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# FAUNISTIC DIVERSITY AND ZOOGEOGRAPHY OF CAVE-DWELLING SPIDERS ON THE BALKAN PENINSULA

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*Abstract* — A total of 326 species from 115 genera and 31 families of Araneae have been established in caves of the Balkan Penisula so far. The species are distributed in different territories as follows: Bulgaria – 99; Greece (Mainland) – 72; Greece (Insular part) – 16; Crete – 44; Croatia – 63; Serbia – 59; Bosnia – 52; Macedonia – 44; Montenegro – 44; Slovenia – 43; Albania – 10; Turkey – eight; and Romania – four species. The largest number of troglobites are encountered in the Dinaric region – 113 (39 blind), Pindus region – 32 (eight blind), Thracian-Macedonian region – 18 (four blind), Balkanid region – 13 (two blind), Danubian region — one; and North Dobruja region — four (three blind) species. The extreme richness of troglobitic spiders in these regions leads to the assumption that these were major centers of speciation and evolution of species. On the basis of their current distribution, the established 324 species can be classified into 17 zoogeographical categories, grouped into four complexes (widely distributed, European, Mediterranean, and Balkan endemics). The largest number of species belong to the group of Balkan endemics (56.5%), which are also the most characteristic and reflect the local character of the fauna. This phenomenon can be regarded as a result of the relative isolation of the mountains compared with the lowlands in the context of paleo-enviromental changes since the Pliocene. Thus, the Balkan Peninsula can be considered as the main center of speciation for the European cave fauna.

*Key words:* Araneae, cave-dwellers, troglobites, zoogeography, Balkan Peninsula

## INTRODUCTION

The Balkan Peninsula is a region with an extremely rich and diversified cave fauna. The group of spiders is characterized by considerable species richness and also by the presence of many endemics, at both the genus and species levels. The spider fauna has been comparatively well studied due to the efforts of many araneologists from different countries. The earliest data were published by Schiødte (1847), Keyserling (1862), Pavesi (1876), Simon (1885), Kulczyński (1903, 1914), Nosek (1903, 1905), Absolon (1912), Absolon and Kratochvíl (1932, 1933), Fage (1913, 1919, 1931, 1945), Roewer (1928, 1931), Reimoser (1919, 1928, 1929), Stojićević (1929), Drensky (1931, 1936), Kratochvíl (1933, 1934, 1935, 1936, 1938 a, 1938 b, 1939, 1978), Kratochvíl and Miller (1938, 1939, 1940), and Hadjissarantos (1940). More recent publications include those

of Brignoli (1971a, 1971b, 1971c 1972, 1974a, 1974b, 1974c, 1976, 1977, 1978, 1979, 1980, 19784), Ćurčić et al. (2000, 2004), Deeleman-Reinhold (1971a, 1971b, 1976, 1977a, 1977b, 1977c, 1978a, 1978b, 1983, 1985, 1993), Deeleman-Reinhold and P. R. Deeleman (1980, 1988), Deltshev (1972a, 1972b, 1972c, 1977a, 1977b, 1978, 1979, 1980, 1983, 1993, 1996, 1999, 2000, 2003), Deltshev and Ćurćić (1997, 2002), Deltshev et al. (1996, 2003, 2007), Deltshev and Petrov (2008), Dumitrescu and Georgescu (1977, 1980, 1981), Dumitrescu and Miller (1962), Gasparo (1999, 2003, 2004a, 2004b, 2005a, 2005b, 2006), and Platnick (2008). These contributions are the result of intensive faunistic research, and the accumulation of new data is now sufficient to allow a critical zoogeographical analysis of the distribution of spiders established in the caves of the Balkan Peninsula.

## STUDY AREA AND MATERIALS

The Balkan Peninsula is situated in the southeastern part of Europe. As defined here, its northern border follows the rivers Danube (including its delta), Sava, and Soča; runs through Gorizia and Monfalcone; and reaches the line of the Gulf of Trieste. Its western border follows the line of the Adriatic and Ionian coasts, including the islands. The eastern border passes to the east of the Aegean islands of Sirina, Astipalea, Amorgos, Miconos, Tinos, Andros, Skiros, Limnos, and Imros; continues along the Dardanelles; crosses the Sea of Marmara; and reaches the Black Sea coast via the Bosphorus. The southernmost points of the peninsula are Crete and the islands of Gavdos, Aiduronisi, and Kufonisi (Fig. 1).

The geographical areas and associated abbreviations used in the text are shown in Fig. 1.

Data on general zoogeographical distribution are taken mainly from Platnick (2008). The zoogeographical categories used and their abbreviations are as follows: WD - widely distributed; COS - cosmopolitan; H- Holarctic; P - Palearctic; WP - West Palearctic; ECA - European-Central Asian; E - European; MEE - Middle East- European; MSEE - Middle Southeast European; EE - East European; SE - South European; SEE - Southeast European; M - Mediterranean; EM - East Mediterranean; NM - North Mediterranean; NEM - Northeast Mediterranean; BK – Balkan; BKA - Balkan-Anatolian.

## RESULTS AND DISCUSSION

**Species composition** - The spiders established in caves of Balkan Peninsula are represented by 326 species, included in 115 genera and 31 families (Table 1). This number was established after a critical review of all available records from the literature concerning the spiders found in caves of the Balkan Peninsula. The species are distributed in different territories as follows: Bulgaria – 99; Greece (Mainland) – 72; Greece (Insular part) – 16; Crete – 44; Croatia – 63; Serbia – 59; Bosnia – 52; Macedonia – 44; Montenegro – 44; Slovenia – 43; Albania – 10; Turkey – eight and Romania – four species. This richness, however, depends not only on the size of the

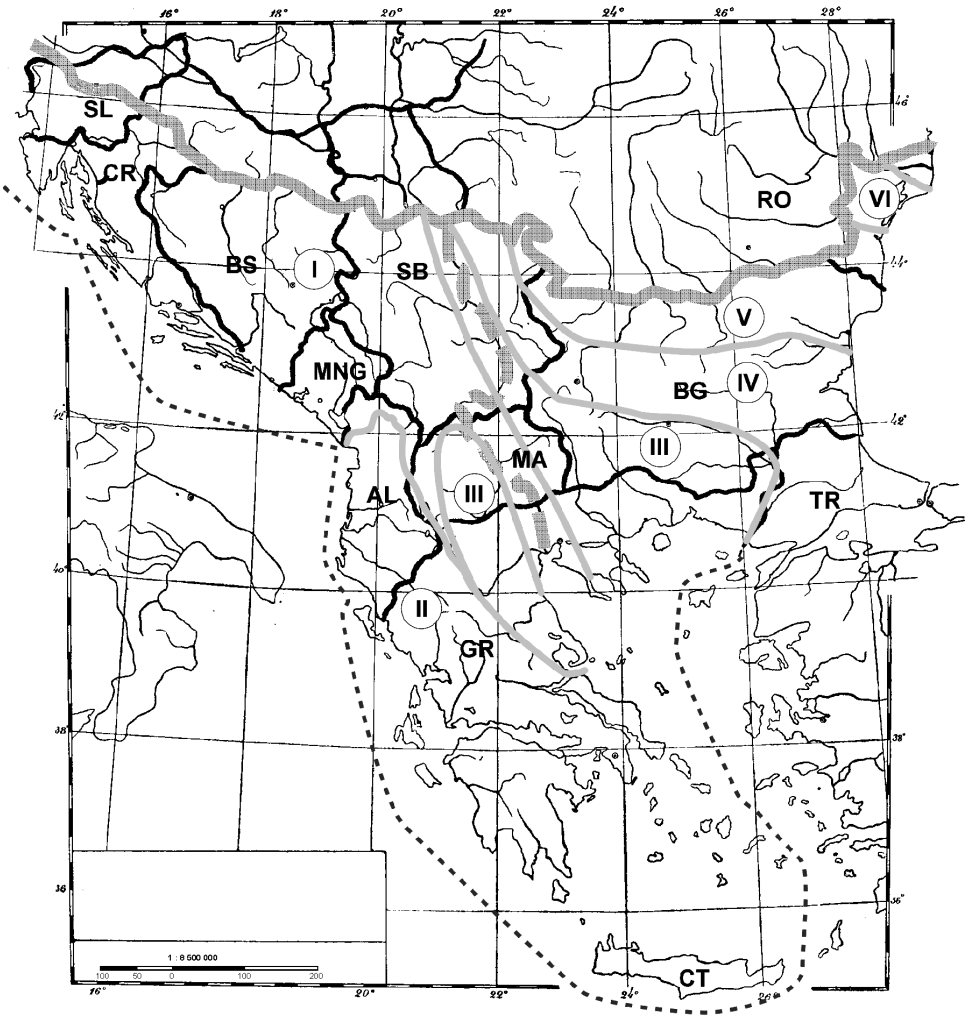


**Fig. 1.** Geographic Division of the Balkan Peninsula.
I - Dinaric region, II - Pindus region, III - Tracian-Macedonic region, IV - Balkanid region, V - Danubian plain region, VI - North-Dobroudzha region.
SL - Slovenia, CR - Croatia, BS - Bosnia, MNG - Montenegro, AL - Albania, GR - Greece, CT - Crete, SB - Serbia, MA - Macedonia, BG - Bulgaria, RO - Romania, TR - Turkey.

Border between Eastern and Western part of the Balkan peninsula
Borders of main geographic regions
Borders of Balkan countries
Borders of Balkan peninsula aquatory

regions, but also on the degree of exploration (Table 1). The territories of Albania and the Balkan part of Turkey have been less explored.

The genera with the most species are: *Troglohyphantes* (51), *Tegenaria* (15), *Centromerus* (13), *Histopona* (12), *Sulcia* (10), *Palliduphantes* (10), and *Lepthyphantes* (eight). The genus *Troglohyphantes* is a remarkable faunistic phenomenon, since

**Table 1.** Species composition of cave-dwelling spiders (Araneae) on the Balkan Peninsula

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Cyrtaucheniidae** | | | | | | | | | | | | | | | |
| *Cteniza moggridgei* O.P.-Cambridge, 1874 | | | | | | | | | | x | | | | tx | NM |
| *Cyrtocarenum grajum* (C. L. Koch 1836) | | | | | | | | | | x | x | x | | tx | BK |
| **Filistatidae** | | | | | | | | | | | | | | | |
| *Filistata insidiatrix* (Forskoel, 1775) | | | | | | | | | | x | | | | tx | M |
| **Sicaridae** | | | | | | | | | | | | | | | |
| *Loxosceles rufescens* (Dufour, 1820) | | | | | | | | | | x | x | x | | tx | COS |
| *Scytodes thoracica* Latreille, 1804 | | | | | x | | x | x | | x | | x | | tx | H |
| **Leptonetidae** | | | | | | | | | | | | | | | |
| *Barusia insulana* (Kratochvíl & Miller, 1939) | | | | | | x | | | | | | | | tb | BK |
| *Barusia maheni* (Kratochvíl & Miller, 1939) | | | | | | x | | | | | | | | tb | BK |
| *Barusia korculana* (Kratochvíl & Miller, 1939) | | | | | | x | | | | | | | | tb | BK |
| *Barusia hofferi* (Kratochvíl, 1935) | | | | | | | | x | | | | | | tb | BK |
| *Barusia laconica* (Brignoli, 1974) | | | | | | | | | | x | x | | | tb | BK |
| *Cataleptoneta sengleti* (Brignoli, 1974) | | | | | | | | | | | | x | | tbb | BK |
| *Leptonetela strinatii* (Brignoli, 1976) | | | | | | | | | | x | | | | tb | BK |
| *Leptonetela andreevi* Deltshev, 1985 | | | | | | | | | | | x | | | tb | BK |
| *Leptonetela thracia* Gasparo | | | | | | | | | | x | | | | tb | BK |
| *Leptonetela kanellisi* (Deeleman-Reinhold, 1971) | | | | | | | | | | x | | | | tb | BK |
| *Protoleptoneta beroni* Deltshev, 1977 | | x | | | | | | | | | | | | tb | BK |
| *Protoleptoneta bulgarica* Deltshev, 1972 | | x | | x | | | | | | | | | | tb | BK |
| *Sulcia cretica* Fage, 1945 | | | | | | | | | | | | x | | tb | BK |
| *Sulcia armata* Kratochvíl, 1978 | | | | | | | | x | | | | | | tb | BK |
| *Sulcia nocturna* Kratochvíl, 1938 | | | | | | x | | | | | | | | tbb | BK |
| *Sulcia cretica violacea* Brignoli, 1974 | | | | | | | | | | x | x | | | tb | BK |
| *Sulcia orientalis* Kratochvíl, 1914 | | | | | x | | | | | | | | | tb | BK |
| *Sulcia oculta* Kratochvíl, 1938 | | | | | x | | | | | | | | | tb | BK |
| *Sulcia montenegrina* (Kratochvíl, 1938) | | | | | | | | x | | | | | | tb | BK |
| *Sulcia mirabilis* Kratochvíl, 1938 | | | | | | | | x | | | | | | tb | BK |
| *Sulcia inferna* Kratochvíl, 1938 | | | | | | x | | | | | | | | tbb | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Sulcia cretica lindbergi* Dresco, 1962 | | | | | | | | | | x | | | | tb | BK |
| **Pholcidae** | | | | | | | | | | | | | | | |
| *Holocnemus pluchei* (Scopoli, 1763) | | x | x | | | x | x | x | x | x | | | | tph | M |
| *Hoplopholcus minotaurinus* Senglet, 1971 | | | | | | | | | | | | x | | tph | BK |
| *Hoplopholcus forskali* (Thorell, 1871) | | x | x | x | | x | | | | | | | x | tph | SEE |
| *Hoplopholcus figulus* Brignoli, 1971 | | | | | | | | | | | x | | | tph | BK |
| *Hoplopholcus labyrinthi* (Kulczyński, 1903) | | | | | | | | | | | | x | | tph | BK |
| *Pholcus opilionoides* (Schrank, 1781) | | x | x | x | x | x | x | x | | x | x | x | x | tph | H |
| *Pholcus phalangioides* (Fuesslin, 1775) | | x | x | x | x | x | x | x | | x | x | x | x | tph | COS |
| *Pholcus creticus* Senglet, 1971 | | | | | | | | | | x | | x | | tph | BK |
| *Spermophora senoculata* Duges, 1836 | | | x | | | | | x | | | | x | | tph | H |
| *Stygopholcus skotophilus* Kratochvíl, 1940 | | | | | x | | | | | | | | | tb | BK |
| *Stygopholcus absoloni* (Kulczyński, 1914) | | | | | x | x | | | | | | | | tb | BK |
| *Stygopholcus photophilus* (Senglet, 1971) | | | | | | | | | | x | x | x | | tb | BK |
| *Stygopholcus skotophilus montenegrinus* Kratochvíl, 1940 | | | | | | | | x | | | | | | tb | BK |
| **Segestridae** | | | | | | | | | | | | | | | |
| *Segestria florentina* (Rossi, 1790) | | | | | | | | | | | | x | | tx | WP |
| *Segestria sbordonii* Brignoli, 1984 | | | | | | | | | | x | | x | | tx | BK |
| *Segestria senoculata* (Linné, 1758) | | | | | | | | | | | x | | | tx | P |
| **Dysderidae** | | | | | | | | | | | | | | | |
| *Dysdera longirostris* Doblika, 1853 | | | | x | | | | | | | | | | tx | EE |
| *Dysderokrates storkani* (Kratochvil, 1935) | | | | | | | | x | | | | | | tx | BK |
| *Dysdera crocota* C.L. Koch, 1839 | | | x | | x | | | | | | | x | | tx | COS |
| *Dysderocrates marani* Kratochvíl, 1937 | | | | | | | | | | | | x | | tph | BK |
| *Dysdera ninnii* Canestrini, 1868 | | | | | | | | | | x | | | | tx | MSEE |
| *Dysdera pretneri* Deeleman-Reinhold, 1988 | | | | | | | | | | | | | | tx | BK |
| *Dysderocrates silvestris* Deeleman-Reinhold, 1988 | | | | x | | | | x | | | | | | tx | BK |
| *Dysderocrates gasparoi* Deeleman-Reinhold, 1988 | | | | | | | | | | | x | | | tx | BK |
| *Folkia boudewijni* Deeleman-Reinhold, 1993 | | | | | | x | | | | | | | | tbb | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Folkia haasi* (Reimoser, 1929) | | | | | | x | | | | | | | | tbb | BK |
| *Folkia inermis* (Absolon & Kratochvíl, 1932) | | | | | | x | | | | | | | | tbb | BK |
| *Folkia mrazeki* (Nosek, 1905) | | | | | | | | x | | | | | | tbb | BK |
| *Folkia pauciaculeata* (Fage, 1943) | | | | | | x | | | | | | | | tbb | BK |
| *Harpactea strinatii* Brignoli, 1979 | | | | | | | | | | x | | | | tbb | BK |
| *Harpactea rubicunda* (C.L. Koch, 1839) | | | | | | | | | | x | | | | tx | E |
| *Harpactea* pr. *inserta* Brignoli, 1979 | | | | x | | | | | | | | | | tx | BK |
| *Harpactea babori* (Nosek, 1905) | | x | | | | | | | | | | | | tph | BAN |
| *Harpactea catholica* (Brignoli, 1984) | | | | | | | | | | | | x | | tph | BK |
| *Harpactea abantia* (Simon, 1884) | | | | | | | | | | x | | | | tph | BK |
| *Harpactea corinthia* Brignoli, 1984 | | | | | | | | | | x | | | | tph | BK |
| *Mesostalita comottii* Gasparo, 1999 | | | | | | x | | | | | | | | tbb | BK |
| *Mesostalita Kratochvíli* Deeleman-Reinhold, 1971 | | | | | x | | | | | | | | | tbb | BK |
| *Mesostalita nocturna* (Roewer, 1931) | | | | | | | | | | | | x | | tbb | BAP |
| *Minotauria fagei* (Kratochvíl, 1970) | | | | | | | | | | | | x | | tbb | BK |
| *Minotauria attemsi* Kulczyński, 1903 | | | | | | | | | | | | x | | tb | BK |
| *Parastalita stygia* (Joseph, 1882) | | | | | x | x | x | | | | | | | tbb | BK |
| *Rhode aspinifera* (Nikolić, 1963) | | | | | | | x | | | | | | | tbb | BK |
| *Rhode subterranean* (Kratochvíl, 1935) | | | | | x | | | | | | | | | tbb | BK |
| *Rhode magnifica* Deeleman-Reinhold, 1978 | | | | | | | | x | | | | | | tb | BK |
| *Rhode stalitoides* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tbb | BK |
| *Rhodera hypogea* Deeleman-Reinhold, 1989 | | | | | | | | | | | | x | | tbb | BK |
| *Stalagtia hercegoviensis* (Nosek, 1905) | | | | | x | x | | | | | | x | | tbb | BK |
| *Stalagtia skadarensis* Kratochvíl, 1970 | | | | | | | | x | | | | | | tbb | BK |
| *Stalagtia Kratochvíli* Brignoli, 1976 | | | | | | | | | | x | | | | tb | BK |
| *Stalagtia monospina* (Absolon & Kratochvíl, 1932) | | | | | | | | x | | | | | | tbb | BK |
| *Stalita taenaria* Schiødte, 1847 | | | | | | x | x | | | | | | | tbb | BAP |
| *Stalita pretneri* Deeleman-Reinhold, 1971 | | | | | | | x | | | | | | | tbb | BK |
| *Stalita inermisfemur* Roewer, 1928 | | | | | | x | | | | | | | | tbb | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Stalita hadzii* Kratochvíl, 1934 | | | | | | | x | | | | | | | tbb | BK |
| *Stalitella noseki* Absolon & Kratochvíl, 1932 | | | | | x | | | | | | | | | tbb | BK |
| **Oonopidae** | | | | | | | | | | | | | | | |
| *Oonops mahnerti* Brignoli, 1974 | | | | | | | | | | x | | | | tx | BK |
| **Mimetidae** | | | | | | | | | | | | | | | |
| *Ero flammeola* Simon, 1881 | | | | | | | | | | x | | | | tx | NM |
| **Eresidae** | | | | | | | | | | | | | | | |
| *Eresus cinnaberinus* (Olivier, 1789) | | | | x | | | | | | x | | | | tx | E |
| **Uloboridae** | | | | | | | | | | | | | | | |
| *Uloborus plumipes* Lucas, 1846 | | | | | | | | | | x | | | | tx | COS |
| **Nesticidae** | | | | | | | | | | | | | | | |
| *Carpathonesticus parvus* (Kulczyński, 1914) | | | | | x | | | | | | | | | tb | BK |
| *Nesticus beroni* Deltshev, 1973 | | x | | | | | | | | | | | | tbb | BK |
| *Nesticus beshkovi* Deltshev, 1979 | | | | | | | | | | | | x | | tbb | BK |
| *Nesticus cellulanus* (Clerck, 1758) | | x | x | x | x | x | x | x | x | x | | x | x | tph | H |
| *Nesticus eremite* Simon, 1879 | | x | | | x | x | x | | x | x | | | | tb | SE |
| *Nesticus henderickxi* Bosselaers, 1998 | | | | | | | | | | | | x | | tbb | BK |
| *Nesticus fagei* Kratochvíl, 1933 | | | | | x | | | x | | | | | | tb | BK |
| *Nesticus speluncarium* Pavesi, 1873 | | | | | x | | | x | | | | | | tb | SE |
| *Nesticus arensdorffi* Kulczyński, 1914 | | | | | x | | | x | | | | | | tb | BK |
| *Typhlonesticus absoloni* (Kratochvíl, 1933) | | | | | | | | x | | | | | | tbb | BK |
| **Theridiidae** | | | | | | | | | | | | | | | |
| *Enoplognata ovata* (Clerck, 1757) | | x | | | | | | | | | | | | tx | H |
| *Episinus cavernicola* Kulczyński, 1897 | | | | | | x | x | | | | | | | tph | BK |
| *Episinus maculipes* Cavanna, 1876 | | x | | | | | | | | | | | | tx | E |
| *Marianana mihaili* Georgescu, 1989 | x | | | | | | | | | | | | | tb | BK |
| *Pholcomma gibbum* (Westring, 1851) | | x | | x | | | | | | x | | | | tx | WP |
| *Robertus frivaldszkyi* (Chyzer, 1894) | | x | | | | | | | | | | | | tx | SEE |
| *Robertus lividus* (Blackwall, 1836) | | x | | x | | | | | | x | | | | tx | H |
| *Steatoda bipunctata* (Linnaeus) | | x | | | | | | | | | | | | tx | H |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
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| *Steatoda triangulosa* (Walckenaer, 1802) | | x | x | x | x | x | x | x | | | x | x | | tx | COS |
| *Steatoda grossa* (C.L. Koch, 1838) | | x | | | | x | | | | | x | x | | tx | COS |
| **Anapidae** | | | | | | | | | | | | | | | |
| *Zangherella relicta* (Kratochvíl, 1935) | | | | | | | | x | | | | | | tb | BK |
| **Linyphiidae** | | | | | | | | | | | | | | | |
| *Antrohyphantes balcanicus* (Drensky, 1931) | | x | | | | | | | | | | | | tb | BK |
| *Antrohyphantes rhodopensis* (Drensky, 1931) | | x | | | | | | | | | | | | tb | BK |
| *Antrohyphantes sofianus* (Drensky, 1931) | | x | | | | | | | | | | | | tb | BK |
| *Caviphantes dobrogicus* (Dumitrescu & Miller, 1962) | x | | | | | | | | | | | | | tph | |
| *Centromerus subcaecus* Kulczyński, 1914 | | | | | | | | x | | | | | | tb | BK |
| *Centromerus obenbergeri* (Kulczyński, 1897) | | | x | | | | | x | | | | | | tb | BK |
| *Centromerus leruthi* Fage, 1933 | | | | | | | x | | | | | | | tb | E |
| *Centromerus acutidentatus* Deltshev, 2002 | | x | x | x | | | | | | | | | | tb | BK |
| *Centromerus serbicus* Deltshev, 2002 | | | | x | | | | | | | | | | tbb | BK |
| *Centromerus sylvaticus* (Blackwall, 1841) | | | | | | | | | | | | | | tx | H |
| *Centromerus cavernarum* (L. Koch, 1872) | | x | | x | | x | x | x | | | | | | tb | E |
| *Centromerus silvicola* (Kulczyn'ski, 1887) | | | | x | | | | | | | | | | tx | E |
| *Centromerus bulgarianus* (Drensky, 1931) | | x | | | | | | | | | | | | tbb | BK |
| *Centromerus capucinus* (Simon, 1884) | | x | | | | | | | | | | | | tb | E |
| *Centromerus europaeus* Simon, 1911 | | | | | | x | | | | | | | | tbb | BK |
| *Centromerus milleri* Deltshev, 1974 | | x | | | | | | | | | | | x | tbb | BK |
| *Centromerus lakatnikensis* (Drensky, 1931) | | x | x | x | | | | | | | | | | tb | BK |
| *Diplocephalus turcicus* Brignoli, 1974 | | | | | | | | | | x | | | | tx | BAN |
| *Diplocephalus foraminifer* (O.P.-Cambridge, 1875) | | x | x | x | | | | | | | | | | tph | E |
| *Diplocephalus cristatus* (Blackwall, 1833) | | | | x | | | | | | | | | | tx | E |
| *Diplostyla concolor* (Wider, 1834) | | | | x | | | | | | | | | | tx | H |
| *Dismodicus elevatus* (C.L. Koch, 1838) | | | x | | | | | | | | | | | tx | P |
| *Drapetisca socialis* (Sundevall, 1833) | | | | x | | | | | | | | | | tx | P |
| *Fageiella patellata* (Kulczyński, 1912) | | | | | x | | | | | | | | | tb | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Fageiella ensigera* Deeleman-Reinhold, 1974 | | | | x | | | | x | | | | | | tb | BK |
| *Gonatium hilare* (Thorell, 1875) | | | x | | | | | | | | | | | tx | P |
| *Gongylidium rufipes* (Linnaeus, 1758) | | | x | | | | | | | | | | | tx | P |
| *Lepthyphantes brignolianus* Deltshev, 1979 | | | | | | | | | | x | | | | tb | BK |
| *Lepthyphantes beshkovi* Deltshev, 1979 | | | | | | | | | | x | | | | tb | BK |
| *Lepthyphantes leprosus* (Ohlert, 1865) | | x | x | x | | x | | | x | x | | | x | tph | H |
| *Lepthyphantes centromeroides* Kulczyński, 1914 | | x | x | x | x | | | | | | | | | tb | SEE |
| *Lepthyphantes Kratochvíli* Fage, 1945 | | | | | | | | | | | | x | | tb | BK |
| *Lepthyphantes magnesiae* Brignoli, 1979 | | | | | | | | | | x | | | | tph | BK |
| *Lepthyphantes constantinescui* Georgescu, 1989 | x | | | | | | | | | | | | | tbb | BK |
| *Lepthyphantes beroni* Deltshev, 1979 | | | | | | | | | | x | | | | tb | BK |
| *Lessertia dentichelis* (Simon, 1884) | | x | | | | | | | | | | | | tx | H |
| *Linyphia triangularis* (Clerck, 1757) | | x | | | | | | | | | | | | tx | P |
| *Linyphia hortensis* Sundevall, 1830 | | x | | | | | | | | | | | | tx | P |
| *Mansuphantes mansuetus* (Thorell, 1875) | | | x | | | | | | | | | | | tx | P |
| *Megalepthyphantes collinus* L. Koch, 1872 | | x | | | | | | | | | | | | tx | P |
| *Meioneta affinis* (Kulczyński, 1898) | | | x | | | | | | | | | | | tx | P |
| *Microctenonyx subitaneus* (O.P.-Cambridge, 1875) | | x | | x | | | | | | | | | | tph | H |
| *Microneta viaria* (Blackwall, 1841) | | x | x | x | | | | | | | | | | tph | H |
| *Oedothorax retusus* (Westring, 1851) | | x | x | | | | | | | | | | | tx | P |
| *Oedothorax apicatus* (Blackwall, 1850) | | x | | | | | | | | | | | | tx | P |
| *Palliduphantes spelaeorum* Kulczyński, 1914 | | x | x | x | x | x | x | x | | x | | | | tb | BK |
| *Palliduphantes alutacius* Simon, 1884 | | x | | | | | | | | | | | | tph | E |
| *Palliduphantes brignolii* Kratochvíl, 1978 | | | | | | x | | | | | | | | tb | BK |
| *Palliduphantes byzantinus* Fage, 1931 | | x | x | | | | | | | x | | x | x | tph | BK |
| *Palliduphantes epaminondae* Brignoli, 1979 | | | | | | | | | | x | | | | tb | BK |
| *Palliduphantes istrianus* Kulczyński, 1914 | | x | | x | | x | | | | x | | | | tb | SEE |
| *Palliduphantes pillichi* Kulczyński, 1915 | | x | | | | | | | | | | | | tpph | MSEE |
| *Palliduphantes trnovensis* (Drensky, 1931) | | x | x | x | | | | | | | | | | tb | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Palliduphantes insignis* (O.P.-Cambridge, 1913) | | | | | | | | | | | | | | tph | E |
| *Palliduphantes pallidus* (O.P.-Cambridge, 1871) | | x | x | x | | | x | | | | | | | tph | E |
| *Porrhomma rosenhaueri* (L. Koch, 1872) | | | | | | | x | | | | | | | tbb | E |
| *Porrhomma lativelum* Tretzel, 1956 | | x | | x | | | | | | | | | | tbb | E |
| *Porrhomma campbeli* O. P.-Cambridge, 1894 | | | | x | | | | | | | | | | tph | P |
| *Porrhomma convexum* (Westring, 1861) | | x | x | x | x | | x | | | | | | | tb | P |
| *Porrhomma microps* (Roewer, 1931) | | x | | | | | | | | | | | | tbb | BK |
| *Styloctetor romanus* (O. P.-Cambridge, 1872) | | x | | | | | | | | | | | | tx | P |
| *Tenuiphantes cristatus* (Menge, 1866) | | | x | | | | | | | | | | | tx | P |
| *Tenuiphantes alacris* (Blackwall, 1853) | | x | | | | | | | | | | | | tx | P |
| *Tenuiphantes tenuis* (Blackwall, 1852) | | x | | | | | | | | | | | | Tx | E |
| *Tenuiphantes zimmermanni* Bertkau, 1890 | | x | | | | | | | | | | | | Tx | E |
| *Thyreosthenius parasiticus* (Westring, 1851) | | x | | x | | | | | | | | | | tph | P |
| *Troghyphantes wiebesi* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tb | BK |
| *Troglohyphantes milleri* Kratochvíl, 1948 | | | | | x | | | | | | | | | tb | BK |
| *Troglohyphantes wiehlei* Miller & Polenec, 1975 | | | | | | x | x | | | | | | | tb | BK |
| *Troglohyphantes vicinus* Miller & Polenec, 1975 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes typhlonetiformis* Absolon & Kratochvíl, 1932 | | | | | | | x | | | | | | | tbb | BK |
| *Troglohyphantes inermis* Deeleman-Reinhold, 1978 | | | x | | | | | | | | | | | tb | BK |
| *Troglohyphantes affinis* (Kulczyński, 1914) | | | | | x | x | | | | | | | | tbb | BK |
| *Troglohyphantes troglodytes* (Kulczyński, 1914) | | | | | x | | | x | | | | | | tb | BK |
| *Troglohyphantes jamatus* Roewer, 1931 | | | | | | | x | | | | | | | tbb | BK |
| *Troglohyphantes karawankorum* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes kordunlikanus* Deeleman-Reinhold, 1978 | | | | | x | x | | | | | | | | tb | BK |
| *Troglohyphantes Kratochvíli* Drensky, 1935 | | | x | | | | | | | | | | | tbb | BK |
| *Troglohyphantes leserti* Kratochvíl, 1935 | | | | | x | | | x | | | | | | tbb | BK |
| *Troglohyphantes pugnax* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tbb | BK |
| *Troglohyphantes liburnicus* Caporiacco, 1927 | | | | | | x | | | | | | | | tbb | BK |
| *Troglohyphantes salax* (Kulczyński, 1914) | | | | | x | | | | | | | | | tbb | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Troglohyphantes polenici* Wiehle, 1964 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes polyophtalmus* Joseph, 1881 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes pretneri* Deeleman-Reinhold, 1978 | | | | | | | | x | | | | | | tbb | BK |
| *Troglohyphantes helsdingeni* Deeleman-Reinhold, 1978 | | | | | | | | | | | | | | tb | BK |
| *Troglohyphantes spinipes* Fage, 1919 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes sketi* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes roberti* Deeleman-Reinhold, 1978 | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes s. bosnicus* Kratochvíl, 1948 | | | | | x | | | | | | | | | tb | BK |
| *Troglohyphantes s. noctiphilus* Kratochvíl, 1948 | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes s. svilajensis* Kratochvíl, 1948 | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes similes* Fage, 1919 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes strandi* Absolon & Kratochvíl, 1932 | | | | | | x | | | | | | | | tbb | BK |
| *Troglohyphantes scientificus* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tbb | BAP |
| *Troglohyphantes cornutus* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tph | BK |
| *Troglohyphantes croaticus* (Chyzer, 1894) | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes d. dekkingae* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tb | BK |
| *Troglohyphantes d. pauciac-uleatus* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tb | BK |
| *Troglohyphantes dalmaticus* (Kulczyński, 1914) | | | x | | | x | | | | | | | | tb | BK |
| *Troglohyphantes diabolicus* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes brignolii* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes dinaricus* Kratochvíl, 1948 | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes draconis* Deeleman-Reinhold, 1978 | | | x | | | | | | x | | | | | tb | BK |
| *Troglohyphantes drenskii* Deltshev, 1973 | | x | | | | | | | | | | | | tbb | BK |
| *Troglohyphantes gracilis* Fage, 1919 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes roberti dalmatensis* Deeleman-Reinhold, 1978 | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes hadzii* Kratochvíl, 1934 | | | | | x | x | | | | | | | | tb | BK |
| *Troglohyphantes boudewijni* Deeleman-Reinhold, 1974 | | | | | | | | x | | | | | | tb | BK |
| *Troglohyphantes excavatus* Fage, 1919 | | | | | | x | x | | | | | | | tb | BAP |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Troglohyphantes giromettai* (Kulczyński, 1914) | | | | | | x | | | | | | | | tb | BK |
| *Troglohyphantes bureschianus* Deltshev, 1975 | | x | | | | | | | | | | | | tb | BK |
| *Troglohyphantes falax* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tbb | BK |
| *Troglohyphantes brevipes* Deeleman-Reinhold, 1978 | | | | | x | | | | | | | | | tb | BK |
| *Troglohyphantes gamsi* Deeleman-Reinhold, 1978 | | | | | | | x | | | | | | | tb | BK |
| *Troglohyphantes fugax* (Kulczyński, 1914) | | | | | x | | | | | | | | | tbb | BK |
| *Typhlonyphia reimoseri* Kratochvíl, 1936 | | | | | | x | | | | | | | | tbb | BK |
| *Walckenaeria vigilax* (Blackwall, 1853) | | x | | | | | | | | | | | | tx | H |
| *Walckenaeria mitrata* (Menge, 1868) | | x | | | | | | | | | | | | tx | P |
| *Walckenaeria simplex* Chyzer, 1894 | | x | | | | | | | | | | | | tx | MSEE |
| **Tetragnathidae** | | | | | | | | | | | | | | | |
| *Meta milleri* Kratochvíl, 1942 | | | | | | x | | | | | | | | tph | BK |
| *Meta bourneti* Simon, 1922 | | x | | | | x | | x | | x | | | x | tph | WP |
| *Meta menardi* (Latreille, 1804) | | x | x | x | | x | x | x | x | x | | | | tph | E |
| *Metellina merianae* (Scopoli, 1763) | | x | x | x | | x | x | x | x | x | | x | | tph | E |
| *Metellina mengei* (Blackwall, 1869) | | x | x | x | | x | x | | | x | | | | tx | E |
| *Metellina segmentata* (Clerck, 1757) | | x | x | x | | | | | | | | | | tx | P |
| *Pachygnatha degeeri* Sundevall, 1830 | | x | | | | | | | | | | | | tx | P |
| *Tetragnatha Montana* Simon, 1874 | | | | | | | | | | x | | | | tx | P |
| *Thetragnatha extensa* (Linnaeus, 1758) | | x | | | | | | | | | | | | tx | H |
| **Araneidae** | | | | | | | | | | | | | | | |
| *Araneus diadematus* Clerck, 1757 | | | | x | | | | | | | | | | tx | H |
| *Araniella alpica* (C. L. Koch, 1869) | | x | | | | | | | | | | | | tx | E |
| *Mangora acalypha* (Walckenaer, 1802) | | x | | | | | | | | | | | | tx | P |
| **Lycosidae** | | | | | | | | | | | | | | | |
| *Alopecosa albofasciata* (Brullé, 1832) | | | | | | | | | | x | | | | tx | M |
| *Pardosa cribrata* Simon, 1876 | | x | | | | | | | | | | | | tx | SE |
| *Pardosa hortensis* (Thorell, 1872) | | x | | | | | | | | | | | | tx | P |
| *Pardosa prativaga* (L. Koch, 1870) | | x | | | | | | | | | | | | tx | E |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Pardosa agrestis* (Westring, 1861) | | x | | | | | | | | | | | | tx | P |
| **Pisauridae** | | | | | | | | | | | | | | | |
| *Pisaura mirabilis* (Clerck, 1757) | | | | x | | | | | | | | | | tx | P |
| **Agelenidae** | | | | | | | | | | | | | | | |
| *Agelena gracilens* C.L. Koch, 1841 | | | | | | | | | | x | | | | tx | ECA |
| *Hadites tegenaroides* Keyserling, 1862 | | | | | x | x | | | | | | | | tbb | BK |
| *Histopona hauseri* Brignoli, 1972 | | | | | | | | | | | x | | | tph | BK |
| *Histopona bidens* (Absolon&Kratochvíl, 1932) | | | x | | | x | | | | | | | | tb | BK |
| *Histopona conveniens* (Kulczyński,1914) | | | | | x | x | | x | | | | | | tb | BK |
| *Histopona dubia* (Absolon&Kratochvíl, 1932) | | | | | x | x | | x | | | | | | tb | BK |
| *Histopona egonpretneri* Deeleman-Reinhold, 1983 | | | | | | x | | | | | | | | tb | BK |
| *Histopona isolata* Deeleman-Reinhold, 1983 | | | | | | | | | | | | x | | tb | BK |
| *Histopona krivosijana* (Kratochvíl, 1935) | | | | | | | | x | | | | | | tb | BK |
| *Histopona myops* (Simon, 1885) | | | | | | | | | | x | | | | tph | BK |
| *Histopona tranteevi* Deltshev, 1978 | | x | | | | | | | | | | | | tph | BK |
| *Histopona thaleri* Gasparo, 2005 | | | | | | | | | | x | | | | tph | BK |
| *Histopona laeta* (Kulczyński, 1897) | | | | x | x | | | | | | | | | tph | BK |
| *Histopona luxurians* (Kulczyński, 1897) | | | | | | | x | | | | | | | tx | SEE |
| *Maimuna cretica* (Kulczyński, 1903) | | | | | | | | | | | | x | | tx | BK |
| *Maimuna vestita* (C.L. Koch, 1841) | | | | | | | | | | x | | | | tx | EM |
| *Pseudotegenaria animate* (Kratochvíl&Miller, 1940) | | | x | | x | | | x | | | | | | tb | BK |
| *Pseudotegenaria bayeri* (Kratochvíl, 1934) | | | | | x | | | x | | | | | | tb | BK |
| *Pseudotegenaria decolorata* (Kratochvíl&Miller, 1940) | | | | | | x | | | | | | | | tb | BK |
| *Pseudotegenaria bosnica* (Kratochvíl&Miller, 1940) | | | | | x | x | | | x | | | | | tb | BK |
| *Tegenaria picta* Simon, 1870 | | | | | | | | | | | | | | tx | WP |
| *Tegenaria schmalfussi* Brignoli, 1976 | | | | | | | | | | | | x | | tb | BK |
| *Tegenaria parietina* (Fourcroy, 1785) | | x | x | x | | x | | | | x | | x | | tph | WP |
| *Tegenaria pagana* C.L. Koch, 1841 | | x | | | | | | | | x | | x | | tph | COS |
| *Tegenaria hauseri* Brignoli, 1979 | | | | | | | | | | | x | | | tx | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Tegenaria ferruginea* (Panzer, 1804) | | x | x | x | | | | | | x | | x | | tph | E |
| *Tegenaria domestica* (Clerck, 1757) | | x | x | x | x | x | x | x | x | x | | x | x | tph | COS |
| *Tegenaria dalmatica* Kulczyński, 1906 | | | | | | | | x | | x | | | | tph | BK |
| *Tegenaria campestris* C.L. Koch, 1834 | | | | x | | | | | | | | | | tx | E |
| *Tegenaria bithyniae* Brignoli, 1978 | | x | | | | | | | | | | x | | tph | BAN |
| *Tegenaria ariadnae* Brignoli, 1984 | | | | | | | | | | | | x | | tb | BK |
| *Tegenaria annulata* Kulczyński, 1912 | | | | | x | x | | x | | | | | | tb | BK |
| *Tegenaria agrestis* (Walckenaer, 1802) | | | | | | | | | | | | | | tx | H |
| *Tegenaria silvestris* L. Koch, 1872 | | x | x | x | | x | | | | x | | | | tph | E |
| *Tegenaria pieperi* Brignoli, 1979 | | | | | | | | | | | | x | | tb | BK |
| *Textrix denticulate* (Olivier, 1789) | | x | | | | | | | | | | | | tx | E |
| **Cybaeidae** | | | | | | | | | | | | | | | |
| *Cybaeus balkanus* Deltshev, 1997 | | | | x | | | | | | | | | | tx | BK |
| *Cybaeus angustiarum* L. Koch, 1868 | | x | | x | | | | | | | | | | tx | MSEE |
| **Hahnidae** | | | | | | | | | | | | | | | |
| *Hahnia caeca* Georgescu, 1992 | x | | | | | | | | | | | | | tbb | BK |
| *Cicurina cicur* (Fabricius, 1793) | | x | x | x | x | | x | | | | | | | tph | E |
| **Dictynidae** | | | | | | | | | | | | | | | |
| *Dictyna uncinata* Thorell, 1856 | | x | | | | | | | | x | | | | tx | P |
| *Mastigusa macrophthalma* (Kulczyński, 1897) | | | | x | | | | | | | | | | tx | MEE |
| *Nigma flavescens* (Walckenaer, 1825) | | x | | | | | | | | | | | | tx | P |
| **Amaurobiidae** | | | | | | | | | | | | | | | |
| *Amaurobius pallidus* L. Koch, 1868 | | x | | | | | | | | | | | | tx | MSEE |
| *Amaurobius deelemanae* Thaler&Knoflach, 1995 | | | | | | | | | | | x | x | | tx | BK |
| *Amaurobius pelops* Thaler&Knoflach, 1991 | | | | | | | | | | x | | | | tx | BK |
| *Amaurobius ferox* (Walckenaer, 1825) | | | | x | | | | | | | | | | tx | H |
| *Amaurobius fenestralis* (Stroem, 1768) | | | | x | | | | | | | | | | tx | E |
| *Amaurobius strandi* Charitonov, 1937 | | | | | | | | | | x | | | | tx | SEE |
| *Callobius claustrarius* (Hahn, 1831) | | x | | | | | | | | x | | | | tx | P |
| *Callobius balcanicus* (Drensky, 1940) | | x | | | | | | | | | | | | tx | BK |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Coelotes atropos* (Walckenaer, 1830) | | | | x | | | | | | | | | | tx | E |
| *Coelotes terrestris* (Wider, 1834) | | | | | | | | | | x | | | | tx | NM |
| *Eurocoelotes jurinischi* (Drensky, 1915) | | x | | x | | | | | | | | | | tx | BK |
| *Eurocoelotes drenskii* Deltshev, 1990 | | x | | | | | | | | | | | | tx | BK |
| *Eurocoelotes inermis* (L. Koch, 1855) | | x | | x | | | | | | | | | | tx | E |
| *Urocoras longispinus* Kulczyński, 1897 | | x | | | | | | | | | | | | tx | SEE |
| **Liocranidae** | | | | | | | | | | | | | | | |
| *Liocranum rupicola* (Walckenaer, 1830) | | x | x | x | x | x | | | | | | | | tph | E |
| *Liocranum rutilans* (Thorell, 1875) | | | x | x | x | x | x | x | | x | | | | tph | |
| *Mesiotelus cyprius scopensis* Drensky, 1935 | | x | | | | | | | | | | | | tx | BK |
| *Agraecina christiani* Georgescu, 1989 | x | | | | | | | | | | | | | tx | BK |
| **Clubionidae** | | | | | | | | | | | | | | | |
| *Clubiona caerulescens* L. Koch, 1867 | | x | | | | | | | | | | | | tx | P |
| *Clubiona compta* C. L. Koch, 1839 | | x | | | | | | | | | | | | tx | WP |
| *Clubiona neglecta* O. P.- Cambridge, 1862 | | | | | | | | | | | | | | tx | P |
| **Corinnidae** | | | | | | | | | | | | | | | |
| *Phrurolithus festivus* (L. Koch, 1835) | | x | | | | | | | | | | | | tx | P |
| **Gnaphosidae** | | | | | | | | | | | | | | | |
| *Drassodes lapidosus* (Walckenaer, 1802) | | | | x | | | | | x | | | x | | tx | P |
| *Echemus angustifrons* (Westring, 1862) | | x | | | | | | | | | | | | tx | E |
| *Gnaphosa luciphuga* (Walckenaer, 1802) | | | | x | | | | | | | | | | tx | P |
| *Pterotricha lentiginosa* (C.L. Koch, 1837) | | | | | | | | | | | | x | | tx | M |
| *Scotophaeus blackwalli* (Thorell, 1871) | | x | | | | | | | | | | | | tx | COS |
| *Zelotes femellus* (L. Koch, 1866) | | | | | | | | | | x | | | | tx | SEE |
| *Zelotes oblongus* (C.L. Koch, 1833) | | | | | | | | | | x | | | | tx | E |
| *Zelotes clivicola* (L. Koch, 1870) | | | | | | | | | | x | | | | tx | P |
| *Zelotes apricorum* (L. Koch, 1876) | | x | | | | | | | | | | | | tx | E |
| **Philodromidae** | | | | | | | | | | | | | | | |
| *Philodromus collinus* C.L. Koch, 1835 | | | | | | | | | | x | | | | tx | E |

**Table 1.** Continued.

| TAXA | RO | BG | MA | SB | BS | CR | SL | MG | AL | GR | IN | CT | TR | CAT | Z-G |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Thomisidae** | | | | | | | | | | | | | | | |
| *Synaema globosum* (Fabricius, 1775) | | | | | | | | | | x | | | | tx | P |
| **Salticidae** | | | | | | | | | | | | | | | |
| *Evarcha falcate* (Clerck, 1757) | | | | | | | | | | | | x | | tx | P |
| *Mendoza canestrinii* (Ninni, 1868) | | | | | | | | | | x | | | | tx | P |
| *Philaeus chrysops* (Poda, 1761) | | | | | | | | | | x | | | | tx | P |
| *Sitticus pubescens* (Fabricius, 1775) | | x | | | | | | | | | | | | tx | H |

out of a total of 51 species, 49 are Balkan endemics, distributed mainly in caves. Deeleman-Reinhold (1978) concluded that the present distribution and morphological diversity of *Troglohyphantes* on the Balkan Peninsula represents of a repeated processes of expansion and contraction of its range. High representation of the genera *Histopona* (11 endemics), *Sulcia* (10 endemics), *Centromerus* (eight endemics), *Tegenaria* (seven endemics), *Lepthyphantes* (six endemics), and *Palliduphantes* (five endemics) is also due to expansion in caves. A present-day example of cave penetration are the species *Lepthyphantes centromeroides* and *L. spelaeorum*, which are comparatively widespread on the Balkan Peninsula. They occur in caves, but also in the humus and ground detritus, indicating active subterranean colonization (Deeleman-Reinhold, 1978).

Cave-dwelling spiders can be relegated to three ecological groups: troglobites – species that must spend their entire life cycle in a cave; troglophiles - species which can live their entire lives in caves, but which also occur in other environments; and trogloxenes (including accidentals) - species which utilize caves, but must leave the caves to complete their life cycle.

Troglobites often show a suite of characters associated with their adaptation to subterranean life - loss of pigment, loss of eyes, and elongation of appendages. The largest number of troglobites are encountered in the Dinaric region – 113 (39 blind), Pindus region – 32 (eight blind), Thracian-Macedonian region – 18 (four blind), Balkanid region – 13 (two blind), Danubian region — one; and North Dobruja region — four (three blind) species (Table 1). The extreme richness of troglobitic spiders in these regions leads to the assumption that these were major centers of speciation and evolution of species.

**Zoogeographical analysis –** On the basis of their current distribution, the established 324 species can be classified into 17 zoogeographical categories, grouped into four complexes (Balkan endemics, widely distributed, European, and Mediterranean).

Best represented is the complex of Balkan endemics, with 184 species (56.5%). The established number is high and reflects the local character of the cave fauna. The endemics are best represented in Croatia - 42, Bosnia - 38, Montenegro – 30, Greece

- 26, Crete – 25, Bulgaria – 22, and Slovenia – 21. It should be emphasized that of the 14 endemic genera established as being endemic to the Balkan Peninsula, only three (*Anthrohyphantes*, *Macedoniella*, and *Protoleptoneta*) are distributed in its eastern part. Especially interesting is the distribution of the genus *Antrohyphantes*, found only in high-altitude zones and caves of the eastern part of the region (Bulgaria). It is related to the genus *Fageiella*, endemic to caves of the western Balkans (Bosnia, Montenegro). Their allopatric distribution indicates that they had already separated before the establishment of the Vardar tectonic zone (Deltshev, 1996). This suggests that these two genera are paleoendemics. The recent cave spider fauna was formed after gradual changes in the fauna of the ancient humid Mediterranean forests. However, due to the lack of knowledge, it is difficult to determine with certainty which cave spiders endemic to the Balkans are Tertiary and which are Quaternary elements.

The complex of widely distributed species (COS+H+P+WP+ECA) comprises 74 species (22.7%). Palearctic species are dominant (12%), followed by Holarctic (5.8%), cosmopolitan (2.8%) West Palearctic (1.8%), and European-Central Asiatic (0.3%) forms. The complex includes especially widespread species associated with lowlands, buildings, caves, woodlands, and high-altitude zones of mountains. Among members of this group, characteristic of caves are *Nesticus cellulanus*, *Lepthyphantes leprosus, Microtenonix subitanea, Porrhomma convexum*, and *Tegenaria domestica*. The species *Nesticus cellulanus* and *Porrhomma convexum* are two of the most widespread taxa in the caves of Europe.

The European complex (E+MEE+MSEE+EE+SEE) includes 50 species (15.6%). European species are dominant (10.5%), followed by Southeast European (2.8%) and Middle Southeast European (1.8%). The remaining categories are represented by single species widespread mainly in mountains. Middle Southeast European (9.0%), Southeast European (9.0%), and East European (7.4%) are relatively well represented. The complex includes spiders widespread in Europe and the Balkan Peninsula which inhabit both lowlands and mountains. The most characteristic of caves are *Hoplopholcus forskali*, *Centromerus cavernarum*, *Diplocephalus foraminifer*, *Lepthyphantes centromeroides*, *Palliduphantes istrianus*, *Porrhomma lativelum*, and *Porrhomma rosenhaueri*.

The last complex includes 18 species (5.5%) occurring in the Mediterranean area (M+SE+NM+EM+BAN+BAP+) or part of it. This complex forms 5.5% of the cave spider fauna of the Balkan Peninsula, but the real percentage is probably higher because some Balkan endemics have Mediterranean origin. True cavernicolous elements are *Mesostalita nocturna*, *Stalita taenaria*, *Nesticus eremita*, and *Nesticus speluncarum*.

## CONCLUSION

A review of the faunistic diversity of its 326 cave-dwelling spiders shows that the Balkan Peninsula is a territory of considerable species richness. This conclusion is also supported by the existence of 184 endemic species. The uneven species richness

**Table 2.** Zoogeographical composition of cave-dwelling spiders (Araneae) in Balkan Peninsula.

| Complexes | Chorotypes | | Species | |
|---|---|---|---|---|
| | Classification | Code | Number | % |
| **Widely distributed** | Cosmopolitian | COS | 9 | 2.8 |
| | Holarctic | HOL | 19 | 5.8 |
| | Palearctic | PAL | 39 | 12 |
| | West Palearctic | WP | 6 | 1.8 |
| | European-Central Asiatic | ECA | 1 | 0.3 |
| | **Total** | | **74** | **22.7** |
| **European** | European | E | 34 | 10.5 |
| | Middle-East European | MEE | 1 | 0.3 |
| | Middle-Southeast European | MSEE | 6 | 1.8 |
| | East European | EE | 1 | 0.3 |
| | Southeast European | SEE | 8 | 2.8 |
| | **Total** | | **50** | **15.6** |
| **Mediterranean** | Mediterranean | M | 4 | 1.2 |
| | South European | SE | 3 | 0.9 |
| | North Mediteranean | NM | 3 | 0.9 |
| | East Mediterranean | EM | 1 | 0,3 |
| | Balkan-Anatolic | BAN | 3 | 0.9 |
| | Balkan-Apennine | BAP | 4 | 1.2 |
| | **Total** | | **18** | **5.5** |
| **Endemics** | Balkan | BK | 183 | 56.3 |
| | **Total** | | **183** | 56.3 |

in some parts of the Balkan Peninsula is mainly due to the different degree of exploration by researchers. In the zoogeographical respect, the endemics are dominant, but elements characteristic of caves are found in all chorological complexes. The high percentage of the Balkan endemics (56.5%) suggests an important process of autochthonous speciation. Thus, the existing data suggest that the Balkan Peninsula represents one of the main centers of speciation in Europe.

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