – 1; Clubionidae – 1; Dictynidae – 1; Gnaphosidae – 15; Linyphiidae – 2; Liocranidae – 3; Lycosidae – 15; Miturgidae – 2; Philodromidae – 4; Phrurolithidae – 1; Pisauridae – 1; Salticidae – 1; Theridiidae – 5; Thomisidae – 4; Zodariidae – 1). Among 520 individuals, 506 were adults (190♀ and 316♂), 3 sub adults and 11 juveniles. Two species are new for the araneofauna of North Macedonia, while all data are new records for Maleshevo. The families Linyphiidae and Lycosidae have the highest number of species (25.9% each). The genera *Alopecosa* (6), followed by *Pardosa* (5) and *Zelotes* (5) are the most diverse (Tab. 1.).

Tab. 1: Species composition and distribution of the recorded spiders; Legend: New records for the spider fauna of North Macedonia are written in bold. Zoogeographic categories listed on the table follow Stefanovska et al. (2008), Deltshev et al. (2011, 2013), Komnenov (2014, 2017): Holarctic (HOL), Palearctic (PAL), W-Palearctic (WPA), Euro-Asian (EURA), Europe-Central Asian (ECA), Euro-Middle Asian (EMA), Mediterranean-Central Asian (MCA), Mediterranean-Middle Asian (MMA), Euro-Siberian (EUS), European (EUR), Euro-Caucasian (EKA), S-European (SEU), Ponto-E-Mediterranean (PEM), Balkan endemic (BP).

Widely distributed chorotype is represented by 37 species (63.79%). Palearctic species dominate (17.24%) followed by European-Central Asian species (10.34%).

European complex is dominated by species with a wide distribution in Europe (17.24%), followed by spiders from the EKA (8.62%) and SEU (5.17%) zoogeographic categories.

Table 1. Species composition and distribution of the recorded spiders

Family/species	L1			L2			L3			Total number of ♀	Total number of ♂	Total number of individuals	Zoogeographic distribution
	♀	♂	Total number of individuals	♀	♂	Total number of individuals	♀	♂	Total number of individuals				
Agelenidae													
Tegenaria campestris (C. L. Koch, 1834)		1	1								1	1	EUR
Araneidae													
Cercidia prominens (Westring, 1851)								1	1		1	1	EUS
Clubionidae													
Clubiona comta C. L. Koch, 1839	1		1							1		1	WPA
Dictynidae													
***Lathys humilis* (Blackwall, 1855)**				1		1				1		1	ECA
Gnaphosidae													
Civizelotes caucasius (L. Koch, 1866)								1	1		1	1	ECA
Civizelotes gracilis (Canestrini, 1868)					1	1					1	1	PEM
Drassodes pubescens (Thorell, 1856)								1	1		1	1	EURA
Drassyllus praeficus (L. Koch, 1866)	1		1	3		3	6	3	9	10	3	13	ECA
Drassyllus pusillus (C. L. Koch, 1833)		3	3								2	3	EURA
Drassyllus villicus (Thorell, 1875)				1		1				1		1	SEU
Gnaphosa lucifuga (Walckenaer, 1802)				1	6	7				1	4	7	PAL
Haplodrassus signifer (C. L. Koch, 1839)				1	2	3	3	5	8	4	7	11	HOL
Phaeocedus braccatus (L. Koch, 1866)								1	1		1	1	ECA

Trachyzelotes pedestris (C. L. Koch, 1837)				2	2	4	2	1	3	3	3	7	EKA
Zelotes apricorum (L. Koch, 1876)		2	2	2	3	5				1	5	7	EUR
Zelotes atrocaeruleus (Simon, 1878)				1		1		3	3	1	3	4	PAL
Zelotes clivicola (L. Koch, 1870)				1	7	8				1	7	8	PAL
Zelotes erebeus (Thorell, 1871)		2	2	2	7	9		1	1	1	10	12	SEU
Zelotes latreillei (Simon, 1878)				1	5	6	1	4	5	2	9	11	EUS
Linyphiidae													
Oedothorax apicatus (Blackwall, 1850)								1	1		1	1	PAL
Tenuiphantes flavipes (Blackwall, 1854)	1		1							1		1	EUR
Liocranidae													
Agroeca cuprea Menge, 1873	2		2		1	1				2	1	3	ECA
Agroeca lusatica (L. Koch, 1875)				2		2				2		2	EUR
Liocranum rupicola (Walckenaer, 1830)	1		1							1		1	EUR
Lycosidae													
Alopecosa accentuata (Latreille, 1817)					2	2					2	2	EMA
Alopecosa aculeata (Clerck, 1757)					1	1					1	1	HOL
Alopecosa albofasciata (Brullé, 1832)	1		1							1		1	PAL
Alopecosa cuneata (Clerck, 1757)					4	4	22	17	39	22	21	43	PAL
Alopecosa pulverulenta (Clerck, 1757)				1		1		1	1	1	1	2	PAL

Alopecosa pulverulenta (Clerck, 1757)				1		1		1	1	1	1	2	PAL
Alopecosa sulzeri (Pavesi, 1873)					1	1					1	1	EUR
Arctosa figurata (Simon, 1876)					2	2					2	2	EKA
Aulonia albimana (Walckenaer, 1805)							1		1	1		1	WPAL
Pardosa alacris (C. L. Koch, 1833)	7	12	19	14	64	78		1	1	21	75	98	EUR
Pardosa bifasciata (C. L. Koch, 1834)				3	1	4	75	74	149	78	74	153	EUS
Pardosa hortensis (Thorell, 1872)	2		2	7	29	36	1		1	8	29	39	EKA
Pardosa lugubris (Walckenaer, 1802)				1		1				1		1	EKA
Pardosa proxima (C. L. Koch, 1847)		1	1	1		1				1	1	2	PAL
Trochosa hispanica Simon, 1870				2	4	6		4	4	1	7	10	MCA
Trochosa terricola Thorell, 1856		2	2								2	2	HOL
Miturgidae													
Zora spinimana (Sundevall, 1833)					2	2		1	1		3	3	EURA
Zora silvestris (Kulczynski, 1897)						1		1					ECA
Philodromidae													
Philodromus aureolus (Clerck, 1757)					1	1					1	1	EUR
Philodromus cespitum (Walckenaer, 1802)				1		1				1		1	HOL
Thanatus atratus Simon, 1875		1	1								1	1	EMA
Thanatus formicinus (Clerck, 1757)					2	2		1	1		3	3	HOL

Phrurolithidae													
Phrurolithus festivus (C. L. Koch, 1835)					1	1		1	1		2	2	PAL
Pisauridae													
Pisaura mirabilis (Clerck, 1757)					1	1					1	1	PAL
Salticidae													
Euophrys frontalis (Walckenaer, 1802)	1	2	3	4	3	7				5	4	10	EURA
Theridiidae													
Asagena meridionalis Kulczyński, 1894				3	2	5				3	2	5	PEM
Crustulina guttata (Wider, 1834)		1	1								1	1	EURA
Enoplognatha thoracica (Hahn, 1833)							1		1	1		1	EUR
***Episinus maculipes* Cavanna, 1876**	1		1							1		1	SEU
Robertus arundineti (O. Pickard-Cambridge, 1871)								1	1		1	1	PAL
Thomisidae													
Ozyptila atomaria (Panzer, 1801)		1	1								1	1	PAL
Xysticus acerbus Thorell, 1872								1	1		1	1	EKA
Xysticus erraticus (Blackwall, 1834)								1	1		1	1	EUR
Xysticus kochi Thorell, 1872					2	2	3	6	9	3	8	11	MMA
Zodariidae													
Zodarion ohridense Wunderlich, 1973				2		2				2		2	BP
Total number of individuals	**18**	**28**	**46**	**57**	**156**	**213**	**115**	**132**	**247**	**190**	**316**	**506**	

Mediterranean chorological complex is represented by the Ponto-E-Mediterranean species *Asagena meridionalis* and *Civizelotes gracilis*, while the only endemic species is *Zodarion ohridense.*

Discussion

New records for the fauna of North Macedonia: Two of the registered species: *Lathys humilis* and *Episinus maculipes* are new for the Macedonian fauna (marked with bold letters). Both of them are widely distributed in Europe as well as other parts of the world. Most probably, their distribution is not isolated

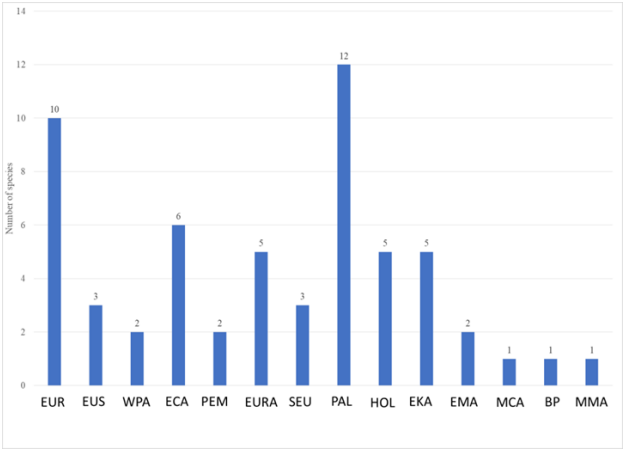

Figure 2. Zoogeographic classification of the araneofauna of Maleshevo

in the Maleshevo and these species are distributed in other Macedonian regions as well. These are the first records of these species due to the lack of faunistic research of Araneae in North Macedonia.

Lathys humilis is distributed in Europe to Caucasus and Iran (WSC 2022) mainly in coniferous forests (spruce and pine), and it is less common in deciduous forests on branches, at the stems of trees and bushes. It was also found in the leaf litter (Marusik et al. 2009). In this study, it was recorded in a *Juniperus communis* scrub.

Episinus maculipes is distributed in Europe, Algeria, Turkey and the Caucasus (WSC 2022) among leaves of bushes and trees (Nentwig et al. 2022). In this study, it was recorded in a *Juniperus communis* scrub.

Zoogeographical analysis: Due to the fact that the araneofauna of adjacent areas in the Balkan region as well as areas important to the genesis of the Balkan fauna is understudied, the zoogeographic analysis presented here can only be considered as a preliminary study (Komnenov, 2013).

Conclusions

A total of 58 species from 16 families were registered. All of them represent first records for Maleshevo region, while two species are new for the Macedonian fauna: *Lathys humilis* and *Episinus maculipes*.

Widely distributed species dominate of the four recorded chorotypes, representing 63.79% of all araneofauna.

Relatively high number of species of Maleshevo region imposes the need for further faunistic research.

Overall, these data will enrich the knowledge about araneofauna of Maleshevo Mt. and in general for the territory of North Macedonia.

Acknowledgments

We thank the students and nature enthusiasts who supported the work on the field (in particular, A. Manchevska, M. Matevski, E. Sehratlikj, M. Tarcugovska, A. Tasevski). Also, gratitude to the reviewers for their help to improving the manuscript.

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