

## Further notes on spiders from the Special Nature Reserve Zasavica (Serbia)

Igor Gajić & Gordana Grbić



doi: 10.5431/aramit5107

**Abstract.** Zasavica is a wetland in western central Serbia with very little information on its spider fauna. During 2011 faunistic research was carried out; the material collected mostly using pitfall traps, but also sweep netting, beating and hand-collecting. A total of 3053 individuals were caught, and 107 species from 21 families were identified. Among these species, seven are first records for the Serbian fauna: *Holocnemus pluchei* (Scopoli, 1763), *Dactylopisthes digiticeps* (Simon, 1881), *Walckenaeria alticeps* (Denis, 1952), *Pachygnatha listeri* Sundevall 1830, *Liocranoeca striata* (Kulczyński, 1882), *Phrurolithus minimus* C. L. Koch, 1839 and *Tibellus maritimus* (Menge, 1875). Additionally, 59 species are new for the reserve. Beside a new species list for the reserve, some notes on these national records were made.

**Keywords:** deciduous forest, devastation, inundation forest, new records, Serbian fauna

**Zusammenfassung. Ergänzungen zur Spinnenfauna des Zasavica-Naturschutzgebietes (Serbien).** Zasavica ist ein Feuchtgebietskomplex im westlichen Mittelserbien, zum dem bisher nur wenige arachnologische Daten vorliegen. Im Jahr 2011 wurde eine faunistische Erhebung durchgeführt, wobei die Erfassung der Spinnen mittels Barberfallen, Keschern, Klopfen und Handaufsammlungen erfolgte. Insgesamt wurden 3053 Individuen, die sich auf 107 Arten aus 21 Familien verteilen, gesammelt. Sieben Arten wurden hierbei erstmals für Serbien nachgewiesen: *Holocnemus pluchei* (Scopoli, 1763), *Dactylopisthes digiticeps* (Simon, 1881), *Walckenaeria alticeps* (Denis, 1952), *Pachygnatha listeri* Sundevall 1830, *Liocranoeca striata* (Kulczyński, 1882), *Phrurolithus minimus* C. L. Koch, 1839 und *Tibellus maritimus* (Menge, 1875). 59 Arten sind Neufunde für Zasavica. Neben einer aktualisierten Artenliste wird die Ökologie und Verbreitung der Neufunde für Serbien näher beschrieben.

Research on spiders in Serbia has been neglected for years. From the first published data (Spasojević 1891) to the latest (Grbić et al. 2015), only 696 species were reported. As Serbia is a part of the Balkans, it could be marked as one of the most significant biodiversity regions in Europe (Savić 2008). The great number (379) of Balkans endemic spider species (Deltshv 2004), and Serbian endemic spiders (21) (Deltshv et al. 2003) support this hypothesis, but an understanding of its importance in support of more faunistic research is lacking. A rare positive example is the management of the Special Nature Reserve (SNR) Zasavica.

SNR Zasavica is a wetland in the western central Serbian region of Mačva. The majority of the protected zone includes the water surface of the Zasavica river and the Jovača, Prekopac and Batar canals. The second largest protected area is the Valjevac pasture with its mixture of semi-aquatic and hydrophilic vegetation and a dry pasture. Also under legal protection is the forest vegetation of the Reserve that contains various hydrophilic forests of European ash, poplar, willow and black alder (Obratov-Petković et al. 2007).

The first historical data reveal that only five spider species were recorded at the locality of Crna bara by Stoićević (1929): *Araneus diadematus* Clerck, 1757, *Araniella cucurbitina* (Clerck, 1757), *Dipoena braccata* (C. L. Koch, 1841), *Heliophanus cupreus* (Walckenaer, 1802) and *Xysticus lanio* C. L. Koch, 1835. Several years later, Drensky (1936) added *Argyroneta aquatica* (Clerck, 1757) to the list, found at the same locality (in Deltshv et al. 2003: 173), but after that no effort was invested in any kind of spider research in this area. Finally Grbić et al. (2011) created the first significant list of 104 spider species based on material collected during student scientific research camps that were organized only in August 2008, 2009 and 2010. In this study, five species were recorded

for the first time in Serbia and, except for *D. braccata* and *X. lanio*, the historical records could be confirmed. This preliminary list of species formed a basis for future faunistic and ecological studies.

In 2011, further collection was performed at the localities of Valjevac and Turske livade, with an emphasis on the faunistic data and species composition in flooded and non-flooded forest areas. The project was a part of the Master's thesis of the first author. The results presented here are envisaged as additions to the faunal list and a short presentation of spider species new to Serbia. The second purpose of the manuscript is to draw attention to ongoing habitat devastation of the area that is out of control, and which could affect survival of the species.

### Material and methods

The Turske livade locality (44° 57' 32", 19° 31' 37") is situated on the left side of the Zasavica river, at an altitude of 78–80 m. It consists of small forest fragments and arable land (Obratov-Petković et al. 2007). About 80% of these forests are private property (Stanković pers. comm.). Wood harvesting happens often, with no supervision, so human influence is very intensive on these forest habitats. For the purpose of this research, two non-flooded forests (coded as non-flooded forests 1 and 2) and one flooded forest were chosen. Non-flooded forests 1 and 2 are deciduous forest fragments with dry vegetation, a thick duff layer and many bushes. The flooded forest has dense vegetation with lots of shade, and becomes flooded during spring. More details on the vegetation of the habitats are given in Tab. 1.

The Valjevac locality (44° 56' 10", 19° 31' 11") is also situated on the left side of the river and at the same altitude as the previous locality, and it consists of a large pasture, forest fragments and arable land. The pasture is property of the Reserve, while 80% of the woods and all arable land are private property (Stanković pers. comm.). On this locality, one non-flooded forest, one flooded forest, the riverside near the Visitors' Centre and a pasture site were chosen for fieldwork. The non-flooded forest has a dense canopy, which provides lots of

Igor GAJIĆ, Bulevar Oslobođenja 28 26/4, Novi Sad, Serbia;  
E-mail: igyargiope@yahoo.com  
Gordana GRBIĆ, Educons University, Faculty of Environmental Protection, Sremska Kamenica, Serbia; E-mail: gordana.grbic@educons.edu.rs

**Tab. 1:** Description of habitats and number of traps during the 2011 campaign for spider research at SNR Zasavica (information taken from Kiš, 2012, Perić, 2012, Stojić, 2012). Plant communities are given in order they appear – from water to land.

Locality	Habitat	Plant communities	Number of traps
Turske livade	Non-flood-forest 1 (F1)	linden ( <i>Tilia</i> sp.), English oak ( <i>Quercus robur</i> ) and Turkey oak ( <i>Quercus cerris</i> ) forest fragments – ass. <i>Rusco aculeati</i> - <i>Tilio</i> – <i>Quercetum roboris</i>	5
	Non-flood-forest 2 (F2)	linden, English oak and Turkey oak forest fragments – ass. <i>Rusco aculeati</i> - <i>Tilio</i> – <i>Quercetum roboris</i>	5
	Flood-forest (F3)	reed beds ass. <i>Scirpo-Phragmitetum</i> reedmace ( <i>Typha</i> sp.) beds of <i>Typha</i> - subass. <i>typhaetosum</i> ( <i>angustifoliae-latifoliae</i> ) ass. <i>Thelyptero-Phragmito-Salicetum cinereae</i> ; ass. <i>Urtico kioviensis-Salicetum cinereae</i> grey willow ( <i>Salix cinerea</i> ) ass. <i>Salicetum cinereae</i> willow, ash ( <i>Fraxinus</i> sp.) and European alder ( <i>Alnus glutinosa</i> ) forest fragments - ass. <i>Alnetum glutinosae</i>	5
Valjevac	Riverside (R)	reed beds ass. <i>Scirpo-Phragmitetum</i> reedmace ( <i>Typha</i> sp.) beds of lesser and common bulrush - subass. <i>typhaetosum</i> ( <i>angustifoliae-latifoliae</i> ) reed beds with bulrush - <i>Scirpo-Phragmitetum</i> subass. <i>schoenoplectosum lacustris</i> reed mannagrass fragments of ass. <i>Glycerietum maximae</i> calamus ass. <i>Acoro-Glycerietum maximae</i> large sedges beds ass. <i>Caricetum acutiformis-ripariae</i>	5
	Pasture (P)	reed beds ass. <i>Scirpo-Phragmitetum</i> reedmace ( <i>Typha</i> sp.) beds - subass. <i>typhaetosum</i> ( <i>angustifoliae-latifoliae</i> ) reed beds with bulrush - <i>Scirpo-Phragmitetum</i> subass. <i>schoenoplectosum lacustris</i> reed mannagrass fragments - ass. <i>Glycerietum maximae</i> calamus ass. <i>Acoro-Glycerietum maximae</i> large sedges beds ass. <i>Caricetum acutiformis-ripariae</i> forest associations – ass. <i>Thelyptero-Phragmito-Salicetum cinereae</i> and ass. <i>Urtico kioviensis-Salicetum cinereae</i> degradation stages of ass. <i>Junco-Menthetum longifoliae</i> remains of ass. <i>Trifolio- Ranunculion pedati</i> ass. <i>Lolio-Potentilletum anserinae</i> and ass. <i>Rumici-Alopecuretum geniculati</i>	0
	Non-flood-forest (F4)	Illyrian ash-oak-alder forest – ass. <i>Fraxino</i> - <i>Quercetum roboris</i>	5
	Flood-forest (F5)	reed beds ass. <i>Scirpo-Phragmitetum</i> reedmace ( <i>Typha</i> sp.) beds subass. <i>typhaetosum</i> ( <i>angustifoliae-latifoliae</i> ) reed mannagrass fragments ass. <i>Glycerietum maximae</i> large sedges beds ass. <i>Caricetum acutiformis-ripariae</i> grey willow - ass. <i>Salicetum cinereae</i> willow, ash and European alder forest fragments - ass. <i>Alnetum glutinosae</i>	10

shadow. The flooded forest shows a mosaic pattern of trees, shrubs and open spaces with tall herbs (Obratov-Petković et al. 2007). The vegetation on the Valjevac pasture is heavily influenced by the Podolian cow and Mangulica pig population. The riverside (Fig. 1) is under pressure from intensive tourism in the Reserve.

Collecting took place in 2011, from 19.05. to 19.11. The pitfall traps were made from two litre plastic bottles cut at 2/3 of their height, thus the dimensions of the traps were 15 cm in height and 11 cm in diameter. Plastic plates were fixed above the traps as a roof, using wooden sticks (Fig. 2). They were filled up to 2/3 with a fixative. At the beginning, vinegar (9%) was used as a fixative, but it was later replaced with 4% formaldehyde with liquid detergent. The change of fixative was made due to the bad condition of the material. A total number of 35 traps were set at two localities in six chosen habitats (Tab. 1). The traps were emptied once a month. Additionally, sweeping, beating and hand collecting methods were applied, but only at the Valjevac pasture.

Collected material was rinsed in water using a sieve with 0.05 mm diameter slits and then preserved in 70% alcohol.



**Fig. 1:** Map of SNR "Zasavica" with sampling plots at locality Valjevac and Turske livade. (F1) non-flood-forest 1; (F2) non-flood-forest 2; (F3) flood-forest; (R) riverside; (P) pasture; (F4) non-flood-forest; (F5) flood-forest

There was a clear difference between the material collected in vinegar and in formaldehyde. The vinegar material was in a very bad condition, so identification was problematic; on the other hand, the formaldehyde species were well preserved.

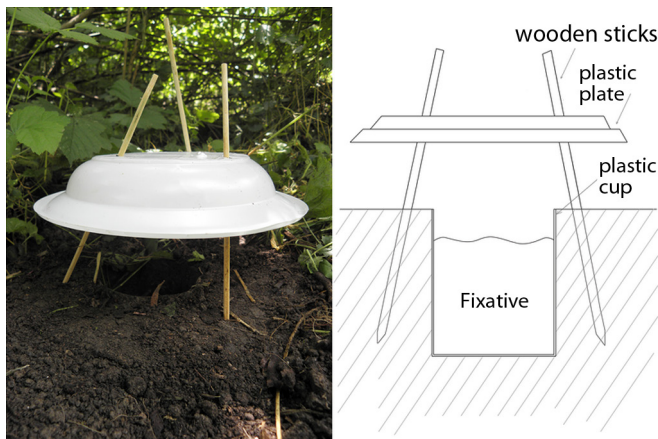


Fig. 2: Trap construction used at SNR "Zasavica" in 2011

Determination of species was largely based on Nentwig et al. (2014). For *Trochosa hispanica* females we used descriptions by Hepner & Milasowszky (2006), while determination of the captured male of *Walckenaeria alticeps* was done according to descriptions provided by Roberts (1987). Nomenclature follows The World Spider Catalog (2014). The new national records and several difficult species were sent to Ambros Hänggi for confirmation, and some voucher species were deposited in the Natural History Museum Basel, Switzerland.

It is important to point out certain problems that occurred during the fieldwork which influenced the results. Some traps

were removed earlier than others because of forest harvesting. From the flooded forest at the Valjevac locality they were removed on 16.09.2011 and from the non-flooded forest 2 at the Turske livade locality they were removed on 15.09.2011. As mentioned above, the forest fragments in the reserve are private property, so it was impossible to predict this kind of influence. At the riverside of the Valjevac locality, the traps were also removed earlier (30.06.2011) due to seasonal cane harvesting.

## Results

A total number of 3053 adult spiders were caught (2109 males and 944 females) (Tab. 2) and 107 species from 21 families were recorded. From the total list of species, 7 represent the first records for the Serbian fauna (marked with \* in Tab. 2), and 59 species are new records for the Reserve fauna (marked with x in Tab. 2). The most diverse family in the material was Lycosidae with 19 species, while the most dominant species in the material was *Diplostyla concolor* (562 individuals), followed by *Urocoras longispinus* (300) and *Histoipona torpida* (267).

The majority of the material was collected by traps, while the following species were collected only by sweep netting, beating and hand-collecting and thus only on pasture at the Valjevac locality: *Tetragnatha extensa*, *T. nigrita*, *T. pinicola*, *Larinioides patagiatus*, *Asagena phalerata*, *Mangora acalypha*, *Hyposinga pygmaea*, *Singa hamata*, *Misumena vatia*, *Evarcha laetabunda*, *Ebrechtella tricuspudata*, *Pseudicius encarpatus* and *Salticus zebraneus*.

Tab. 2: List of the recorded spider species in SNR Zasavica during 2011. Species marked with \* represent new data for the Serbian fauna. Species marked with x represent new data for SNR Zasavica.

General information	Valjevac				Turske livade			Number of individuals
	Flood forest	Non-flood forest	Visitor's center riverside	pasture	Flood forest	Non-flood forest 1	Non-flood forest 2	
Species	46	19	36	17	44	23	33	3053
Families	13	12	10	7	16	13	13	
Individuals	699	134	766	36	609	410	400	
Males	348	90	563	21	490	356	242	
Females	351	44	203	15	119	54	158	
Species information	♂♂/♀♀	♂♂/♀♀	♂♂/♀♀	♂♂/♀♀	♂♂/♀♀	♂♂/♀♀	♂♂/♀♀	
<b>Scytodidae</b>								
<i>Scytodes thoracica</i> (Latreille, 1802) *	0/1	.	.	.	.	.	.	1
<b>Pholcidae</b>								
<i>Holocnemus pluchei</i> (Scopoli, 1763) **	0/1	.	.	.	.	.	.	1
<b>Dysderidae</b>								
<i>Dysdera longirostris</i> Doblaka, 1853	38/0	4/0	.	.	1/0	3/1	19/1	67
<i>Dysdera ninnii</i> Canestrini, 1868 *	.	.	.	.	2/0	6/1	.	9
<b>Mimetidae</b>								
<i>Ero furcata</i> (Villers, 1789) *	2/0	0/1	.	.	.	.	1/1	5
<b>Theridiidae</b>								
<i>Asagena phalerata</i> (Panzer, 1801) *	.	.	1/0	.	.	.	.	1
<i>Crustulina guttata</i> (Wider, 1834) *	.	.	.	.	.	1/0	.	1
<i>Enoplognatha ovata</i> (Clerck, 1757)	.	.	.	.	1/1	.	.	2
<i>Episinus truncatus</i> Latreille, 1809	.	.	.	.	1/0	2/0	.	3
<i>Sardinidion blackwalli</i> (O. P.-Cambridge, 1871) *	.	.	.	.	0/1	.	.	1
<b>Linyphiidae</b>								
<i>Dactylopisthes digiticeps</i> (Simon, 1881) ** *	.	.	48/0	.	.	.	2/0	50
<i>Dicymbium tibiale</i> (Blackwall, 1836) *	7/0	.	.	.	.	.	.	7

Tab. 2: ff.

General information	Valjevac				Turske livade			Number of individuals
	Flood forest	Non-flood forest	Visitor's center riverside	pasture	Flood forest	Non-flood forest 1	Non-flood forest 2	
<i>Diplostyla concolor</i> (Wider, 1834) <sup>x</sup>	196/194	.	15/6	.	112/36	0/1	2/0	562
<i>Erigone dentipalpis</i> (Wider, 1834)	9/0	0/1	68/0	.	43/0	.	1/0	122
<i>Linyphia triangularis</i> (Clerck, 1757)	1/0	.	1/0	.	2/0	2/0	0/2	8
<i>Microlinyphia pusilla</i> (Sundevall, 1830)	.	.	.	1/0	.	.	.	1
<i>Neriere clathrata</i> (Sundevall, 1830)	0/9	.	.	.	.	.	.	9
<i>Oedothorax apicatus</i> (Blackwall, 1850) <sup>x</sup>	.	.	50/68	.	.	.	9/19	146
<i>Pelecopsis radiccicola</i> (L. Koch, 1872) <sup>x</sup>	.	.	.	.	3/2	.	.	5
<i>Prinerigone vagans</i> (Audouin, 1826)	.	.	2/0	.	.	.	.	2
<i>Walckenaeria alticeps</i> (Denis, 1952) <sup>* x</sup>	.	.	.	.	1/0	.	.	1
<i>Walckenaeria furcillata</i> (Menge, 1869) <sup>x</sup>	.	.	.	.	2/0	11/6	8/11	38
<i>Walckenaeria mitrata</i> (Menge, 1868) <sup>x</sup>	.	1/0	.	.	.	.	.	1
<b>Tetragnathidae</b>								
<i>Pachygnatha clercki</i> Sundevall, 1823 <sup>x</sup>	1/0	.	5/0	.	2/0	.	1/0	9
<i>Pachygnatha degeeri</i> Sundevall, 1830	5/3	.	4/4	.	9/3	.	1/0	29
<i>Pachygnatha listeri</i> Sundevall, 1830 <sup>* x</sup>	1/0	.	0/4	.	1/2	.	.	8
<i>Tetragnatha extensa</i> (Linnaeus, 1758)	.	.	3/1	.	.	.	.	4
<i>Tetragnatha montana</i> Simon, 1874	.	1/0	.	.	2/0	.	.	3
<i>Tetragnatha nigrata</i> Lendl, 1886 <sup>x</sup>	.	.	.	1/0	.	.	.	1
<i>Tetragnatha pinicola</i> L. Koch, 1870 <sup>x</sup>	.	.	.	0/1	.	.	.	1
<b>Araneidae</b>								
<i>Araneus diadematus</i> Clerck, 1757	.	.	.	.	.	0/1	.	1
<i>Araneus quadratus</i> Clerck, 1757	.	.	.	1/0	.	.	.	1
<i>Hyposinga pygmaea</i> (Sundevall, 1831)	.	.	.	0/2	.	.	.	2
<i>Larinioides patagiatus</i> (Clerck, 1757)	.	.	.	3/3	.	.	.	6
<i>Mangora acalypha</i> (Walckenaer, 1802)	.	.	.	0/1	.	.	.	1
<i>Singa hamata</i> (Clerck, 1757) <sup>x</sup>	.	.	.	0/1	.	.	.	1
<b>Lycosidae</b>								
<i>Alopecosa</i> cf. <i>pinetorum</i> (Thorell, 1856) <sup>x</sup>	.	.	1/0	.	.	.	.	1
<i>Arctosa leopardus</i> (Sundevall, 1833)	0/1	.	147/44	1/0	4/3	.	2/3	205
<i>Pardosa agrestis</i> (Westring, 1861)	3/6	.	7/0	.	0/1	.	.	17
<i>Pardosa alacris</i> (C.L. Koch, 1833) <sup>x</sup>	.	0/1	.	.	7/4	0/2	9/62	85
<i>Pardosa amentata</i> (Clerck, 1757)	0/12	.	8/13	0/1	3/6	0/2	1/1	47
<i>Pardosa hortensis</i> (Thorell, 1872)	0/2	.	3/5	.	.	0/1	0/2	13
<i>Pardosa lugubris</i> (s.lat.) (Walckenaer, 1802)	0/1	.	.	.	0/7	0/5	0/9	22
<i>Pardosa</i> cf. <i>mixta</i> (Kulczyński, 1887) <sup>x</sup>	0/2	.	.	.	.	.	.	2
<i>Pardosa monticola</i> (Clerck, 1757)	1/6	.	0/2	.	0/1	.	.	10
<i>Pardosa prativaga</i> L. Koch, 1870	0/2	.	8/1	.	6/1	.	.	18
<i>Pardosa proxima</i> (C.L. Koch, 1847)	1/7	.	28/10	0/4	.	.	2/0	52
<i>Pardosa vittata</i> (Keyserling, 1863) <sup>x</sup>	0/2	.	.	.	.	.	.	2
<i>Pirata piraticus</i> (Clerck, 1757)	1/1	.	4/9	.	1/0	.	.	16
<i>Pirata</i> cf. <i>tenuitarsis</i> Simon, 1876 <sup>x</sup>	.	.	13/0	.	.	.	.	13
<i>Piratula hygrophila</i> (Thorell, 1872)	5/20	1/12	5/2	.	11/4	.	1/0	61
<i>Piratula latitans</i> (Blackwall, 1841)	0/8	.	128/27	.	36/8	.	0/1	208
<i>Trochosa hispanica</i> Simon, 1870 <sup>x</sup>	2/0	1/2	.	.	8/3	.	.	16
<i>Trochosa ruricola</i> (De Geer, 1778) <sup>x</sup>	.	.	1/0	.	.	.	.	1
<i>Xerolycosa miniata</i> (C.L. Koch, 1834) <sup>x</sup>	0/1	.	.	.	.	.	.	1
<b>Pisauridae</b>								
<i>Dolomedes fimbriatus</i> (Clerck, 1757)	1/0	.	.	.	.	.	.	1
<i>Dolomedes plantarius</i> (Clerck, 1757)	.	.	0/1	.	.	.	.	1
<i>Pisaura mirabilis</i> (Clerck, 1757)	0/1	.	.	.	1/2	.	1/1	6
<b>Miturgidae</b>								
<i>Zora spinimana</i> (Sundevall, 1833) <sup>x</sup>	.	1/3	.	.	.	.	.	4
<b>Agelenidae</b>								
<i>Agelena labyrinthica</i> (Clerck, 1757)	.	.	.	.	4/0	.	.	4
<i>Histopona torpida</i> (C.L. Koch, 1837)	.	6/1	.	.	7/0	109/20	96/28	267

Tab. 2. ff.

General information	Valjevac				Turske livade			Number of individuals
	Flood forest	Non-flood forest	Visitor's center riverside	pasture	Flood forest	Non-flood forest 1	Non-flood forest 2	
<i>Tegenaria campestris</i> (C.L. Koch, 1834) <sup>x</sup>	.	2/0	.	.	.	.	.	2
<i>Tegenaria silvestris</i> (L. Koch, 1872) <sup>x</sup>	.	.	.	.	.	0/1	.	1
<i>Urocoras longispinus</i> (Kulczyński, 1897) <sup>x</sup>	.	70/11	.	.	67/11	129/8	4/0	300
<b>Dictynidae</b>								
<i>Dictyna uncinata</i> Thorell, 1856	.	.	.	.	1/0	.	.	1
<b>Liocranidae</b>								
<i>Agroeca cuprea</i> Menge, 1873 <sup>x</sup>	0/1	.	.	.	.	4/0	0/4	9
<i>Liocranoeca striata</i> (Kulczyński, 1882) <sup>* x</sup>	0/7	0/6	.	.	1/0	2/0	.	16
<b>Clubionidae</b>								
<i>Clubiona brevipes</i> Blackwall, 1841 <sup>x</sup>	.	.	.	0/1	.	.	.	1
<i>Clubiona comta</i> C.L. Koch, 1839 <sup>x</sup>	.	.	.	.	.	.	1/0	1
<i>Clubiona lutescens</i> Westring, 1851	1/4	.	.	.	2/2	.	.	9
<i>Clubiona pallidula</i> (Clerck, 1757)	.	.	.	.	1/0	.	1/3	5
<i>Clubiona phragmitis</i> C.L. Koch, 1843 <sup>x</sup>	.	.	1/0	.	.	.	.	1
<i>Clubiona terrestris</i> Westring, 1851	.	0/1	.	.	.	2/2	.	5
<b>Corinnidae</b>								
<i>Cetonana laticeps</i> (Canestrini, 1868) <sup>x</sup>	.	.	.	.	.	2/0	.	2
<b>Phrurolithidae</b>								
<i>Phrurolithus festivus</i> (C.L. Koch, 1835) <sup>x</sup>	17/33	.	6/1	.	91/10	.	.	158
<i>Phrurolithus minimus</i> C.L. Koch, 1839 <sup>* x</sup>	5/0	.	.	.	.	.	.	5
<b>Gnaphosidae</b>								
<i>Drassyllus lutetianus</i> (L. Koch, 1866) <sup>x</sup>	1/0	.	2/0	.	0/1	.	.	4
<i>Drassyllus pusillus</i> (C.L. Koch, 1833) <sup>x</sup>	0/1	.	.	.	.	.	.	1
<i>Drassyllus villicus</i> (Thorell, 1875) <sup>x</sup>	0/3	.	.	.	4/0	.	13/7	27
<i>Haplodrassus silvestris</i> (Blackwall, 1833) <sup>x</sup>	.	.	.	.	.	.	5/0	5
<i>Micaria pulicaria</i> (Sundevall, 1831) <sup>x</sup>	.	.	.	.	1/0	.	.	1
<i>Trachyzelotes pedestris</i> (C.L. Koch, 1837) <sup>x</sup>	1/6	.	.	.	5/1	.	3/2	18
<i>Zelotes apricorum</i> (L. Koch, 1876) <sup>x</sup>	1/0	.	.	.	2/5	.	1/1	10
<i>Zelotes latreillei</i> (Simon, 1878) <sup>x</sup>	2/0	.	0/1	.	2/1	.	.	6
<b>Philodromidae</b>								
<i>Tibellus maritimus</i> (Menge, 1875) <sup>* x</sup>	.	.	0/1	.	.	.	.	1
<b>Thomisidae</b>								
<i>Cozyptila blackwalli</i> (Simon, 1875) <sup>x</sup>	.	.	.	.	.	.	1/0	1
<i>Ebrechtella tricuspidata</i> (Fabricius, 1775)	.	.	.	5/0	.	.	.	5
<i>Misumena vatia</i> (Clerck, 1757)	.	.	.	7/0	.	.	.	7
<i>Ozyptila praticola</i> (C.L. Koch, 1837)	42/12	0/4	.	.	21/2	74/0	50/0	205
<i>Ozyptila simplex</i> (O. P.-Cambridge, 1862) <sup>x</sup>	0/2	.	.	.	.	.	.	2
<i>Synema globosum</i> (Fabricius, 1775)	.	.	.	1/0	.	.	.	1
<i>Tmarus piger</i> (Walckenaer, 1802)	.	1/0	.	.	0/1	.	.	2
<i>Xysticus kochi</i> Thorell, 1872	2/0	.	0/1	.	.	.	.	3
<i>Xysticus luctator</i> (L. Koch, 1870)	.	.	.	.	22/0	9/0	5/0	36
<b>Salticidae</b>								
<i>Ballus chalybeius</i> (Walckenaer, 1802) <sup>x</sup>	.	.	.	.	.	9/2	1/0	3
<i>Evarcha falcata</i> (Clerck, 1757)	.	.	.	.	.	.	1/0	1
<i>Evarcha laetabunda</i> (C.L. Koch, 1846) <sup>x</sup>	.	.	.	1/0	.	.	.	1
<i>Heliophanus flavipes</i> (Hahn, 1832)	1/0	.	.	.	.	.	.	1
<i>Marpissa muscosa</i> (Clerck, 1757)	0/1	1/0	.	.	.	.	.	2
<i>Marpissa radiata</i> (Grube, 1859) <sup>x</sup>	.	1/0	.	.	.	.	.	1
<i>Mendoza canestrinii</i> (Ninni, 1868)	.	.	0/1	.	.	.	.	1
<i>Myrmarachne formicaria</i> (De Geer, 1778) <sup>x</sup>	.	0/1	.	.	.	.	.	1
<i>Neon reticulatus</i> (Blackwall, 1853) <sup>x</sup>	0/1	.	.	.	.	0/1	.	2
<i>Pseudeuophrys obsoleta</i> (Simon, 1868) <sup>x</sup>	.	.	2/0	.	.	.	.	2
<i>Pseudicius encarpatus</i> (Walckenaer, 1802)	.	.	1/0	.	.	.	.	1
<i>Salticus zebraneus</i> (C.L. Koch, 1837) <sup>x</sup>	.	.	0/1	.	.	.	.	1
<i>Sitticus floricola</i> (C.L. Koch, 1837) <sup>x</sup>	.	.	1/0	0/1	.	.	.	2

Analysing the result presented in Tab. 2, some clear differences between the habitats are obvious but will not be discussed in detail. In the forest habitats, the highest number of species was found in the flooded forest at the Valjevac locality, where 46 spider species were recorded, while the smallest number of species was in the non-flooded forest at the same locality (19 species) (Tab. 2). At the second research locality of Turske livade, even lower numbers of species were recorded in all habitats compared to the Valjevac flooded forest. No species were common for all the habitats (Tab.2).

## Discussion

### First records for the Serbian spider fauna

#### *Holocnemus pluchei*

**Records.** 1♀, 16.09.2011; Valjevac – flooded forest

**Note.** The original distribution for this species is Africa, the Mediterranean region and the Middle East (Huber 2011), but today this species is spread over Western, Central and Eastern Europe (World Spider Catalog 2014). According to Nentwig et al. (2014), it was previously recorded in the countries surrounding Serbia, so this species was expected to be found here as well. The related species, *H. caudatus* (Dufour, 1820) and *H. hispanicus* Wiehle, 1933, have a very low probability of appearance in our region, since they are common in Spain, Portugal and Sicily (World Spider Catalog 2014).

#### *Dactylopisthes digiticeps*

**Records.** 12♂♂ 10.06.2011; 32♂♂ 30.06.2011; 4♂♂ 03.08.2011. Valjevac – a riverside Visitors' Centre; 2♂♂ 30.06.2011. Turske livade - Non-flood forest 2

**Note.** This species was first described by Simon (1881) from a male specimen, while the female was described 115 years later (Weiss & Schneider 1996). As a typical habitat of this spider, Weiss & Schneider (1996) suggested wetlands and vegetation near water. In their research it was found at some localities near the Danube River together with other wetland species. According to the World Spider Catalog (2014), the global distribution of this species covers an area from Europe to Israel, Iran and Afghanistan, but in Europe this species was recorded only in some countries (Nentwig et al. 2014): France, Austria, Romania, Ukraine, Greece. Because of its scattered distribution, this record represents an important element of the Serbian fauna and we feel obliged to make a note about how its future could be affected here. The Visitor's centre at the riverside where this species is found is under a great pressure from tourism (both legal and illegal) and uncontrolled seasonal cane harvesting. According to what we know from the field, we think that there is a high possibility of habitat loss in the near future so these new records would be lost and the species could become lost in Serbia too. For prevention we suggest that this species should be included in the list of protected species in Serbia. Only if SNR Zasavica has a legal obligation to pay more attention to this species and its habitat will everything be maintained.

#### *Walckenaeria alticeps*

**Records.** 1♂ 12.10.2011; Turske livade – flood forest

**Note.** Closely related and often confused with *W. antica*. Males of these species are morphologically very similar (Kronstedt 1980, Palmgren 1982), both in the cephalic part and

in the configuration of the palps. Females are less problematic (Kronstedt 1980), but we didn't have any among our material. The sibling species *W. antica* was recorded in Serbia (in Deltchev et al. 2003:132) in 1929 and 1936 before *W. alticeps* (Denis, 1952) was even described and since the old material is not available, it remains uncertain what we had in Serbia so far. If we accept that we already had *W. antica*, looking at the global distribution area of the *W. alticeps*, which is from Europe to Central Asia (World Spider Catalog 2014), this record in Serbia is not surprising (Nentwig et al. 2014).

#### *Pachygnatha listeri*

**Records.** 1♂/1♀ 10.06.2011. Turske livade – flood forest; 3♀♀ 30.06.2011. Valjevac – a riverside Visitors' center; 1♂ 3.08.2011 Valjevac – flood forest; 1♀ 3.08.2011 Valjevac – a riverside Visitors' center; 1♀ 15.09.2011. Turske livade – flood forest

**Note.** In general appearance similar to the *P. clercki* and *P. terilis* but close study of genital details allows it to be distinguished very well (Nentwig et al. 2014). It has a Palearctic distribution (World Spider Catalog 2014) and it is widely distributed in Europe. The species was not found in most countries of the Balkan Peninsula, except Bulgaria and Romania (Nentwig et al. 2014). Based on such a wide distribution, this species was expected to be found in our country as well. Our discovery of this species in the flooded forests of both localities also corresponds to literature data (Roberts 1995, Krumpálová 1997, Hänggi et al. 1995).

#### *Liocranoeca striata*

**Records.** 1♂ 10.06.2011. Turske livade – flood-forest; 2♂♂ 30.06.2011. Turske livade – non-flood forest 1; 5♀♀ 03.08.2011. Valjevac – flood forest; 5♀♀ 03.08.2011. Valjevac – non-flood forest; 2♀♀ 16.09.2011. Valjevac – flood forest; 1♀ 16.09.2011. Valjevac – non-flood forest

**Note.** Not so hard to determine although several synonyms make a literature search more difficult. According to the World Spider Catalog (2014), this species is distributed across Europe and Russia. Widespread but rare in northern Europe (Roberts 1995), it was already recorded in some surrounding countries (Hungary, Macedonia, Bulgaria, Romania) (Nentwig et al. 2014), so it could be expected in Serbia too. This species prefers wet habitats, especially deciduous forests on wetlands and alluvial plains (Roberts 1995, Buchholz 2009, Nentwig et al. 2014). According to Hänggi et al. (1995) it is associated exclusively with the "layer 1" which means that it prefers soil and litter.

#### *Phrurolithus minimus*

**Records.** 5♂♂ 03.08.2011; Valjevac – flood forest

**Note.** The global distribution of this species is Palearctic (World Spider Catalog 2014), and it is present all over Europe, but not in most parts of the Balkan Peninsula (Nentwig et al. 2014). Since it was recorded in Hungary and Romania (Nentwig et al. 2014), it was expected to be found in Serbia too. According to Nentwig et al. (2014) and Hänggi et al. (1995), this species prefers dry meadows, steppes, rocky slopes and open forests, but could also be found on peat area (Rély & Dapkus 2002) or at the edges of forests and on oligotrophic grasslands (Hänggi et al. 1995). It is connected to the litter (Hänggi et al. 1995) where we also found it in flooded wood of willow, ash and European alder.

***Tibellus maritimus***

**Records.** 1♂ 10.06.2011; Valjevac – a riverside Visitors' center

**Note.** Among the European philodromid species *Tibellus* sp. can easily be distinguished by the slender body and legs. Differences between the species in the genera are more or less solid, so determination is not so complicated (Efimik 1999). This species has a Holarctic distribution (World Spider Catalog 2014), and with records from almost all European countries (Nentwig et al. 2014) it was also expected in Serbia. Usually *T. maritimus* can be found both on humid and dry but also sunny places (Nentwig et al. 2014, Cera et al. 2010), and the riverside Visitor's centre in our study is just like that. But like in the case of *Dactylopisthes digiticeps* described earlier, the future of the species is uncertain since the riverside is under constant threat. If we add the fact that this species completely disappeared from Poland after the drying up of flooded areas (Kajak 1993), we have to suggest that this species should also be included in the list of protected species in Serbia to prevent the possibility of a loss scenario.

**Species of special interest*****Tetragnatha pinicola***

**Records.** 1♀ 19.05.2011. Valjevac – pasture

**Note.** Very similar to *T. extensa* (see Russell-Smith 2011). Although they normally differ markedly in size, occasionally *T. pinicola* may superficially resemble young *T. extensa* and stayed unnoticed. This specimen was found by chance and caught by sweep netting. Apparently it has a Palearctic distribution (World Spider Catalog 2014), but it is also considered very rare in Northern Europe (Roberts 1995). In Serbia this species was last recorded in 1985 at the Sokolica locality on the Veliki Jastrebac Mountain (Deltshev et al. 2003). Since then no recent records were made and its current status in the country cannot be determined, therefore its rediscovery in the protected area of the SNR Zasavica could be highly relevant for the species and for the future habitat protection plans of the Reserve.

***Trochosa hispanica***

**Records.** 3♂♂/2♀♀ 03.08.2011. Valjevac – non-flood forest; 2♂♂ 03.08.2011. Valjevac – flood forest; 8♂♂/3♀♀ 12.10.2011. Turske livade – flood-forest

**Note.** According to literature data *T. hispanica* was very recently found in Serbia by Ćurčić et al. (2007) in Čačak. But as Hepner & Milasowszky (2006) noted, many misidentifications of *Trochosa* females occur in museum and private collections. Considering also that no specimens from Serbia have been included in their revision or rechecked yet, there is a possibility that *T. hispanica* could be more widely present in Serbia, not only at the two recently discovered localities. Unfortunately, most of the old collection records are lost or could not be re-checked, so the current status and distribution of the *T. hispanica* as a Mediterranean species (Nentwig et al. 2014) in Serbia still needs to be confirmed.

**Conclusions**

Based on our first impressions, the number of new records in Serbia appears to be high for the small sampled area, but most of the species were already known in the surrounding countries (Nentwig et al. 2014), thus their presence at Zasavica

was not unexpected. This research increased the total number of species in Serbia to 703, although this is only a fraction of what would be expected for this region. More important is that this is a one more step towards a future comprehensive species list. Spider research in the Special Nature Reserve Zasavica is also far from complete. Together with the current results, a total number rose to 163 species, but we could roughly estimate that at least the same number still awaits detection. In future studies, it should be investigated if there is any connection between species compositions and human devastation in the area, since unsupervised harvesting is still taking place.

**Acknowledgements**

The authors would like to express their gratitude to Dr Ambros Hänggi (Natural History Museum Basel, Basel, Switzerland) for his unselfish help with the determination of some difficult species and also for providing comments on an earlier version of this paper. For the laboratory support of this work, we are grateful to Dr Ivo Karaman from the Department of Biology and Ecology at the University of Novi Sad, Serbia, and for the botanical support we are grateful to Alen Kiš, Ranko Perić and Vida Stojšić from the Institute for Nature Conservation of Vojvodina Province. Many thanks to Ljiljana Vasiljević for the English improvement, and finally, we are grateful to the management of the SNR Zasavica for their financial support of this research, and also to Mihajlo Stanković for his help during field collecting.

**References**

- Buchholz S 2009 Community structure of spiders in coastal habitats of a Mediterranean delta region (Nestos Delta, NE Greece). – *Animal Biodiversity and Conservation* 32: 101-115
- Cera I, Spunģis V & Melecis V 2010 Occurrence of grass-dwelling spiders in habitats of Lake Engure Nature Park. – *Environmental and Experimental Biology* 8: 59-69
- Ćurčić B, Deltshev C, Tomić V & Ćurčić S 2007 Biodiversity of spiders: on some taxa new to Serbia and to science. – *Archives of Biological Science Belgrade* 59: 19P-20P – doi: [10.2298/ABS0702001C](https://doi.org/10.2298/ABS0702001C)
- Deltshev C 2004 A zoogeographical review of the spiders (Araneae) of the Balkan Peninsula. In: Griffiths JH, Kryštufek B & Reed JM (eds.) *Balkan biodiversity. pattern and process in the European hotspot*. Kluwer Academic Publishers, Dordrecht, Boston, London, pp. 193-200
- Deltshev C, Ćurčić B & Blagoev G 2003 The spiders of Serbia. Committee for Karst and Speleology – Serbian Academy of Sciences and Arts; Institute of Zoology – Bulgarian Academy of Sciences; Institute of Zoology – Faculty of Biology – University of Belgrade; Institute for Biological Research “Siniša Stanković” (co-publishers), Belgrade – Sofia. 833 pp.
- Efimik VE 1999 A review of the spider genus *Tibellus* Simon, 1875 of the East Palearctic (Aranei: Philodromidae). – *Arthropoda Selecta* 8: 103-124
- Grbić G, Gajić I & Stanković M 2011 Preliminary notes on the spider fauna (Arachnida, Araneae) of the Special Nature Reserve Zasavica. – *Acta Entomologica Serbica* 16: 127-138
- Grbić G, Hänggi A & Savić D 2015 New faunistic records of spiders (Arachnida, Araneae) from the Fruška Gora Mountain, northern Serbia. – *Acta Zoologica Bulgarica* 67: 479-486
- Hänggi A, Stöckli E & Nentwig W 1995 Habitats of central European spiders – Characterisation of the habitats of the most abundant spider species of Central Europe and associated species. – *Miscellanea Faunistica Helvetiae* 4: 1-459
- Hepner M & Milasowszky N 2006 Morphological separation of the Central European *Trochosa* females (Araneae, Lycosidae). – *Arachnologische Mitteilungen* 31: 1-7 – doi: [10.5431/aramit3101](https://doi.org/10.5431/aramit3101)

- Huber BA 2011 Phylogeny and classification of Pholcidae (Araneae): an update. – *Journal of Arachnology* 39: 211-222 – doi: [0001-7272\(94\)00037-9](https://doi.org/10.1111/j.1365-3113.2011.00037-9)
- Kajak A 1993 Long term changes in spider communities of drained fens. – *Bulletin de la Société neuchâtoise des sciences naturelles* 116: 125-131 – doi: [10.5169/seals-89375](https://doi.org/10.5169/seals-89375)
- Kiš A 2012 Forests and forest vegetation. In: Dobretić V (ed.) Special Nature Reserve “Zasavica”, proposal for attribution of I category protection status. Institute for Nature Conservation of Vojvodina province, Novi Sad. pp. 85-94 [in Serbian]
- Kronstedt T 1980 Notes on *Walckenaeria alticeps* (Denis), new to Sweden, and *W. antica* (Wider) (Araneae, Linyphiidae). – *Bulletin of the British arachnological Society* 5: 139-144
- Krumpálová Z 1997 Epigeic spiders (Araneae) of the inundation of the Danube River, on the area of interest of the Gabčíkovo waterworks, 1: Before the waterworks were put into operation. – *Ekológia (Bratislava)* 16: 147-162
- Nentwig W, Blick T, Gloor D, Hänggi A & Kropf C 2014 Araneae Spiders of Europe, version 9. 2014. – Internet: <http://www.araneae.unibe.ch> (September 23, 2014)
- Obratov-Petković D, Popović I & Stanković M 2007 Diversity of the medical plants of the Zasavica Special Nature Reserve. In: Simić S (eds.) Zbornik, Naučno-stručni skup Zasavica 2007, sa međunarodnim učešćem. Pokret gorana, Sremska Mitrovica. pp. 15-22 [in Serbian, English summary]
- Palmgren P 1982 Ecology of the spider *Walckenaeria (Wideria) alticeps* (Denis) new to Finland, and *W. (W.) antica* (Wider) (Araneae, Linyphiidae). – *Annales Zoologici Fennici* 19: 199-200
- Perić R 2012 Floristic features. In: Dobretić V (ed.) Special Nature Reserve “Zasavica”, proposal for attribution of I category protection status. Institute for Nature Conservation of Vojvodina province, Novi Sad. pp. 50-70 [in Serbian]
- Russell-Smith A 2011 Identification of *Tetragnatha extensa* and *Tetragnatha pinicola*. – *Newsletter of the British arachnological Society* 121: 23-24
- Rélys V & Dapkus D 2002 Comments to the checklist of Gnaphosidae and Liocranidae (Arachnida, Araneae) of the Baltic States, with remarks on species new to Lithuania. In: Toft S & Scharff N (eds) *European Arachnology 2000*. pp. 273-278
- Riecken U 1998 The importance of semi-natural landscape structures in an agricultural landscape as habitats for stenotopic spiders. In: Selden PA (eds) *Proceedings of the 17<sup>th</sup> European Colloquium of Arachnology*, Edinburgh. pp. 301-310
- Roberts MJ 1987 The spiders of Great Britain and Ireland. Vol. 2. Linyphiidae and check list. Harley Books, Colchester. 204 pp.
- Roberts MJ 1995 Spiders of Britain and Northern Europe. Collins Field Guide, Harper Collins, London. 383 pp.
- Savić I 2008 Diversification of the Balkan fauna: its origin, historical development and present status. In: Makarov SE & Dimitrijević RN (eds) *Advances in arachnology and developmental biology. Papers dedicated to Prof. Dr. Božidar Čurčić*. Institute of Zoology, Belgrade: Bulgarian Academy of Sciences, Sofia; Faculty of Life Sciences, Vienna; SASA, Belgrade; UNESCO MAB Committee, Serbia. Monographs 12: 57-78
- Spasojević M 1891 *Trochosa infernalis* Moth, jedan interesantan pauk – trkač iz okoline Beograda, Šapca, Niša, Leskovca i Pirot. – *Nastavnik* 2 (3): 202-218 [in Serbian]
- Stojić V 2012 Vegetation features. In: Dobretić V (ed.) Special Nature Reserve “Zasavica”, proposal for attribution of I category protection status. Institute for Nature Conservation of Vojvodina province, Novi Sad. pp. 70-85 [in Serbian]
- Weiss I & Schneider E 1996 Erstbeschreibung des Weibchens von *Dactylopisthes digiticeps* (Simon, 1881) (Arachnida: Araneae: Linyphiidae). – *Annalen des Naturhistorischen Museums Wien* 98: 111-116
- World Spider Catalog 2014 World spider catalog, version 15.5. Natural History Museum, Bern. – Internet: <http://wsc.nmbe.ch> (December 25, 2014)

#### Sažetak

Zasavica predstavlja jedno od vlažnih staništa centralne Srbije sa veoma malo podataka o fauni paukova. Zbog toga je 2011 godine sprovedeno faunističko istraživanje tokom kojeg je material najvećim delom sakupljan klopkama, ali i ručno, zatim košenjem i trešenjem. Ukupno je sakupljeno 3053 jedinki i utvrđeno je 107 vrsta iz 21 familije. Među svim tim vrstama, sedam predstavlja prve nalaze za faunu Srbije: *Holocnemus pluchei* (Scopoli, 1763), *Dactylopisthes digiticeps* (Simon, 1881), *Walckenaeria alticeps* (Denis, 1952), *Pachygnatha listeri* Sundevall 1830, *Liocranoeca striata* (Kulczyński, 1882), *Phrurolithus minimus* C. L. Koch, 1839 and *Tibellus maritimus* (Menge, 1875), dok 59 vrsta predstavlja prve nalaze za rezervat. Pored nove liste vrsta, u radu su malo detaljnije komentarisani i novi nacionalni nalazi.