

## Spiders from the Skopje Region: a faunistic and zoogeographical analysis

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**Abstract.** 118 species from 67 genera and 17 families have been found in the region of Skopje City. 31 species are new for the spider fauna of Macedonia. The spiders are classified into 16 zoogeographical categories combined in 5 chorological complexes. The faunal composition shows a Palearctic and European character for the Skopje region spider fauna. Endemics and Southeast European species emphasise the local character of this fauna, but its low percentage suggests an important process of colonization.

**Key words:** spiders, faunistic, zoogeography, urban fauna

### Introduction

No detailed study of spiders in the Skopje region has been published so far. The first information can be found in the papers of STOJICEVIĆ (1907; 1929) and DRENSKY (1924; 1929; 1935; 1936). Some recent publications add data concerning the spiders of Skopje region (BLAGOEV, 2002; ĆURČIĆ et al., 2000, DELTSHEV et al., 2000, KOMNENOV 2006).

The present study is a result of collecting and processing of original materials and observations during 2005, in the frame of the project GLOBENET (Global network for monitoring biodiversity changes across urban-rural landscapes).

### Study area and methods

The survey of spiders inhabiting the region of Skopje comprises 3 study sites (Fig. 1):

#### Urban – U:

**U I** – Skopje (240 m), region Karpos, grass vegetation dominated by *Hordeum murinum*.

**U II, III** – Skopje, region Karpos (240 m), grass vegetation dominated by *Onopordon acanthium*, *Verbascum phlomoides*, *Melilotus officinalis*, *Echium vulgare*, *Reseda lutea*, *Dipsacus silvestris*, *Sisymbrium officinale*, *Hordeum murinum*, *Bromus sterilis*, *Sonchus oleraceus*.

#### Suburban – SU:

**SU I** – Skopje, (240m), region Maxari, grass vegetation dominated by *Elymus repens*, *Lepidium draba*, *Bromus inermis*, *Bromus sterilis*, *Bromus tectorum*, *Ballota nigra*.

**SU II, III** – Skopje (240m), region Maxari, grass vegetation dominated by *Petrorhagia saxifraga*, *Medicago minima*, *Poa bulbosa f. vivipara*, *Chondrila juncea*.

**Rural – R:**

**R I, II, III** – Skopje (240m), Mralino village, grass vegetation dominated by *Plantago lanceolata*, *Poa pratensis*, *Achillea millefolium*, *Trifolium repens*.

The exploration includes only stationary methods: pit-fall traps. The study lines served by pitfall traps include 9 points (Urban – 3; Suburban – 3; Rural – 3). Ten pitfall traps (mouth diameter 6 cm) with 125 ml formalin + 875 ml vine vinegar were placed in a line, about 10 meters apart from each other, at each study point. The traps were emptied once in month and operated during the period 01.02. – 01.07.2005.



Fig. 1. Localities where spiders were collected, Skopje region (see text)

## Results and discussion

### Species composition

118 species of 16 families: Dysderidae – 4; Theridiidae – 7; Linyphiidae – 36; Tetragnathidae – 1; Araneidae – 1; Lycosidae – 18; Pisauridae – 1; Zoridae – 1; Agelenidae – 1; Dictynidae – 1; Liocranidae – 4; Corinidae – 2; Zodariidae – 2; Gnaphosidae – 22; Philodromidae – 4; Thomisidae – 5; Salticidae – 9 (Table 1). 31 species are new for the spider fauna of Macedonia (marked in the text by an asterisk).

Most numerous are the families: Linyphiidae (36) – 30.25 %, Gnaphosidae (22) – 18.5 %, Lycosidae (18) – 15.1 %, Salticidae (9) – 7.5 % and Theridiidae (7) – 5.9 %. The presence of species of families such as Dysderidae, Araneidae, Linyphiidae, Theridiidae, Agelenidae, Liocranidae and Gnaphosidae in the urban parts of the region is due to the eu- and hemisynanthropic representatives (SACHER, 1983). The genera *Pardosa* (9) and *Zelotes* (8) are the most numerous.

### Interesting new faunistic and taxonomic records:

*Dysdera granulata* – hitherto known from the Adriatic coast of the Balkan Peninsula. The new localities in the region of Skopje extend its range in eastern direction. The information is in concordance with a record by HANSEN (1995) who reported *D. cf. granulata* from an urban park in Venice, Italy.

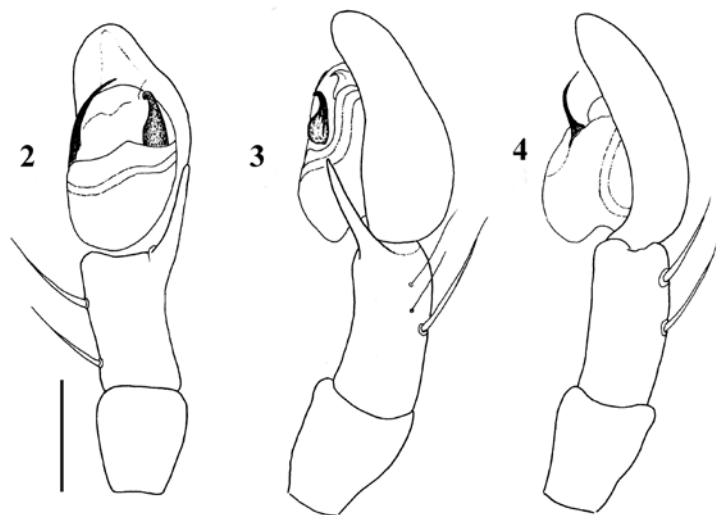
*Harpactea samuili* – described and hitherto known only from Southwest Bulgaria (LAZAROV, 2006). The new record supports its distribution as a Balkan endemic.

*Palliduphantes byzantinus* – hitherto known from European Turkey and Bulgaria. The new record supports its distribution as a Balkan endemic.

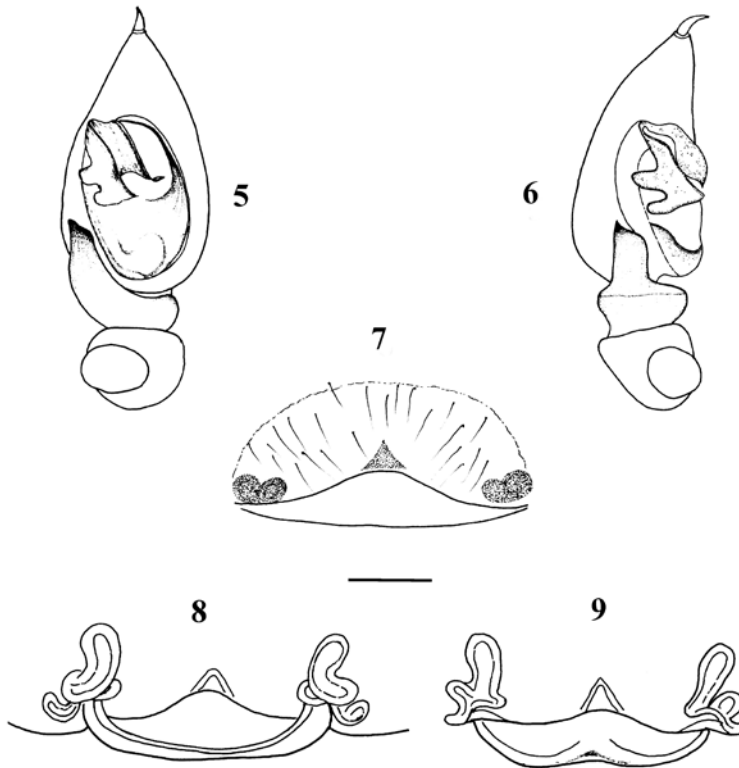
*Agraeicina* pr. *bodna* – the species *A. bodna* was described and so far known from a single locality in North Algeria (Mergueb) (BOSMANS, 1999). The material collected in the Skopje region is very close to figured specimens of *A. bodna*, but has a thinner and longer embolus (Figs. 2-4).

*Zodarium hauseri* – described only by a female and hitherto known only from Central Greece (Monte Elicon) (BRIGNOLI, 1984). The new material, including the previously unknown male, contribute to the taxonomic characteristics of the species (Figs. 5-9). The new localities indicate that the species may be widespread on the Balkan Peninsula.

*Haplodrassus bohemicus* – described and hitherto known only from single localities in Northwestern Bohemia and Southeastern Moravia (MILLER & BUCHAR, 1977; BUCHAR & RŮŽIČKA, 2002). The new locality extends its range in southern direction. The specimens of the Skopje population are either identical with, or closely related to *Haplodrassus bohemicus*. The male palps and female epigyne and vulva agree in more respects with the figures and description of the species presented by MILLER & BUCHAR (1977). The new materials contribute to the taxonomic characteristics of the species (Figs. 10-15).



Figs. 2-4. *Agraeicina* pr. *bodna* (Bosmans, 1999): 2 – male palp, ventral view; 3 – male palp, retrolateral view; 4 – male palp, prolateral view. Scale lines: 0.3 mm



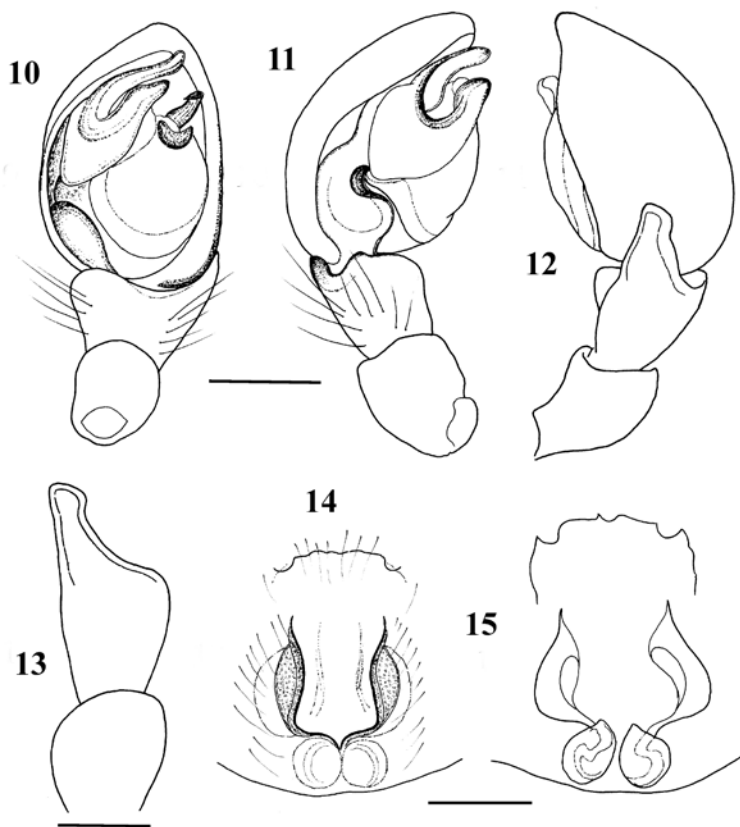
Figs. 5-9. *Zodarion hauseri* (Brignoli, 1984): 5 – male palp, ventral view; 6 – male palp, retrolateral view; 7 – epigyne; 8, 9 – vulva, dorsal view. Scale lines: 0.1mm

### Zoogeographical analysis

According to their current distribution the established 118 species can be classified in 16 zoogeographic categories, grouped into 5 chorological complexes (I, Cosmopolitan; II, widely distributed in Holarctic; III, European; IV, Mediterranean; V, Endemics) (Table 1, Fig. 16). Data on general distribution and chorological classification of spiders are taken from PLATNICK (2007) and TAGLIANTI et al. (1999).

*Cosmopolitan species complex* (COS, 1.7 %) includes only the species *Dysdera crocota* and *Steatoda albomaculata*. The first species is found in urban and suburban and the second in suburban and rural regions.

*Complex of species widely distributed in the Holarctic Region* (HOL + PPT + PAL + WPA + EMC + ECA + EUS, 60.9 %) is best represented and comprises 72 species widespread in Macedonia. Palearctic species s. l. are dominant (40, 33.9 %), followed by European-Central Asian species (13, 10.9 %), Holarctic species (10, 7.6 %) and West Palearctic species (5, 4.2 %). The remaining chorotypes are represented by single species.



Figs. 10-15. *Haplodrassus bohemicus* (Miller & Buchar, 1977): 10 – male palp, ventral view; 11 – male palp, retro-lateral view; 12 – male palp, dorsal view; 13 – male palp, tibial apophysis; 14 – epigyne; 15 – vulva, dorsal view. Scale lines: 0.1mm

The complex includes widespread species associated mainly with lowlands and xenotopic elements, which can reach the highest summits in the mountains. Most numerous species are: *Acartauchenius scurrilis*, *Meioneta rurestris*, *Microlinyphia pussilla*, *Trichoncoides piscator*, *Pardosa hortensis*, *P. proxima*, *Trochosa ruricola*, *Haplodrassus signifer*, *Thanatus arenarius*, and *Xysticus kochi*. They are best presented also in the urban territory.

*European chorological complex* (EUR + MEE + MSEE, 21.1 %) comprises 25 species widespread on the territory of Europe. European species s. l. are dominant (16 %); followed by Middle and Southeast European species (4 %); Well presented in the urban sites are: *Mecopisthes peussi*, *Sintula retroversa*, *Trichoncus hackmani*, *Trichopterna cito*, *Micaria guttulata*, and *Zelotes gracillis*.

*Mediterranean species complex* (MCA + MED + EME + NEM, 10.1 %) includes 12 species widespread in Mediterranean (*Trochosa hispanica*, *Trachyzelotes hyonneti*, *Euophrys rufibarbis*), Mediterranean and Middle Asia (*Alopecosa albofasciata*, *Hogna radiata*, *Drassodes lutescens*) and North Mediterranean (*Dysdera granulata*, *Maimuna vestita*, *Trachyzelotes malkini*, *Pellenes brevis*) region. Most of them are found in urban territory.



Table 1  
Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	<i>Centromerus lakatnikensis</i> (Drensky, 1931)	+ 1	1																	BK
*	<i>Centromerus semiater</i> (L. Koch, 1879)	+ 1	1																	WPA
	<i>Diplosyla concolor</i> (Wider, 1834)	+				1	+						1		1	3	1			HOL
	<i>Dicymbium nigrum</i> (Blackwall, 1834)						+			1										PAL
	<i>Erigone dentipalpis</i> (Wider, 1834)	+ 8	2				+		5						+	10	5			HOL
	<i>Leptyphantes quadrimaculatus</i> (Kulczyński, 1898)													+		6	1			EUR
*	<i>Mecopisthes peusi</i> (Wunderlich, 1872)	+ 10	15	3			+		18	4					+	2	1			EUR
	<i>Meioneta fuscipalpa</i> (C.L. Koch, 1836)	+				1	2									13	6			PAL
	<i>Meioneta mollis</i> (O.P.-Cambridge, 1871)													+			1			PAL
	<i>Meioneta rurestris</i> (C.L. Koch, 1836)	+		17	4			+	13	2	1	2	+	8	11	4			6	PAL
	<i>Microlinyphia pusilla</i> (Sundevall, 1830)	+ 40						+	1											HOL
	<i>Oedothorax fuscus</i> (Blackwall, 1834)													+		1				WPA
*	<i>Palliduphantes byzantinus</i> (Fänge, 1931)	+ 10	9	1	8	7	+	12	4	8	1	3	+	14	4	7	2	4		BK
	<i>Peleopsis krausi</i> Wunderlich, 1980	+				1	+				1	1								BK
*	<i>Peleopsis parallela</i> (Wider, 1834)						+	15	3	4	7	3								PAL
*	<i>Pocadicnemis juncea</i> Locket & Millidge, 1953													+		1				EUR
	<i>Porrhomma convexum</i> (Westring, 1851)													+	2	3				PAL
*	<i>Porrhomma microphthalnum</i> (O.P.-Cambridge, 1871)													+	17	10	4		3	PAL
	<i>Prinerigone vagans</i> (Audouin, 1826)	+ 1																		PPT
*	<i>Sintula retroversus</i> (O.P.-Cambridge, 1875)	+ 9	1				+	4												EUR
	<i>Stemonyphantes lineatus</i> (Linnaeus, 1758)													+		1				PAL

Table 1  
Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	<i>Syloctetor romanus</i> (O.P.-Cambridge, 1872)	+	1					+	1	1										PAL
*	<i>Tallusia vindobomensis</i> (Kulczyński, 1898)													+	15					MEE
*	<i>Tapinocyba pallens</i> (O.P.-Cambridge, 1872)	+	2																	EUR
	<i>Tenuiphantes tenuis</i> (Blackwall, 1852)							+	6							+	1	4	1	WPA
*	<i>Trichonoides piscator</i> (Simon, 1884)	+	4	28												+	4	3		ECA
*	<i>Trichoncus backmani</i> Millidge, 1956	+	1	6	2	3	+	3	4	3	6	7	+	2		31	1	9		EUR
	<i>Trichoncus saxicola</i> (O.P.-Cambridge, 1861)							+			4	4	+			1				EUR
*	<i>Trichopterna cito</i> (O.P.-Cambridge, 1872)	+	8	24	2		1	+	1	3				+	6	14	3	2		EUR
*	<i>Walckenaeria vigilax</i> (Blackwall, 1853)													+	1	1	1			HOL
	TETRAGNATHIDAE																			
	<i>Pachynatha degeeri</i> Sundevall, 1830	+	1	1	1	1	+	13	8	16				+	3	9	40	3	1	PAL
	ARANEIDAE																			
	<i>Mangona acalypha</i> (Walckenaer, 1802)							+												PAL
	LYCOSIDAE																			
	<i>Alopecosa albofasciata</i> (Brullé, 1832)	+	3	1	8	7	+			2	3	4								MCA
	<i>Alopecosa cuneata</i> (Clerck, 1757)							+			1									PAL
	<i>Alopecosa pulverulenta</i> (Clerck, 1757)							+	2	2	2	+		+	6	10	6			PAL
	<i>Arctosa leopardus</i> (Sundevall, 1833)													+		1	6			PAL
	<i>Aulonia albimana</i> (Walckenaer, 1805)	+		1										+		1				PAL
	<i>Hogna radiata</i> (Latreille, 1817)	+				22	61	+	1	20	26	+							8	MCA
	<i>Paradosa agrestis</i> (Westring, 1861)													+		1				PAL
	<i>Paradosa agricola</i> (Thorell, 1856)	+				1		+			1	+			5	3	5			ECA
	<i>Paradosa hortensis</i> (Thorell, 1872)	+		13				+	2	1		+		+	5					PAL



Table 1  
Continued

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	<i>Pardosa monticola</i> (Clerck, 1757)	+				1	1							+				25	20	PAL
	<i>Pardosa paludicola</i> (Clerck, 1757)													+			18	1	1	PAL
	<i>Pardosa prativaga</i> (L. Koch, 1870)													+				1	4	EUS
	<i>Pardosa proxima</i> (C.L. Koch, 1847)	+	2	12	4	11	7	+	42	32	39	9	10	+	66	24	137	37	43	PAL
	<i>Pardosa pullata</i> (Clerck, 1757)													+				3	11	ECA
	<i>Pardosa vittata</i> (Keyserling, 1863)													+					3	EUR
	<i>Trochosa hispanica</i> Simon, 1870	+				1	2							+		12	21	12	5	MED
	<i>Trochosa ruricola</i> (De Geer, 1778)	+		6	16			+			8			+		30	3			PAL
	<i>Xerohycosa miniata</i> (C.L. Koch, 1834)													+				4	62	PAL
	PISAURIDAE																			
	<i>Pisaura mirabilis</i> (Clerck, 1757)	+	1	1				+	3					+	2					PAL
	ZORIDAE																			
	<i>Zona silbestris</i> Kulezýnski, 1897	+					1													ECA
	AGELENIDAE																			
*	<i>Maimuna vestita</i> (C.L. Koch, 1841)							+	2	1										EME
	DICTYNIDAE																			
	<i>Argenna subnigra</i> (O.P.-Cambridge, 1861)							+			1	1								EUR
	LIOCRANIDAE																			
	<i>Agroeca cuprea</i> (Menge, 1873)	+	1				1	+	1	2	1			+	2	1				ECA
*	<i>Agroeca lusatica</i> (L. Koch, 1875)													+		2	1			EUR
*	<i>Agroeca proxima</i> (O.P.-Cambridge, 1871)							+			1			+	2	1				EUR
	<i>Agroecina pr. hodna</i> Bosmans, 1999	+					1													MED
	CORINNIDAE																			
	<i>Phrurolithus festivus</i> (C.L. Koch, 1835)							+			1	1	+	1	2	2	6			PAL





Table 2  
 Zoogeographical composition of the spiders of Skopje region (abbreviations, see Table 1).

Complexes	Chorotypes	Code	species	%
Cosmopolitan	Cosmopolitan	COS	2	1.69
	Total		2	1.69
	Holarctic	HOL	10	8.4
	Palaearctic-Paleotropical	PPT	1	0.84
	Palaearctic	PAL	40	33.9
Holarctic	West Palaearctic	WPA	5	4.2
	European-Mediterranean-Central Asian	EMC	2	1.69
	European-Central Asian	ECA	13	11.0
	European-Siberian	EUS	1	0.84
	Total		72	60.9
	European	EUR	19	16.1
	Middle and East European	MEE	1	0.84
	Middle and Southeast European	MSEE	5	4.2
	Total		25	21.1
	Mediterranean and Central Asia	MCA	3	2.5
	Mediterranean	MED	4	3.4
Mediterranean	East Mediterranean	EME	1	0.84
	Northeast Mediterranean	NEM	4	3.4
	Total		12	10.1
	Balkan endemics	BALK	7	5.9
Endemics	Total		7	5.9

*Complex of endemics* (BALK, 5.9 %) comprises 7 species. All are presented in urban sites in small populations. They are known not only from Macedonia, but also from Bulgaria (*Harpacea samuili*, *Centromerus lakatnikensis*, *Pelecopsis krausi*, *Zodarion ochridense*), Greece (*Zodarion hauseri*) and Turkey (*Palliduphantes byzantinus*).

## Conclusion

The faunistic diversity of the 118 spider species shows that the small region of Skopje is a territory of high species richness. This conclusion is supported also by the existence of seven endemic species.

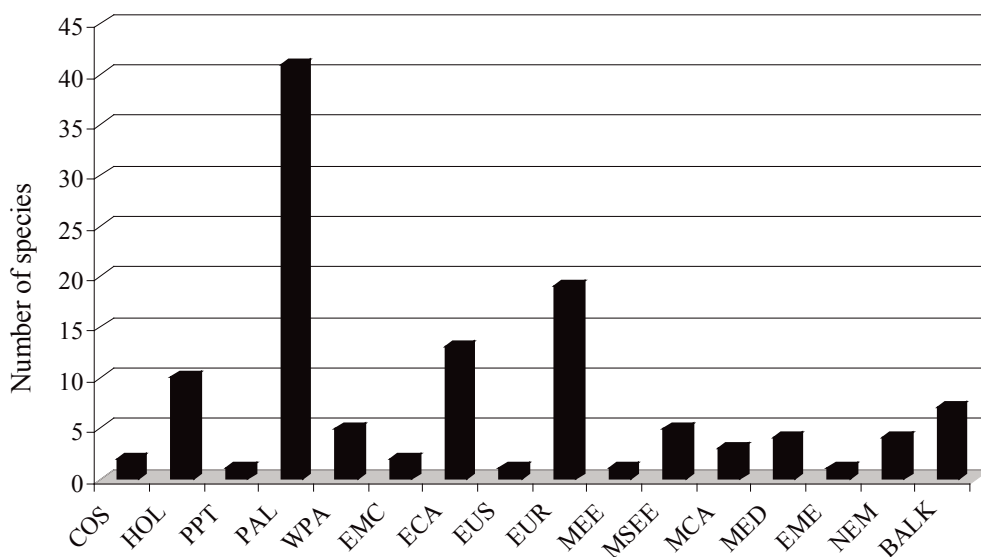


Fig. 16. Zoogeographical characteristics of spiders of Skopje region (abbreviations, see Table 1)

The outline of the spider fauna in Skopje region is determined by the Palearctic and European species. They are best presented also in the urban territory. The group of endemics is also presented in urban territory. Endemics and Southeast European species emphasize the local character of this fauna, but their low percentage suggests an important process of colonization.

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## Паяците от района на Скопие: фаунистичен и зоогеографски анализ

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Стоян ЛАЗАРОВ

### (Резюме)

118 вида от 67 рода и 16 семейства са установени в района на Скопие. 31 от намерените видове са нови за аранеофауната на Република Македонија. Видовете *Agracina* sp. *hodna*, *Zodarium hauseri* и *Haplodrassus bobemicus* са дискутирани в таксономично отношение, като са представени и нови рисунки. В зоогеографско отношение паяците са разпределени в 16 зоогеографски категории, обединени в 5 ареалографски комплекса. Палеарктичните и европейските видове доминират и определят характера на аранеофауната и значението на колонизацијата. Локалниот карактер на фауната се определува од ендемитите и југоисточноевропейските елементи.