

## THE ENDEMIC SPIDERS (ARANEAE) OF THE BALKAN PENINSULA

CHRISTO DELTSHEV

Institute of Zoology, Bulgarian Academy of Sciences, bld Tsar Osvoboditel 1, 1000-Sofia, Bulgaria. Fax: +359-2-882-897. E-mail: zoology@bgcict.acad.bg

### Abstract

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The endemic taxa of spiders (Araneae) in the Balkan peninsula are represented by 348 species included in 30 families. Countries with the highest number of recorded endemic species are Greece (115), Croatia (68), Bulgaria (55), Bosnia (41), Crete (46). The distribution of the endemic spiders in the main geographic systems of the Balkan peninsula shows that they are best represented in the Pindus region – 150, Dinaric region – 145, Tracian-Macedonic region – 52, Balkanid region – 14, Danubian region – 4 and North Dobrudzha with 4 species. The largest proportion of endemics was encountered mainly in the mountains and islands, where they inhabit caves – 159, woodlands – 139, coastal sites – 48 and high altitude zones – 20 species. The extreme richness of troglitic spiders in the Dinaric region (96) leads to the assumption that this was a major center of speciation and evolution of species. The same can be said for the forest of the Pindus region (74) and for the highest mountains (Rila, Pirin) of the Tracian-Macedonic region, where are found the greatest number of high altitude elements (15). The phenomenon can be regarded as a result of the relative isolation of the mountains compared with the lowland areas, in the context of paleo-environmental changes since the Pliocene. The high percentage of endemic spiders (25%) suggests an important process of autochthonous speciation. So the Balkan Peninsula can be considered as a main center of speciation in Europe.

### Introduction

The first significant work concerning the spiders discovered and described on the Balkan peninsula was written by DRENSKY (1936). He reported 1066 species, 250 of them were found and described only from the territory of this region. More recent publications list the species described from Bulgaria, Greece, Serbia, Macedonia, Montenegro and part of Turkey (BRIGNOLI 1968, 1971, 1972, 1974a, 1974b, 1976, 1977, 1979, 1984, 1986; BUCHAR 1968; DEELEMAN 1976, 1978, 1988, 1993; DELTSHEV 1979a, 1979b, 1983a, 1983b, 1985, 1988, 1990, 1993, 1996, 1997a, 1997b; DELTSHEV, CURCIC 1997; DELTSHEV, PARASCHI 1990;

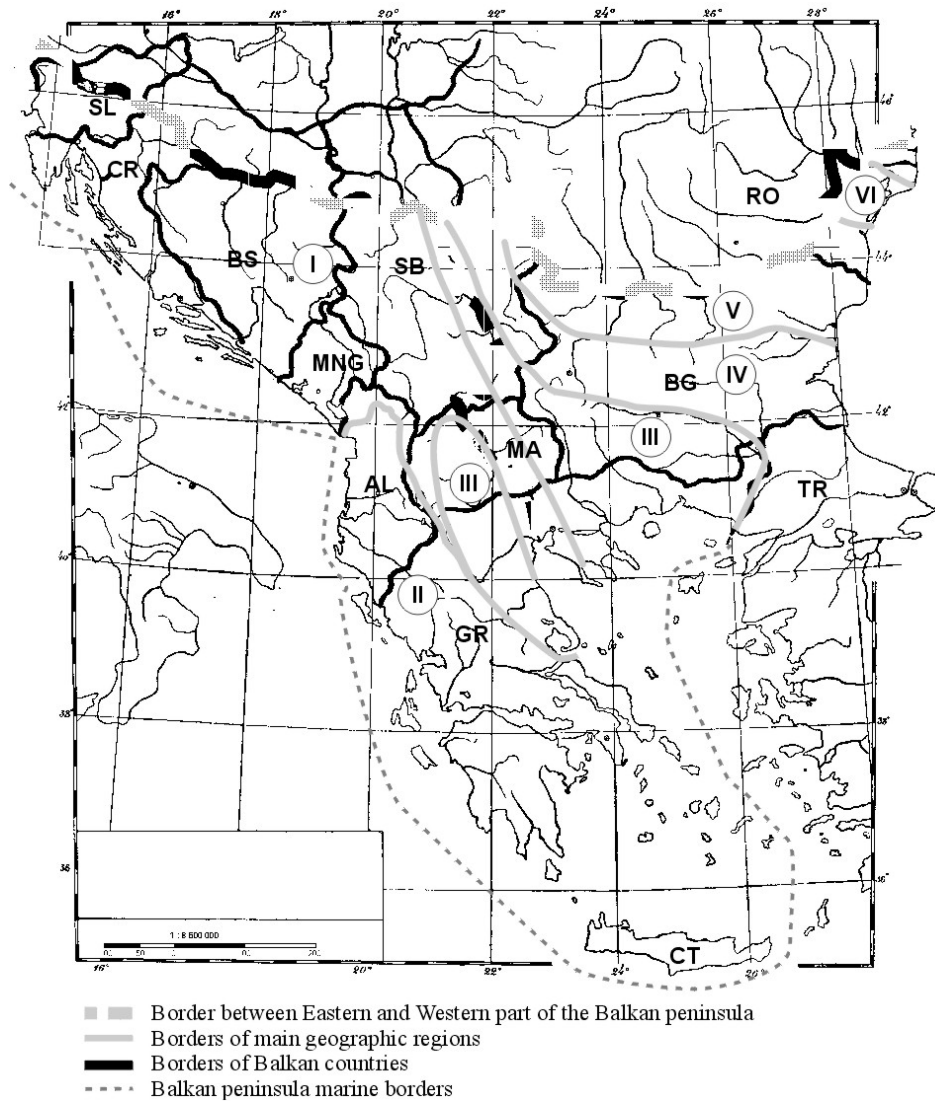


Fig. 1. Geographic division of the Balkan peninsula. I- Dinaric region, II- Pindus region, III- Tracian-Macedonic region, IV- Balkanid region, V- Danubian plain region, VI- North-Dobroudzha region, AL- Albania, BG- Bulgaria, BS- Bosnia, CR- Croatia, CT- Crete, GR- Greece, MA- Macedonia, MNG- Montenegro,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

THALER 1996; THALER, KNOFLACH 1991, 1993, 1995; WUNDERLICH 1985, 1994a, 1994b, 1994c). The pooling of all available literature records and the accumulation of new data makes it possible to critically review all so called “endemic” taxa.

## Study Area

The Balkan Peninsula is situated in the southeastern part of Europe. The northern border follows the rivers Danube (including its delta), Sava and Soca, and through Gorizia and Monfalcone reaches (the line of) the Gulf of Trieste. Its western border follows the (line of) Adriatic and Ionian coast including the islands. The eastern border passes to the east of the Aegean Islands Sirina, Astipalea, Amorgos, Miconos, Tinos, Andros, Skiros, continues along the Dardanelles, goes across the Marmara Sea and through the Bosphorus and then reaches the Black Sea coast. The southernmost point of the Balkan Peninsula region is Crete and the islands of Gavdos, Aiduronisi and Kufonisi (Fig. 1).

The question about the status and distribution of endemic spiders found in the Balkan peninsula is complicated. Some of them are found only in restricted areas (even in a single cave) while the others show wider distributions, sometimes even over the whole peninsula. Certainly, some of the widespread Balkan peninsula endemics can be found in neighbouring territories as well and can be placed in the Balkan, Asia Minor or to Southeast European spider fauna.

The geographical areas and their abbreviations used in the text, are as follows: AL – Albania; BG – Bulgaria; CT – Crete; CR – Croatia; GR – Greece; BS – Bosnia; MA – Macedonia; MNG – Montenegro; RO – Romania; SB – Serbia; SL – Slovenia; TR – Turkey.

## Results and discussion

This contribution is the result of a critical revision of all data available for the endemic spiders of the Balkan peninsula territory and comprises 348 species from 30 families: Ctenizidae 5, Nemesiidae 4, Pholcidae 9, Leptonetidae 21, Segestriidae 2, Dysderidae 73, Oonopidae 1, Palpimanidae 1, Uloboridae 1, Nesticidae 6, Theridiidae 5, Anapidae 1, Mysmenidae 1, Linyphiidae 109, Tetragnathidae 2, Araneidae 1, Lycosidae 1, Agelenidae 29, Cybaeidae 1, Hahniidae 5, Dictynidae 1, Amaurobiidae 17, Liocranidae 4, Clubionidae 3, Zodariidae 8, Gnaphosidae 18, Zoridae 1, Philodromidae 2, Thomisidae 4, Salticidae 12. The established number is high and represents 25% of all spiders of the Balkan peninsula. The most characteristic families are: Linyphiidae s. l. (31.3%), Dysderidae (21%) and Agelenidae (8.3%). The genus *Troglohyphantes* is the most numerous and can be regarded as a faunistic phenomenon since from all 53 species established in the territory of the Balkans, 52 are endemics, distributed mainly in caves. DEELEMANN-REINHOLD (1978) concluded that

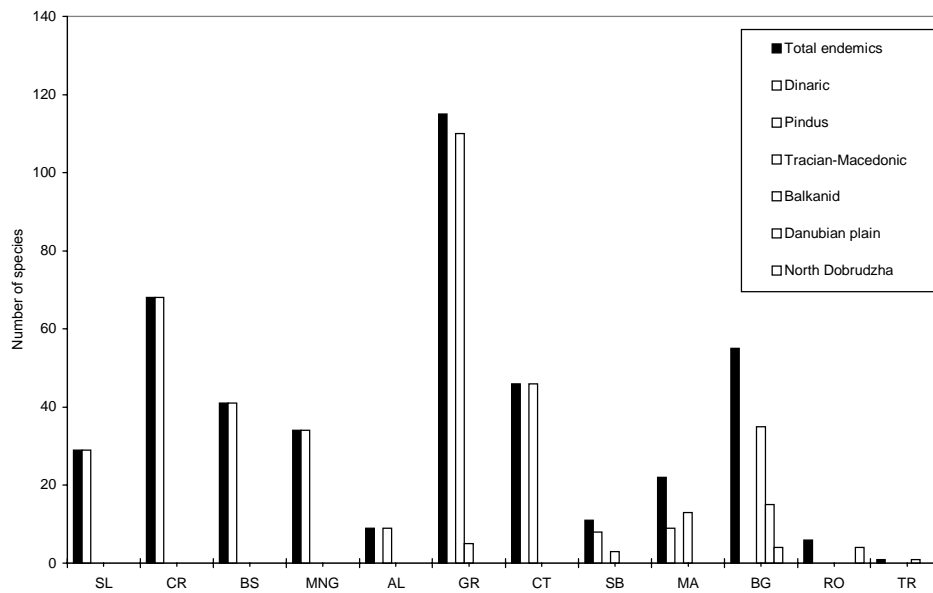


Fig. 2. Distribution of the endemic spiders into different countries and main geographic regions.

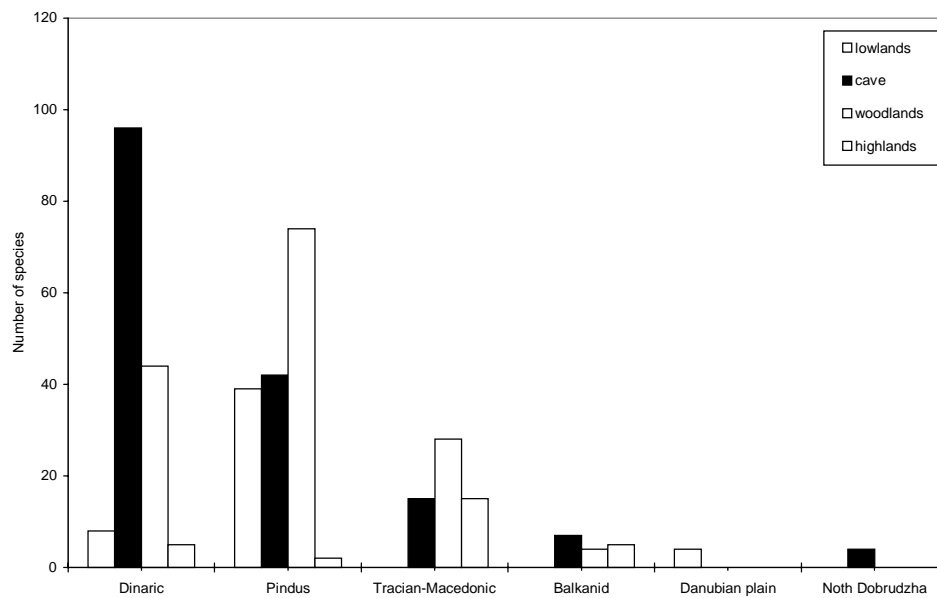


Fig. 3. Distribution of the endemic spiders into different altitude zones of the main geographic regions.

the present distribution and morphological diversity of *Troglohyphantes* in the Balkan Peninsula represents a repeated processes of expansion and contraction of its range. The representation of the genera *Dysdera* (28 endemics from 38 species), *Lepthyphantes* (18 endemics from 49 species) and *Tegenaria* (17 endemics from 31 species) is also due to expansion in caves, woodlands and highlands. Present day examples of cave penetration are the species *Lepthyphantes centromeroides* KULCZYŃSKI and *L. spelaeorum* KULCZYŃSKI, widespread in the Balkan peninsula. They occur in caves but also in the humus and ground detritus and indicate active subterranean colonisation (DEELEMEN-REINHOLD, 1978). It should be emphasised that from the established 14 endemic genera (*Antrohyphantes*, *Barusia*, *Cryphoecina*, *Fageiella*, *Folkia*, *Icariella*, *Lasconia*, *Macedoniella*, *Minotauria*, *Protoleptoneta*, *Parastalita*, *Rhoderia*, *Stalagtia*, *Sulcia*) for the Balkan Peninsula, only three (*Antrohyphantes*, *Macedoniella*, *Protoleptoneta*) occur in the east of the Balkan Peninsula. Especially interesting is the distribution of the genera *Antrohyphantes* and *Fageiella*. The genus *Antrohyphantes* is found only at high altitude zones and caves of the eastern part of the region (Bulgaria). The genus *Fageiella* is endemic to the caves of the western part of the Balkan Peninsula (Bosnia, Montenegro). The two genera are closely related – their allopatric distribution indicates that they had been already separated before the establishment of the Vardar tectonic zone (DELTSHEV, 1996). This suggests that these two genera are paleoendemics.

The highest number of endemic species is recorded for the territories of Greece (115), Croatia (68), Bulgaria (55) and Crete (46) (Fig. 2). The picture concerning the distribution of the endemics in the main geographic systems of the Balkan peninsula, shows that they are best represented in the Pindus region – 150, Dinaric region – 145, Tracian-Macedonic region – 52, Balkanid region – 14, Danubian region – 4 and North Dobrudzha with 4 species (Figs 2, 3). The largest fraction of endemics was encountered mainly in mountains and islands, where they inhabit the caves – 159, woodlands – 139, coastal sites – 48 and high altitude zones – 20 species (Fig. 3). In the group of cave spiders, 51 are troglobites (blind or semi-blind) with the most numerous genera: *Troglohyphantes* – 15, *Folkia* – 6, *Stalagtia* – 5, *Leptonetella*, *Nesticus* and *Stalita* – 3 species. The recent cave spider fauna is 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 spider endemics of the Balkans are Tertiary and which are Quaternary elements. The extreme richness of endemic cave spiders in the Dinaric region (96) leads to the assumption that this was a major center of speciation and evolution of species. The same can be considered for the woodlands of the Pindus region (74) and for the highest mountains (Rila, Pirin) of the Tracian-Macedonic region, where the greatest number of high altitude elements (15) is found.

As a conclusion it should be noted that, according to their ranges, the endemic spiders of the Balkan peninsula belong to two different faunal complexes: Mediterranean and European. The Mediterranean elements are distributed in caves, forests, coastal sites and single species at high altitudes, while the European elements are distributed mainly in forests and high altitude sites. This phenomenon can be regarded as a result of the relative isolation of

the mountains compared with the lowlands, in the context of paleo-environmental changes since the Pliocene (DELTSHEV, 1996). The high percentage of endemic spiders (25%) suggests an important process of autochthonous speciation. So the Balkan Peninsula can be considered as a main center of speciation in Europe.

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