CONTRIBUTIONS TO THE KNOWLEDGE OF THE SPIDER FAUNA FROM THE NATIONAL PARK BUILA VÂNTURARIŢA, COUNTY VÂLCEA (ROMANIA)

LOTREAN Nicolae

Abstract. The article presents the results of the research carried out on the spider fauna of the National Park Buila Vânturariţa, County Vâlcea, during April-October 2011. There were identified 84 species of spider belonging to 17 families, of which only four species can be considered relatively rare for the Romanian fauna. The families Lycosidae, as number of specimens and Linyphiidae, as number of species and genera, were the dominant families. There are presented data on: sex ratio, the biogeographical features of the spider fauna and grouping of the investigated habitats depending on the species identified.

Keywords: spiders, fauna, National Park Buila Vânturariţa, sex ratio, similarity, zoogeographical distribution.

Rezumat. Contribuţii la cunoaşterea faunei de aranee din Parcul Naţional Buila Vânturariţa, judeţul Vâlcea (România). Articolul prezintă rezultatele cercetărilor întreprinse asupra faunei de aranee din Parcul Naţional Buila Vânturariţa, judeţul Vâlcea, în perioada aprilie-octombrie 2011. Au fost identificate 84 de specii de aranee încadrate în 17 familii, dintre care doar patru specii pot fi considerate relative rare pentru fauna României. Familiile Lycosidae, ca număr de exemplare şi Linyphiidae, ca număr de specii şi genuri, au fost familiile dominante. Sunt prezentate date cu privire la: raportul numeric al sexelor, caracteristicile biogeografice ale faunei de aranee şi gruparea habitatelor investigate în funcţie de speciile identificate.

Cuvinte cheie: aranee, faună, Parcul Naţional Buila Vânturariţa, raportul sexelor, similaritate, distribuţie zoogeografică.

INTRODUCTION

Until the achievement of the present the study, which renders data collected in the field, in the literature, there were no data on the spider fauna from the National Park Buila Vânturariţa. There could have been made some extrapolations, related to the spider species present in the park area, starting from the data on the spider fauna from adjacent areas.

Cleopatra Sterghiu counts 69 species of spider from 18 families, collected from several types of habitats located in Cozia Massif (STERGHIU, 1993). Of these, 26 species were identified in the National Park Buila Vânturariţa, as well. All Cleopatra Sterghiu mentions the species *Clubiona terrestris* WESTRING 1851 and *Liocranum rupicola* (WALCKENAER 1830) as being collected at 5-10 km upstream of Căciulata-Vâlcea (STERGHIU, 1985).

I. E. Fhun and Floriana Niculescu-Burlacu cites several species of the family Lycosidae, collected in Vâlcea County, from habitats located relatively close to the National Park Buila Vânturariţia: *Pardosa hortensis* (THORELL 1872) collected from Băile Govora, *Arctosa cinerea* (FABRICIUS 1777) collected from the Brezoi-Cornetu, *Lycosa radiata* (LATREILLE 1817) collected from Racoviţa, Cozia, Teiuş and *Pirata knorii* (SCOPOLI 1763) collected from Vaideeni (FHUN & NICULESCU-BURLACU, 1971).

In the fauna fascicle dedicated to the family Salticidae, I. E. Fhun and V. F. Gherasim (FHUN & GHERASIM, 1995) mentions two species, collected from areas relatively close to National Park Buila Vânturariţa: *Phelgra fasciata* (HAHN 1826) and *Heliophanus cupreus* (WALCKENAER 1802) collected on the Olt Valley, at Cornetu. These were, in the year 2011, the available data on the spider fauna of an area large enough that included the National Park Buila Vânturariţa, very vague information, which practically represented the starting point in studying the park area, in terms of the spider fauna.

MATERIAL AND METHODS

Buila-Vânturariţa Massif is located in central-northern part of Vâlcea County and makes part of Căpăţânii Mountains (Fig. 1). It is a calcareous massif that extends from west of Bistriţa Gorge and up to the east of the Olăneşti Gorge. The ridge of the massif has a linear spatial extension, on SW-NE direction, with a length of about 14 km and a width between 0.5 and 2.5 km. The altitude varies between 1,885 m (the peak Vânturariţa Mare) and 550 m (at the output the Bistriţa River from gorges). The climate varies on vertical, due to the relief altitude. The beech floor is characterized by precipitation between 600 and 900 mm/year, peaking even 1,000 mm/year, humidity between 68% and 70% and annual average temperatures between 6^{o}C and 9^{o}C. The spruce belt is characterized by rainfall ranging between 700 and 900 mm/year, humidity between 67% and 70%, annual average temperatures between 2^{o}C and 5^{o}C and predominant winds from NW-SE. The top of the mountain is characterized by precipitation higher than 900 mm/year and annual average temperatures between 1^{o}C and 2^{o}C. It was recorded a relatively large difference between the climate of slopes with southeastern exposure and those with northwestern exposure. In the first case, we have a mild climate, due to strong insolation and storage of heat by limestone and the influence of the mild climate of Oltenia.

The material was collected during April-October 2011, in four types of habitats (10 collection stations): forest (beech, mixed, coniferous), riparian, meadow and bog, located on both sides of the mountain: riverside coppice (RC), river Prislop; riparian 1 (R1), creek Izvorul Larg; mixed forest, beech and spruce (MF1), creek Izvorul Larg; riparian 2 (R2), the hut Cheia; beech forest (B), the hut Cheia; mixed forest, beech and spruce (MF2); bog (Bog); spruce forest (S); mountain meadow (MM); gorges of the Cheia River (CH).

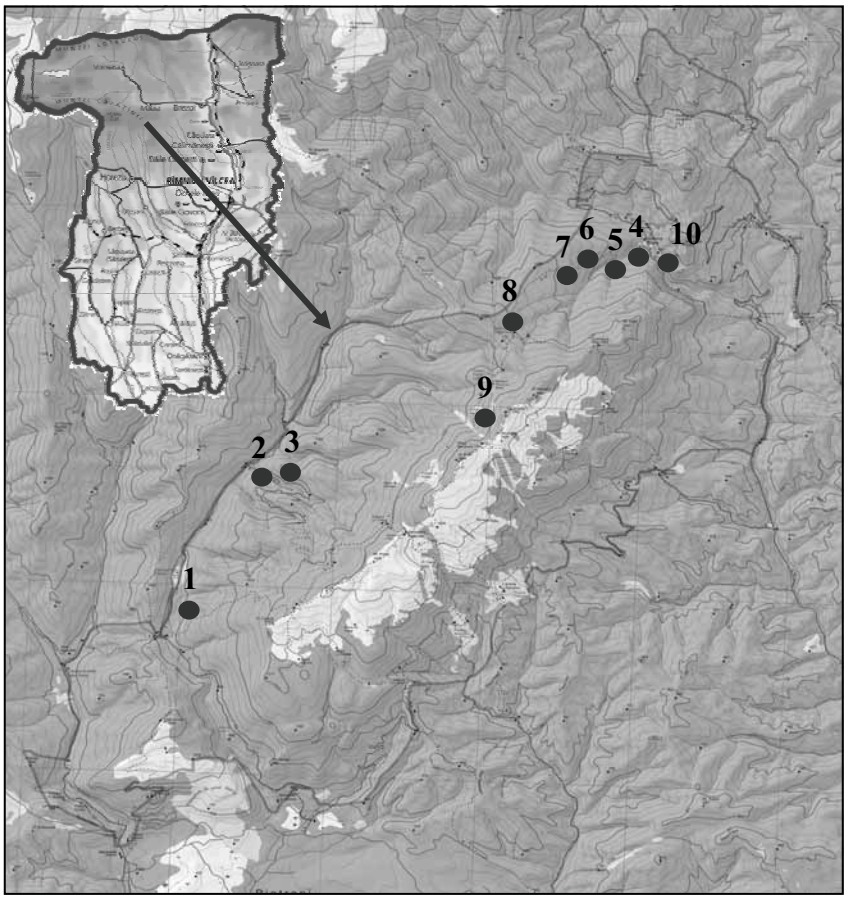

Figure 1. Locating the 10 collection stations in the National Park Buila Vanturariţa: 1 - riverside coppice (RC), creek Prislop; 2 - riparian 1 (R1), creek Izvorul Larg; 3 - mixed forest, beech and spruce (MF1), creek Izvorul Larg; 4 - riparian 2 (R2), the hut Cheia; 5 - beech forest (B), the hut Cheia; 6 - mixed forest, beech and spruce (MF2); 7 - bog (Bog); 8 - spruce forest (S); 9 - mountain meadow (MM); 10 - gorges of the Cheia River (CH). / Figura 1. Localizarea celor 10 staţii de colectare din Parcul Naţional Buila Vânturariţa: 1 - zăvoi (RC), pârâul Prislop; 2 - riparian 1 (R1), pârâul Izvorul Larg; 3 - pădure de amestec, fag şi molid (MF1), pârâul Izvorul Larg; 4 - riparian 2 (R2), cabana Cheia; 5 - pădure de fag (B), cabana Cheia; 6 - pădure de amestec, fag şi molid (MF2); 7 - mlaştină (Bog); 8 - pădure de molid (S); 9 - pajişte montană (MM); 10 - Cheile Cheii (CH).

To capture spiders from different habitat types, there were used the following collection techniques: pitfall traps (Barber traps) used to collect invertebrates with high activity at ground level; in each collection station we placed five traps, arranged in line, to a distance of five meters apart; the traps have worked in the field 184 days; the sampling have been made in average to 46 days; manual collection, direct or with tweezers from the substrate: under logs, on and under the bark of trees, on plants, etc.; sweeping with an entomological net for herbaceous and shrub layer species.

The biological material collected by the pitfall traps represented 96.32% of all captured individuals and 76.2% of all identified species; the other two collection methods have played a secondary role, being used in areas where it was too difficult to use traps (gorges of Cheia River) or to complete the faunal data from some habitats. Manual collection and sweeping were made in summer, in August (August 3-4, 2011), in the gorges of the Cheia River, riparian (R2) and mixed forest (MF2).

RESULTS AND DISCUSSIONS

There were collected 1,819 specimens, of whom 1,804 specimens were determined until species level; the remaining 15 specimens were identified until genus or family, due to the inability to establish exactly the species for juvenile specimens.

Of the 1,804 specimens identified to species level: 1,021 were males, 644 females and 139 immature specimens. In terms of systematics, the material was classified in: 17 families, 57 genera and 84 species. The full list of the spider species collected in the National Park Buila Vânturariţa, with data on the number of males, females, immature and juveniles collected from each stationary, is presented in table 1.

From the fauna point of view, spider species collected from the National Park Buila Vânturariţa are generally common species, not cited in any of the categories: species of community interest, IUCN species, endemic species and species mentioned in the Annex OUG 57/2007 or species present on red lists in Romania. However, we want to draw attention on some species of spider we can consider relatively rare for the Romanian fauna:

Robertus scoticus JACKSON 1914 from the family Theridiidae, is a relatively rare species, that prefers wet areas from the coniferous forests (pine, spruce) and the wetlands, with peat, at ground level, in the moss and plant debris, in open, partially shaded or shaded areas. On altitude, the species can be found from 300 m to over 1,300 m altitude. Adults are active from May to September. In Slovakia it is considered an endangered species, vulnerable in North Rhine and Westphalia (Germany), in Austria near-threatened and in Belgium, it belongs to the category of rare species.

Evansia merens O. P. CAMBRIDGE 1900, from the family Linyphiidae, is a relatively rare species found in forests, with moderate humidity, in open or partially shaded places, between 600 m and 1,400 m altitude. It is active at the ground level, under rocks, logs, rarely found in the litter, but and in the galleries of some species of ants: *Lasius niger* (LINNAEUS 1758), *L. fuliginosus* (LATREILLE 1798), *Formica fusca* LINNAEUS 1758, *F. sanguinea* LATREILLE 1798. Adults are present all year. It is an endangered species in Poland and vulnerable in Slovakia.

Pelecopsis elongate (WIDER 1834), from the family Linyphiidae. It is a relatively rare species, found in coniferous forests, at altitudes between 300 m and 1,000 m, in the litter, more rarely on rocks, in moss or shrub branches, near the ground. It prefers wetlands, partly shaded, semi-open or open. Adults are found from June to December. It is considered an endangered species in Germany and rare in England.

Walckenaeria mitrata (MENGE 1868), from the family Linyphiidae. It is a relatively rare species, present in different types of forests, with moderate humidity, in the litter and moss, at altitudes between 200 and 800 m. It prefers shady places. Adults are present from March until June/July, according to altitude. The species is considered threatened in Belgium and vulnerable in Poland.

Table 1. List of spider species identified in the National Park Buila Vânturariţa.
Tabel 1. Lista speciilor de aranee identificate în Parcul Naţional Buila Vânturariţa.

No.	Taxon	Stationary										F
		RC	R1	MF1	R2	B	MF2	Bog	S	MM	CH	
	Fam. **DYSDERIDAE**											
1	***Dysdera crocata*** C. L. KOCH 1838			13♂,12♀, 1im,	5♀, 4im	6♀	15♀				4♀	50%
2	***Harpactea rubicunda*** (C. L. KOCH 1838)			1♀	1♀	1♀	2♀					40%
3	***Harpactea saeva*** (HERMAN 1879)				1♂, 1♀							10%
	***Dysdera* sp.**				1j							
	***Harpactea* sp.**			1j								
	Fam. **THERIDIIDAE**											
4	***Asagena phalerata*** (PANZER 1801)									1♂		10%
5	***Robertus scoticus*** JACKSON 1914							1♂				10%
	Fam. **LINYPHIIDAE**											
6	***Bathyphantes nigrinus*** (WESTRING 1851)	15♂, 6♀						2♂, 1♀				20%
7	***Centromerus cavernarum*** (L. KOCH 1872)					1♂						10%
8	***Centromerus pabulator*** (O. P. CAMBRIDGE 1875)								1♂			10%
9	***Centromerus sellarius*** (SIMON 1884)				2♀	3♂, 2♀	2♂					30%
10	***Centromerus silvicola*** (KULCZYNSKI 1887)	1♂, 1♀		14♂, 3♀		1♀						30%
11	***Centromerus sylvaticus*** (BLACKWALL 1841)	1♀			1♂, 1♀			20♂, 1♀	1♀			40%
12	***Ceratinella brevipes*** (WESTRING 1851)	1♂										10%
13	***Dicymbium tibiale*** (BLACKWALL 1836)	9♂, 5♀		1♀				1♂, 1♀				30%
14	***Diplocephalus latifrons*** (O. P. CAMBRIDGE 1863)	5♂, 1♀	13♂, 4♀, 2im		4♂, 2♀			7♂, 2♀				40%
15	***Diplostyla concolor*** (WIDER 1834)	16♂, 3♀, 4im	1♀	1♂, 1♀			1♂					40%
16	***Drapetisca socialis*** (SUNDEVALL 1833)		2♂									10%
17	***Evansia merens*** O. P. CAMBRIDGE 1900			1♂								10%
18	***Gonatium rubellum*** (BLACKWALL 1841)			1♂			1♀				1♂, ♀	30%
19	***Gongylidiellum latebricola*** (O. P. CAMBRIDGE 1871)	1♂						15♂				20%
20	***Lepthyphantes minutus*** (BLACKWALL 1833)								3♂, 1♀			10%
21	***Linyphia hortensis*** SUNDEVALL 1830						1♂, 1♀					10%
22	***Megalepthyphantes nebulosus*** (SUNDEVALL 1830)								2♀			10%
23	***Micrargus apertus*** (O. P. CAMBRIDGE 1871)			2♂		1♂						20%

No.	Taxon	Stationary										F
		RC	R1	MF1	R2	B	MF2	Bog	S	MM	CH	
24	***Mughiphantes mughi*** (FICKERT 1875)								4♂			10%
25	***Neriene emphana*** (WALCKENAER 1841)		2♂, 2♀, 1im	1♀	1♂, 3♀, 13im	1♀	4♂, 3♀				1♀	60%
26	***Neriene peltata*** WIDER 1834										1♂, 2♀	10%
27	***Oedothorax agrestis*** (BLACKWALL 1853)							1♂, 2♀				10%
28	***Palliduphantes pallidus*** (O. P. CAMBRIDGE 1871)	3♂	8♂, 1♀	2♂, 2♀	1♂	1♂	2♂, 1♀			1♂		70%
29	***Pelecopsis elongate*** (WIDER 1834)								2♂			10%
30	***Pelecopsis radicicola*** (L. KOCH 1872)	1♂										10%
31	***Tenuiphantes alacris*** (BLACKWALL 1853)		6♂, 6♀, 4im			1♂, 1♀						20%
32	***Tenuiphantes tenebricola*** (WIDER 1834)	1♂	4♂, 12♀, 2im	2♂, 2♀	5♂, 11♀	6♂, 10♀, 3im	4♂, 9♀	1♂, 2♀	12♂, 12♀, 3im			80%
33	***Tenuiphantes tenuis*** (BLACKWALL 1852)					1♂, 6♀						10%
34	***Tiso vagans*** (BLACKWALL 1834)									52♂, 39♀		10%
35	***Walckenaeria antica*** (WIDER 1834)	1♂										10%
36	***Walckenaeria atrotibialis*** (O. P. CAMBRIDGE 1878)									1♂		10%
37	***Walckenaeria mitrata*** (MENGE 1868)			2♂								10%
38	***Walckenaeria vigilax*** (BLACKWALL 1853)							2♂, 1♀		3♂		20%
	Fam. **TETRAGNATHIDAE**											
39	***Pachygnatha degeeri*** SUNDEVALL 1830	1♂								1♂, 2♀, 21im		20%
40	***Pachygnatha listeri*** SUNDEVALL 1830	10♂, 13♀										10%
41	***Tetragnatha extensa*** (LINNAEUS 1758)				3♀						4♀	20%
	Fam. **ARANEIDAE**											
42	***Araneus diadematus*** CLERCK 1758										3♀, 1c	10%
43	***Araniella cucurbitina*** (CLERCK 1757)										1♀	10%
44	***Mangora acalypha*** (WALCKENAER 1802)										1♀, 2im	10%
45	***Zygiella x-notata*** (CLERCK 1757)										4♀, 1im	10%
	Fam. **LYCOSIDAE**											
46	***Alopecosa aculeata*** (CLERCK 1757)									1♀		10%
47	***Alopecosa cuneata*** (CLERCK 1757)	1♂										10%
48	***Alopecosa trabalis*** (CLERCK 1757)									7♂, 2♀		10%
49	***Aulonia albimana*** (WALCKENAER 1805)	3♀										10%
50	***Pardosa alacris*** (C. L. KOCH 1833)	1♂		1♂, 1♀				1♂, 3♀				30%
51	***Pardosa amentata*** (CLERCK 1757)	4♂, 1♀						1♂, 2♀, 1im			1♂, 2♀	30%
52	***Pardosa morosa*** (L. KOCH 1870)										1♀	10%
53	***Pardosa palustris*** (LINNAEUS 1758)									109♂, 165♀, 38im, 87c		10%
54	***Pardosa riparia*** (C. L. KOCH 1833)	2♂, 7♀										10%
55	***Pardosa saltuaria*** (L. KOCH 1870)									3♂, 1♀		10%
	Pardosa sp.	3j										
56	***Piratula hygrophila*** (THORELL 1872)							89♂, 67♀, 14im, 1c				10%
57	***Trochosa terricola*** THORELL 1856	22♂, 7♀								3♂, 1♀		20%
	Fam. **ZORIDAE**											
58	***Zora spinimana*** (SUNDEVALL 1833)	1♂, 1♀										10%

No.	Taxon	Stationary										F
		RC	R1	MF1	R2	B	MF2	Bog	S	MM	CH	
	Fam. **AGELENIDAE**											
59	***Coelotes terrestris*** (WIDER 1834)		2♀		14♂, 1im	5♂, 4♀, 2im	9♂, 1♀	35♂, 4♀	72♂, 7♀, 4im	2♂		70%
60	***Histopona torpida*** (C. L. KOCH 1837)			2♀	1♂		3♂, 1♀					30%
61	***Inermocoelotes inermis*** (L. KOCH 1855)	10♂, 1♀	43♂, 10♀,3im	12♂	18♂, 1♀	17♂, 4♀	11♂		1im			70%
62	***Malthonica ferruginea*** (PANZER 1804)		1♂									10%
63	***Malthonica silvestris*** (L. KOCH 1872)										1♂, 2♀	10%
	Coelotes sp./*Inermocoelotes* sp.			3j	1j		1j		1j			
	Fam. **CYBAEIDAE**											
64	***Cybaeus angustiarum*** L. KOCH 1868	13♂, 5♀	10♂, 7♀, 4im	1♀	7♂, 1im	16♂, 6♀, 1im	18♂, 8♀, 2im	5♂, 1♀	4♂, 3♀			80%
	Fam. **HAHNIIDAE**											
65	***Cryphoeca silvicola*** (C. L. KOCH 1834)				1♂	2♂			5♂, 1♀			30%
	Fam. **DICTYNIDAE**											
66	***Cicurina cicur*** (FABRICIUS 1793)	2♂	3♂	4♂, 3♀	9♂, 1♀	15♂						50%
	Fam. **AMAUROBIIDAE**											
67	***Callobius claustrarius*** (HAHN 1833)		3♂, 1♀	31♂, 2♀	7♂, 5♀	1♂, 1♀	6♂, 2♀		5♂		3♂	70%
	Amaurobius sp.										1j	
	Fam. **LIOCRANIDAE**											
68	***Apostenus fuscus*** WESTRING 1851			11♂, 13♀, 3im								10%
	Fam. **CLUBIONIDAE**											
69	***Clubiona comta*** C. L. KOCH 1839						1♀				1♂, 1♀	20%
70	***Clubiona corticalis*** (WALCKENAER 1802)						1♀					10%
71	***Clubiona reclusa*** O. P. CAMBRIDGE 1863							1♀				10%
	Fam. **GNAPHOSIDAE**											
72	***Drassyllus lutetianus*** (L. KOCH 1866)									2♂		10%
73	***Drassyllus pusillus*** (C. L. KOCH 1833)	1♂								6♂, 3♀		20%
74	***Haplodrassus signifer*** (C. L. KOCH 1839)									4♂, 5♀, 2im		10%
75	***Haplodrassus silvestris*** (BLACKWALL 1833)			4♀								10%
76	***Zelotes latreille*** (SIMON 1878)	1♂								1♂, 1♀		20%
	Fam. **THOMISIDAE**											
77	***Ozyptila atomaria*** (PANZER 1801)										1♂, 1♀	10%
78	***Ozyptila claveata*** (WALCKENAER 1837)	1♂										10%
79	***Xysticus audax*** (SCHRANK 1803)	2♂, 1♀			1♂							20%
80	***Xysticus erraticus*** (BLACKWALL 1834)									4♂, 1♀		10%
81	***Xysticus kochi*** THORELL 1872										1♂, 2♀	10%
	Xysticus sp.									3j		
	Fam. **SALTICIDAE**											
82	***Evarcha falcata*** (CLERCK 1757)						1♂				1♂	20%
83	***Heliophanus aeneus*** (HAHN 1832)										1♂, 1♀	10%
84	***Pseudeuophrys erratica*** (WALCKENAER 1826)										1♀	10%
	Sum (number of species per site)	**28 sp.**	**13 sp.**	**20 sp.**	**18 sp.**	**17 sp.**	**17 sp.**	**15 sp.**	**12 sp.**	**17 sp.**	**19 sp.**	

No.	Taxon	Stationary									F
		RC	R1	MF1	R2	B	MF2	Bog	S	MM	CH	
	Sum (number of specimen, male, female, immature and juvenile per site)	**189 spe.** 127♂, 55♀, 4im, 3j	**157 spe.** 95♂, 46♀, 16im	**154 spe.** 98♂, 48♀, 4im, 4j	**128 spe.** 71♂, 36♀, 19im, 2j	**119 spe.** 70♂, 43♀, 6im	**111 spe.** 62♂, 46♀, 2im, 1j	**284 spe.** 181♂, 88♀, 15im	**144 spe.** 108♂, 27♀, 8im, 1j	**485 spe.** 200♂, 221♀, 61im, 3j	**48 spe.** 12♂, 32♀, 3im, 1j	

Legend: ♂-male, ♀-female, im-immature (from the appearance of the primary genitalia to the stage in which genitals are almost fully developed, but non-functional, last moult; j - juvenile (after leaving the cocoon from the appearance of primary genitalia; c - cocoon); sp. - species; spe. - specimens; F - frequency calculated by the number of sites where the species was identified.

For Romania, due to incomplete data, the criterion which was the basis for the classification of the aforementioned species as relatively rare is the small number of collected specimens or specimens present in different collections and the reduced number of citations in the specialized literature in our country. Thus, we mention four works for *Robertus scoticus* (FHUN & OLTEAN, 1970; WEISS & PETRIŞOR, 1999; WEISS & URÁK, 2000; URÁK *et al*., 2010); a work for *Evansia merens* (WEISS & PETRIŞOR, 1999); four works for *Pelecopsis elongate* (FHUN & OLTEAN, 1970; NAE, 2008; WEISS & PETRIŞOR, 1999; WEISS & URÁK, 2000); four citations for *Walckenaeria mitrata* (WEISS & PETRIŞOR, 1999; LOTREAN, 2008; URÁK, 2008; URÁK *et al*., 2010).

From the quantitative point of view, most of the collected specimens belonged to the family Lycosidae (31.06%), followed by the families: Linyphiidae (27.10%), Agelenidae (17.04%), and Cybaeidae (6.16%). The rest of the spider families had weights less than 5% (Fig. 2). There were large variations from one resort to another; for example, in the case of family Lycosidae the weight of specimens of this family ranged from zero (MF2, S, B, R1, R2) to 59.85% (Bog) or 64.73% (MM).

The hierarchy changes if we consider the number of genera and species. From this point of view, most genera and species belonged to the family Linyphiidae (38.60%, respectively 39.29%), followed by the families: Lycosidae (8.77% for genera and 14.29% for species), Agelenidae (7.02% for genera, 5.95% for species), Araneidae (7.02% for genera and 4.76% for species), Gnaphosidae (5.26% for genera and 5.95% for species) and Salticidae (5.26%, respectively 3.57%). The rest of the spider families had weights below 5%, as well as the number of genera and the number of species (Fig. 3).

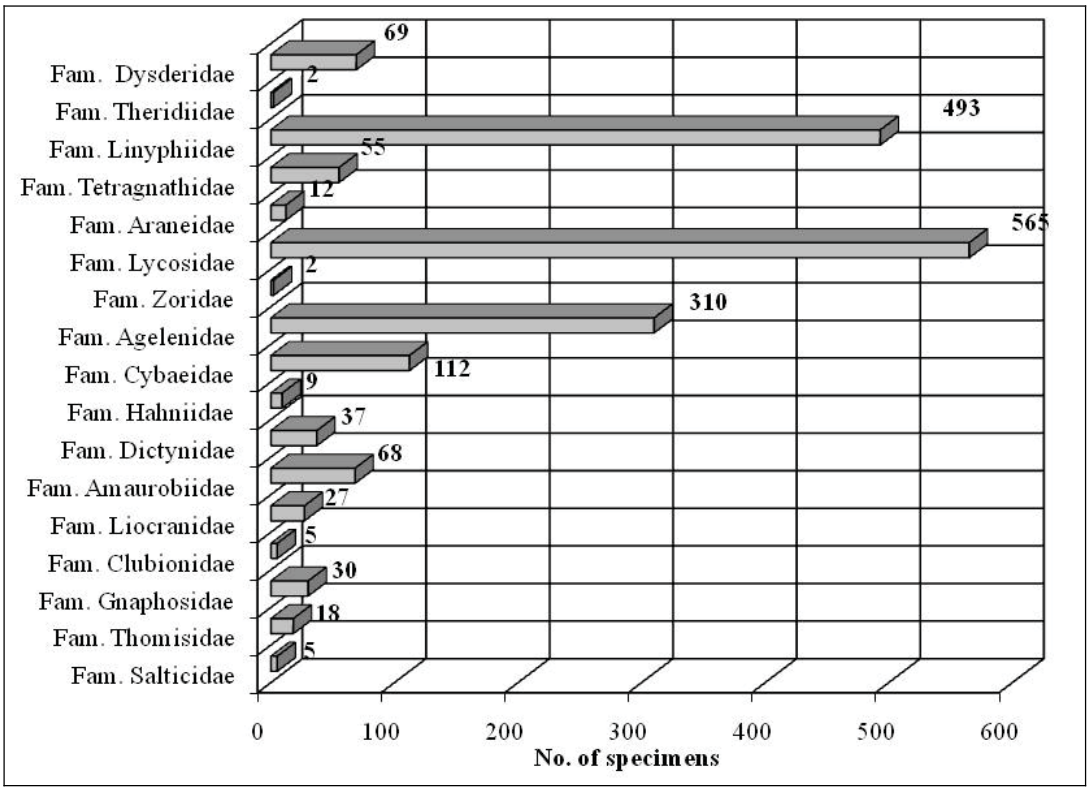

Figure 2. Number of specimens collected from each family. / Figura 2. Numărul de exemplare colectate din fiecare familie.

The "frequencies" of the collected species, depending on the number of habitats in which they were found, varied between 10% and 80%. 75 species (89.28%), of the 84 identified in the National Park Buila Vânturariţa, had frequencies below 50% being identified in a small number of habitats. Most species, 50 species (59.52% of all species collected), were found in one habitat of the 10 studied, their weight, reported to the number of species from the respectively habitat, being higher in: riverside coppice (32.14%), gorges of the Cheia River (57.89%) and mountain

meadow (58.82%). Only four species: *Palliduphantes pallidus* (O. P. CAMBRIDGE 1871), *Coelotes terrestris* (WIDER 1834), *Inermocoelotes inermis* (L. KOCH 1855) and *Callobius claustrarius* (HAHN 1833), respectively two species, *Cybaeus angustiarum* L. KOCH 1868 and *Tenuiphantes tenebricola* (WIDER 1834) had frequencies of 70%, respectively 80%. For the riparian and forest habitats I found a decrease of the weight of species with frequency less than 50% and an increase of the weight of species with frequency above 50%, which shows a grouping of these habitats according to their structure (their nature) and their neighbourhood.

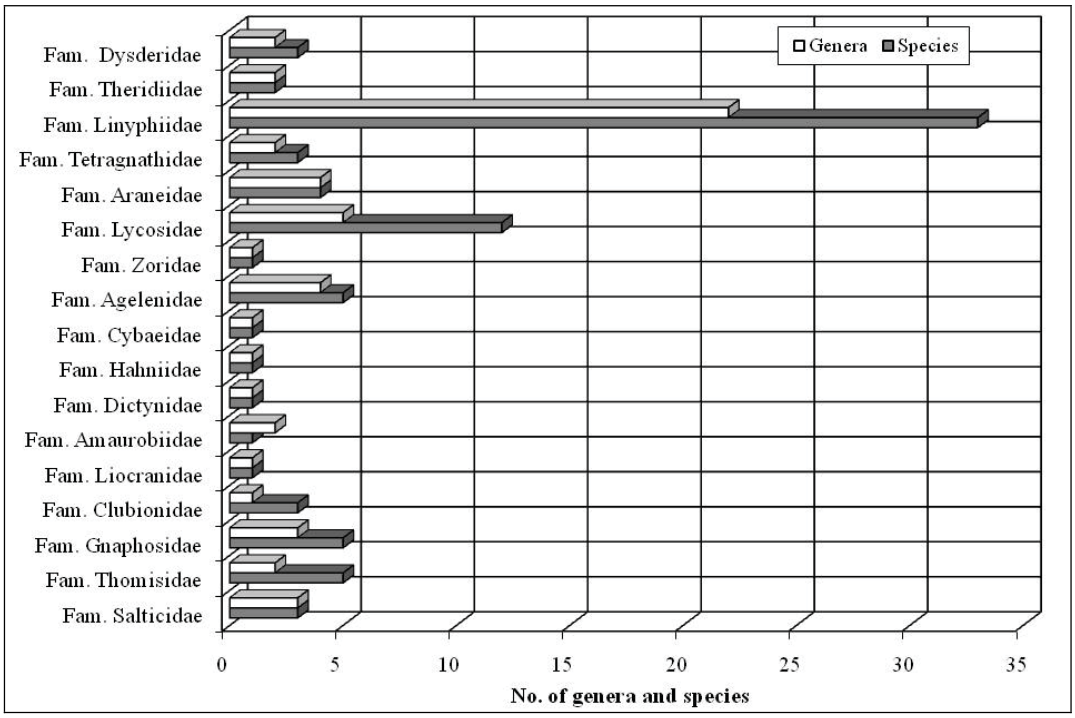

Figure 3. Number of genera and species identified for each family. / Figura 3. Numărul de genuri şi specii identificate din fiecare familie.

In terms of the sex ratio, in the collected material, 61.32% were male and 38.68% were females, the sex ratio being approximately 2:1 in favour of males. The sex ratio, for the 50 spider species for which both sexes were collected, in 20 cases, it was favourable for males, for 6 species it was favourable to females and for 24 species it was relatively balanced, being very close to the theoretical value of 1:1. For the rest of the species (34 species), there were collected either males, in most cases, or females. If we consider juvenile individuals, the sex ratio changes very little, the weight of immature and juvenile specimens being small, only 8.47% of the total collected specimens, of which the juveniles were less than 1% (Fig. 4).

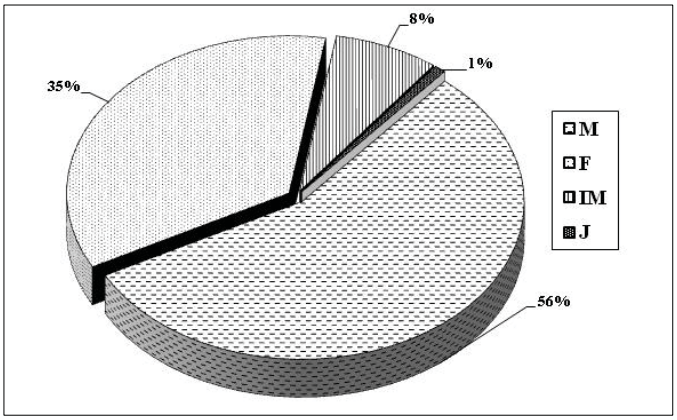

Figure 4. The report between: males, females, immature and juvenile individuals (M-male, F-female, IM-immature, J-juveniles). / Figura 4. Raportul dintre: masculi, femele, imaturi şi juvenili (M-masculi, F-femele, IM-imaturi, J-juvenili).

In accordance with their current spreading, the 84 species of spider identified in the National Park Buila Vânturariţa, were classified into 9 zoogeographical groups (DELTSHEV, 2005). In terms of number of spider species for each zoogeographical groups, I found the presence of large numbers of Palearctic species, almost half (48.81%) of the identified species belonging to this category. These were followed by: the Holarctic species (16.67%), European-Siberian species (13.10%), European species (7.14%) and European Central-Asian species (5.95%). The rest of the zoogeographical elements had weights less than 5% (Fig. 5).

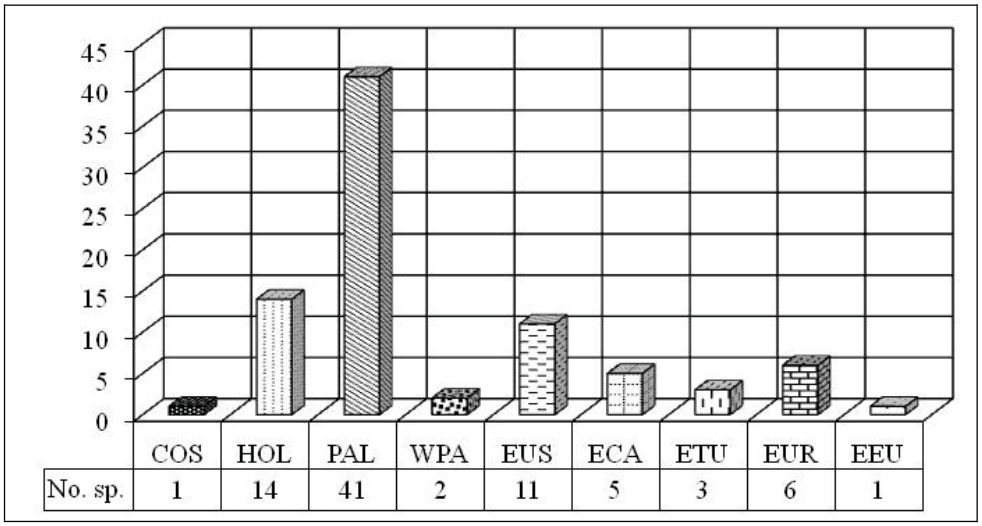

Figure. 5. Distribution of the identified species on zoogeographical groups (COS - Cosmopolitan, HOL - Holarctic, PAL - Palearctic, WPA - Western Palearctic, EUS - European-Siberian, ECA - European Central-Asian, ETU - European-Turanian, EUR - European, EEU - Eastern European). / Figura 5. Distribuţia speciilor identificate pe grupe zoogeografice (COS - Cosmopolit, HOL - Holarctic, PAL - Palearctic, WPA - Vest-Palearctic, EUS - European-Siberian, ECA - European Central-Asiatic, ETU - European-Turanian, EUR - European, EEU - Est European).

Leaving aside the zoogeographical elements with low discriminating power, the Holarctic and Palearctic species, we believe that, the European-Siberian, European-Central Asian, European-Turanian and European zoogeographical elements, totalling 29.76%, are those that allow a more accurate location of the spider fauna of the National Park Buila Vânturariţa. The European-Central Asian, European-Turanian and European elements are located in nemoral belt (mainly in the beech forest), and the European-Siberian ones in the boreal belt (spruce forest). They indicate the appurtenance to Dacian province, the most extensive zoogeographical unit in Romania, including mountainous and hilly areas (DRUGESCU, 1994).

For grouping the habitats, according to the spider fauna, I used the Jaccard index, based on the presence/absence of the species (Fig. 6).

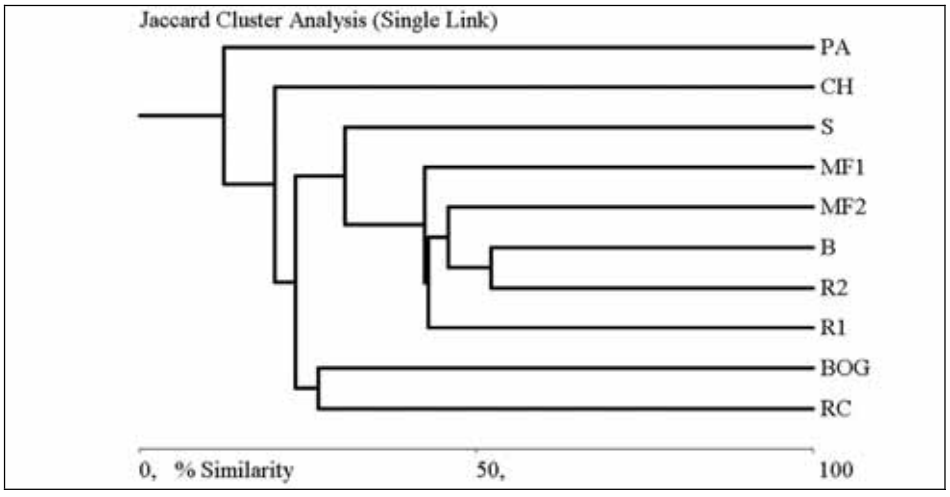

Figure 6. The similarity of studied habitats according to the composition of spider fauna. / Figura 6. Similaritatea habitatelor studiate în funcţie de compoziţia faunei de aranee.

From this viewpoint the mountain meadow clearly detaches from the other investigated habitats, due to particular conditions from this habitat (the similarity is only 12.50%); stationary Cheile Cheii, in terms of specific composition of spider fauna, represents a special habitat, which had a similarity of only 20.00% with other habitats; compared with the mountain meadow, greater similarity with the rest of habitats, was induced by the presence of patches of trees and shrubs; bog and riverside coppice, two wetlands, clearly differs from the forest ecosystems (similarity with these is only 26.30%) and from this group, it emerges the coniferous forest, which shows a low similarity (30.36%) with the other forest ecosystems, being more darker, more uniform, as a monoculture, with a small number of microhabitats.

It is observed the existence of a group of habitats (box with solid line) with higher similarity (over 46.87% and 54.67%); the cluster corresponds to the spatial groups of those three collection stations, their order in the field, starting

from Cheia hut being: R2 → B → MF2. Even if it is part of the cluster which groups deciduous and mixed forests (box with dashed), the habitat MF1 shows a similarity of only 42.14% with the previous group.

The explanation might be that this habitat is represented by a mixed, young forest, probably the result of natural regeneration, located on a slope with southern exposition that means it is warmer, drier and brighter compared to the other forest habitats, which is reflected in the structure of the spider fauna as well. A relatively close similarity (43.48%) was calculated for the stationary R1, located in a mixed forest with a higher percentage of coniferous, wetter and colder compared to MF1.

CONCLUSIONS

This is the first study of the spider fauna of the National Park Buila Vânturariţa; the study led to the identification of 84 species of spider, grouped in 57 genera and 17 families. All species are at the first citation for this area.

From the point of view of fauna only four species: *Robertus scoticus*, *Evansia merens*, *Pelecopsis elongata* and *Walckenaeria mitrata* can be considered relatively rare for the Romanian fauna.

From the point of view of number of species per dominant families we mention Linyphiidae (39.29%) and Lycosidae (14.29%). In terms of number of individuals, the hierarchy is reversed ascertaining the numerical dominance of the species from the family Lycosidae (31.06%), followed by family Linyphiidae (27.10%).

The frequency the spider species, calculated according to the number of habitats in which they were identified, showed that the spider fauna from the National Park Buila Vânturariţa includes a large number of species that have a low continuity in the investigated area, their share being higher in isolated habitats, characterized by a relatively small surface.

The analysis of data on sex ratio showed that it is not balanced, most of the times being in favour of males; overall ratio is to 2:1 in favour of males. Out of the 50 spider species for which there were collected both sexes, in 20 cases, it was favourable for males, for 6 species for females and for 24 species, it was relatively balanced.

Grouping species of spiders according to their distribution area showed the net dominance of widely spread elements, Palearctic and Holarctic species, which totalized nearly 66% of the identified species. In terms of zoogeographical structure of the spider fauna, it is confirmed the affiliation of the investigated area at the Palearctic region, European-Siberian subregion, Central European over-province, Dacian province, with a little Turanian influence.

The values of Jaccard similarity index, less than 55%, reflect a relatively low similarity of the studied habitats through the spider fauna, which indicates a high heterogeneity of the studied area.

REFERENCES

DELTSHEV C. 2005. *Fauna and zoogeography of spiders (Araneae) of Bulgaria*. Journal of Arachnology. **33**: 306-312. http://www.americanarachnology.org/JoA_tocs/JOA_contents_v33n2.html (accessed: January 11, 2012).

DRUGESCU C. 1994. *Zoogeografia României*. Edit. All. Bucureşti. 140 pp.

FHUN I. E. & OLTEAN CLEOPATRA. 1970. *Lista Araneelor din R. S. România*. Studii şi comunicări. Muzeul de Ştiinţele Naturii Bacău: 157-196.

FUHN I. E. & NICULESCU-BURLACU FLORINA. 1971. *Fauna R. S. România. Fam. Lycosidae.* Edit. Academiei R. S. România. Bucureşti. **5**(3). 256 pp.

FUHN I. E. & GHERASIM V. 1995. *Fauna României. Fam. Salticidae.* Edit. Academiei Române. Bucureşti. **5**(5). 296 pp.

LOTREAN N. 2008. *Observations about arachnid fauna from Miceşti forest (Argeş District)*. Drobeta. Seria Ştiinţele Naturii. Muzeul Regiunii Porţilor de Fier. Edit. Universitaria, Craiova. **18**: 111-123.

NAE A. 2008. *Data concerning the araneae fauna from the Aninei Mountains karstic area (Banat, Romania)*. Travaux de l'Institute de Speólogie "Émil Racovitza". Bucharest. **47**: 53-63.

STERGHIU CLEOPATRA. 1985. *Fauna R. S. România. Fam. Clubionidae.* Edit. Academiei R. S. România. Bucureşti. **5**(4). 168 pp.

STERGHIU CLEOPATRA. 1993. *Aranee din Masivul Cozia.* Ocrotirea Naturii şi a Mediului Înconjurător. Edit. Academiei Române. Bucureşti. **37**(2): 99-108.

URÁK I., 2008. *Date despre arahnofauna din bazinul superior al Oltului*. Edit. Scientia. Cluj-Napoca. 240 pp.

URÁK I., SAMU F., MÁTHÉ I., BALOG A. 2010. *Arachnológiai (Arachnida: Araneae) kutatások a Mohos Tözeglápban*. Acta Siculica. Muzeul Naţional Secuiesc. Edit. Sepsiszentgyörgy. Sfântu Gheorghe. **5**: 127-144.

WEISS I. & PETRIŞOR ANGELA. 1999. *List of the spiders (Arachnida: Araneae) from Romania.* Travaux du Muséum National d'Histoire Naturelle "Grigore Antipa". Bucureşti. **41**: 79-107.

WEISS I. & URÁK I. 2000. *Faunenlisten der Spinnen Rumäniens (Arachnida: Araneae).* http://www.arachnologie.info/fauna.htm (accessed: March 14, 2012).

Lotrean Nicolae
Argeş County Museum, Armand Călinescu, 44, 110047,
Piteşti, Argeş, Romania
E-mail: lotrean_n@yahoo.com

Received: March 30, 2012
Accepted: July 18, 2012