The Harvestmen Fauna (Opiliones, Arachnida) of the City of Sofia (Bulgaria) and its Adjacent Regions

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Abstract

This is the first paper dealing with the opilionid fauna of urban park-areas (located in the city of Sofia) in Bulgaria. In addition, the harvestmen fauna of the regions surrounding the city of Sofia is summarized. The faunistic list presents data on the 32 species hitherto found in the covered area. Two of them (*Trogulus closanicus* and *Rilaena serbica*) are new to the Bulgarian fauna, and a further one, referred herein as *Rilaena* cf. *serbica*, is currently of unclear taxonomical status. A detailed analysis of the opilionid assemblages (both local and regional) under study is provided, and hypotheses concerning the genesis and development of the urban fauna are presented.

INTRODUCTION

Although the opilionid fauna of Bulgaria is relatively well known as being represented by 57 species belonging to 31 genera and 6 families (Staręga, 1976, Juberthie, 1991, Beron & Mitov, 1996, Mitov, 1994, 1995a, 1997b, 2001, 2002, 2003a,b, and present study), data concerning the chorology and ecology of this animal group in Bulgaria are still very scarce.

With increasing anthropogenic pressures, caused mainly by the migration of rural populations towards the heavily developed cities of Bulgaria and the parallel process of increasing the level of anthropogenic stressors (especially during the last ten years), the need for specialized urban-faunistic and urban-ecological investigations of the Opiliones has increased. The results of such research could be used in the future as a baseline for comparison and analysis of the anthropogenic impacts and for determining the change in status of these animals.

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Despite the fact that Sofia is the largest city (with more than 1 million inhabitants and covering an area of more than 190 km^2) and the capital of Bulgaria, its opilionid fauna has not been investigated until now. In the literature there are only scarce and scattered data available – only four harvestmen species were recorded – *Carinostoma ornatum* and *Phalangium opilio* (see Staręga, 1976), *Opilio saxatilis* (Šilhavý, 1956) and *Opilio parietinus* (Šilhavý, 1956; Staręga, 1976). Moreover, the territory of the Sofia Kettle that surrounds the city has been even less investigated – only *Zachaeus crista* was mentioned (sub *Zacheus crista*) by Staręga (1976).

Keeping this in mind, the first aim of the present paper is to contribute to the knowledge of the opilionid fauna of the city of Sofia and its surroundings (referred to here as the Sofia Kettle, and the bordering mountains). Our second aim will be to present an analytical overview of the urban and non-urban opilionid assemblages, and subsequently to present hypotheses on the origin of the fauna of the city of Sofia on the basis of the faunal similarities found.

MATERIAL AND METHODS

This study is based on all the available up-to-date Opiliones material, collected within the borders of the city of Sofia, and in the regions surrounding it.

To complete the faunistic list, literature data on harvestmen species previously recorded, but left unsampled throughout the intensive sampling programme were also included. Due to the comparative aims pursued with the present research, all records from caves (including both endemic and widespread species) were not included neither in the list, nor in the analyses.

The sites

A significant part of the collected Opiliones originate from a set of permanent sampling sites (coded as: R1, R2, R3, R4 (Rural sites), S1, S2, S4 (Suburban sites), U1, U2, U3, and U4 (Urban sites)) where the main sampling activities were concentrated for a period of two years (1998-1999). All these were chosen as to be positioned in *Quercus*-formations, mainly because this vegetation type was characteristic for the geographic region of interest, but as a result of the strong anthropogenic influence during the last 300 years, it has almost vanished or has been strongly degraded (see Stoyanov, 1937; Kunchev & Koseva, 1990). For a brief description of these sites see Niemelä *et al.* (2002), a more detailed review is published by Penev *et al.* (this volume). Additionally, many Opiliones were less systematically collected by hand in various parts of the city – in the great parks, and in the smaller gardens scattered through the highly urbanised city core (as indicated in the faunistic list). Also, much harvestmen material was obtained from the geographical regions (defined by Georgiev, 1991; Nikolov & Yordanova, 1997) surrounding the city of Sofia – i. e. the Sofia Kettle, West Stara Planina range, Zavalska Mt., Lyulin Mt., Vitosha Mt., Plana Mt. and Sredna Gora Mt.

The material examined

Along the material sampled during the main sampling programme, a considerable amount of harvestmen material, originating from their own research (mainly in the surrounding regions),

was kindly provided by many colleagues (see Acknowledgements). Material from the collections of the National Museum of Natural History (Sofia) was also studied.

All material, except the latter, is currently in the private collection of the senior author.

The following opilionid material was utilized for diverse comparative needs:

8♂♂, 1♀ *Trogulus closanicus* (Germany, Sonnenberg, Timmenrode, Nördl. Harzvorland, 1995/96, det. Chistian Komposch, in the collection of P.M.), 3♂♂, 5♀♀ *Rilaena serbica serbica* Karaman, 1992 (Yugoslavia, Serbia, Zlatibor Mt.: Tornik, 1300 m, 08.VII.1995, leg. & det. Ivo M. Karaman – 1♂, 3♀♀; Šargan, 800 m, 08.VI.1996, leg. & det. Ivo M. Karaman – 2♂♂, 2♀♀; all in the collection of P.M.) and 2♂♂, 2♀♀ (Paratypes) *R. serbica kopaonica* Karaman, 1992 (Yugoslavia, Serbia, Kopaonik Mt., Sunčana Dolina, 1600 m, 10.VIII.1981, leg. & det. Ivo M. Karaman; in the collection of P.M.).

The classification and nomenclature of harvestmen follow closely Martens (1978). The only exceptions are *Trogulus closanicus* Avram, 1971, treated after Chemini (1984), and the genus *Zacheus*, for which we have adopted the spelling *Zachaeus* (after Crawford, 1992).

For facilitating a future comparative analysis of the phenolocical data, we have also included summarized information (based on the material examined) about body length and the presence of eggs in the egg reservoir (=*uterus internus*).

The collecting techniques

The main sampling sites (see above) were sampled by a set of 12 uncovered and unbaited pitfall traps (plastic cups with mouth diameter of 8.5 cm and a volume of 500 ml), randomly placed at least 10 meters apart, filled with a 4% formaldehyde solution in vinegar, which were emptied approximately every month starting from April and ending in October in 1998 and 1999 (thus obtaining 7 monthly samples). In the concurrent sampling programmes (not especially targeted at Opiliones), carried out by some of our colleagues, the placement of the traps was similar, the main difference being the collecting fluid and/or the bait used (see Abbreviations used and Results).

The analyses

Since we primarily aimed at emphasizing the similarities, instead of the peculiarities when comparing the various fauna, the full faunistic table containing the presence of each taxon at each locality or region (Table 1, 2) was reduced by excluding taxa that appeared only at one locality. The region of Zavalska Mt. was also excluded from the analysis, because its fauna (hitherto only 4 known species) is clearly poorly investigated. Subsequently, this reduced matrix was subjected to a Correspondence Analysis procedure (e. g. Hill, 1974), and the ordination diagram was plotted using its recently described and still little known joint property of reciprocal averaging and dual scaling (Thioulouse & Chessel, 1992). So the species and the sites are plotted at identical scales and permit a convenient interpretation in view of the graphical representation of the species amplitudes and sample diversity (perimeter of stars in the corresponding plot). The analyses were performed with the ADE-4 package (Thioulouse *et al*., 1997).

Table 1. Summary of the opilionid fauna of the city of Sofia and the surrounding regions.
SOF=city of Sofia, SOFK=Sofia Kettle, SPW=Western Stara Planina Mts., Z=Zavalska Mt., L=Lyulin Mt., V=Vitosha Mt., PL=Plana Mt., SG=Sredna Gora Mt.

	SOF	**SOFK**	**SPW**	**Z**	**L**	**V**	**PL**	**SG**
Nemastoma lugubre			+					
N. bidentatum sparsum			+					+
Paranemastoma radewi			+			+	+	+
P. aurigerum ryla						+		
Pyza bosnica			+		n	+		+
Histricostoma drenskii						n		+
Carinostoma ornatum	+	n	+	+		+		+
Mitostoma chrysomelas			+			+		
Dicranolasma scabrum			+			+		
Trogulus tricarinatus	n	n	+		n	+		+
Trogulus nepaeformis			+					
Trogulus closanicus **					n	n		
Phalangium opilio	+	n	+		+	+		+
Opilio parietinus	+		+			+		+
Opilio saxatilis	+	n	+		+	+		+
Opilio dinaricus	n		n		n	+		n
Opilio ruzickai	+		+		n	+		+
Rilaena triangularis			+					
Rilaena balcanica			n	+	n	+	+	n
Rilaena serbica **			n					
Rilaena cf. serbica **	n		n		n	n		n
Lophopilio palpinalis			+		n	+		+
Rafalskia olympica						+		n
Zachaeus crista	n	+	+		n	+		+
Zachaeus anatolicus		n				+		n
Egaenus convexus		n	+					
Lacinius horridus	n		+	+	n	+		+
Lacinius ephippiatus			+		n	+		
Lacinius dentiger	n	n	+	+	n	+		+
Odiellus lendli	n	n	+		n	+		+
Mitopus morio			+			+		n
Leiobunum rumelicum			+			+		+
S	**12/7***	**9/8***	**27/4***	**4/0***	**15/13***	**26/3***	**2/0***	**22/6***

** = taxon new to the Bulgarian fauna
+ = previous records
* = new records
S = number of species

Table 2. Summary of the opilionid fauna of the city of Sofia and the surroundings - main sampling localities. **Urban habitats:** U1 = Knyaz Borisovata Gradina (Park area); U2 = Zapaden park; U3 = Severen park; U4 = Knyaz Borisovata Gradina (Forest area = "Loven park"). **Non-urban habitats:** *Rural sites:* R1 = near German monastery, Lozenska Mt.; R2 = near locality Bonsovi Polyani, Lyulin Mt.; R3 = near Drenovo Village, Sofia Kettle; R4 = locality "Tikhiya Kat", Vitosha Mt.; *Suburban sites:* S1 = near German Village, Lozenska Mt.; S2 = between r.d. "Gorna Banya" and loc. Bonsovi Polyani, Lyulin Mt.; S4 = above Vladaya Village, Vitosha.

	R1	**R2**	**R3**	**R4**	**S1**	**S2**	**S4**	**U1**	**U2**	**U3**	**U4**
P. bosnica		+		+							
H. drenskii	+										
C. ornatum			+		+			+	+	+	+
T. tricarinatus	+	+	+		+	+	+	+	+	+	+
T. closanicus		+				+					
P. opilio	+			+	+				+	+	+
O. parietinus								+		+	
O. saxatilis					+			+	+	+	+
O. dinaricus	+	+				+			+		+
O. ruzickai	+			+				+	+	+	
R. balcanica	+	+		+	+	+	+				
R. cf. *serbica*		+		+		+		+	+	+	+
L. palpinalis				+							
Z. crista	+	+	+	+	+	+	+	+	+		+
L. horridus	+			+			+	+			+
L. ephippiatus		+				+					
L. dentiger	+			+							+
O. lendli									+	+	
S	**9**	**8**	**3**	**9**	**6**	**7**	**4**	**8**	**9**	**8**	**9**

S = number of species

Abbreviations used

ad. = adultus
Ass. = plant association
C.V. = Coefficient of Variation
d = interocular distance in *Trogulus closanicus*.
EPT = pitfall traps with ethylene glycol (unbaited)
FPT = pitfall traps with formaline (unbaited)
FPT-1 = pitfall traps filled with formaline (baited with tinned fish)
FPT-2 = pitfall traps filled with formaline + vinegar (unbaited)
H = hand-collected
juv. = juveniles
L = body length
l = egg length
LTU = experimental station "Vrazhdebna" (University of Forestry, Sofia).
MNHS = National Museum of Natural History in Sofia
n = number of individuals
v. = village
inv. No = inventory number
I.S. = Ivailo Stoyanov
P.M. = Plamen Mitov
r.d. = residental district
S.S. = Stefanka Subeva
sub. = subadultus
$\bar{x}$ = mean
± = standard error of the mean

RESULTS

A total of 2356 opilionid specimens, pertaining to 28 species, from the investigated area were examined (635♂♂, 984♀♀, 1 ad., 733 juv.). The taxon, here formally named as "*Rilaena* cf. *serbica*", is currently of unclear taxonomical status, but prominently different from all hitherto known Bulgarian *Rilaena*-species, is also marked as being new to the Bulgarian fauna. Seven species are new to the fauna of Sofia, eight are new to the fauna of the Sofia Kettle (referred here as the territory outside of Sofia city), four species are new to the fauna of West Stara Planina Mts., 15 are new to the fauna of Lyulin Mt., three and six are new respectively to the faunas of Vitosha and Sredna Gora Mts.

Systematic list of the Opiliones of Sofia city, the Sofia Kettle and the surrounding areas[1]

The species marked with two asterisks are new records to the Bulgarian fauna.

Family Nemastomatidae Simon, 1879

1. *Paranemastoma (Paranemastoma) radewi* (Roewer, 1926)

Paranemastoma (Paranemastoma) radewi: Staręga, 1976: 330 (West Stara Planina range: "Cerovo", "Gara Thompson", "Iskrec", "Lakatnik", "Paß Petrohan", "Byrzija", "Babkite-Quelle", "Brusen", "Berghütte "Ledenika", "Kloster "Sv. Ivan pusti"; Vitosha Mt.: "Bojana", "Bojanski vodopad", "Dragalevci", "Zlatni mostove"; Plana Mt.: "Kokaljane"; Lozenska Mt.: "Germanski manastir"; Sushtinska Sredna Gora Mt.: "Koprivštica", "Berg Bogdan", "zwischen den Bergen Malyk Bogdan und Bogdan").

Paranemastoma radewi: Mitov, 1988: 484 (Vitosha Mt.: "above Dragalevtsi"); Mitov, 1995b: 70 (Vitosha Mt.:"above Dragalevtsi", "Shoumako"); Mitov, 1996: 483 (Vitosha Mt.: "über Dragalevzi"); Mitov, 1997a: 255 (Vitosha Mt.: "above Dragalevtsi"); Mitov, 1997a: 255 (Vitosha Mt.: "Bay Krustyo").

Material examined: 10♂♂, 21♀♀, 1 juv.

New localities: West Stara Planina range: Chiprovtsi, county Debledelska Murtvina, on the edge of *Fagus*-forest, under stones, 1100-1300 m, 28.VII.1998, leg. B. Petrov – 1♀ (4.8 mm)(with eggs); the surroundings of hut Kom (the old one), *Picea abies*-forest, 1600-1700 m, 19.VI.1998, leg. B. Petrov – 1♀ (4.8 mm)(with few eggs); Distr. Vratsa, in the region of hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. B. Petrov – 3♂♂, 2♀♀; above Vurshets: near Botunya River, Vegetation: *Fagus* sp., *Alnus* sp., *Quercus* sp., *Pinus nigra* Arn., *Rubus* sp., under stones, 27.VI.2000, leg. P.M. – 2♂♂, 4♀♀; loc. Vodopada, near Orlovitsa River, Vegetation: *Alnus* sp., *Crataegus* sp., *Rubus* sp., *Urtica dioica* L., 400-500 m, 28.VI.2000, leg. P.M. – 2♂♂, 2♀♀ (with eggs); Railway station Lakatnik, spring "Zhitolyub", 08.VII.1948, leg. P. Drenski, MNHS – 5♀♀, 1 juv. (2.4 mm); Distr. Godech, v. Breze, 750 m, 20.VI.1993, leg. B. Petrov – 1♂, 1♀; Distr. Svoge, v. Zanoge, 1100-1300 m, 02.V.1984, leg. P. Beron, (MNHS: inv. No 350) – 1♂, 4♀♀; Sushtinska Sredna Gora Mt.: above Klisura, loc. Koritata, 900-1100 m, FPT, 05.VI.1996, leg. S. Lazarov – 1♂, 1♀ (without eggs).

[1] All records from caves in the considered regions are excluded.

2. *Paranemastoma (Paranemastoma) aurigerum ryla* (Roewer, 1951)

Paranemastoma (Paranemastoma) aurigerum ryla: Staręga, 1976: 324 (Vitosha Mt.: "Dragalevci", "Berghütte "Fonfon", "Zlatni mostove").

Paranemastoma aurigerum joannae Staręga, 1976: Mitov, 1987: 60 (Vitosha Mt.: "loc. Yarema, loc. Romanski, Platoto, hut Edelvays, loc. Kiselishte").

Paranemastoma aurigerum ryla: Mitov, 1995b: 70 (Vitosha Mt.: "Bai Krustyu"); Mitov, 1997a: 255 (Vitosha Mt.: "Goli Vruh").

Initially, part of the material was misidentified (on the basis of taxonomical characters first introduced by Staręga (1976)) as *P. aurigerum joannae* Staręga, 1976 (see Mitov, 1987). Considering, that in the region of Vitosha Mt. the other subspecies (*P. a. ryla*) also occurs (Staręga, 1976), we assumed that these two taxa have vertically disjunct areals. Later, more abundant materials of *P. a. aurigerum* (Roewer, 1951), *P. a. joannae* and *P. a. ryla* were collected (incl. from *locus typicus*). Part of this material was SEM-micrographed (the integument sculpture and the male copulatory organ were more closely examined). As a result of these analyses it was found that these subspecies exhibit significant variation in the sculpture and shape of glans penis, even among individuals from a very small area. Other species from the genus *Paranemastoma* are also known to exhibit similar variation (see Kolosvary, 1943; Martens, 1978). Some anomalies in the armament of the cuticle were also found in this genus (Mitov, 1995d). All this evidence indicate that the main taxonomic character introduced by Staręga (1976) for the distinction between both subspecies – i. e. the absence of a spine on Area IV – is not reliable at all. Moreover, in the describtion of *P. a. ryla* (sub *Nemastoma ryla*), Roewer (1951, p. 109, fig. 13; p. 120) clearly states that Areae II-IV are bearing spurs. It is also noteworthy that in some specimens of *P. a. joannae* and *P. a. ryla* Area I (similary to *P. a. aurigerum*) is also armed, a fact not mentioned by Staręga (1976) in the description. As a summary of these notes, it may be stated that it is very possible for *P. a. joannae* to turn out to be synonymous with *P. a. ryla* after examination of an adequate number of material.

3. *Nemastoma lugubre* (O.F. Müller, 1776)

Nemastoma lugubre: Staręga, 1976: 312 (West Stara Planina range: "Paß Petrohan").

4. *Nemastoma bidentatum sparsum* Gruber et Martens, 1968

Nemastoma bidentatum sparsum: Staręga, 1976: 314 (West Stara Planina range: "Komštica"; Sushtinska Sredna Gora Mt.: "Gara Koprivštica", "Koprivštica", "Klisura").

5. *Pyza bosnica* (Roewer, 1919)

Pyza bosnica: Staręga, 1976: 317-318 (West Stara Planina range: "Berghütte "Ledenika", "Paß Petrohan", "Bistrec", "Berg Pyrševica"; Vitosha Mt.: "Zlatni mostove", "Berghütte "Fonfon", "Berghütte "Edelvajs"; Sushtinska Sredna Gora Mt.: "Koprivštica"); Mitov, 1995b: 70 (Vitosha Mt.: "above Dragalevtsi", "Shoumako", "above v. Chuypetlovo").

Material examined: 21♂♂, 21♀♀, 2 juv.

New localities: West Stara Planina range: in the region of Chiprovtsi, below peak Midzhur, 1900 m, 26.X.1969, leg. P. Beron, (MNHS: inv. No 81) – 1♀ (4.0 mm); Lyulin Mt.: R2, 920 m, FPT-2: 08.V.-31.V.1998, leg. I.S. – 3♂♂, 1♀ (with eggs), 1 juv. (3.1 mm); 31.V.-13.VIII.1998, leg. I.S. – 2♂♂, 1♀ (3.5 mm) (without eggs); 04.IV.-09.VIII.1999, leg. I.S. – 6♂♂ (2.8-3.4 mm), 1♀ (with eggs); above Dragichevsko Ezero, 1130 m, forest/meadow boundary, FPT, leg. M. Sotirova: 05.XI.2000-

07.IV.2001 – 1♂ (3.5 mm); 04.IX.-04.X.2001 - 1 juv. (1.8 mm); Vitosha Mt.: loc. Tihiya Kut (R4), 1000 m, FPT-2, 05.IV.-16.IX.1999, leg. I.S. – 4♂♂ (3.1 mm), 4♀♀ (with and without eggs); Sushtinska Sredna Gora Mt.: in the region of v. Chavdar, *Populus tremula*-forest, FPT, 03.VII.1996, leg. S. Lazarov – 1♂, 1♀ (with many eggs); Distr. Koprivshtitsa, below peak Bogdan, *Fagus*-forest, 1380 m, FPT, 05.VI.1996, leg. S. Lazarov – 5♀♀ (4.3 mm)(with many eggs); above hut Chivira, meadows, FPT, 05.VI.1996, leg. S. Lazarov – 4♂♂ (3.3-3.6 mm), 6♀♀ (3.8-4.1 mm)(with many eggs);

Confirmed locality: "Sredna gora", loc. (?), 20.VI.1911, leg. P. Drenski, MNHS – 1♀

6. *Histricostoma drenskii* Kratochvil, 1958

Histricostoma drenskii: Staręga, 1976: 320 (Lozenska Mt.: "Schlucht Urvič")

Material examined: 3♂♂, 1 ad.

New localities: Vitosha Mt.: forest, loc. (?), 1985, leg S. Subeva - 1 adult (2.1 mm); Lozenska Mt.: German monastery (R1), 850 m, FPT-2, 10.VII.-04.VIII.1998, leg. I.S. – 1♂; above v. Pasarel, 800 m, 03.X.1993, leg. B. Petrov – 2♂♂.

7. *Carinostoma ornatum* (Hadži, 1940)

Carinostoma ornatum: Staręga, 1976b: 343 (West Stara Planina range: "Belogradčik", "Berghütte "Ledenika", "Lakatnik"; Zavalska Mt.: "Filipovci"; Lozenska Mt.: "Germanski manastir, Schlucht Urvič"; Sofia: "Gorubljane"; Vitosha Mt.: "Berghütte "Aleko", "Bojana", "Dragalevci"; Sushtinska Sredna Gora Mt.: "Gara Koprivštica"; Mitov, 1995b: 70 (Vitosha Mt.: "above Dragalevtsi", "Shoumako"); Mitov, 1997a: 255 (Vitosha Mt.: "above Dragalevtsi").

Material examined: 68♂♂, 81♀♀, 2 juv.

New localities: West Stara Planina range: the pass above hut Kom, under stones near the road, 1650 m, 19.VI.1998, leg. B. Petrov – 1♀ (2.15 mm)(with eggs)(without silvery spots); Vurshets, city park, under stones, 395 m, 29.VI.2000, leg. P.M. – 3♂♂, 1♀ (without eggs); above Vurshets: near Botunya River, Vegetation: *Fagus* sp., *Alnus* sp., *Quercus* sp., *Pinus nigra* Arn., *Rubus* sp., under stones, 27.VI.2000, leg. P.M. – 1♂; Sofia: Severen Park: on the banks of Kakach River, forest edge: under bark, 09.IV.1999, leg. P.M. – 1♂ (without spots); under stones and tree remnants, 06.IX.2001, leg. P.M. - 1♂, 1♀; Zapaden Park: U2, 525 m, FPT-2: 09.V.-02.VI.1998, leg. I.S. – 1♀ (with eggs); 03.IX.-16.X.1998 – 3♂♂, 1♀; Yuzhen Park: on the banks of Perlovska River (on the side of r.d. "Ivan Vazov" and r.d. "Emil Markov"), under stones and tree remnants, 20.X.2001, leg. P.M. – 5♂♂, 3♀♀; Knyaz Borisovata Gradina: the area of the Open-air Theatre, under stones, forest (*Quercus*, *Tilia*, *Acer*), 04.XI.1999, leg. P.M. – 1♂, 2♀♀ (without spots); in the area of sports-hall "Sofia", 11.VI.2001, leg. P.M. – 2♂♂, 5♀♀ (without eggs); in the area of Astronomical Observatory, 12.VI.2001, leg. P.M. - 2 juv. (1.25 mm); near the crossing of blvd. "Dr. Tsankov" and blvd. "P. Yavorov", under stones, 11.IX.2001, leg. P.M. – 3 mm; in the area of the Television tower, under tree remnants and stones, 11.IX.2001, leg. P.M. – 2♂♂, 4♀♀ (with eggs); in the area between blvd. "Dr. Tsankov" and the Astronomical Observatory, under tree remnants, 14.IX.2001, leg. P.M. – 3♀♀ (with eggs); Loven Park: under stones, 26.II.1994, leg. P. Stoev – 2♀♀ (without eggs); U4, 570 m, FPT-2: 13.V.-12.X.1998, leg. I.S. – 24♂♂, 22♀♀; 07.IV.-03.X.1999, leg. I.S. – 13♂♂ (1.5 mm), 26♀♀ (with eggs); in the area of "Pioneer" railway station, forest (*Tilia*, *Acer*, *Quercus*, *Ulmus*), under tree remnants and stones, 23.V.2001, leg. P.M. – 1♂ (1.5 mm), 5♀♀ (2.15 mm)(with and without eggs); Sofia

Kettle: near v. Chibaovtsi (R3), 800 m, FPT-2, 08.IX.-19.X.1998, leg. I.S. – 4 ♂♂, 2♀♀; Lozenska Mt.: v. German (S1), 650 m, 12.V.-14.X.1998, leg. I.S. – 2♂♂, 1♀ (with eggs);

Confirmed locality: Lozenska Mt.: "Urvic near Sofia", 20.IV.1980, leg. P. Beron, (MNHS: inv. No 143) – 2♂♂, 1♀ (with eggs).

8. *Mitostoma chrysomelas* (Hermann, 1804)

Mitostoma chrysomelas: Staręga, 1976: 337 (West Stara Planina range: "Berghütte "Ledenika", "Paß Petrohan"); Mitov, 1987: 60 (Vitosha Mt.: "loc. Yarema", "loc. Romanski", "monastery "St. Nikola"); Mitov, 1997a: 255 (Vitosha Mt.: "Bay Krustyo").

Material examined: 2 juv.

New localities: West Stara Planina range: Chiprovtsi, county Debledelska Murtvina, on the edge of *Fagus*-forest, under stones, 1100-1300 m, 28.VII.1998, leg. B. Petrov - 1 juv. (3.2 mm); in the region of Chiprovtsi, below peak Midzhur, 1900 m, 26.X.1969, leg. P. Beron, (MNHS: inv. No 81) - 1 juv. (1.3 mm).

Family Dicranolasmatidae Simon, 1879

9. *Dicranolasma scabrum* (Herbst, 1799)

Dicranolasma scabrum: Staręga, 1976: 305 (West Stara Planina range: "Berghütte "Ledenika"), Mitov, 1987: 60 (Vitosha Mt.: "above v. Bistritsa")

Material examined: 1♂, 1♀.

New localities: West Stara Planina range: Distr. Svoge, Bov, 09.05.1982, leg. P. Beron, (MNHS: inv. No 221) – 1♀ (5.3 mm)(with eggs).

Confirmed locality: Vitosha Mt.: above v. Bistritsa, 1200 m, 23.XI.1992, leg. N. Kodzhabashev – 1♂.

Family Trogulidae Sundevall, 1833

10. *Trogulus tricarinatus* (Linnaeus, 1767)

Trogulus tricarinatus: Staręga, 1976: 299 (West Stara Planina range: "Berghütte "Ledenika", "Čelopek", "Bistrec", "Petrohan-Paß"; Surnena Sredna Gora Mt.: "Starozagorski bani"; Vitosha Mt.: "Bojana", "Zlatni mostove"; Lozenska Mt.: "Urvič-Schlucht", "Germanski manastir").

Material examined: 31♂♂, 106♀♀, 3 juv.

New localities: West Stara Planina range: Chiprovtsi, county Debledelska Murtvina, at the edge of a *Fagus*-forest, under stones, 1100-1300 m, 28.VII.1998, leg. B. Petrov – 1♀ (5.5 mm)(with eggs); Distr. Godech, in the region of v. Breze, 750 m, 20.VI.1993, leg. B. Petrov – 1♀; Sofia: r.d. "Nadezhda", the park between r.d. "Lev Tolstoy" and r.d. "Triugulnika" (near the tram-station "Triugulnika", under concrete blocks, 08.X.2001, leg. P.M. – 1♀ (5.9 mm) (without eggs); Severen Park: U3, 575 m, FPT-2: 02.VI.-02.VII.1998, leg. I.S. – 1♀ (with eggs); 06.IV.-14.VI.1999, leg. I.S. – 2♀♀ (5.6-6.0 mm) (with eggs); Zapaden Park: U2, 525 m, FPT-2: 02.VI.-16.X.1998, leg. I.S. – 2♀♀ (without eggs); 07.V.-14.VI.1999, leg. I.S. – 2♀♀ (5.8-6.0 mm) (with eggs); Yuzhen Park: right bank of Perlovska River (the side of r.d. "Ivan Vazov"), under tree remnants, 20.X.2001, leg. P.M. – 1♀ (5.9 mm) (without eggs); Knyaz Borisovata Gradina: U1, 550 m, FPT-2: 03.VII.-12.X.1998, leg I.S. – 5♀♀ (5.2-5.9 mm) (without and with eggs); 07.IV.-01.X.1999, leg. I.S. –

8♀♀ (5.1-5.4 mm)(with eggs); Loven Park: U4, 570 m, FPT-2: 05.VI.-12.X.1998, leg. I.S. – 1♂, 20♀♀ (with eggs), 1 juv. (3.85 mm); 07.IV.-03.X.1999, leg. I.S. – 10♀♀ (5.4-6.1 mm)(with eggs); Sofia Kettle: near v. Chibaovtsi, 800 m, FPT-2, 08.IX.-19.X.1998, leg. I.S. – 2♀♀ (with eggs); Lyulin Mt.: S2, 900 m, FPT-2, 04.IV.-14.IX.1999, leg. I.S. – 5♀♀ (5.3-5.8 mm)(without and with eggs); R2, 920 m, FPT-2: 08.V.-17.X.1998, leg. I.S. – 4♀♀ (with eggs); 04.IV.-13.X.1999, leg. I.S. – 1♂ (4.3 mm), 6♀♀ (5.3-5.75 mm) (without and with eggs); Vitosha Mt.: v. Vladaya (S4), 950 m, FPT-2, 10.IX.-15.X.1998, leg. I.S. – 1♀; 07.VIII.-16.IX.1999, leg. I.S. – 2♀♀ (with eggs); Lozenska Mt.: v. German (S1), 650 m, FPT-2: 04.VI.-14.X.1998, leg. I.S. – 2♀♀ (5.7-5.9 mm)(with eggs); 12.V.-05.VI.1999, leg. I.S. – 1♀ (5.7 mm)(with eggs);

Confirmed localities: Lozenska Mt.: German monastery (R1), 850 m, FPT-2: 07.V.-20.X.1998, leg. I.S. – 16♂♂, 16♀♀ (without and with eggs), 2 juv. (2.73 mm); 02.IV.-10.IX.1999, leg. I.S. – 13♂♂ (4.5-5.2 mm), 12♀♀ (5.0-5.5 mm) (without and with eggs);

Sredna Gora Mt.: "Sredna gora", loc. (?), 20.VI.1911, leg. P. Drenski, MNHS – 1♀ (6.5 mm).

11. *Trogulus nepaeformis* (Scopoli, 1763)

Trogulus nepaeformis: Staręga, 1976: (West Stara Planina range: "Umgebung der Höhle Ledenika").

** 12. *Trogulus closanicus* Avram, 1971

Trogulus nepaeformis: Mitov, 1987: 60 (Vitosha Mt.: "Vladaya", "loc. Cherniya kos").

This species is new to the Bulgarian fauna. *Trogulus closanicus* is known from Romania, Austria, Slovenia, Germany, France and Switzerland (Avram, 1971; Weiss, 1978, 1984, 1996; Chemini, 1984; Weiss *et al.*, 1998; Komposch, 1995, 1997, 1999, 2000; Komposch *et al.*, 1997; Komposch & Gruber, 1999) and is considered as a relatively young species with expanding distribution. It is also described as an ecologically tolerant species, showing significant genetical heterogeneity (see Weiss, 1978).

The initial misidentification of the material from Vitosha Mt. (sub *Trogulus nepaeformis*, see Mitov, 1987) resulted from the opinion of Martens (1978) who considered *Trogulus closanicus* as a synonym of *Trogulus nepaeformis*.

Later, as more abundant comparative material came together, it became possible to confirm the more popular opinion (see Weiss, 1978; Chemini, 1984; Weiss *et al.*, 1998; Komposch, 2000; Klimeš, pers. comm.) concerning the validity of *Trogulus closanicus* and consequently to revise the status of the previously available *Trogulus*-material. The population from Lyulin Mt. has the following parameters: L♂♂ = 7.56±0.03 mm (7.2-8.2 mm, n=61♂♂, C.V.=3.22), d♂♂ = 0.51±0.01 mm (0.4-0.57 mm, n=25♂♂, C.V.=9.56); L♀♀ = 8.74±0.07 mm (8.2-9.2 mm, n=18♀♀, C.V.=3.22), d♀♀ = 0.59±0.01 mm (0.55-0.63 mm, n=8♀♀, C.V.=5.95);

Material examined: 83♂♂, 23♀♀, 1 juv.

Localities: Lyulin Mt.: S2, 900 m, FPT-2: 08.V.-17.X.1998, leg. I.S. - 20♂♂, 5♀♀ (with eggs); 04.IV.-13.V.1999, leg. I.S. - 10♂♂; 13.V.-03.VI.1999, leg. I.S. - 5♂♂, 1 subad. (7.2 mm); 03.VI.-13.X.1999, leg. I.S. - 24♂♂, 13♀♀ (with eggs); R2, 920 m, FPT-2: 08.V.-17.X.1998, leg. I.S. - 2♂♂, 1♀ (without eggs); 13.V.-13.X.1999, leg. I.S. - 15♂♂, 2♀♀ (with eggs); Vitosha Mt.: above Dragalevtsi, in the area of the chair-lift station: fresh to moist forest-meadow, Ass. *Deschampsia caespitosa* + *Lerchenfeldia flexuosa* + *Urtica dioica* - *Rubus idaeus*, 900 m, FPT, 24.V.-25.VI.1988, leg. P.M. - 2♂♂ (7.5-7.7 mm, d=0.5 mm); on the banks of Dragalevska River, Ass. *Carpinus betulus* + *Fagus sylvatica* - *Rubus idaeus* - *Carex* sp., 900 m, FPT, 25.VI.-23.VII.1988, leg. P.M. - 1♂ (7.8 mm, d=0.52 mm); forest, Ass.

Carpinus betulus + *Fagus sylvatica* - *Poa nemoralis* + *Galium odoratum*, 900 m, FPT, 04.IV.-09.V.1988, leg. P.M. - 1♀ (9.0 mm, d=0.575 mm); above Simeonovo, between loc. Zhelezni Vrata and loc. Sovata, 1100 m, fresh forest-meadow, Ass. *Alopecurus pratensis* + *Agrostis capillaris*, FPT, 05.VII.-19.IX.1988, leg. P.M. - 4♂♂ (7.4-7.8 mm, d=0.45-0.575 mm), 1♀ (9.0 mm, d=0.72 mm).

Family Phalangiidae Simon, 1879

13. *Phalangium opilio* Linnaeus, 1758

Phalangium opilio: Šilhavý, 1965: 381 (Lyulin Mt.: "Ljumon"[2], Vitosha Mt.: "Vitoša planing", "Bistrica"; Lozenska Mt.: "Monastir Džerman", "Lozen"; Sredna Gora Mt.: "Srtuna gora"[3]); Staręga, 1976: 371 (West Stara Planina range: "Berg Malyk Kom", "Byrzija", "Komštica", "Paß Petrohan", "Iskrec", "Berg Javorec", "Druževo", "Schlucht Vratcata", "Berghütte "Ledenika", "Čerepiš", "Lakatnik", "Gara Lakatnik", "Cerovo"; Sofia: "Gorubljane"; Vitosha Mt.: "Černi kos", "Berghütte "Aleko", "Bojana", "Bojanski vodopad", "Berg Černata skala", "Berghütte "Fonfon", "Knjaževo", "Kopitoto", "Berghütte "Rodina"; Surnena Sredna Gora Mt.: "Starozagorski bani"); Mitov, 1988: 485 (Vitosha Mt.: "above Zheleznitsa"); Mitov, 1995b: 69-70 (Vitosha Mt.: "above Dragalevtsi", "Bai Krustyu", "Selimitsa hut", "Goli Vruh"); Mitov, 1996: 487-488 (Vitosha Mt.: "über Dragalevzi"); Mitov, 1997a: 255 (Vitosha Mt.: "above Dragalevtsi", "Bay Krustyo", "Goli Vruh").

Material examined: 62♂♂, 65♀♀, 31 juv.

New localities: West Stara Planina range: Vurshets, city park, under stones, 395 m, 29.VI.2000, leg. P.M. - 1♂; above Vurshets: near Botunya River, Vegetation: *Fagus* sp., *Alnus* sp., *Quercus* sp., *Pinus nigra* Arn., *Rubus* sp., under stones, 27.VI.2000, leg. P.M. - 1♂, 1 juv. (6.1 mm); loc. Vodopada, near Orlovitsa River, Vegetation: *Alnus* sp., *Crataegus* sp., *Rubus* sp., *Urtica dioica* L., 400-500 m, 28.VI.2000, leg. P.M. - 2♂♂, 1♀; Distr. Dragoman, Northern slopes of the karstic ridge Chepun, stony terrain with shrubs, 850 m, FPT, 27.VII.-28.IX.1997, leg. D. S. Dimitrov - 1♂, 1♀; Distr. Vratsa: v. Zgorigrad - hut Purshevitsa, 500-1300 m, forest, 10.VII.1993, leg. B. Petrov, P. Stoev - 4 juv. (3.5 mm)(4.0 mm); in the region of hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. B. Petrov - 6 juv. (3.0 mm); above Etropole, 24.VII.-04.VIII. 1999, leg. G. Krustev - 1♀ (8.5 mm) (with many eggs); Sofia: Severen Park: on leaf-litter, shrubs and tree-trunks, 29.VI.1997, leg. P.M. - 8 juv. (2.7 mm, 3.0 mm, 3.8 mm, 3.9 mm); on shrubs and grassy vegetation in the forest, 02.VII.1998, leg. P.M. - 2♂♂; U3, 575 m, FPT-2, 02.VII.-03.IX.1998, leg. I.S. - 4♀♀ (with many eggs), 1 juv. (4.7 mm); 14.VI.1999, leg. P.M. - 1 juv. (1.9 mm); on a tree-trunk, 06.VII.1999, leg. P.M. - 1♀ (4.6 mm)(without eggs), 1 juv. (3.0 mm); on shrubs, at height 1-1.5 m, 06.IX.1999, leg. P.M. - 1♀; at the Northern periphery of the park, on a *Betula*-trunk at height 0.5 m, 05.VIII.2001, leg. P.M. - 1♀ (without eggs); *Picea abies*-forest, under stones, 28.VIII.2001, leg. P.M. - 1♂ (4.0 mm), 1♀ (6.5 mm)(without eggs); Zapaden Park: U2, 525 m, FPT-2, 02.VII.-11.VIII.1998, leg. I.S. - 1 juv. (3.5 mm); Loven Park: U4, 570 m, FPT-2, 13.V.-05.VI.1998, leg. I.S. - 1 juv. (2.0 mm); Studentski grad, 25.VII.1997, leg. ? - 3♂♂, 1♀; Sofia Kettle: between r.d. "Vrazhdebna" and v. Dolni Bogrov, LTU, wheat-field, 05.VII.-21.VII.1999, leg. R. Kostova - 16♂♂, 34♀♀ (with eggs), 4 juv. (4.3 mm); Vitosha Mt.: "Dragalewzi b. Sofia", 25.VIII.1917,

[2] Šilhavý (1956) reported *Phalangium opilio* from "Ljumon", but such a place does not exist in Bulgaria. Probably this record concerns Lyulin (=Ljulin) Mt.

[3] The same holds also for the record "Srtuna gora" – this is probably a reference to Sredna Gora Mt.

leg. Dr. Buresch, MNHS - 1♂; loc. Tihiya Kut (R4), 1000 m, FPT-2: 08.VIII.-10.IX.1998, leg. I.S. - 1♀ (with many eggs), 01.VII.-09.X.1999, leg. I.S. - 1♂, 2♀♀ (5.9-7.4 mm) (with many eggs), 16.IX.1999, H, leg. P.M. - 1♀; "Zlatnite mostove", 21.X.1943, leg. (?), MNHS - 1♂; Lozenska Mt.: v. German (S1), 650 m, FPT-2, 08.VII.-06.VIII.1998, leg. I.S. - 3♂♂; Sushtinska Sredna Gora Mt.: Koprivshtitsa, 02.VII.1968, leg. K. Kumanski, MNHS - 2 juv. (1.6-2.6 mm); Distr. Koprivshtitsa, pick Bratiya, 1519 m, FPT, 12.V.1996, leg. S. Lazarov - 3♂♂, 1♀ (7.0 mm) (with many eggs); in the region of Panagyurishte, loc. Fetentsi, 900 m, FPT, 27.V.1993, leg. S. Lazarov - 26♂♂ (3.2-4.1 mm), 12♀♀ (4.0-5.5 mm) (with eggs).

Confirmed localities: Lozenska Mt.: "German monast.", 20.VIII.1915, leg. Dr. Buresch, MNHS - 1♀ (with eggs); German monastery (R1), 850 m, 01.VIII.-10.IX.1999, leg. I.S. - 1♀ (5.2 mm) (with eggs); West Stara Planina range: above Lakatnik, pick Yavorets, 1348 m, 12.VII.1948, leg. P. Tranteev & I. A. Ivanov, MNHS - 1 juv. (2.7 mm).

14. *Opilio parietinus* (De Geer, 1778)

Opilio parietinus: Šilhavý, 1965: 379 (West Stara Planina range: "Čurek"; Sofia: "Sofia", Lozenska Mt. "Monastir Džerman"); Staręga, 1976: 399 ("Sofia"; Vitosha Mt.: "Bojana", "Dragalevci").

Remark: According to Staręga (1976), *Opilio parietinus* is a synanthropic species in Bulgaria. This species has been found also on different buildings (climbing up to heights of 20 m) in the city of Sofia (Staręga, 1976).

Material examined: 6♂♂, 7♀♀, 2 juv.

Confirmed localities: Sofia: Severen Park: on a building-wall in the Northern periphery of the park, at 1.0-3.0 m height: 02.X.1998, leg. P.M. - 1♂; 25.X.1998, leg. P.M. - 1♀; 01.X.2000, leg. P.M. - 1♂ (4.4 mm); 14.X.2001, leg. P.M. - 2♂♂ (4.6-5.7 mm), 4♀♀ (6.5-7.0 mm) (with eggs); on building-walls in the Northern periphery of the park at 4 m height, 17.X.1998, leg. P.M. - 2♂♂ (3.8-4.9 mm), 1♀ (4.5 mm)(without eggs); park "Oborishte", on a building-wall at 0.5 m height, 03.VII.2000, leg. P.M. - 1 juv.; park "Doktorska Gradina", at the periphery of the park, next to the National Library, under stones, 12.VI. 2002, leg. P.M. – 1 juv. (2.45 mm); Knyaz Borisovata Gradina: Western periphery of the park, on a building-wall at 1.50 m height, 24.IX.2001, leg. P.M. - 1♀ (4.4 mm) (without eggs).

15. *Opilio saxatilis* C.L. Koch, 1839

Opilio saxatilis: Šilhavý, 1965: 380 (Sofia: "Sofia"); Staręga, 1976: 402-403 (West Stara Planina range: "Berkovica", "Komštica", "Pyrševica", "Berghütte "Ledenika", "Vraca", "Schlucht Vratcata", "Lakatnik", "Kytina", "Kremikovski manastir"; Lyulin Mt.: "Ljulin"; Vitosha Mt.: "Bojana", "Bojanski vodopad", "Železnica", "Dragalevci", "Knjaževo"; Lozenska Mt.: "Schlucht Urvič"; Sushtinska Sredna Gora Mt.: "Gara Koprivštica"; Surnena Sredna Gora Mt.: "Starozagorski bani").

Material examined: 29♂♂, 17♀♀, 38 juv.

New localities: West Stara Planina range: Vurshets, city park, under stones, 395 m, 29.VI.2000, leg. P.M. - 2♂♂, 1♀ (with many eggs); above Vurshets: loc. Vodopada, near Orlovitsa River, Vegetation: *Alnus* sp., *Crataegus* sp., *Rubus* sp., *Urtica dioica* L., 400-500 m, 28.VI.2000, leg. P.M. - 1♂; Distr. Dragoman, southern slopes of the karstic ridge Chepun, among short *Syringa vulgaris* L. shrubs, 1000 m, FPT, 27.VII.-28.IX.1997, leg. D. S. Dimitrov - 1 juv. (3.25 mm); Sofia Kettle: between r.d. "Vrazhdebna" and v. Dolni Bogrov, LTU, 05.VII.-21.VII.1999, wheat-field, leg. R. Kostova - 3♀♀ (5.0 mm)(with eggs); v. Dolni Bogrov, 13.XI.1987, carrot-field, leg. P.M. - 1♂ (2.5

mm), 1♀ (3.5 mm); Lozenska Mt.: v. German (S1), 650 m, FPT-2, 06.VIII.-07.IX.1998, leg. I.S. - 1♀ (subad.) (4.0 mm);

Confirmed localities:

Note: *Opilio saxatilis* was recorded from Sofia by Šilhavý (1965), but without an exact locality within the city.

Sofia: the park between r.d. "Lev Tolstoy" and r.d. "Triugulnika" (near the tram-station "Triugulnika"), under stones, concrete blocks and tree remnants, 08.X.2001, leg. P.M. - 11♂♂ (3.0-5.0 mm), 1 juv. (2.8 mm); Severen Park: under stones, *Picea abies* forest-edge, 575 m: 14.VIII.2001, leg. P.M. - 2 juv. (1.3-2.7 mm); 28.VIII.2001, leg. P.M. - 1♂ (3.5 mm), 2 juv. (1.8-3.0 mm); 14.X.2001, leg. P.M. - 1♂ (3.3 mm); Zapaden Park: park "Chr. Smirnenski", 575 m, under stones and tree remnants, and on tree trunks, 13.IX.2001, leg. P.M. - 3♂♂ (3.6-4.1 mm), 3♀♀ (3.5-3.7 mm)(without eggs), 1 juv. (2.7 mm); Knyaz Borisovata Gradina: at the periphery of the park, in the area of "Ariana" pond, under bark and in grass , 19.X.1998, leg. P.M. - 1♂ (2.6 mm); U1, 550 m, FPT-2, 03.VIII.-04.IX.1998, leg. I.S. - 2♂♂ (3.5-4.0 mm); at the area of "Narodna armia" stadium, at the base of oak-trees and under stones, 12.VI.2001, leg. P.M. - 1♂ (3.7 mm), 2♀♀ (3.6-4.0 mm)(without eggs), 2 juv. (2.2-3.5 mm); in the area of the Astronomical observatory, 12.VI.2001, leg. P.M. - 2 juv. (1.75-2.75 mm); near the crossing of "Dr. Tsankov" blvd. and "P. Yavorov" blvd., under stones, 11.IX.2001, leg. P.M. - 2♂♂ (3.5 mm), 1♀ (4.9 mm) (without eggs), 1 juv. (3.0 mm); in the area of the TV-tower, under tree remnants and stones, 11.IX.2001, leg. P.M. - 3♀♀ (6.1 mm) (without eggs), 1 juv. (3.2 mm); in the area between blvd. "Dr. Tsankov" and the Astronomical observatory, under tree remnants and stones, 14.IX.2001, leg. P.M. - 1♂ (2.7 mm), 17 juv. (1.8-4.0 mm); on a building-wall (at 1.5 m height) at the tennis-court, near "V. Levski" stadium, 05.X.2001, leg. P.M. - 1♂ (3.9 mm), 1♀ (4.8 mm)(without eggs); Loven Park: in the area of the railway-station "Pioneer", under stones and in grass, forest-edge (*Tilia*, *Acer*, *Quercus*, *Ulmus*), near the railway, crossing "Simeonovsko Shousse" blvd., 23.V.2001, leg. P.M. - 5 juv. (1.3-3.7 mm); the park between the National Palace of Culture and "Bulgaria" blvd., under stones, 10.VI. - 20.VI. 2002, leg. P.M. – 1♂ (3.5 mm), 1♀ (3.4 mm)(without eggs), 3 juv. (2.6-3.25 mm).

16. *Opilio dinaricus* Šilhavý, 1938

Opilio dinaricus: Mitov, 1987: 61 (Vitosha Mt.: "loc. Shumako, above v. Bistritsa, above v. Chuypetlovo, loc. Kisselishte, monastery "St. Nikola"); Mitov, 1997a: 255 (Vitosha Mt.: "above Dragalevtsi").

Material examnied: 6♂♂, 2♀♀, 5 juv.

New localities: West Stara Planina range: in the region of Vratsa, hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. B. Petrov - 1♂ (4.0 mm); Vurshets, city park, under stones, 395 m, 29.VI.2000, leg. P.M. - 1♂; above Vurshets: near Botunya River, Vegetation: *Fagus* sp., *Alnus* sp., *Quercus* sp., *Pinus nigra* Arn., *Rubus* sp., under stones, 27.VI.2000, leg. P.M. - 2♂♂ (3.0-3.5 mm); loc. Vodopada, near Orlovitsa River, Vegetation: *Alnus* sp., *Crataegus* sp., *Rubus* sp., *Urtica dioica* L., 400-500 m, 28.VI.2000, leg. P.M. - 1 juv. (3.75 mm); Sofia: Zapaden Park: U2, 575 m, FPT-2, 02.VII.-11.VIII.1998, leg. I. S. - 1♂, 1♀ (with eggs); Loven Park: U4, 570 m, FPT-2, 03.VII.-10.VIII.1998, leg. I. S. - 1♀ (with eggs); Lyulin Mt.: S2, 900 m, FPT-2, 06.VII.-09.VIII.1999, leg. I. S. - 1♂ (3.4 mm); R2, 920 m, FPT-2, 09.VIII.-14.IX.1999, leg. I. S. - 1 juv.; Lozenska Mt.: v. German (R1), 650 m, FPT-2, 07.V.-30.V.1998, leg. I. S. - 1 juv. (2.0 mm); v. Lozen, ~700-800 m, leg. ?, 15.VI.1993 - 2 juv. (3.7 - 4.8 mm).

17. *Opilio ruzickai* Šilhavý, 1938

Opilio ruzickai: Šilhavý, 1965: 380 (Vitosha Mt.: "Vitoša planina"); Beron, 1975: 57 (Vitosha Mt.: "Petrohan"); Staręga, 1976: 406 (West Stara Planina range: "Berghütte "Ledenika", "Cerovo", "Druževo", "Zaselje", "Želen-Tynkoserci", "Kalotina"; Vitosha Mt.: "Bojana", "Bojanski vodopad", "Knjaževo", "Zlatni mostove", "Černi kos"; Lozenska Mt.: "Schlucht Urvič"; Sofia: "Gorubljane"); Mitov, 1995b: 69-70 (Vitosha Mt.: "above Dragalevtsi", "Shoumako", "Selimitsa hut"); Mitov, 1996: 486-487 (Vitosha Mt.: "über Dragalevzi").

Material examined: 59♂♂, 20♀♀, 9 juv.

New localities: Sofia: Severen Park: in leaf-litter, grass, shrubs (*Ulmus* sp., *Corylus* sp.; at 0.5-2.0 m height) and on tree-trunks (*Fraxinus* sp.; at 0.5-2.0 m height): 29.VI.1997, leg. P.M. - 3 juv. (1.75-2.3 mm); 06.VIII.1997, leg. P.M. - 2♂♂; 06.IX.1997, leg. P.M. - 3♂♂, 1♀; 12.X.1997, leg. P.M. - 3♂♂, 1♀; 12.X.1997, leg. P.M. - 3♂♂, 1♀ (6.1 mm)(with many eggs); 02.VII.1998, leg. P.M. - 4 juv. (3.1-4.2 mm); 04.X.1998, leg. P.M. - 3♂♂, 1♀ (5.0 mm) (with eggs); 29.VIII.1999, leg. P.M. - 12♂♂, 2♀♀ (7.0 mm)(with and without eggs); 06.IX.1999, leg. P.M. - 4♂♂, 3♀♀; 11.IX.2000, leg. P.M. - 2♂♂, 1♀ (6.5 mm) (with eggs); U3, 575 m, FPT-2: 03.VIII.-03.IX.1998, leg. I. S. - 1♂, 09.VII.-04.VIII.1999, leg. I. S. - 1 juv. (3.2 mm); in the Northern periphery of the park, on leaves of *Rubus* and *Ulmus*-shrubs: 05.VIII.2001, leg. P.M. - 3♂♂, 2♀♀ (without eggs); 14.VIII.2001, leg. P.M. - 2♂♂; on a building-wall in the Northern periphery of the park: 02.X.1998, leg. P.M. - 2♂♂; 16.I.1999, leg. P.M. - 1♂; 08.IX.2000, leg. P.M. - 1♀ (7.3 mm) (with many eggs); 11.IX.2000, leg. P.M. - 2♂♂, 1♀ (7.2 mm), 2♀♀ (5.1 mm)(without eggs); 26.-28.VIII.2001, leg. P.M. - 1♂, 1♀ (7.2 mm) (with many eggs); Zapaden Park: on shrub, 19.XI.1997, leg. P.M. - 1♂; Knyaz Borisovata Gradina: on a Northern wall of the Ecclesiastical Seminary, 13.VIII.1990, leg. P.M. - 1♂; Lyulin Mt.: Bankya, 15-16.IX.1990, leg. B. Mitov - 1♂; S2, 900 m, FPT-2, 09.VIII.-14.IX.1999, leg. I. S. - 1♀ (7.0 mm); Vitosha Mt.: loc. Tihiya Kut (R4), 1000 m, FPT-2, 06.VI.-11.VII.1998, leg. I. S. - 1 juv.; 16.IX.1999, H, leg. P.M. - 2♂♂, 1♀; Lozenska Mt.: "German monast.", 20.VIII.1915, leg. Dr. Buresch, MNHS - 1♂ (4.2 mm); Sushtinska Sredna Gora Mt.: in the region of Panagyurishte, loc. Fetentsi, 900 m, 19.IX.1993, FPT, leg. S. Lazarov - 9♂♂ (3.8 mm)(4.2 mm), 1♀ (5.8 mm)(with eggs).

18. *Rafalskia olympica* (Kulczyński, 1903)

Rafalskia olympica: Staręga, 1976: 396 (Vitosha Mt.: "Berghütte "Aleko", "Berghütte "Tintjava")

Material examined: 1♀.

New localities: Sushtinska Sredna Gora Mt.: above Klisura, forest, FPT, 05.VI.1996, leg. S. Lazarov - 1♀ (5.5 mm) (without eggs).

19. *Rilaena triangularis* (Herbst, 1799)

Rilaena triangularis: Staręga, 1976: 382 (West Stara Planina range: "Paß Petrohan", "Berghütte "Ledenika").

Material examined: 2♀♀.

New localities: West Stara Planina range: above Vurshets, 395-500 m, 27.VI.-02.VII.2000, leg. P.M. - 2♀♀.

20. *Rilaena balcanica* Šilhavý, 1965

Rilaena balcanica: Staręga, 1976: 380 (Zavalska Mt.: "Filipovci"; Vitosha Mt.: "Bojana"; Plana Mt.: "Kokaljane"); Mitov, 1992: 75 (Vitosha Mt.: "above Dragalevtsi"); Mitov, 1988: 484 (Vitosha Mt.: "Cherniya Kos"); Mitov, 1995b: 69 (Vitosha Mt.: "Chernya Kos"); Mitov, 1996: 484 (Vitosha Mt.: "über Dragalevzi"); Mitov, 1997a: 255 (Vitosha Mt.: "above Dragalevtsi").

Material examined: 23♂♂, 33♀♀, 33 juv.

New localities: West Stara Planina range: Distr. Godech, v. Gintsi, in front of cave Dinevata dupka, EPT, 10.V.-27.IX.1992, leg. B. Dimitrova - 1♂ (2.8 mm); Distr. Dragoman, Northern slopes of the karstic ridge Chepun, forest (*Carpinus orientalis* Miller, *Fagus sylvatica* ssp. *moesiaca* (K. Maly) Hjelmq., *Acer* sp.), 1100 m, FPT, 18.V.-07.VII.1997, leg. D. S. Dimitrov - 13♂♂, 12♀♀ (with many eggs); in the region of Lakatnik railway-station, under stones, 06.IV.1991, leg. Z. Mitova - 1 juv. (4.0 mm); Lyulin Mt.: S2, 900 m, FPT-2: 08.V.-13.VIII.1998, leg. I.S. - 1♂, 4♀♀ (4.5 mm) (with eggs); 11.IX.-17.X.1998, leg. I.S. - 1 juv. (2.0 mm); 04.IV.-13.V.1999, leg. I.S. - 1♂ (3.6 mm), 1 juv. (3.6 mm); 09.VIII.-13.X.1999, leg. I.S. - 8 juv. (1.8-3.0 mm); R2, 920 m, FPT-2: 08.V.-13.VIII.1998, leg. I.S. - 2♂♂, 2♀♀ (with many eggs); 11.IX.-17.X.1998, leg. I.S. - 1 juv. (2.75 mm); 13.V.-03.VI.1999, leg. I.S. - 1♂, 1♀; 14.IX.-13.X.1999, leg. I.S. - 3 juv. (2.2-2.6 mm); Vitosha Mt.: v. Vladaya (S4), 950 m, FPT-2, 06.VI.-11.VII.1998, leg. I.S. - 1♂; loc. Tihiya Kut (R4), 1000 m, FPT-2: 21.V.-06.VI.1998, leg. I.S. - 1♀ (with eggs); 09.V.-10.VI.1999, leg. I.S. - 1♀ (with eggs); 01.VII.-07.VIII.1999, leg. I.S. - 1 juv. (2.0 mm); Lozenska Mt.: v. German (S1), 650 m, FPT-2: 04.VI.-08.VII.1998, leg. I.S. - 1♂, 1♀ (4.6 mm); 12.V.-05.VI.1999, leg. I.S. - 1♀ (5.5 mm) (with many eggs); 31.VII.-06.X.1999, leg. I.S. - 2 juv. (1.6-1.85 mm); German monastery (R1), 950 m, FPT-2: 07.V.-10.VII.1998 - 1♂, 6♀♀ (with many eggs); 04.VIII.-20.X.1998, leg. I.S. - 4 juv. (1.7-2.1 mm); 02.IV.-05.V.1999, leg. I.S. - 2 juv. (3.6 mm); 13.VI.-05.VII.1999, leg. I.S. - 1♀ (4.4 mm) (with many eggs); 01.VIII.-10.IX.1999, leg. I.S. - 6 juv. (1.65-2.1 mm); Pancharevski Prolom, under tree remnants, 600 m, 17.X.1993, leg. B. Petrov - 3 juv. (2.0 mm); in the region of v. Pasarel, loc. Hambar Dere, 1000-1400 m, 15.V.1993, leg. D. S. Dimitrov - 1♂; Sushtinska Sredna Gora Mt.: in the region of v. Chavdar, *Populus tremula*-forest, FPT, 03.VII.1996, leg. S. Lazarov - 3♀♀ (5.2 mm)(with eggs);

** 21. *Rilaena serbica* Karaman, 1992

This species is new to the Bulgarian fauna. It was described in 1992 by I. Karaman from the Zlatibor Mt., a subspecies of it (*R. s. kopaonica*) was described simultaneously from the Kopaonik Mt. (both in Serbia). *Rilaena serbica* was later found on Golija Mt., Bjelasica Mt., Zlot Mt., Durmitor Mt. and at many other localities on the mountains of Serbia, Macedonia and Montenegro (Karaman, 1995, pers. comm.).

Karaman (1995) notes that *R.* cf. *serbica* from Durmitor Mt. (Montenegro) differs slightly from the Kopaonik and Zlatibor populations with respect to body coloration, shape of dorsal saddle, the male chelicerae and penis. The Bulgarian *R. serbica* also differs[4] from these populations in the abovementioned structures by having a combination of their character states. The individuals from the Bulgarian population have both distinctive characters, as well as characters shared with

[4] For comparative purposes 3♂♂, 5♀♀ *Rilaena serbica serbica* Karaman, 1992 were examined and 2♂♂, 2♀♀ (Paratypes) *R. serbica kopaonica* Karaman, 1992 (see Material and methods).

R. serbica serbica (shape and colouration of the pedipalps and saddle, shape of tuber oculorum, etc.), *R. s. kopaonica* (dorsal shape of tuber oculorum, shape of glans penis, etc.), and *R.* cf. *serbica* from Durmitor Mt. (shape of male chelicerae). According to Karaman (pers. comm.), the Bulgarian population combines the characteristics (based on the structure of penis only) of *R. s. kopaonica* and of *Rilaena* sp. from Kučaj Mt. (East Serbia). These findings indicate that it is fairly possible for *R. s. kopaonica* to be a subjective synonym of the highly variable *R. serbica*.

Material examined: 25♂♂, 19♀♀, 18 juv.

New localities: West Stara Planina range: Distr. Dragoman, Northern slopes of the karstic ridge Chepun, Vegetation: *Quercus pubescens* Willd., *Carpinus orientalis* Miller, *Fagus sylvatica* ssp. *moesiaca* (K. Maly) Hjelmq., *Rosa canina* L., *Festuca valesiaca* Schleich. ex Gaud., *Genista subcapitata* Pancic, *Satureja montana* L., *Edraianthus serbicus* (Kern.) Petrovic, *Achillea ageratifolia* (Sibth. et Sm.) Boiss.; 800-1100 m, FPT, leg. D. S. Dimitrov - on open stony terrain with shrubs, 850 m: 18.V.-07.VI.1997 - 2♀♀; 27.VII.-28.IX.1997 - 9♂♂, 2♀♀ (with many developed eggs in the uterus); under shrubs, 1100 m, 18.V.-07.VI.1997 - 3 juv. (3.5 mm); in mixed deciduous forest (*Fagus* sp., *Carpinus* sp., *Acer* sp.), 1000 m: 18.V.- 07.VI.1997 - 13♂♂, 14♀♀ (with many developed eggs in the uterus), 15 juv. (4.4-5.5 mm; $\bar{x}$=4.9±0.27, n=4)(1 juv. (5.2 mm), vermined with Gregarinia); 27.VII.-28.IX.1997 - 3♂♂, 1♀.

** 22. *Rilaena* cf. *serbica* Karaman, 1992

Rilaena triangularis: Mitov, 1995b: 70 (Vitosha Mt.: "Goli Vruh"); Mitov, 1997a: 255 (Vitosha Mt.: "Bay Krustyo", "Goli Vruh").

In this taxon we refer to all parthenogenetic (thelytokous) forms which are very similar to *Rilaena serbica*, but are characterised by the presence of very atypical for the entire genus strongly shortened ampullae of the *receptaculum seminis* (16-180 μm long; their length is minimum 220 μm in *R. serbica*) – a situation most probably a result of the absent copulation. A similar phenomenon of receptacle-reduction is also known among other groups of parthenogenetic invertebrates [see Enghoff, 1976; Korge, 1975, Omodeo, 1953 (after Enghoff, 1976)], but here we describe this phenomenon for the first time in Opiliones and hypothesize its relation to the parthenogenetical development of the respective species.

Initially, due to the absence of male specimens and because of the observed similarity with the only known from representative of the genus in Bulgaria, the parthenogenetic material from Vitosha was determined as *Rilaena triangularis* (Herbst, 1799) (see Mitov, 1995b, 1997a). Later, as comparative material from *R. serbica* became available, and after the discovery of its bisexual forms in Bulgaria, it became possible to distinguish morphologically (but still not formally taxonomical) the previously determined *R. triangularis* material from Vitosha Mt.

Material examined: 295♀♀, 399 juv.

New localities: West Stara Planina range: Distr. Vratsa, in the region of pick Sokolets, 800 m, in forest, 05.VI.1994, leg. B. Petrov - 1♀; Distr. Svoge, v. Zanoge, 1100-1300 m, 02.V.1984, leg. P. Beron, (MNHS: inv. No 350) - 1 juv. (3.2 mm); Sofia: Severen Park: on a shrub, at 0.5 m height, 13.VI.1997, leg. P.M. - 1♀; U3, 575 m, FPT-2: 02.IV.-03.VIII.1998, leg. I.S. - 2♀♀; 06.IV.-07.V.1999 - 1 juv. (3.0 mm); 07.V.-14.VI.1999, leg. I.S. - 1♀; in a spruce-forest, under stones and tree remnants, in the leaf-litter, 28.III.1999, leg. P.M. - 2 juv. (1.7 mm, 2.4 mm); under stones and tree-remnants, 04.IV.1999, leg. P.M. - 1 juv. (2.9 mm); forest (*Betula* sp., *Populus* sp.), under stones and tree-remnants, 09.IV.1999, leg. P.M. - 2 juv. (2.5 mm, 2.5 mm); *Picea abies*-forest-edge, under tree remnants, 14.X.2001,

leg. P.M. - 1 juv. (1.7 mm); Zapaden Park: "Chr. Smirnenski" park area, 575 m, under stones and tree remnants, on three-trunks, dry, 13.IX.2001, leg. P.M. - 2 juv. (1.32-1.42 mm); Knyaz Borisovata Gradina: on a shrub, 3-5 m from "Dr. Tzankov" blvd., 20.V.1998, leg. P.M. - 1♀ (with eggs); under tree remnants, 23.V.1998, leg. P.M. - 5♀♀; U1, 550 m, FPT-2: 05.VI.-03.VII.1998, leg. I.S. - 1♀ (6.8 mm); 07.IV.-13.V.1999, leg. I.S. - 1 juv. (4.2 mm); 13.V.-02.VII.1999, leg. I.S. - 2♀♀; in the TV-tower area, under tree remnants, 11.IX.2001, leg. P.M. - 1 juv. (1.7 mm); Loven Park: U4, 570 m, FPT-2, 07.IV.-11.V.1999, leg. I.S. - 1 juv. (4.1 mm); in the area of the railway-station "Pioneer", forest (*Tilia* sp., *Acer* sp., *Quercus* sp., *Ulmus* sp.), under tree remnants, moist and shady, 23.V.2001, leg. P.M. - 2♀♀ (with eggs) (later (31.V.) one of them layed 248 eggs (l=0.60-0.65 mm) in laboratory conditions); Lyulin Mt.: S2, 900 m, FPT-2: 31.V.-13.VIII.1998, leg. I.S. - 1♀ (with many eggs); 04.IV.-13.V.1999, leg. I.S. - 3 juv. (2.75-3.15 mm); R2, 920 m, FPT-2, 04.IV.-13.V.1999, leg. I.S. - 1 juv. (3.4 mm); above Dragichevsko Ezero, 1130 m, at forest/meadow border, 05.XI.2000-07.IV.2001, FPT, leg. M. Sotirova - 1 juv. (2.5 mm); in the region of peak Dupevitsa, 1130 m, meadow, 01.VI.-01.VII.2001, FPT, leg. M. Sotirova - 1♀; in the region of loc. Dobrinova Skala, 1130 m, meadow, FPT, leg. M. Sotirova: 04.X.-05.XI.2001 - 8 juv. (1.40-1.5 mm); 01.VIII.-04.IX.2001 - 1 juv. (1.65 mm); Vitosha Mt.: loc. Tihiya Kut (R4), 1000 m, FPT-2: 21.V.-11.VII.1998, leg. I.S. - 16♀♀ (6.75 mm), 2♀♀ (4.25 mm)(without eggs)(male-like, probably gynandromorphic); 05.IV.-09.V.1999, leg. I.S. - 2 juv. (2.15-2.9 mm); 01.VII.-07.VIII.1999, leg. I.S. - 2♀♀; loc. Cherniya Kos, 900 m, FPT, 08.X.1987-03.XI.1988, leg. P.M. - 4♀♀, 3 juv.; 31.V.1988, leg. P.M. - 2♀♀; above Boyana: 800-900 m, FPT, VI.1994, forest, leg. B. Petrov - 4♀♀; 900 m, FPT, V.1994, leg. B. Petrov - 2 juv.; hut Iglika-loc. Dendrariuma, 1100 m, 03.VII.1988, leg. P.M. - 1♀; above Dragalevtsi: in the area of the lift-station, 900 m, FPT, 03.IX.-20.X.1988, leg. P.M. - 1 juv.; between loc. Pascha bunar and loc. Kaleto 1100 m, FPT, 05.VI.1987-18.IX.1988, leg. P.M. - 26♀♀, 2 juv.; above Simeonovo, 1100 m, FPT, 30.V.1988-04.III.1989, leg. P.M. - 27♀♀, 10 juv.; loc. Bay Krustyo, 1300-1350 m: FPT, 07.IV.1987-18.IX.1988, leg. P.M. - 20♀♀, 108 juv.; 02.V.1987-08.VII.1988, leg. P.M. - 1♀, 2 juv.; peak Goli Vruh: 1800-1820 m, 10.V.1987-24.X.1988, leg. P.M. - 90♀♀, 85 juv.; 10.VII.-24.X.1988, leg. P.M. - 3♀♀, 1 juv.; peat-bog "Dolnoto Blato", 1800 m, FPT, 31.VIII.1987-24.IX.1988, leg. P.M. - 7♀♀, 11 juv.; above peak Goli Vruh, at the periphery of peat-bog "Gornoto Blato", 1950 m, FPT, 12.VIII.1987-11.VI.1988, leg. P.M. - 1♀, 3 juv.; above v. Bistritsa, 1200 m: FPT-1, 29.VI.- 31.X.1985, leg. S.S. - 10 juv.; 24.X.1988, leg. P.M. - 1 juv.; above v. Zheleznitsa, 1100-1300 m, FPT, 09.IV.-17.VII.1988, leg. P.M. - 3♀♀, 3 juv.; loc Yarema, 1200-1600 m: FPT-1, 10.VI.1984-30.X.1985, leg. S.S. - 1♀, 4 juv.; loc. Mecha Polyana, 1820 m: FPT, 11.IX.1987-20.IX.1988, leg. P.M. - 10♀♀, 80 juv.; 28.V.1988, leg. P.M. - 1 juv.; above hut Aleko, 2000 m, FPT-1, 31.X.1984-28.X.1985, leg. S.S. - 2 juv.; in the region of the "St. Nikola" monastery, 1100-1200 m: FPT-1, 31.VII.1985, leg. S.S. - 1♀; FPT, 10.V.-08.X.1988, leg. P.M. - 8♀♀, 8 juv.; 10.V.1988, leg. P.M. - 2 juv.; in the region of hut Selimitsa, 1250-1300 m, FPT, 10.I.-24.VII.1988, leg. P.M. - 1♀, 5 juv.; loc. Zlatni Mostove-hut Kumata, 1500-1600 m, 03.VII.1988, leg. P.M. - 1♀; in the region of hut Kumata, 1735 m, FPT, 03.VII.-27.IX.1988, leg. P.M. - 1♀; above v. Bosnek, loc. Luvski Rid, 1500 m, FPT, 01.V.1992, leg. G. Tsonev - 14 juv.; above v. Chuypetlovo, 1200-1407 m: FPT-1, 30.V.-31.VII.1985, leg. S.S. - 2♀♀, 1 juv.; FPT, 20.VI.1987-16.X.1988 - 15♀♀; 26.IV.-05.V.1989 - 3 juv.; above v. Chuypetlovo, 1800 m, FPT, 12.IX.1992, leg. G. Tsonev - 1♀; under peak Mecha Dupka, 1790 m, FPT, 25.IX.1988-28.X.1989, leg. P.M. - 1 juv.; loc. Tihiya Kut, 1000 m, FPT-2: 21.V.-11.VII.1998, leg. I.S. - 18♀♀ (4.25-6.75 mm); 05.IV.-09.V.1999, leg. I.S. - 2 juv. (2.15-2.9 mm); 01.VII.-07.VIII.1999, leg. I.S. - 2♀♀; Sushtinska Sredna Gora Mt.: in the region of v. Chavdar,

Populus tremula-forest, FPT, 03.VII.1996, leg. S. Lazarov - 1 juv. (3.4 mm); Distr. Koprivshtitsa, pick Mala Bratiya, beech-forest/meadow border, 1370 m, FPT: 08.VII.1996, leg. S. Lazarov - 1♀; 08.VIII.1996, leg. S. Lazarov - 3♀♀ (with eggs); Distr. Koprivshtitsa, below peak Bogdan, northern slope, 1380 m: beech-forest, 05.VI.1996, leg. S. Lazarov - 2 juv. (2.0-2.8 mm); beech-forest/meadow border, FPT, 09.VIII.1996, leg. S. Lazarov - 1♀ (with eggs); above Klisura, loc. Koritata, swampy meadow, 900-1100 m, FPT, 05.VI.1996, leg. S. Lazarov - 2 juv. (2.0 mm).

23. *Lophopilio palpinalis* (Herbst, 1799)

Lophopilio palpinalis: Staręga, 1976: 391-392 (West Stara Planina range: "Berghütte "Ledenika", "Paß Petrohan"; Vitosha Mt.: "Bistriški vodopad", "Bojanski vodopad", "Berghütte "Fonfon", "Zlatni mostove"; Lozenska Mt.: "Germanski manastir"; Sushtinska Sredna Gora: "Koprivštica"); Mitov, 1996: 485-486 (Vitosha Mt.: "über Dragalevzi").

Material examined: 3♂♂, 2♀♀, 6 juv.

New localities: West Stara Planina range: v. Gorni Lom, county Zastavata, *Fagus*-leaf litter, 1000 m, 05.IX.1999, leg. B. Petrov - 2 juv. (2.8-3.2 mm); Chiprovtsi, county Debledelska Murtvina, on the edge of a *Fagus*-forest, under stones, 1100-1300 m, 28.VII. 1998, leg. B. Petrov - 3 juv. (1.9 mm); Distr. Vratsa, in the region of hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. B. Petrov - 1 juv. (2.0 mm); Lyulin Mt.: above Dragichevsko Ezero, 1130 m, forest/meadow border, 05.XI.2000-07.IV.2001, FPT, leg. M. Sotirova - 2♂♂ (2.8-3.0 mm); between Vladayska River and loc. Bonsovi Polyani, 1010 m, *Fagus-Carpinus* forest, FPT, leg. M. Sotirova: 04.IX.-04.X.2001 - 1♀; 04.X.-05.XI.2001 - 1♂ (2.8 mm); Vitosha Mt.: loc. Tihiya Kut (R4), 1000 m, FPT-2, 10.IX.-15.X.1998, leg. I.S. - 1♀.

24. *Zachaeus crista* (Brullé, 1832)

Zacheus crista: Šilhavý, 1965: 392 (Vitosha Mt.: "Bistrica", "Vladzio"[5], Lozenska Mt.: "Monastir Džerman"); Staręga, 1976: (West Stara Planina range: "Čelopek"; Sofia Kettle: "Belediehan", "Busmanci"; Surnena Sredna Gora Mt.: "Mračenik", "Starozagorski bani"); Mitov, 1996: 487 (Vitosha Mt.: "über Dragalevzi"); Mitov, 1997a: 255 (Vitosha Mt.: "above Dragalevtsi", "Bay Krustyo").

Material examined: 142♂♂, 154♀♀, 68 juv.

New localities: West Stara Planina range: Distr. Dragoman, Northern slopes of the karstic ridge Chepun, forest (*Carpinus orientalis* Miller*, Fagus sylvatica* ssp. *moesiaca* (K. Maly) Hjelmq.*, Acer* sp.), 1100 m, FPT, 18.V.-07.VII.1997, leg. D. S. Dimitrov - 2♂♂ (7.3-7.5 mm), 2♀♀ (9.0-10.0 mm)(with eggs); Distr. Vratsa, in the region of hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. B. Petrov - 3♂♂ (6.5 mm); above Vurshets: near Botunya River, Vegetation: *Fagus* sp., *Alnus* sp., *Quercus* sp., *Pinus nigra* Arn., *Rubus* sp., under stones, 27.VI.2000, leg. P.M. - 1♀, 1 juv.; loc. Vodopada, near Orlovitsa River, Vegetation: *Alnus* sp., *Crataegus* sp., *Rubus* sp., *Urtica dioica* L., 400-500 m, 28.VI.2000, leg. P.M. - 1♂ (6.5 mm); Iskurski prolom, along Ochindolska River, above v. Eliseyna, in forest, 700 m, 21.V.1994, leg. B. Petrov - 3 juv. (2.5 mm); Railway station Lakatnik; 06.VII.1948, leg. I. Buresh, MNHS - 1♂ (7.5 mm); above Lakatnik, peak Yavorets, 1348 m, 12.VII.1948, leg. P. Tranteev & I. A. Ivanov, MNHS - 1♂, 1 juv. (4.7 mm); "d. Eleschniza b. Sofia", 22.V.1927, leg. P. Drenski, MNHS - 3 juv.; in the region of Etropole, 01.V.1994, leg. T. Lyubomi-

[5] Šilhavý (1956) mentions, for *Z. crista*, the locality "Vladzio bei Sofia, Vitoša planina, 1300 m". In this case we suggest that this record refers to Vladaya.

rov - 1 juv. (2.5 mm); Sofia: Zapaden Park: U2, 525 m, FPT-2: 02.VI.-11.VIII.1998, leg. I.S. - 32♂♂, 40♀♀ (without/with eggs), 11 juv. (2.2-6.0 mm); 07.V.-04.VIII.1999, leg. I.S. - 15♂♂ (6.1-8.2 mm), 14♀♀ (8.2-10.2 mm) (with many eggs), 12 juv. (2.2-5.2 mm); Knyaz Borisovata Gradina: U1, 550 m, FPT-2: 07.V.-03.VIII.1998, leg. I.S. - 12♂♂ (6.2 mm), 4♀♀, 9 juv. (3.2-6.0 mm), 13.V.-03.VIII.1999, leg. I.S. - 15♂♂ (5.7-6.0 mm), 7♀♀ (7.3 mm) (without/with eggs); under tree remnants, 23.V.1998, leg. P.M. - 1 juv. (4.6 mm); mixed deciduous forest, 600 m, 19.VI.1998, leg. Ch. Ivanova & R. Gorelska - 1♂; at the periphery of forest east of the Ecclesiastic Seminary, under stones and tree remnants, 560-570 m, 23.V.2001, leg. P.M. - 6 juv. (3.2-5.3 mm); Loven Park: U4, 570 m, FPT-2: 13.V.-10.VIII.1998, leg. I.S. - 8♂♂, 12♀♀ (without/with eggs), 1 juv. (5.2 mm); 11.V.-03.VIII.1999, leg. I.S. - 5♂♂ (6.0 mm), 5♀♀ (without/with eggs), 4 juv. (2.5-6.0 mm); behind railway station "Pioneer", in a meadow in the forest (*Tilia* sp.*, Acer* sp.*, Quercus* sp.*, Ulmus* sp.), under tree remnants, 23.V.2001, leg. P.M. - 10 juv. (2.75-4.2 mm); Sofia Kettle: between r.d. "Vrazhdebna" and v. Dolni Bogrov, LTU, wheat-field, FPT, 05.VII.-21.VII.1999, leg. R. Kostova - 4♂♂, 9♀♀ (with eggs); Lyulin Mt.: S2, 900 m, FPT-2: 08.V.-31.V.1998, leg. I.S. - 2♂♂, 1♀, 2 juv. (3.0-3.7 mm); 06.VII.-09.VIII.1999, leg. I.S. - 7♂♂ (7.5-7.7 mm), 6♀♀ (10-10.9 mm) (with many eggs); R2, 920 m, FPT-2, 31.V.-13.VIII.1998, leg. I.S. - 1♂, 1 juv. (6.0 mm); 06.VII.-09.VIII.1999, leg. I.S. - 2♂♂ (5.7 mm), 5♀♀ (8.8 mm) (with eggs); Lozenska Mt.: v. German (S1), 650 m, FPT-2: 04.VI.-06.VIII.1998, leg. I.S. - 8♂♂, 10♀♀ (without eggs), 1 juv. (7.5 mm); 05.VI.-07.IX.1999, leg. I.S. - 11♂♂ (6.5 mm), 20♀♀ (9.7-10 mm) (with eggs), 1 juv. (3.9 mm); v. Lozen, 07.VII.1981, leg. ? - 2♂♂, 2♀♀ (10 mm) (with many eggs); Sushtinska Sredna Gora Mt.: in the region of v. Chavdar, *Populus tremula*-forest, FPT, 03.VII.1996, leg. S. Lazarov - 2♂♂, 2♀♀ (with eggs).

Confirmed localities: Sofia Kettle: near v. Chibaovtsi (R3), 800 m, FPT-2, 29.VI.-06.VIII.1999, leg. I.S. - 1♂; Vitosha Mt.: v. Vladaya, 950 m, FPT-2, 10.VI.-07.VIII.1999, leg. I.S. - 6♂♂ (6.0-8.0 mm), 10♀♀ (6.2-8.3 mm) (without/with eggs); loc. Tihia Kut, 1000 m, FPT-2, 01.VII.-07.VIII.1999, leg. I.S. -1♀; Lozenska Mt.: German monastery (R1), 850 m, FPT-2, 13.VI.-05.VII.1999, leg. I.S. - 3♀♀ (without/with eggs).

25. *Zachaeus anatolicus* (Kulczyński, 1903)

Zacheus anatolicus: Mitov, 1987: 60 (Vitosha Mt.: "above v. Chuypetlevo")

Material examined: 41♂♂, 39♀♀, 4 juv.

New localities: Sofia Kettle, r.d. "Vrazhdebna" and v. Dolni Bogrov, LTU, wheat-field: 15.IV.1999, leg. R. Kostova - 4 juv. (1.5-1.8 mm); FPT, 05.VII.-21.VII.1999, leg. R. Kostova - 39♂♂, 36♀♀ (with eggs); Lyulin Mt.: NW of Vladaya railway-station, grassland (abandoned agricultural plot) with *Prunus spinosa* L., 890 m, FPT, 28.VI.2002, leg. M. Sotirova – 1♂ (8.0 mm), 3♀♀ (7.0 mm) (without eggs); Sushtinska Sredna Gora Mt.: in the region of Klisura, loc. Koritata, 900-1100 m, FPT, 07.VII.1996, leg. S. Lazarov - 1♂.

26. *Egaenus convexus* (C.L. Koch, 1835)

Egaenus convexus: Staręga, 1976: 411 (West Stara Planina range: "Vraca", "Berghütte "Ledenika", "Brusen", "Botevgrad").

Material examined: 3♀♀, 3 juv.

New localities: West Stara Planina range: above Vurshets, 400-500 m, *Pinus nigra*-forest, under tree remnants, 29.VI.2000, leg. P.M. - 1♀ (10.5 mm); Distr. Dragoman, Northern slopes of the

karstic ridge Chepun, forest (*Carpinus orientalis* Miller*, Fagus sylvatica* ssp. *moesiaca* (K. Maly) Hjelmq.*, Acer* sp.), 1100 m, FPT, 18.V.-07.VII.1997, leg. D. S. Dimitrov - 2♀♀ (11.0-11.5 mm) (with eggs), 1 juv. (7.5 mm); Sofia Kettle: in the region of hut Belidie Han, *Fagus*-forest, in leaf-litter, 11.V.1996, leg. A. Antov - 2 juv. (4.0-6.8 mm).

27. *Lacinius horridus* (Panzer, 1794)

Lacinius horridus bulgaricus Šilhavý, 1965: 378 (syn. after Staręga, 1976) (Vitosha Mt.: "Vitoša planina", "Slatni mostove"; Lozenska Mt.: "Monastir Džerman", "Džermanski manastir");

Lacinius horridus: Staręga, 1976: 362 (West Stara Planina range: "Berg Malyk Kom", "Kalotina", "Komštica", "Lakatnik", "Paß Petrohan", "Ginci", "Byrzija", "Čerepiš", "Berghütte "Ledenika", "Schlucht Vratcata"; Zavalska Mt.: "Filipovci"; Vitosha Mt.: "Bistriški vodopad", "Bojana", "Bojanski vodopad", "Zlatni mostove", "Železnica"; Lozenska Mt.: "Germanski manastir", "Schlucht Urvič"; Sushtinska Sredna Gora Mt.: "Gara Koprivštica", "Koprivštica"; Surnena Sredna Gora Mt.: "Kazanka", "Starozagorski bani", "Staro Zaimovo"); Mitov, 1992: 75 (Vitosha Mt.: "Bai Krustyo", "above Zheleznitsa"); Mitov, 1995b: 70 (Vitosha Mt.: "Goli Vruh"); Mitov, 1996: 485 (Vitosha Mt.: "über Dragalevzi"); Mitov, 1997a: 256 (Vitosha Mt.: "above Dragalevtsi", "Bay Krustyo", "Goli Vruh").

Material examined: 8♂♂, 38♀♀, 59 juv.

New localities: West Stara Planina range: Chiprovtsi, county Debledelska Murtvina, at the edge of a *Fagus*-forest, under stones, 1100-1300 m, 28.VII.1998, leg. B. Petrov - 2 juv. (2.7-3.3 mm); the pass above hut Kom, under stones near the road, 1650 m, 19.VI.1998, leg. B. Petrov - 2 juv. (1.7 -2.0 mm); Distr. Godech, v. Breze, 750 m, 20.VI.1993, leg. B. Petrov - 2 juv.; Distr. Dragoman, Northern slopes of the karstic ridge Chepun, on a stony terrain with shrubs, 850 m, FPT, 27.VII.-28.IX.1997, leg. D. S. Dimitrov - 1♂, 1♀; Distr. Vratsa, in the region of hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. B. Petrov - 5 juv. (2.8 mm); above Vurshets, 400-500 m, 27.VI.2000, leg. P.M. - 1 juv. (4.0 mm); above Lakatnik, peak Yavorets, 1348 m, 12.VII.1948, leg. P. Tranteev & I. A. Ivanov, MNHS - 1 juv. (3.8 mm); Sofia: Knyaz Borisovata Gradina: U1, 550 m, FPT-2: 03.VII.-12.X.1998, leg. I.S. - 2♀♀ (5.0-8.0 mm) (without eggs), 1♀ (7.0 mm) (with eggs), 3 juv. (2.8 mm); 12.VI.-03.IX.1999, leg. I.S. - 4 juv. (3.0-4.2 mm); at the periphery of a forest east of the Ecclesiastical Seminary, 560-570 m, under tree-remnants, 23.V.2001, leg. P.M. - 2 juv. (2.6 mm, 2.8 mm); in the area of the Astronomical Observatory, 12.VI.2001, leg. P.M. - 1 juv. (3.0 mm); in the TV-tower area, under tree-remnants, 11.IX.2001, leg. P.M. - 1 juv. (5.2 mm); in the area between "Dragan Tsankov" blvd. and the Astronomical Observatory, under tree-remnants, 14.IX.2001, leg. P.M. - 1 juv. (5.8 mm); Loven Park: in the area of the railway-station "Pioneer", forest (*Tilia* sp.*, Acer* sp.*, Quercus* sp.*, Ulmus* sp.), on the tree-trunks up to 1.5 m height, moist and shady, 23.V.2001, leg. P.M. - 2 juv. (3.0 mm); Lyulin Mt.: above Dragichevsko Ezero, FPT, leg. M. Sotirova: 1010 m, *Betula-Pinus* forest, 04.X.-06.XI.2001 - 1♀ (7.5 mm)(without eggs); 1130 m, forest/meadow border, 05.XI.2000-07.IV.2001 - 1♂ (5.7 mm); in the region of peak Dupevitsa, 1130 m, meadow, 01.X.-05.XI.2000, FPT, leg. M. Sotirova - 2♀♀ (5.5-7.5 mm)(without/with eggs), 1 juv. (4.0 mm); in the region of loc. Dobrinova Skala, 1130 m, meadow, 01.VIII.-04.IX.2001, FPT, leg. M. Sotirova - 1♂ (4.5 mm), 1♀ (7.3 mm)(with many eggs); Vitosha Mt.: v. Vladaya (S4), 950 m, FPT-2, 01.VII.-07.VIII.1998, leg. I.S. - 1 juv. (5.3 mm); loc. Tihiya Kut (R4), 1000 m, FPT-2, 08.VIII.-10.IX.1998, leg. I.S. - 1

juv. (4.2 mm); 16.IX.1999, H, leg. P.M. - 2 juv.; Sushtinska Sredna Gora Mt.: in the region of v. Chavdar, *Populus tremula*-forest, FPT, 03.VII.1996, leg. S. Lazarov - 1 juv. (3.0 mm); Distr. Koprivshtitsa: peak Mala Bratiya, beech-forest/meadow border, 1370 m, FPT, 08.VII.1996, leg. S. Lazarov - 1 juv.; pick Bratiya, 1519 m, FPT, 12.V.1996, leg. S. Lazarov - 2♂♂ (5.1 mm), 5♀♀ (7.8 mm) (with many eggs); in the region of Panagyurishte, loc. Fetentsi, 900 m, FPT, 27.V.1993, leg. S. Lazarov - 2juv. (2.8 mm); 19.IX.1993 - 3♂♂, 22♀♀ (4.0 mm, 6.2 mm, 7.6 mm), 23 juv. (3.0-4.8 mm); Surnena Sredna Gora Mt.: in the region of Kazanluk, TVK Kavakliyka, 1050 m, loc. Batakluka, deciduous forest, FPT, 21.VII.1982, leg. S. Lazarov - 1 juv. (5.5 mm).

Confirmed localities: Lozenska Mt.: "Germanski monastir", 1-15.VIII.1914, leg. A. Urumow, MNHS - 1 juv. (4.6 mm); R1, 850 m, FPT-2: 04.VIII.-07.IX.1998, leg I.S. - 1♀ (without eggs); 01.VIII.-10.IX.1999, leg. I.S. - 1♀ (4.5 mm), 1♀ (without eggs);

28. *Lacinius ephippiatus* (C.L. Koch, 1835)

Lacinius ephippiatus: Staręga, 1976: 365 (West Stara Planina range: "Berghütte "Ledenika"; Vitosha Mt.: "Bojanski vodopad").

Material examined: 2♂♂, 8♀♀, 1 juv.

New localities: West Stara Planina range: Distr. Chiprovtsi, below peak Midzhur, 1900 m, 26.X.1969, leg. P. Beron, (MNHS: inv. No 81) - 1♀ (4.3 mm); Lyulin Mt.: S2, 900 m, FPT-2, 06.VII.-09.VIII.1999, leg. I.S. - 2♀♀ (5.3-6.2 mm) (with eggs); R2, 920 m, FPT-2: 31.V.-13.VIII.1998, leg. I.S. - 1♀ (with eggs), 1 juv. (3.25 mm); 06.VII.-09.VIII.1999, leg. I.S. - 2♂♂ (4.5 mm), 4♀♀ (5.2-6.0 mm)(with eggs).

29. *Lacinius dentiger* (C. L. Koch, 1848)

Lacinius dentiger: Šilhavý, 1965: 378 (Lozenska Mt.: "Monastir Džermen"); Staręga, 1976: 367 (West Stara Planina range: "Berghütte "Ledenika", "Schlucht Vratcata", "Paß Petrohan", "Druzevo", "Lakatnik"; Zavalska Mt.: "Filipovci"; Vitosha Mt.: "Bojana", "Bojanski vodopad", "Zlatni mostove"); Mitov, 1988: 486 (Vitosha Mt.: "above Dragalevtsi"); Mitov, 1995b: 69-70 (Vitosha Mt.: "above Dragalevtsi", "Shoumako", "Selimitsa hut", "Bai Krustyu"); Mitov, 1995c: 2-4 (Vitosha Mt.: "Gelände zwischen Pascha bunar und Kaleto"); Mitov, 1996: 487 (Vitosha Mt.: "über Dragalevzi"); Mitov, 1997a: 256 (Vitosha Mt.: "above Dragalevtsi", "Bay Krustyo").

Material examined: 1♂, 4♀♀, 6 juv.

New localities: West Stara Planina range: Chiprovtsi, county Debledelska Murtvina, at the edge of a *Fagus*-forest, under stones, 1100-1300 m, 28.VII.1998, leg. B. Petrov - 1 juv. (3.2 mm);

Sofia: "Vrana" residence: on a wall at 0.3-0.4 m height, 06.-08.V.2000, leg. P.M. - 2 juv. (1.8 mm)(3.0 mm); Loven Park: the area of the railway-station "Pioneer", forest (*Tilia* sp., *Acer* sp., *Quercus* sp., *Ulmus* sp.), on tree-trunks, moist and shady, 23.V.2001, leg. P.M. - 1 juv. (2.75 mm).

Lyulin Mt.: in the region of peak Dupevitsa, 1130 m, meadow, 01.X.-05.XI.2000, FPT, leg. M. Sotirova - 4♀♀ (5.5-7.0 mm) (with eggs).

Vitosha Mt.: loc. Tihiya Kut (R4), 1000 m, 16.IX.1999, H, leg. P.M. - 1♂.

Confirmed localities: Lozenska Mt.: German monastery (R1), 850 m, FPT-2, 04.VIII.-07.IX.1998, leg. I.S. - 2 juv. (4.4-5.5 mm);

30. *Odiellus lendli (*Sørensen, 1894)

Odiellus bieniaszi: Staręga, 1976: 358-359 (West Stara Planina range: "Lakatnik", "Berghütte "Ledenika", Sushtinska Sredna Gora Mt.: "Gara Koprivštica"; Lozenska Mt.: "Schlucht Urvič"; Vitosha Mt.: "Bojana", "Železnica") (syn. after Martens, 1978).

Material examined: 9♂♂, 18♀♀, 21 juv.

New localities: West Stara Planina range: Distr. Dragoman, Northern slopes of the karstic ridge Chepun, on stony terrain with shrubs, 850 m, FPT, 27.VII.-28.IX.1997, leg. D. S. Dimitrov - 1♂, 1♀; above Etropole, 24.VII.-04.VIII.1999, leg. G. Krustev - 1 juv. (3.8 mm); Sofia Kettle: between r.d. "Vrazhdebna" and v. Dolni Bogrov, LTU, wheat-field, 05.VII.-21.VII.1999, leg. R. Kostova - 1 juv. (3.5 mm); Sofia: Severen Park: at the base of three-trunks, 29.VI.1997, leg. P.M. - 2 juv. (2.5 mm, 2.5 mm); under tree-remnants and in leaf-litter, *Picea abies*-forest/*Quercus rubra*-forest border, 02.X.1998, leg. P.M. - 2♂♂, 1♀ (with eggs); 14.X.2001, leg. P.M. - 1♂ (4.8 mm), 2♀♀ (6.2 mm) (with eggs); on a building-wall at the northern periphery of the park, up to 0.30-0.50 m height, 25.X.1998, leg. P.M. - 2♂♂; on a tree-trunk, 06.VII.1999, leg. P.M. - 13 juv. (2.7-3.2 mm); *Picea abies*-forest, under tree-remnants: 14.VIII.2001, leg. P.M. - 1 juv. (3.7 mm); 28.VIII.2001, leg. P.M. - 5♀♀ (5.0 mm) (without eggs), 2 juv. (3.9 mm); Zapaden Park: U2, 525 m, FPT-2, 11.VIII.-03.IX.1998, leg. I.S. - 1 juv. (4.1 mm); Lyulin Mt.: above railway station Vladaya, meadow between wheat and maize-fields, 890 m, FPT, leg. M. Sotirova: 02.IX.-01.X.2000 - 1♂ (4.3 mm), 3♀♀ (5.6-6.0 mm)(with eggs); 01.IX.-05.X.2001 - 2♂♂ (4.3-4.5 mm), 5♀♀ (5.5-6.0 mm)(with eggs); above Dragichevsko Ezero, 1130 m, forest/meadow border, 05.XI.2000-07.IV.2001, FPT, leg. M. Sotirova - 1♀ (6.0 mm) (without eggs).

31. *Mitopus morio* (Fabricius, 1779)

Mitopus morio: Beron, 1975: 57 (Vitosha Mt.: "Chalet Aleko"); Staręga, 1976: 354 (West Stara Planina range: "Berg Kom", "Berg Malyk Kom", "Paß Petrohan", "Druževo"; Vitosha Mt.: "Berghütte "Aleko", "Bistriški vodopad", "Bojana", "Bojanski vodopad", "Berg Černi vryh", "Berghütte "Edelvajs", "Berghütte "Fonfon", "Zlatni mostove"); Mitov, 1995b: 69-70 (Vitosha Mt.: "Bai Krustyu"); Mitov, 1997a: 256 (Vitosha Mt.: "Bay Krustyo", "Goli Vruh").

Material examined: 3♀♀, 6 juv.

New localities: West Stara Planina range: Chiprovtsi, county Debledelska Murtvina, at the edge of a *Fagus*-forest, under stones, 1100-1300 m, 28.VII.1998, leg. B. Petrov - 2 juv. (5.3-5.6 mm); the surroundings of hut Kom (the old one), *Picea abies*-forest, 1600-1700 m, 19.VI.1998, leg. B. Petrov - 2 juv. (2.0-4.2 mm); in the region of Vratsa, hut Purshevitsa, 1000-1300 m, 11.-12.VII.1993, leg. P. Beron, MNHS - 1 juv. (5.5 mm); District of Berkovitsa, v. Burziya, *Fagetum*, 19.VII.1968, leg. P. Beron, (MNHS: inv. No. 193) - 1♀; Lyulin Mt.: W of loc. Cherniya Kos, in the region of loc. Bonsovi Polyani, *Carpinus betulus*-forest with grass layer, 1010 m, FPT, 31.V.2002, leg. M. Sotirova – 1 juv. (3.6 mm); Sushtinska Sredna Gora Mt.: in the region of v. Chavdar, *Populus tremula*-forest, FPT, 03.VII.1996, leg. S. Lazarov - 1♀ (6.2 mm)(without eggs); Surnena Sredna Gora Mt.: in the region of Kazanluk, TVK Kavakliyka, 1050 m , loc. Batakluka, deciduous forest, FPT, 21.VII.1982, leg. S. Lazarov - 1♀ (7.0 mm) (with eggs).

32. *Leiobunum rumelicum* Šilhavý, 1965

Leiobunum rumelicum: Staręga, 1976: 347-348 (West Stara Planina range: "Byrzija", "Paß Petrohan", "Druževo", "Berghütte "Ledenika"; Vitosha Mt.: "Berghütte "Aleko", "Bojana", "Bojanski

vodopad", "Berghütte "Edelvajs", "Kopitoto", "Vladaja", "Zlatni mostove"; Lozenska Mt.: "Germanski manastir"; Sushtinska Sredna Gora Mt.: "Koprivštica"); Mitov, 1995c: 2-4 (Vitosha Mt.: "Gelände zwischen Pascha bunar und Kaleto"); Mitov, 1997a: 256 (Vitosha Mt.: "Bay Krustyo", "Goli Vruh"); Mitov, 1997c: 2 (Vitosha Mt.: "über Dragalevtzi").

Material examined: 2♂♂, 1♀, 17 juv.

New localities: West Stara Planina range: Distr. Godech, v. Gintsi, in front of cave Dinevata dupka, ETP, 10.V.-27.IX.1992, leg. B. Dimitrova - 1 juv. (2.7 mm); in the region of Vratsa, hut Purshevitsa, 1000-1300 m, 11-12.VII.1993, leg. B. Petrov - 1♂, 1♀; above Vurshets: near Botunya River, Vegetation: *Fagus* sp., *Alnus* sp., *Quercus* sp., *Pinus nigra* Arn., *Rubus* sp., under stones, 27.VI.2000, leg. P.M. - 1♂, 5 juv. (3.0 mm); loc. Vodopada, near Orlovitsa River, Vegetation: *Alnus* sp., *Crataegus* sp., *Rubus* sp., *Urtica dioica* L., 400-500 m, 28.VI.2000, leg. P.M. - 11 juv. (2.5 mm).

DISSCUSSION

Local fauna

Species assemblages in the urban habitats: U1-U4.

Severen Park (U3), 575 m a. s. l., area: 100 ha (970 dka)

This site is characteristic with a very low abundance of the four harvestmen-species caught using pitfall traps. (Table 2). Additional hand-collecting revealed the presence of another four species, also occurring at low abundances. These are *Carinostoma ornatum*, *Opilio parietinus*, *O. saxatilis* and *Odiellus lendli*, which may be found mainly at the periphery of the park.

This park was created about 40 years ago on agricultural terrain (e. g. vegetable gardens, forest nursery) (see Kovachev, 2001; Radoslavova, 2001). Furthermore, the recent deforestation and the active urban development occuring around this park during the last 30 years, as well as the presense of vast dry grasslands northwards, has led to a relatively strong isolation of the park in comparison to the other parts in this study, and possibly to limit the exchange in species with the relatively more preserved habitats from the lower mountain zone.

Due to the closeness of "Severen Park" to the heavily built up housing estate, a tendency towards a stronger manifesting anthropogenization of the opilionid fauna may be observed – the presence of *Opilio parietinus* on buildings within the territory of the park is an indication of a probable faunal exchange with the heavily urbanised fauna, since the mentioned species is a typical representative of building walls within the central parts of the city of Sofia (Mitov, in prep.). The rest of the species also show preferences to warm climate and under natural conditions are typical forest (*Opilio ruzickai*), open habitat (*Phalangium opilio*, *Odiellus lendli*) or habitat generalist (*Trogulus tricarinatus*, *Carinostoma ornatum*) species. It is most likely that *Odiellus lendli* has invaded the park from the surrounding open grassy habitats; the same may hold true for *Phalanguim opilio*. The latter species prefers open and sunny habitats with a well developed grassy layer, but in the park it also occurs in the grassy ecotones within the forested zones (under stones, on tree trunks and on shrubs). Regardless of the fact that the termophilous and night active species *Zachaeus crista* does not avoid anthropogenically influenced habitats (see Martens, 1978), "Severen Park" is the only park where this

species was not presently found. This phenomenon may be explained with the special microclimatic conditions in this park (e. g. lower temperatures and rainfall (and humidity), frequent and long-lasting temperature inversions, low nightly temperatures during the summer) (see Bluskova *et al.*, 1983). According to Martens (1978) *Opilio saxatilis* occurs in anthropogenically influenced habitats as well, but contrary to *Zachaeus crista*, *O. saxatilis* is ecologically more tolerant (see Avram & Dumitrescu, 1969 (after Weiss, 1975)) and withstands much lower temperatures and humidity. The presence of the parthenogenetic (and probably primary mountaineous species) *Rilaena* cf. *serbica* in the park is of great interest. The shape of its rudimentary *receptacula seminis* is very similar to the populations found on Lyulin and Vitosha Mts. This fact, together with the reports of Stoyanov (1937) about forest corridors that have existed in the territory between these mountains and parts of the present city (e. g. Sukhodol and Konyovitsa), may be an indication that this taxon is a pre-urbanization relict for the city and especially for "Severen Park". However, it is also possible that some of the harvestmen are transported into the areas by humans.

Zapaden Park: "Christo Smirnenski" park area (U2), 525 m a. s. l., area: 48 ha

The park area "Chr. Smirnenski" of Zapaden Park was created between 1934 and 1940 as a tree nursery. In 1961 this part of the park was transformed into a typical park and later, after 1967, the forest-like part was established (Kovachev, 2001). This park is opened only towards its W-SW end and is bordered in this direction by open grassy habitats. This has most probably determined the opilionid taxocoenoses inhabiting the park at present. Here, nine harvestmen species were found, three of them - *Opilio saxatilis*, *O. ruzickai* and *Rilaena* cf. *serbica* – were only found by hand-collecting (see Table 2). The most numerous species is *Zachaeus crista* – here, in comparison to the other parks, it reaches the highest densities. It is known that in areas with a more continental climate *Z. crista* is more strongly adherent to moist and shady habitats (Weiss & Sarbu, 1977). The rest of the species are also thermophilous; some of them are forest-dwellers (*Opilio dinaricus*, *O. ruzickai*, *Rilaena* cf. *serbica*), some are open habitat inhabitants (*Phalangium opilio*, *Odiellus lendli*) and habitat generalists are also represented (*Trogulus tricarinatus*, *Carinostoma ornatum*, *Opilio saxatilis*). Due to the higher temperatures in this part of the city (see Bluskova *et al.*, 1983), finding the opilionid species *Opilio parietinus* and *Lacinius horridus* is highly possible.

Knyaz Borisovata Gradina: Park area (U1) - 550 m a. s. l., area: 88.0 ha

According to data provided by Kovachev (2001, pers. comm.), the terrain on which the park "Knyaz Borisovata Gradina" is situated, was initially constituted by private gardens, vineyards and other agricultural lands. In 1885 the park was established on these, first as a tree-nursery outside the city, and later (between 1892 and 1934) as a typical park (Kovachev, 2001). Presently, "Knyaz Borisovata Gradina" is completely surrounded by urban infrastructure – housing estates and some of the most traffic-loaded highways within the city of Sofia. The northern (and oldest) part of the park is situated almost at the very center of the city, where the air temperatures nearly reach their maximum within the boundaries of the city (see Bluskova *et al.*, 1983), and where it is heavily used for recreational purposes. In contrast, the vegetation of the Southern part of "Knyaz Borisovata Gradina" is much less cultivated and managed and appears much more forest-like (more shady and with more leaf-litter). These conditions reflect the composition of the opilionid fauna as well.

Pitfall traping collected five species here (Table. 2). Additionally, hand-collecting yielded three more species - *Carinostoma ornatum*, *Opilio parietinus* and *O. ruzickai*. The latter occurs only at the periphery of the park (between boulevards "Dragan Tsankov" and "Peyo Yavorov"), on building-walls. The occurrence of *Opilio parietinus*, which may be found mainly on building-walls is an indicator of anthropogenic pressure. This collecting site is also characterised by the extremely low numbers of Opiliones caught using pitfall traps (Table 2). The only exception is, again, *Zachaeus crista* – the collected specimens of this species rank second, right after those caught at U2. This species seem to be much more competitive, compared to other species, and is very successful in colonizing young and fast developing secondary forest habitats.

Although at very low densities, the termophilous *Opilio saxatilis* and *Lacinius horridus* also occur in the park. At densities just below these of *Z. crista*, here may be found *Trogulus tricarinatus*, which inhabits the leaf-litter where it possibly finds suitable shelter and food (Gastropoda) (about the gastropod fauna of the park and the city as a whole, see Dedov & Penev, 2000).

In the more shady and forest-like parts of the park, the parthenogenetic forms *Rilaena* cf. *serbica* may also be found. Most probably, the natural forest-vegetation corridor (consisting mainly of *Quercus*, *Ulmus*, *Fraxinus*, *Acer*, *Populus*, *Corylus*, *Crataegus*, and *Rubus*), that existed until the beginning of the 20th century between the territory of the city and the surrounding mountains (i.e. Vitosha Mts. and Sredna Gora Mts.) (see Stoyanov 1937; Kitanov 1985) permitted this peculiar harvestmen species to become more widespread throughout the southern vicinity of the city (consisting recently of "Loven Park", which contact the Southern part of "Knyaz Borisovata Gradina"). Later, with the destruction of the abovementioned forest massives, these animals perhaps remained isolated within the forested patches left in the city. Nevertheless, the alternative scenario – i .e. that species interchange between these territories have occurred much later, when the park was widely opened southwards (until the second half of the 20th century) to the relatively low-developed region between the city and the surrounding villages (as Dragalevtsi, Simeonovo, and Durvenitsa), is also plausible.

It could be expected that the species *Opilio dinaricus* and *Odiellus lendli* may also be found here in the future.

Knyaz Borisovata Gradina: Forest part (="Loven Park") (U4), 570 m a. s. l., area: 169,570 ha (municipality Izgrev) + 57,764 ha (municipality Lozenets)

Chronologically, this park was created after "Knyaz Borisovata Gradina" and during the first 20 years of the 20th century it served as a tree-nursery, that had to meet later the increased demand for trees along the roads of the intensively growing city after WWII (Kovachev, pers. comm.). "Loven Park" is the closest park to the Vitosha Mt., and is also opened toward the mountain. The Dragalevska River runs through the park and the habitat is more humid and shady, the vegetation is more uncultivated and dense, and the leaf-litter is thicker. Due to its function and distance from the city center, this park is much less anthropogenically influenced. All this may be the reason for the high species richness of the park and for the higher number of forest-specific harvestmen-species that inhabit it.

The pitfall traps yielded a catch of 6 opilionid species (Table 2). Additionally, a further 3 species (i. e. *Lacinius dentiger, L. horridus*, and *Opilio saxatilis*) were hand-collected.

The most numerous species is *Carinostoma ornatum*, followed by *Zachaeus crista* and *Trogulus tricarinatus*. *Carinostoma ornatum* is less vagile and, as a representative of the family Nemastoma-

tidae, requires a higher humidity. Much less abundant here is the photophylic species *Phalangium opilio*, which has probably colonized the park from the surrounding open habitats. Here also occurs the ombrophylic and mesothermophilic *Opilio dinaricus,* a species typical of the dense forest habitats at the lower foothills of the mountains. The same is frue for the species *Lacinius dentiger*.

Rilaena cf. *serbica* is also very sparse in this park. This species has probably colonized this park through "Knyaz Borisovata Gardina" or through the abovementioned forest-corridor that connected the territory of the city with Vitosha Mt.

In the warmer and dry parts of this park, the occurrence of *Opilio parietinus* and *Odiellus lendli* may be expected.

Species assemblages in the non-urban habitats (S1, S2, S4, R1, R2, R3, R4)

Sofia Kettle: near Drenovo Village (R3), 800 m a. s. l.

Despite weak anthropogenic pressures, this habitat is highly isolated, very dry, and in addition provides an insufficent trophic base for supporting a species-rich opilionid fauna. Here, at very low densities, occur only three species typical of warm forest habitats and the plain – *Trogulus tricarinatus*, *Carinostoma ornatum*, and *Zachaeus crista*.

Lyulin Mt.: a forest-patch between "Gorna Banya" residental district and locality Bonsovi Polyani (S2), 900 m a. s. l.

This is a thinner oak-hornbeam forest (8,0 ha) with a relatively well developed grass layer. Its opilionid fauna is represented by 7 species, among which the number of harvestmen with preferences to shady, moist, and cool places is clearly reduced (e. g. *Lacinius ephippiatus*), and, moreover, *Pyza bosnica* is totally absent. On the contrary, here *Trogulus closanicus* dominates. The next most abundant species are *Zachaeus crista* and *Rilaena balcanica*, which are indicators for warm foothill habitats. Here, the parthenogenetic forms of *Rilaena serbica* are scarce, which is probably a result of competition with the other opilionid species in the warmer foothill habitats.

Lyulin Mt.: forest N of locality Bonsovi Polyani (R2), 920 m a. s. l.

This habitat is a similar to the previous oak-hornbeam forest, which is characterized by a more dense tree-vegetation, thicker leaf-litter, and is larger (15,2 ha). This, together with the larger number of microhabitats, probably determines the larger species-richness (8) in comparison to S2. The heavier shade and the river that runs through this forest lead to an decrease (both proportion and abundance) of the warmth-loving species (*Zachaeus crista*, *Opilio dinaricus*) at the expense of the species that prefer shady and moist (*Rilaena balcanica*, *Lacinius ephippiatus*), or cool habitats (*Pyza bosnica*). *Trogulus closanicus* is again the dominating species (but much less abundant in comparison to S2), followed by *Pyza bosnica* and *Trogulus tricarinatus*. Here the parthenogenetic forms of *Rilaena serbica* are very scarce, and the explanation may be the same as already stated above.

Vitosha Mt.: above Vladaya Village (S4), 950 m a. s. l.

In this foot hill forest habitat, only 4 opilionid species were found. Among them, only the thermophilous *Zachaeus crista* dominates (Table 2). Despite the fact that *Trogulus tricarinatus* and

Lacinius horridus are ecologically more tolerant species, at this site they are very scarce. This may be due to a relatively limited trophic basis. In such dry forest habitats the gastropod fauna is poor, and it is well known (Pabst, 1953), that *T. tricarinatus* is strongly associated with it. Besides, the main destructors in decidous forests are members of Lumbricidae and Enchytraeidae, but *Lacinius horridus* feeds on Acari (see Šilhavý, 1956), which together with Collembola are the main decomposers not in the decidous, but in the coniferous forests (Dyilis, 1978; I. Tsonev, pers. comm.).

The reasons for the absence of *Rilaena* cf. *serbica* in this habitat is perhaps a complex one, but the most important are probably 1) lower moisture (indicator of this is also the low density of *Rilaena balcanica*, which prefer moist and shady forest habitats) and 2) competitive exclusion by the dominant of *Zachaeus crista*.

Vitosha Mt.: loc. Tikhiya Kat (R4), 1000 m a. s. l.

In this habitat, natural vegetation predominates, both the tree-density and the diversity of microhabitats are higher, and with the increase in altitude the temperatures naturally decrease. Taking all this into account, it seems easy to predict the observed species richness, which is twice as high as in S4. Ombrophilous and psychrophilous harvestmen species such as *Pyza bosnica*, *Rilaena balcanica*, and *Lophopilio palpinalis* appear, whereas the photophilous (*Phalangium opilio*) and thermophilous species (*Zachaeus crista, Lacinius horridus, Opilio ruzickai*) decrease in abundance. Here, also, hylobiont species such as *Lacinius dentiger* occurs, which prefers moderately warm and moist forest habitats in the oak-hornbeam zone of Vitosha Mt.

It is important to note that in this habitat the cold-resistant parthenogenetic forms of *Rilaena* cf. *serbica* are the most abundant opilionids. As already mentioned, this is a species of mountaineous origin and occurs only in these investigated habitats, which are mountaneous (S2, R2, R4) or in those (U1, U3, U4) that are known to have been connected to mountains in the past (see Stoyanov, 1937; Kitanov, 1985).

Lozenska Mt.: German Village (S1), 650 m a. s. l.

S1 is a small (1,9 ha) secondary forest that is relatively isolated from the other forest habitats through dry open grasslands. Due to this, the species assemblage (6 species) is composed of thermophilous and ecologically tolerant species and do not differ from those occurring in the region of the Sofia Kettle and the city parks (Table 2). The only exception is *Rilaena balcanica*, which prefers habitats in the oak-hornbeam zone of the mountains and may be considered as an indicator species of the shady and moist forests of the mountain foothills. In this forest, these conditions are met and here *Rilaena balcanica* probably finds necessary shelter and food. Among the species that may be found in S1, only *Phalangium opilio* and *Opilio saxatilis* prefer open lands and tend to migrate seasonally from the surrounding grasslands into the forest, where they may find shadow, shelter and food. In this opilionid assemblage, *Zachaeus crista* dominate, thus showing again clear preferences for young forest habitats at the mountain foothills.

Lozenska Mt.: German monastery (R1), 850 m a. s. l.

This is an oak-hornbeam forest, much larger than S1 (18 ha), and offers thus a more diverse spectrum of microhabitats to the Opiliones. These characteristics, combined with the more dense

tree stand and the more stable moisture conditions, is reflected in the species composition of the harvestmen assemblage at R1. The traps yielded 8 species, and the hand-collecting added a further species to the list (Table 2). Among them, indicators for shady and moist forest-habitats at the foothills are mainly *Histricostoma drenskii* and *Rilaena balcanica*, as well as *Opilio dinaricus,* and the more ecologically tolerant *Opilio ruzickai* and *Lacinius dentiger*. Photophilous species, as for example *Phalangium opilio*, are scarce. Here the most abundant harvestmen species is *Trogulus tricarinatus*, which, at the foothills, prefers mainly forest habitats, where it finds shelter, moisture, and food (snails) among the leaf-litter. *Rilaena balcanica* and *Zachaeus crista* are ranked respectively second and third in abundance. The above-mentioned fauna that include species which prefer higher temperatures, species that show preferences toward cool microclimate and higher moisture, as well as species that are more tolerant with respect to ecological conditions, directly reflect the combination of climatic peculiarities of the Sofia Kettle and of Lozenska Mt. (see Bluskova *et al*., 1983; Nikolov & Yordanova, 1997).

Local fauna in the context of the regional species pool

When examining the ordination diagram of the sites (regions and sampled localities) (Fig. 1A), it is evident the clearly differentiated cluster containing the mountain massifs enclosing the Sofia Kettle from north and south (including the regions SG, SPW, and V). This region-group posseses a high species richness, mainly due to the contribution of more locally restricted species (*N. bidentatum sparsum*, *M. chrysomelas*, *D. scabrum*, *P. radewi*, *R. olympica*, *M. morio*, *L. rumelicum*) (Fig. 1B). Additionally, there occur species that are distributed throughout other regions (e. g. Lyulin Mt., "L" on Fig. 1A) – *Tr. closanicus*, *L. epphipiatus*, *P. bosnica*, *L. palpinalis*, and *H. drenskii*, for example. A much inferior position in the fauna of this mountain-group possess species that inhabit the lower altitudes and the lowlands (*Z. anatolicus*, *E. convexus*) (Fig. 1B).

In the second, much less differentiated cluster, fall the region of the Lyulin Mt. (L), together with the localities S4, R4 (both geographically within Vitosha Mt.), R1 (geographically within Sredna Gora Mt.), and the two localities R2 and S2 (both geographically within Lyulin Mt.). One of the striking peculiarities within this cluster is the placement of locality R4 closer to L than to V (to which it belongs geographically). This situation may be attributed to the natural heterogeneity of the latter region, which is currently a National Park and thus quite well conserved. Another interesting feature, observed in Fig. 1, is the even much farther placement of S4 relative to its geographical origin. This "behavior" is most probably related to the faunal heterogeneity of the region, which is closely related to the anthropogenic pressure since it is still strongly tangible at S4 (for a more detailed description of S4 see Penev *et al.* this volume). The close relationship of R1 (quite well separated on the plot from its geographical region – Sredna Gora Mt.) with this and its affinities to the next site/region cluster, is probably due to the effects of the abovementioned trends – i.e. this could be a result of the natural heterogeneity of the larger region, to which this site pertains, or due to the anthropogenically induced faunal transformation that is also quite well notable there. The same may be valid for the two localities within the Lyulin Mt. – R2 and S2 – which possess an opilionid fauna that is generally non-representative of the mountain, but nevertheless, on the ordination diagram the less influenced locality (R2) is still placed closer to its region. The position of the only region in this cluster – Lyulin Mt. itself – indicates the existence

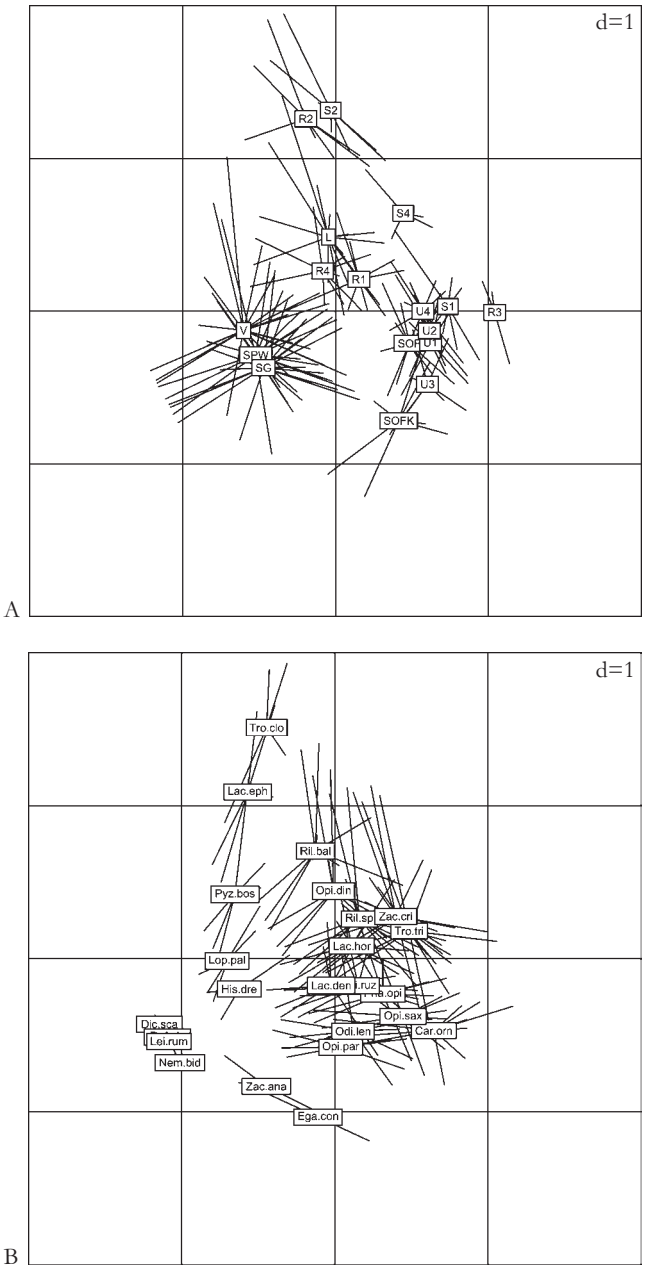

Figure 1. Reciprocal scaling of sample diversity (A) and opilionid species tolerance (B) after a correspondence analysis (CA). The relative values of sample (locality, region) diversity and species tolerance may be inferred from the spread of "stars" centered at the corresponding label.

of a transitional zone on a gradient from the Sofia Kettle to the surrounding high mountains. This gradient is most probably a result of the mixed influence of both the orography of the investigated area, and the anthropogenically induced transformation and subsequent degradation of the forest vegetation in the region. As support for this statement, the relative positioning of S2 and R2 may be used. At these localities, as already mentioned – quite isolated from their geographical region, a (to a different degree) typical mezophylous forest opilionid fauna (*Tr. closanicus*, *O. dinaricus*, *L. ephippiatus*, *R. balcanica*, and *P. bosnica* among others) (Fig. 1B) survived mainly due to the more conserved forest vegetation and soil in this part of Lyulin Mt.

The third cluster obvious from the diagram is centered around the regions of the city of Sofia and the Sofia Kettle (SOF, SOFK). The sites forming this cluster are inhabited by open-habitat, highly ecologically tolerant harvestmen species that are relatively eurytopic – *O. parietinus*, *O. saxatilis*, *C. ornatum*, *O. ruzickai*, *Ph. opilio*, *Tr. tricarinatus*, and *Z. crista* (Fig. 1B). Due to these characteristics, these species are also relatively resistant to anthropogenic influences and some of them are the only representatives of Opiliones that are found in the very urban center of the city of Sofia (Mitov, in prep.). The strong clumping of the park-localities (U1, U2, U4) around SOF on the ordination diagram indicates that the fauna of the city is very homogeneous as a result of the strongly impoverished opilionid fauna. The extreme example for such faunal impoverishment represents the highly isolated and dry locality R3 (geographically at the transition between the Sofia Kettle and the foothills of Western Stara Planina Mts.) which is inhabited by only three, relatively eurytopic harvestmen species. Further, the fauna of the Sofia Kettle may be considered as a relatively well delimited unit within the transition-zone between the fauna of the city and that of the surrounding high mountains, being in close geographical and faunistic relationships with the local fauna of U3 (Severen Park).

Finally, it is noteworthy that the overall structure of the ordination diagram of regions and localities (Fig. 1A) almost exactly approaches the picture obtained by the ordination of the faunistic structure that possess all the characteristics of a "nested subset" (about nested subsets see details in Atmar & Patterson, 1993). Moreover, a preliminary analysis (Stoyanov, unpublished data) in this respect has shown that the resulting pattern is extremely highly-ordered – thus providing more evidence that the observed species-diversity pattern most probably originates from heavy fragmentation processes that have occurred within faunistically structured landscape.

Origin and characteristics of the opilionid fauna of the Sofia Kettle and the City of Sofia

In the past, the territory of the Sofia Kettle was covered with dense deciduous forests (*Quercus, Ulmus, Acer, Carpinus, Populus, Corylus* and other), which extended to the foothills of the surrounding mountains, and survived until the 18th century (Stoyanov, 1937). Considering this, and bearing in mind our knowledge on the biology, ecology and recent distribution of harvestmen in Bulgaria, it may be suggested that the historical fauna of the Sofia Kettle was not much different from the fauna of the foothills of the surrounding mountains, and has included mainly species inhabiting forest habitats, forest meadows and moist riverside vegetation communities.

The destruction of forests in the Kettle as a result of human activities, and the gradual transformation of the forested landscape into a steppe-like habitat (Stoyanov, 1937), accompanied

with further transformation of parts of this newly-created habitat into ruderal lands with the ongoing development of the city (Avramova, 1956), has led most probably to a strongly impoverished and altered opilionid fauna. The species that prefer moist and shady habitats (e. g. representatives of *Paranemastoma, Pyza, Histricostoma, Mitostoma*, *Rilaena balcanica*) as well as the slightly more ecologically tolerant species that are associated with a broader spectrum of forest habitats (e. g. forest meadows) (e. g. *Trogulus closanicus, Dicranolasma scabrum*) have disappeared. The thermophilous species and species resistant to dry conditions, with better dispersal abilities, have survived and have come to dominate the newly created habitats. It is most likely, that in the forest-remnants and in the riverside vegetation, some small-bodied and ecologically tolerant trogulid and nemastomatid species (as e. g. *Carinostoma ornatum*, *Trogulus tricarinatus*) able to occupy very confined habitats with condensed moisture, as well as larger and more agile forest-dwelling species from the family Phalangiidae (*Opilio ruzickai*, *O. dinaricus*, *Lacinius dentiger*, *Rilaena cf. serbica*), have retained some of their populations or have established new ones after secondary migrations.

During the 1940's, the forest habitats in the Sofia Kettle were already very rare (Stoyanov, 1937). The period of creation of the tree-nurseries, gardens and parks in Sofia (about 40-116 years ago (see Kovachev, 2001)) coincides with the disappearance of the last forest-remnants in the Sofia Kettle. The latter is already entirely transformed into a patchwork of diverse antropogenic habitats and the harvestmen-species that inhabit it are almost identical to these that colonize the newly established tree-nurseries and park areas within the city of Sofia. This may be a reason for the high similarity of the fauna of the city of Sofia and that of the Sofia Kettle (Fig. 1A).

When declared a capital in 1879, Sofia covered an area of only 250 ha, and was inhabited by 11500-18000 citizens (Kovachev, 2001). The territories north of Vladayska River and east of Perlovska River were agricultural (Kovachev, 2001). With the increased population migration towards the city and as a result of intensive building, the city has grown "like an ink-spot" (Kovachev, pers. comm.). Many former villages fused into the growing city, becoming part of it and part of the former agricultural lands were covered with new buildings, gardens, parks and nurseries. So the harvestmen, originally inhabiting open grasslands and degraded forest habitats outside the boundary of the city (for examples of such habitats see the pictures in Takhov, 1987), faced new habitat-types with a much lower trophical basis, higher temperatures, and lower humidity. These harsh habitat conditions have caused, most probably, higher mortality rates throughout the affected opilionid populations and the affected animals have tried to minimize such effects by migration into the newly-created parks and nurseries, while the synanthropic forms have found appropriate food and shelter in the gardens, on building-walls, and in the interior of houses and cellars.

The favourable habitats in the city were colonized by the harvestmen most probably directly, from the surrounding open environments, through the riverside habitats, and also through the forest remnants that have connected the territory of the city with the surrounding mountains (mainly Lyulin, Vitosha, and Stara Planina). Direct evidence supporting this hypothesis is the faunal similarity between the mentioned regions (Fig. 1A). Part of the species are probably transferred into the city and its park areas through planting (e. g. saplings (see Vekov, 1983)) and/or building (stones, timber, soil) materials.

To draw a general conclusion, the opilionid fauna of the city of Sofia has most likely been formed under the outlined abovementioned conditions of anthropogenic pressure, in combina-

tion with the gradually increasing air temperature within the borders of the city, and accompanied by a severe loss of primary plant communities representing the vanishing natural habitats. The fauna may thus be considered as a result of adaptation of the impoverished fauna of the Kettle to secondary forest and park areas (currently the city parks cover 901,608 ha, or 21.03% of the green area within the city of Sofia (see Kovachev, 2001)).

CONCLUSIONS

To summarise, we draw the following conclusions concerning the opilionid fauna of the city of Sofia and its surroundings:

1) The fauna of the city of Sofia includes only 12 of the 32 species that inhabit the territory of the Sofia Kettle and the surrounding mountains. It is clearly differentiated, and is most similar to the fauna of the Sofia Kettle.
2) The fauna of the city is characterized by: the presence of: a) ecologically tolerant species that resist higher temperatures and lower humidity (e. g. *Phalangium opilio, Opilio saxatilis, Lacinius horridus*); b) species that may inhabit diverse habitats (open/forest, ruderal, buildings) and may switch to different habitats with an increase in altitude (e. g. *Trogulus tricarinatus, Carinostoma ornatum, Odiellus lendli, Rilaena* cf. *serbica, Zachaeus crista*); c) species that possess high agility, and respectively high dispersal abilities (e. g. *Phalangium opilio, Opilio parietinus, O. ruzickai, O. dinaricus, Zachaeus crista, Lacinius dentiger*); d) thermophilous species that may adapt more easily to anthropogenic habitats (e. g. *Opilio parietinus*, *O. ruzickai, Lacinius dentiger*, *Phalangium opilio*, and *Opilio saxatilis,* which occur on building-walls (Staręga, 1976; Klimeš, 1987; Komposch, 1993, 1997), as well as *Lacinius horridus* and *Zachaeus crista*, which are often found in anthropogenically influenced habitats (Martens, 1978). Here was also mention *Odiellus lendli*, which (in Bulgaria) occurs also in fields and rarely on building-walls in the city-parks. As is known (Klausnitzer, 1990), some species with southern origins show signs of anthropogenization toward the northern parts or the margins of their distributions. Higher temperatures within the cities[6] is important here.
3) The effect of urbanization manifest mainly in the absence of species that prefer shady, moist and cool habitats (examples are *Paranemastoma*, *Nemastoma*, *P. bosnica, Histricostoma drenskii, Mitostoma chrysomelas, Rilaena balcanica, Lacinius ephippiatus,* and *Lophopilio palpinalis*). The low humidity, typical for urban habitats and the remote mountain regions, prevented their dispersal and/or survival within the boundary of the city.
4) The urban opilionid fauna has been formed as a result of the adaptation of the highly impoverished fauna of the Sofia Kettle to the secondary vegetation in the parks that replaced the forests under conditions of anthropogenic pressure (forest fragmentation and deforestation), accompanied by a gradual increase in temperatures in the city and the appearance of new habitats.

[6] Bluskova *et al.* (1983) have shown that the mean annual temperature in the centre of Sofia is about 0.7-0.8°C higher in comparison to the city surroundings. Moreover, the mean nightly temperature is also 1.5°C higher because of slower air-cooling processes in the city.

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