

Spiders (Araneae) from the high Altitude Zone of Rila Mountain (Bulgaria)

by

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Synopsis: 82 species (1 Segestriidae, 1 Zodariidae, 1 Metidae, 5 Araneidae, 29 Linyphiidae, 7 Theridiidae, 14 Lycosidae, 5 Agelenidae, 6 Clubionidae, 4 Gnaphosidae, 4 Philodromidae, 2 Thomisidae, 3 Salticidae) are established from 24 sites (2000 - 2925 m) in the high altitude zone of Rila. The species composition of the high mountain spider community was not well known and this is the first contribution to the problem. Concerning the altitudinal distribution, there are only 11 species occurring mainly in the alpine belt, though a good number of species is present in the subalpine belt also and even some in the lowlands. Characteristic for the highest points are *Araeoncus clivifrons*, *Erigone pirini*, *Metopobactrus orbelicus*, *Scotinotylus alpigenus*, *Tiso aestivus*, *Lepthyphantes annulatus* (Carpatho-Balkan relict), *L. improbulus*, *L. lithoclasticolus*, *Oreonetides glacialis*, *Pardosa nigra*, *Gnaphosa muscorum*. The species (20) which are not found below the tree-line can be regarded as high mountain species complex, which is composed by euro-mountaine (7, 35%), endemic (6, 30%), holarctic (2, 10%), palearctic (1, 5%), arctic-alpine (2, 10%), and mountaine-mediterranean (1, 5%) elements. The high percentage of endemics shows that the process of autogenesis is considerable but the process of colonization, mainly by Middle-european species is stronger.

1. Introduction:

The species composition of the high mountaine spider community in Rila is not well known and this is the first real contribution to the problem. Some single data can be found in the papers of DRENSKY (1913, 1936), BUCHAR (1968), DELTSHEV (1980, 1993) and THALER et al. (1994). The accumulation of new data, therefore, makes possible this review of the spiders inhabiting the high altitude zone of Rila.

2. Study area and materials:

The Rila mountain is situated in south-west Bulgaria and is part of the Rila-Rodope massif. The total area of the mountain is 2396 km², one of the most typical alpine mountains in Bulgaria and the highest on the Balkan peninsula (2925 m). Two stages of glaciation have been established in the higher parts of Rila (Riss, Würm) and the main peaks (above 2600 m) were also glaciated (KLEBELSBERG 1949). The snow-line at 2000 - 2100 m (LOUIS 1930) shows that the parts situated below this altitude have not been covered with ice. This is of great importance for the survival of the fauna.

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The high altitude zone in Rila begins at 1900 - 2100 m and includes the subalpine (dwarf shrub) and alpine (grassland) belts.

In the alpine belt (above 2300 - 2500 m) grass formations and partially formations of dwarf shrubs predominate. Acidophilic formations as *Cariceta curvulae*, *Festuceta riloensis*, *Seslerieta comosae*, *Junceta trifidi*, *Agrostideta rupestris* and rarely other grass and dwarf shrub formations as *Saliceta herbacea*, *Empetreta nigrae*, *Vaccinieta uliginosi* and others are present (BONDEV 1991).

In the subalpine belt (2000 - 2300 m) the vegetation is mainly the formation of *Pineta mugi* and at the wet places *Alneta viridis*. Peat vegetation is formed from *Cariceta acutae*, *C. stellulatae*, *C. rostratae*, *Sphagneta* ssp., *Saliceta lapponi*, *Primula deori* and others (BONDEV 1991).

The survey of spiders inhabiting the high altitude zone of Rila mountain comprises 22 collecting sites from 2000 - 2925 m, situated in northwestern (5), middle (5) and eastern (12) parts of the mountains (fig 1). The spiders have been collected by hand (under stones and screes, on patches of moss and grass between stones), by netting (meadows) and beating (small bushes).

The localities where the spiders have been collected are shown in Fig. 1.

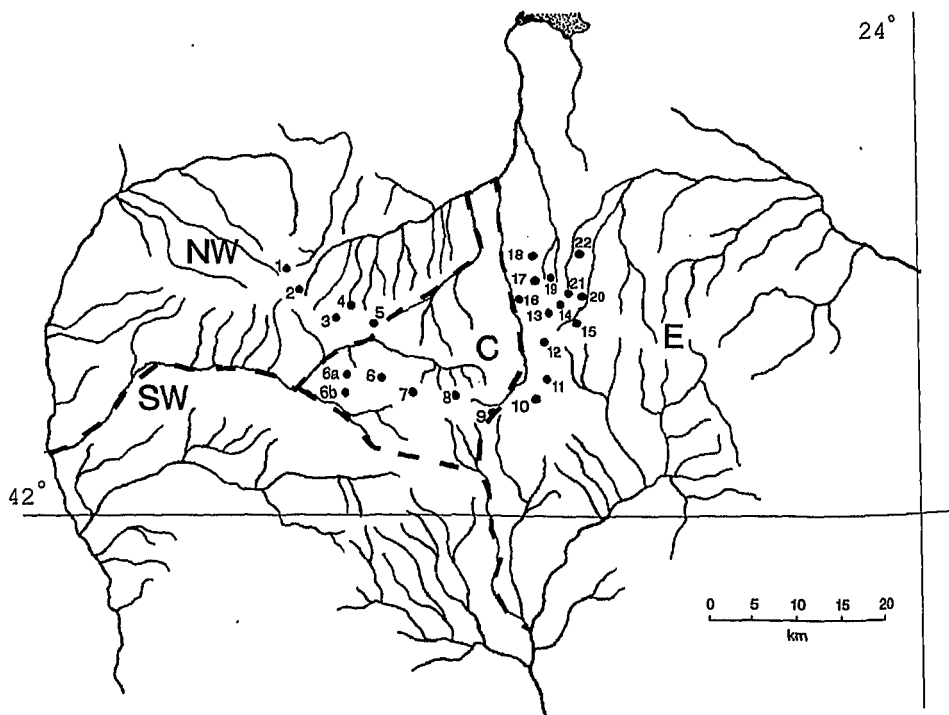


Fig. 1: The localities where spiders have been collected on Rila Mountain (see table 1): NW - Northwestern, SW - Southwestern, C - Central, E - Eastern.

Table 1: List of the localities where spiders have been collected on high altitude zone of Rila Mountain: 1 - 5 North-Western Rila; 6 - 9 Central Rila; 10 - 22 Eastern Rila.

- 1 - area of Bubreka lake (2200 m), rocky sites, screes, stones, patchy and sparse vegetation, 22 Sept. 1968.
- 2 - area of cottage Sedemte ezera (2196 m), low bushes, grassy patches between stones and alpine meadows, 20 Sept. 1968.

- 3 – area of peak Maljovitsa (2400 m), screes, and grassy patches between stones 18 Sep. 1993, leg. P. Beron.
 - 4 – area of cottage Maljovitsa (1960 m), rocky sites, screes, grassy patches between stones, 18 Sept. 1993, leg P. Beron.
 - 5 – area of lake Strashnoto ezero (2465 m), screes, stones and grassy patches between stones, 20 Sept. 1987.
 - 6 – area of lakes Manastirski ezera (2400 m), screes, moss and alpine meadows, 1 Aug. 1968.
 - 6a – area of peak Cherney (2200 m) (DRENSKY 1913).
 - 6b – area of peak Brichebor (2200 m) (DRENSKY 1913).
 - 7 – area of lake Smradiwoto ezero (2400 m), screes, moss and alpine meadows, 20 July 1993, leg P. Stoev.
 - 8 – area of cottage Ribni ezera (2300 m), screes, stones and grassy patches between stones, 21 July 1993, leg P. Stoev.
 - 9 – area of lakes Wapski ezera (2200 m), screes, moss and alpine meadows, 11 August 1964, leg S. Andreev.
 - 10 – area of peak Kowach (2600 m), screes and grassy patches between stones, 16 July 1986.
 - 11 – area of cottage Granchar (2200 m), rocky and scree sites and alpine meadows 14 July 1986 (former publication: DELTSHEV, 1993).
 - 12 – area of Marishki chal (2600 m), rocky and scree sites, 19 July 1969, leg P. Beron.
 - 13 – area of lakes Marichini ezera (2500 m), rocky and scree sites and grassy patches between stones, 19 July 1969, leg. P. Beron; 11 July, 1986.
 - 14 – the valley of Marichini ezera (2300 m), rocky sites, wet grassy patches between stones and alpine meadows, 13 July 1986.
 - 15 – area of cottage Zavrachica (2200 m), scree sites and alpine meadows, 14 July 1996 (former publication: DELTSHEV 1993).
 - 16 – area of peak Musala (2925 m), rocky and scree sites, 17 Aug. 1979, leg P. Beron; 22 July 1993, leg P. Stoev (former publication: THALER et al. 1994).
 - 17 – area of lakes Musalenski ezera (2500 m), rocky and scree sites and grassy patches between stones, 13 Aug. 1987, leg P. Beron.
 - 18 – area of cottage Musala (2400 m), rocky and scree sites, 16 July 1969, leg P. Beron.
 - 19 – area of peak Studenia chal (2500 m), rocky and scree sites. 17 July 1980, leg P. Beron.
 - 20 – area of cottage Marica (1900 m), scree sites and alpine meadows, 12 July 1986.
 - 21 – area of lakes Sarugiolski ezera (2200 m), rocky and scree sites and grassy patches between stones, 11 July 1986.
 - 22 – area of cottage Chakur wojwoda (2000 m), scree sites and alpine meadows, 9 July 1986.
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3. Results and discussion:

3.1. Species composition:

The contribution is due to collections in 22 localities situated in Northwestern, Central and Eastern parts of Rila mountain above 2000 m (Fig. 1) which comprise 82 species from 12 families: Segestriidae 1, Zodariidae 1, Araneidae 5, Linyphiidae 30 (Erigoninae 16, Linyphiinae 14), Theridiidae 7, Lycosidae 13, Agelenidae 6, Clubionidae 6, Gnaphosidae 4, Philodromidae 4, Thomisidae 2, Salticidae 3 (Table 2). 78 species are new for the spider fauna of Rila and 6 of these are new to the Bulgarian fauna (marked in the list with *). The data are close to results from the high altitude zone of Pirin mountain, where 87 species of spiders are established (DELTSHEV 1990). Most characteristic are the families: Linyphiidae s.l. 37%, Lycosidae 16% and Theridiidae 8.6%. The most numerous genera are *Pardosa* with 12 species, *Lepthyphantes* with 7 species and *Clubiona* with 7 species. But not all species listed can be considered as typical high-altitude elements. This is why the spiders were divided into 3 groups (DELTSHEV 1980, 1990). The first group (A) incorporates the species inhabiting both the lowlands and the moun-

tains above the forest-line. Those which are grouped into the second group (B) are rare or absent in the lowlands but abundant in the mountains exceeding the forest line. The third group (C) incorporates the species inhabiting only the high-altitude zone.

The species of the first group (xenozonal, THALER 1988) are 42 (51.2%) and they are widespread in Bulgaria, reaching the high-mountain zone as "aeronautes" mainly. Quite characteristic here are *Meioneta rurestris*, *Erigone dentipalpis*, *E. vagans*, *Oedothorax apicatus*, *O. fuscus*, *Bathypantes gracilis*, *Pardosa amentata*, *P. lugubris*, *Euophrys petrensis*, inhabiting the high mountain zone in dense populations.

Table 2. The spiders established in high alpine zone (2000 - 2925 m) of Rila Mountain. A, B and C indicate the groups defined in section 2. Geographical distribution: h = holarctic, p = palearctic, e = european, se = south european, ee = east european, aa = arctic-alpine, mm = montaine-mediterranean. Different degree of endemism: r = Rila, b = Bulgaria, bp = Balkan peninsula, em = European mountains. *) Species new to the Bulgarian faune.

Segestriidae		
<i>Segestria senoculata</i> (LINNAEUS)	20 (3 ♀), 21 (1 ♀)	A, p
Zodariidae		
<i>Zodarion pirini</i> DRENSKY	11 (2 ♀)	B, b
Metidae		
<i>Zygiella montana</i> (C.L. KOCH)	20 (1 ♀)	A, h
Araneidae		
<i>Aculepeira talishia</i> (ZAWADSKY)	6(2 ♀), 13 (1 ♂, 1 ♀), 14 (♂, 1 ♀)	B, mm
<i>Araniella alpica</i> (L. KOCH)	6b (DRENSKY 1913)	A, e
<i>Atea sturmi</i> (HAHN)	6a, 6b (DRENSKY 1913)	A, p
<i>Larinioides folium</i> (SCHRANK)	6 (1 ♀)	A, se
<i>Larinioides patagiatus</i> (CLERCK)	11 (1 ♀), 13 (2 ♀)	A, h
Linyphiidae (Erigoninae)		
<i>Araeoncus anguineus</i> (L. KOCH)	20 (1 ♂)	B, em
<i>Araeoncus clivifrons</i> DELTSHEV	4 (1 ♂, 1 ♀), 11 (1 ♀), 13 (1 ♀), 14 (1 ♀), 16 (1 ♂, 1 ♀)	C, b
<i>Diplocephalus foraminifer</i> (O.P.-CAMBR.)	4 (1 ♂, 1 ♀), 5 (1 ♂, 6 ♀), 11 (1 ♂), 13 (1 ♀), 14 (1 ♀), 16 (3 ♂, 5 ♀), 20 (1 ♂, 1 ♀)	C, b
<i>Erigone dentipalpis</i> (WIDER)	14 (1 ♀), 22 (5 ♀)	A, p
<i>Erigone pirini</i> DELTSHEV	14 (3 ♀), 16 (1 ♂, 1 ♀)	C, e
<i>Erigone vagans</i> AUDOUIN	13 (1 ♀)	A, p
<i>Evansia merens</i> (O.P.-CAMBR.)	18 (1 ♂, 1 ♀)	B, p
<i>Gonatium rubens</i> (BLACKWALL)	11 (1 ♀)	A, h
<i>Metopobactrus orbelicus</i> DELTSHEV	16 (1 ♀)	C, b
<i>Oedothorax agrestis</i> (BLACKWALL)	11 (1 ♂, 1 ♀)	A, e
<i>Oedothorax apicatus</i> (BLACKWALL)	4 (1 ♀), 16 (1 ♂), 17 (1 ♀)	A, p
* <i>Scotinotylus alpigenuus</i> (L. KOCH)	16 (1 ♀)	C, aa
* <i>Tiso aestivus</i> (L. KOCH)	11 (1 ♀)	C, aa
<i>Walckenaeria capito</i> (WESTRING)	4 (1 ♂), 13 (2 ♀)	A, h
Linyphiidae (Linyphiinae)		
<i>Antrohyphantes rhodopensis</i> (DRENSKY)	11 (2 ♀), 11 (1 ♂)	B, b

<i>Bathyphantes gracilis</i> (BLACKWALL)	11 (2 ♀)	A, p
<i>Bolyphantes luteolus</i> (BLACKWALL)	11 (3 ♀)	B, em
<i>Centromerus paucidentatus</i> DELTSHEV	4 (2 ♂, 1 ♀), 5 (2 ♂, 2 ♀), 11 (1 ♀), 14 (1 ♀)	B, b
<i>Lepthyphantes annulatus</i> KULCZYNSKI	16 (1 ♂, 1 ♀), (1 ♂), (4 ♀), 17 (1 ♂)	C, em
<i>Lepthyphantes drenskii</i> HELSDINGEN	11 (1 ♂, 1 ♀), 14 (1 ♂, 1 ♀), 20 (2 ♂, 2 ♀)	B, b
<i>Lepthyphantes improbulus</i> SIMON	3 (1 ♀), 4 (1 ♂), 5 (1 ♀), 12 (1 ♀), 14 (1 ♀), 16 (1 ♂)	C, em
<i>Lepthyphantes leprosus</i> (OHLERT)	20 (1 ♀)	A, p
<i>Lepthyphantes lithoclasticolus</i> DELTSHEV	3 (1 ♂, 1 ♀), 5 (1 ♂), 14 (1 ♀), 16 (4 ♀)	C, b
<i>Lepthyphantes pulcher</i> (KULCZYNSKI)	3 (1 ♂)	C, em
<i>Lepthyphantes tenebricola</i> (WIDER)	5 (1 ♀), 22 (1 ♀)	A, p
<i>Meioneta rurestris</i> (C.L. KOCH)	3 (1 ♀), 8 (1 ♀), 13 (1 ♀), 14 (3 ♀), 16 (1 ♂), 20 (♂), 22 (4 ♀)	A, p
* <i>Oreonetides glacialis</i> (L. KOCH)	16 (1 ♀)	C, em
<i>Porrhomma convexum</i> (WESTRING)	3 (1 ♀), 4 (1 ♂, 1 ♀), 5 (1 ♀), 16 (1 ♂, 1 ♀), 20 (3 ♂, 2 ♀)	A, e
* <i>Scotargus pilosus</i> SIMON	20 (1 ♀)	B, p
Theridiidae		
<i>Achaearanea ohlerti</i> (THORELL)	11 (1 ♀), 20 (1 ♀)	B, em
<i>Enoplognatha ovata</i> (CLERCK)	20 (1 ♀)	A, h
<i>Robertus mediterraneus</i> ESKOV	8 (2 ♀)	B, mm
* <i>Rugathodes bellicosus</i> SIMON	11 (1 ♀), 20 (1 ♀)	B, em
<i>Steatoda albomaculata</i> (DEGEBER)	5 (1 ♀)	A, h
<i>Steatoda phalerata</i> (PANZER)	8 (1 ♀)	A, p
<i>Theridion petraeum</i> L. KOCH	5 (2 ♂, 1 ♀), 12 (1 ♀)	C, h
Lycosidae		
<i>Alopecosa pulverulenta</i> (CLERCK)	20 (1 ♀)	A, p
<i>Pardosa agricola</i> (THORELL)	22 (2 ♀)	A, e
<i>Pardosa amentata</i> (CLERCK)	4 (1 ♂), 7 (1 ♀), 11 (3 ♂, 10 ♀), 12 (1 ♂, 1 ♀), 14 (1 ♀), 22 (1 ♂)	A, p
<i>Pardosa blanda</i> (C.L. KOCH)	8 (1 ♂, 1 ♀), 22 (5 ♂, 4 ♀)	B, em
<i>Pardosa drenskii</i> BUCHAR	5 (3 ♀), 13 (3 ♀), 14 (3 ♀), 16 (1 ♂, 1 ♀), 22 (2 ♀)	C, b
<i>Pardosa ferruginea</i> (L. KOCH)	20 (4 ♂, 7 ♀)	B, em
<i>Pardosa incerta</i> NOSEK	5 (1 ♂), 10 (4 ♂, 2 ♀)	C, mm
<i>Pardosa lugubris</i> (WALCKENAER)	8 (1 ♀)	A, p
<i>Pardosa mixta</i> (KULCZYNSKI)	7 (1 ♂), 10 (6 ♂, 8 ♀), 11 (1 ♀), 13 (4 ♂, 20 ♀), 14 (4 ♀), 16 (1 ♂, 1 ♀), 19 (3♂, 7 ♀), 20 (5 ♂, 10 ♀)	C, em
<i>Pardosa monticola</i> (CLERCK)	22 (1 ♂, 2 ♀)	A, p
<i>Pardosa morosa</i> (L. KOCH)	20 (1 ♀)	A, e
<i>Pardosa nigra</i> (C.L. KOCH)	16 (1 ♂)	C, em
<i>Pardosa palustris</i> (LINNE)	22 (1 ♀)	A, h
<i>Xerolycosa nemoralis</i> (WESTRING)	22 (1 ♀)	A, p
Agelenidae		
<i>Coelotes kulczynskii</i> (DRENSKY)	4 (1 ♀), 9 (2 ♀), 11 (1 ♀), 14 (1 ♀)	B, b

<i>Cybaeus angustiarum</i> L. KOCH	20 (1 ♀)	A, e
<i>Cryphoeca pirini</i> (DRENSKY)	11 (1 ♀), 12 (3 ♀), 14 (3 ♀), 20 (1 ♂)	C, b
<i>Histopona luxurians</i> KULCZYNSKI	22 (1 ♂)	B, ee
<i>Tegenaria rilaensis</i> DELTSHEV	3 (1 ♀), 4 (1 ♀), 11 (1 ♂, 3 ♀), 14 (2 ♂, 3 ♀)	B, r
Clubionidae		
<i>Clubiona alpicola</i> KULCZYNSKI	11 (2 ♀), 13 (1 ♀), 14 (1 ♀), 17 (1 ♀)	C, em
<i>Clubiona frutetorum</i> L. KOCH	18 (2 ♀)	A, e
<i>Clubiona genevensis</i> L. KOCH	20 (3 ♀), 21 (4 ♀)	A, p
<i>Clubiona pallidula</i> (CLERCK)	11 (1 ♀)	A, h
<i>Clubiona similis</i> L. KOCH	11 (1 ♀), 14 (2 ♀), 20 (1 ♂, 5 ♀)	A, e
<i>Clubiona trivialis</i> C.L. KOCH	11 (1 ♂)	A, e
Gnaphosidae		
* <i>Gnaphosa muscorum</i> (L. KOCH)	16 (1 ♂, 1 ♀)	C, h
<i>Haplodrassus signifer</i> (C.L. KOCH)	9 (1 ♀), 10 (1 ♀), 11 (1 ♀), 16 (2 ♀), 17 (1 ♂, 1 ♀), 19 (2 ♀), 20 (1 ♀)	A, h
<i>Haplodrassus silvestris</i> (BLACKWALL)	8 (1 ♀)	A, e
* <i>Micaria aenea</i> THORELL	20 (2 ♀)	B, h
Philodromidae		
<i>Philodromus rufus</i> WALCKENAER	11 (1 ♀), 20 (1 ♀)	A, h
<i>Philodromus vagulus</i> SIMON	10 (1 ♂, 1 ♀)	B, em
<i>Thanatus formicinus</i> (CLERCK)	16 (1 ♀)	A, h
<i>Tibellus oblongus</i> (WALCKENAER)	20 (1 ♀)	A, h
Thomisidae		
<i>Xysticus macedonicus</i> SILHAVY	3 (1 ♀), 5 (1 ♀)	B, bp
<i>Oxyptila scabricula</i> (WESTRING)	4 (1 ♀)	A, p
Salticidae		
<i>Chalcoscirtus infimus</i> (SIMON)	17 (1 ♀), 20 (1 ♀)	A, se
<i>Euophrys petrensis</i> C.L. KOCH	10 (2 ♂, 4 ♀), 11 (1 ♀)	A, e
<i>Sitticus rupicola</i> (C.L. KOCH)	4 (2 ♀), 20 (8 ♂, 2 ♀)	A, h

To the second group belong 19 (23.2%) species occurring in the forest zone which are also abundant in the low-bushes subalpine belt. Characteristic here are *Aculepeira talishia* (stone rivers), *Araeoncus anguineus*, *Gonatum rubens*, *Antrohyphantes rhodopensis*, *Centromerus paucidentatus*, *Lepthyphantes drenskii*, *Robertus mediterraneus*, *Pardosa blanda*, *P. ferruginea*, *Ceolotes kulczynskii* and *Tegenaria rilaensis*, occurring in the forest and low-bushes belt. Common in alpine belt and established on the highest point of the mountain (2925 m) are *Haplodrassus signifer*, *Philodromus rufus*, *Thanatus formicinus*.

The third group incorporates 19 species (23.2%) and these are the typical high altitude elements. Similar is the number of the species occurring in the alpine belt of Pirin (DELTSHEV 1990) but some species are different for both sites. *Scotinotylus alpigenus*, *Tiso aestivus*, *Lepthyphantes annulatus*, *Oreonetides glacialis* and *Gnaphosa muscorum* are not established in Pirin, while *Diplocephalus altimontanus* DELTSHEV, *Entelecara media* KULCZYNSKI, *Rhaebothorax paelulus* (O.P.-CAMBRIDGE) and *Xysticus bonneti* DENIS are not found in Rila. Char-

acteristic local high-mountain elements are *Araeoncus clivifrons*, *Erigone pirini*, *Metopobacterus orblicus*, *Lepthyphantes lithoclasticolus*, known only from the alpine belt of Rila and Pirin and *Pardosa drenska*, *Cryphoeca pirini*, known from subalpine and alpine belts of these mountains.

In taxonomical respect some of the species need discussions. *Aculepeira talishia* (ZAWADSKI) = *Araneus carbonarius* (non L. KOCH); DRENSKY (1913: 24: 1936: 110); *Aculepeira carbonaria*: DELTSHEV (1990: 3).

The species is known from Caucasus and Turkey. The Bulgarian population is either identical with, or closely related to the Middle East population. A future revision will show the real situation.

Similar is the situation with Bulgarian materials of *Diplocephalus foraminifer*, closely related to the Middle-european populations.

3.2. Zoogeographic analysis:

The established 82 species are very different concerning their ranges, widely distributed (h + p), european (e + ee + se), characteristic to the European mountains only (em), with arcto-alpine distribution (aa), with mountain - mediterranean distribution (mm) and certainly the endemics (local elements) (b + r + bp), (Fig. 2, 3).

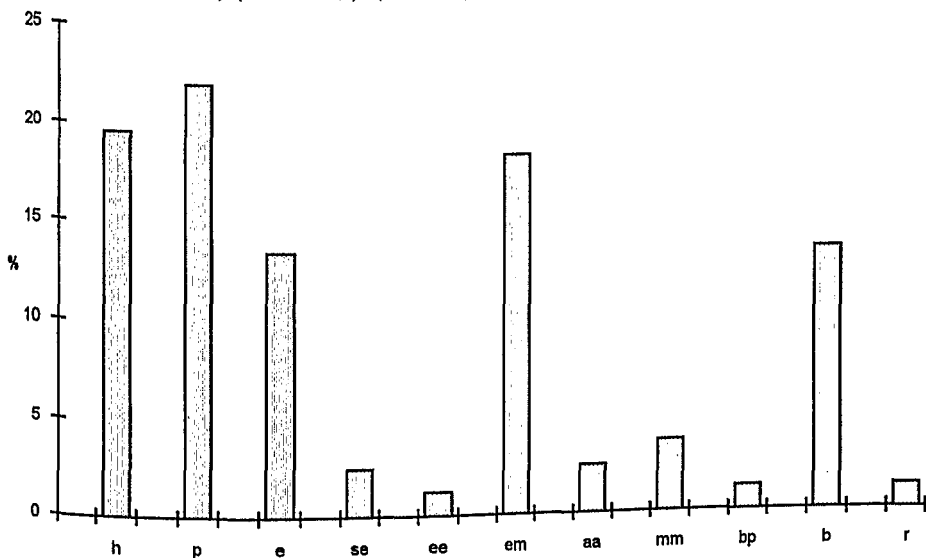


Fig. 2: Zoogeographic characteristic of the Spiders established in the high altitude Zone of Rila mountain. Explanations see Table 2.

Best represented is the complex of widely distributed species (h + p, 16, 19.5 %, 19, 22 %), occurring mainly in the forest and subalpine belts. Only *Theridion petraeum* and *Gnaphosa muscorum* are not found below the tree-line, characteristic for subalpine and alpine belts, the real high altitude element. The species *Meioneta rurestris*, *Haplodrassus signifer* and *Thanatus forminicus* reach the highest point (2925 m) of the mountain due to "aeronautic" and "protocratic" (*H. signifer*; THALER, 1988) phenomenon.

The group of European species (e + se + ee, 11, 13.4 %; se 2, 2.4 % ee, 1, 1.2 %) comprises the spiders widespread in Europe and Bulgaria, inhabiting both the lowland and the mountain with penetration into high mountain zone.

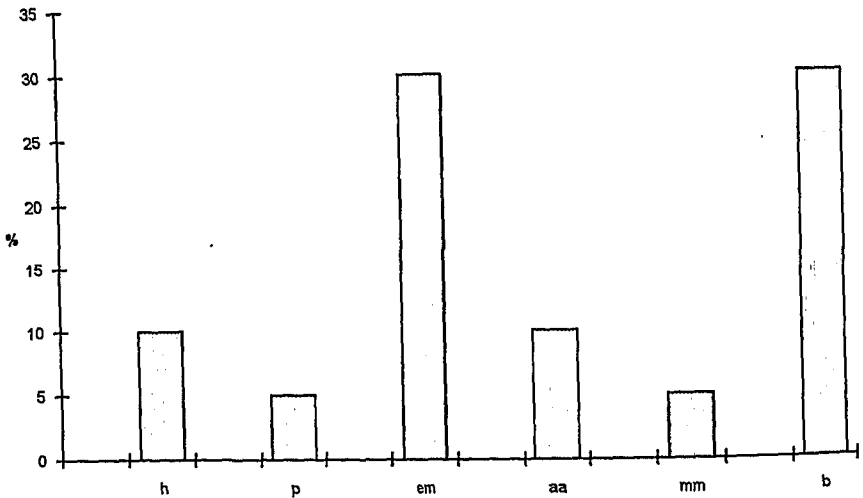


Fig. 3: Zoogeographic characteristic of the high mountain Species complex of Spiders in Rila mountain.

Characteristic is the group of European mountain species (em, 15, 18.3%), most of which are not found below tree-line. All species without *Araeoncus anguineus*, *Bolyphantes luteolus*, *Achearanea ohlerti*, *Rugathodes bellicosus*, *Pardosa blanda*, *P. ferruginea*, *Philodromus vagulus* are considered as high mountain elements. Here it is necessary to clarify the distribution of *P. ferruginea*, which is considered as a palearctic species (MAURER, 1990; PLATNICK 1993), due to the paper of ZJUZIN (1979 in russian) on the palearctic species of genus *Pardosa*. But in this paper it is written that "*P. ferruginea* is characteristic only for the Alps and Carpatian and all former records (CHARITONOV 1933, PALMGREN 1939, ROEWER 1960, LOKSA 1965, BEER 1968, IZMAILOVA 1975, LOBANOWA 1977, AZHEGANOVA & STENCHENKO 1977) are due to mistakes" (ZJUZIN 1979).

Curious is the distribution of *Lepthyphantes annulatus*, endemic for Carpatian-Balkan mountain system. It is more abundant in West Carpatians and the High Tatra but rare in Southeast Europe, it is not found in Pirin mountain (THALER et al. 1994).

The groups of arcto-alpine (aa, 2, 2.4%) and mountain-mediterranean (mm, 3, 3.7%) species normally comprise ancient elements, and *Scotinotylus alpigenus*, *Tiso aestivus* (THALER 1976), and *Pardosa incerta* can be considered as real high mountain elements.

In the group of endemic species (b + r + bp, 11, 13.4%; 1, 1.2%; 1, 1.2%) the high alpine elements are: *Araeoncus clivifrons*, *Erigone pirini*, *Metopobacterus orbelicus*, *Lepthyphantes lithoclasticolus*, *Pardosa drenskii*, *C. pirini*, characteristic for the high altitude parts of Pirin mountain too (DELTSHEV 1990). They can be regarded as derivatives of their respective Middle European or North European species, due to the disjunction of ranges during the glaciation and interglaciation (DELTSHEV 1990).

Curious is the distribution of *Antrohyphantes rhodopensis*, found only at high altitude and in the caves (in lowland and mountains). It is closely related to the genus *Fageiella*, known only from caves in Bosnia and Hercegovina. Therefore it may be a relic of ancient mediterranean fauna (DELTSHEV 1990). The remaining species, *Centromerus paucidentatus*, *Lepthyphantes drenskii*, *Coelotes kulczynskii*, *Tegenaria rilaensis*, *Xysticus macedonicus* are abundant in mountain and subalpine belts (1200 - 2400 m) and are related to their respective Holarctic (*C. sylvaticus*), Palearctic (*X. cristatus*) and European (*L. tenuis*, *C. inermis*, *T. campestris*) sister species.

4. Conclusion:

82 species are established in the high altitude zone of Rila mountain, but only 20 which are not found below the tree-line and occur in the subalpine and alpine belt can be considered as high mountain elements. Among these the most characteristic and interesting are (11) species which occur only in the alpine belt and can be regarded as a high mountain species complex, composed by euro-mountain (7, 35%), endemic (6, 30%), holarctic (2, 10%), palearctic 1, 5%), arctic-alpine (2, 10%), and mountain-mediterranean (1, 5%) elements (Fig. 3). The high percentage of endemics shows that the process of autogenesis is considerable but the process of colonization mainly by Middle European species is stronger.

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