

A review of the family Agelenidae (Araneae) in Bulgaria. Taxonomic, faunistic and zoogeographical analysis

CHRISTO DELTSHEV

Institute of Zoology, Bulgarian Academy of Sciences, bld. Tsar Osvoboditel 1, 1000-Sofia, Bulgaria

Spiders, Agelenidae, faunistics, zoogeography, distribution, Balkan peninsula

Abstract. The family Agelenidae (sensu Maurer, 1992) is represented in Bulgaria by 35 species, included in 10 genera (*Agelena* 3, *Cicurina* 1, *Coelotes* 8, *Cryphoeca* 2, *Cybaeus* 2, *Histoipona* 3, *Lycosoides* 1, *Maimuna* 1, *Tegenaria* 12, *Textrix* 1, *Tuberta* 1). This number was established after a taxonomic revision of all available collections containing agelenid spiders in Bulgaria. One new record is also added (*Tegenaria zinzulusensis* Dresco).

Species of the family Agelenidae are distributed in all districts in Bulgaria, occurring in lowland, forest, mountains, caves and buildings or close to them. Regarding their distribution by altitude, there are only 5 species which inhabit the high mountain zone, but only *Cryphoeca pirini* Drensky is characteristic of the alpine belt. According to their current distribution, the Bulgarian agelenid spiders can be split into 11 zoogeographical categories, grouped into 5 complexes (Cosmopolitan, Palearctic, European, South-east European, Mediterranean). The Southeast European complex is the best represented (40%) and shows quite well the local character of this fauna and the main role of the Balkan peninsula in its origin and formation.

INTRODUCTION

The agelenid fauna of Bulgaria has been comparatively well studied and Drensky (1936) reported 38 species (4 *Agelena*, 1 *Cicurina*, 8 *Coelotes*, 2 *Cryphoeca*, 1 *Cybaeus*, 16 *Tegenaria*, 6 *Textrix*, 1 *Tuberta*). Six years later the same information was presented again with some additional faunistic data (Drensky, 1942). More recent publications (Deltshev, 1967, 1972a,b, 1973, 1976, 1982, 1990a,b, 1993; Deltshev & Blagoev, 1992) are mainly the result of intensive faunistic research after 1967. The accumulation of new data makes possible a critical taxonomic and faunistic review, together with a zoogeographical analysis.

MATERIAL AND STUDY AREA

The material treated herein can be divided into three major parts. The first part comprises the original collections made in 1965–1992 during a field survey covering most of the districts in Bulgaria (Fig. 1). The second concerns a revision of Drensky's collection and the third is the critical incorporation of all available literature records concerning the distribution of agelenid spiders in Bulgaria.

The program BIODIV (Baev & Penev, 1993) was used for calculating of Czekanowski-Sørensen similarity index and for constructing the dendrogram.

The geographical areas and their abbreviations used in the text are as follows: DW – Western Danubian plain; DM – Middle Danubian plain; DE – Eastern Danubian plain; PRW – Western Predbalkan; PRM – Middle Predbalkan; PRE – Eastern Predbalkan; SPW – Western Stara planina Mt.; SPM – Middle Stara planina Mt.; SPE – Eastern Stara planina Mt.; GB – Golo bardo Mt.; K – Kraishte; ZP – Zemenska planina Mt.; KP – Konyavska planina Mt.; SO – Sofia basin; L – Lyulin Mt.; V – Vitosha Mt.; PL – Plana



Fig. 1. The geographical regions and districts of Bulgaria.

Mt.: LO – Lozenska planina Mt.; PO – Podbalkan basin; SGI – Ihtimanska Sredna gora Mt.; SGS – Sushitinska Sredna gora Mt.; SGR – Surnena Sredna gora Mt.; T – Trakia basin; ST – Sakar-Toundzha district; SK – Sakar Mt.; SD – Strandzha-Dervent district; S – Strandzha Mt.; BB – Bakadzhisiko-Burgas district; OP – Osogovska planina Mt.; VP – Vlahina planina Mt.; MPO – Maleshevsko-Ograzhden district; B – Belasitsa Mt.; BSW – Boboshevsko-Simitly valley; SAP – Sandansky-Petrich valley; R – Rila Mt.; P – Pirin Mt.; SL – Slavianka Mt.; RDW – Western Rhodope Mt.; RDE – Eastern Rhodope Mt.; BN – Northern Black sea coast; BS – Southern Black sea coast.

The data concerning the general zoogeographical distribution are taken from Maurer (1992) and Platnick (1993). The zoogeographical categories used and their abbreviations are: C – Cosmopolitan; P – Palaearctic; WP – West Palaearctic; E – European; MSE – Middle South European; MSEE – Middle Southeast European; SE – South European; SEE – Southeast European; NM – North Mediterranean; NEM – Northeast Mediterranean; BKE – Endemic to Balkan peninsula; BGE – Endemic to Bulgaria.

RESULTS

Species composition

The family Agelenidae is represented in Bulgaria by 35 species, included in 10 genera (Table 1). This number was established after a critical revision of all data available on the family in Bulgaria. An important new record is *Tegenaria zinzulusensis* Dresco, considered by Brignoli (1983) to be a probable synonym of *T. dalmatica* Kulczynski, 1906. Some species which have been misidentified are deleted from the regional fauna: “*Coeletes pabulator*” (= *T. domestica*), “*C. poweri*” (= *C. kulczynskii*), “*C. anoplus*” (= *C. falciger*) (Deltshev, 1990); “*Tegenaria annulata*” (= *T. montana*), “*T. dentifera*” (= *T. montana*), “*T. pagana*” (= *T. bithynae*), “*T. picta*” (= *T. silvestris*) (Deltshev, 1993). The

species *Coelotes atropos*, *C. terrestris*, *Tegenaria argaieica* and *T. atrica* are also deleted, because their occurrence in Bulgaria has not been confirmed.

TABLE I. Distribution of the family Agelenidae in Bulgaria.

Species	Districts	Zoog. cat.
<i>Agelena gracilens</i> C.L. Koch	SPW, SPM, ZP, SO, SG, T, R, P, BSN	MSE
<i>Agelena labyrinthica</i> (Clerck)	DW, PRW, SPW, SPM, SO, T, SAP, R, P	P
<i>Agelena orientalis</i> C.L. Koch	T, ST, S	NEM
<i>Cicurina cicur</i> (Fabricius)	D, V, S, OP, R	E
<i>Coelotes drenskii</i> Deltshv	SPE	BGE
<i>Coelotes falciger</i> Kulczynski	GB, K, ZP	SEE
<i>Coelotes inermis</i> (L. Koch)	RDW	MSEE
<i>Coelotes jurinitschi</i> (Drensky)	SPW, V, P, RDW	BKE
<i>Coelotes karlinski</i> (Kulczynski)	V, OP	BKE
<i>Coelotes kulczynskii</i> (Drensky)	V, OP, R, P	BGE
<i>Coelotes longispinus</i> Kulczynski	PRW, OP	SEE
<i>Coelotes microlepidus</i> R. De Blauwe	ZP	SEE
<i>Cryphoeca pirini</i> (Drensky)	V, R, P	BGE
<i>Cryphoeca silvicola</i> (C.L. Koch)	OP, P	P
<i>Cybaeus angustiarum</i> L. Koch	V	MSEE
<i>Cybaeus</i> sp. (prope <i>brignolii</i>)	SGS	BGE
<i>Histopona luxurians</i> (Kulczynski)	ZP, V	SEE
<i>Histopona torpida</i> (C.L. Koch)	ZP, V, R, P	MSEE
<i>Histopona tranteevi</i> Deltshv	RDW	BGE
<i>Lycosoides coarctata</i> (Dufour)	P, RDW	NM
<i>Maimuna vestita</i> (C.L. Koch)	S, RDW, BSN	NEM
<i>Tegenaria agrestis</i> (Walckenaer)	ZP, BSN	MSE
<i>Tegenaria bithyniae</i> Brignoli	S	NEM
<i>Tegenaria campestris</i> (C.L. Koch)	ZP, V, RDW, BSN	MSEE
<i>Tegenaria domestica</i> (Clerck)	DW, DE, PRW, PRM, SPW, SPM, SO, PO, SGS, OP, BSN, R, RDW	C
<i>Tegenaria ferruginea</i> Panzer	SPW, SPM, ZP, RDW	E
<i>Tegenaria montana</i> Deltshv	P	BGE
<i>Tegenaria nemorosa</i> Simon	RDE	NM
<i>Tegenaria parietina</i> Fourcroy	SO, T, SAP, P, RDW, BSE	WP
<i>Tegenaria regispyrri</i> Brignoli	ZP	BKE
<i>Tegenaria rilaensis</i> Deltshv	R	BGE
<i>Tegenaria silvestris</i> L. Koch	DE, PRW, SPW, SL, RDW	MSE
<i>Tegenaria zinzulusensis</i> Dresco	SAP	NM
<i>Textrix denticulata</i> (Olivier)	PRM, SPM, P, RDW	E
<i>Tuberta maerens</i> (O. P.-Cambridge)	ZP, R	MSEE

The number of species (35) is high, compared with the number for other regions in the Balkan peninsula: Greece – 28; Croatia – 35; Slovenia – 28; Macedonia – 22; Serbia – 21; Bosnia-Herzegovina – 10; Montenegro – 7 (numbers taken from Maurer, 1992; Nikolic & Polenc, 1981). According to the level of similarity, two main faunistic complexes can be differentiated (Fig. 2). The first includes the Bulgarian and Macedonian agelenid fauna, at a high level of similarity above 60%. Very close to this is the complex of Croatian, Slovenian and Serbian agelenid fauna, at a level of similarity around 50%. The second complex comprises only the agelenid fauna of Bosnia-Herzegovina and Montenegro at a low level

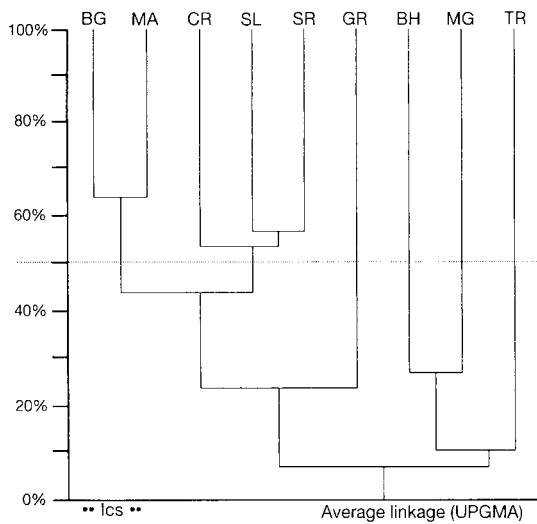


Fig. 2. Dendrogram of the similarity of agelenid faunas in the Balkan peninsula, according to Czekanovski-Sørensen, calculated by average linkage method. BG – Bulgaria. MA – Macedonia, CR – Croatia, SL – Slovenia, SR – Serbia, GR – Greece, BH – Bosnia-Herzegovina, MG – Montenegro, TR – Turkey.

of similarity (25%). Peculiar is the position of the Greek agelenid fauna, connected with the first complex at a low level of similarity (23%). The Turkish agelenid fauna shows a very low level of similarity (10%).

Species of the family Agelenidae are distributed in all districts in Bulgaria, occurring in lowland, forest, mountains, caves, and in buildings or

close to them. The most numerous genera are *Tegenaria* (12) and *Coelotes* (8), but the most widespread species are *Agelena gracilens*, *A. labyrinthica* and *Tegenaria domestica*, distributed all over the country.

Characteristic of the lowlands are the species of *Agelena*, where *A. orientalis* is distributed only in southern Bulgaria. The same applies to *Tegenaria parietina* and *T. agrestis*, known mainly from southern and eastern regions of Bulgaria, and *T. nemorosa*, *T. regispyrrhi* and *T. zinzulusensis*, known only from single localities in southeastern and southwestern Bulgaria.

Among the synanthropic species, the most frequent is *T. parietina*, almost restricted to buildings, followed by *T. domestica*. This species and *T. silvestris*, *T. ferruginea*, *T. campestris* and *T. bithyniae* are commonly found in the entrances of caves. Particularly in the mountains they also occur in open country.

The mountain complex includes most of the species in the family. All species in the genera *Histopona* and *Cybaeus*, *Cicurina cicur*, *Lycosoides coarctata*, *Tegenaria campestris*, *T. ferruginea*, *T. silvestris*, *Textrix denticulata* and *Tuberta maerens* occur in the montane-deciduous and montane-coniferous belts of Rila, Pirin, Vitosha, Rhodope, Stara planina and Osogovska planina mountains. All species in the genus *Coelotes* are also found in mountains (Rila, Pirin, Vitosha, Rhodope, Stara planina, Osogovska planina); they are characteristic mainly of the montane-coniferous belts, but *C. kulczynskii* exceeds the subalpine belt of Pirin, Rila and Vitosha mountains. Quite characteristic of the high altitude zone on these mountains is *Cryphoeca pirini*, which inhabits rocky sites and screes in the subalpine and alpine belts (1,800–2,500 m). The high mountain complex is completed by *T. montana* and *T. rilaensis*, allopatric sibling species, characteristic of the subalpine belt of Pirin and Rila mountains but also occurring in the montane-coniferous and montane-deciduous belts. *Cicurina cicur* and *Cybaeus angustiarum* are also characteristic of mountain and high mountain belts.

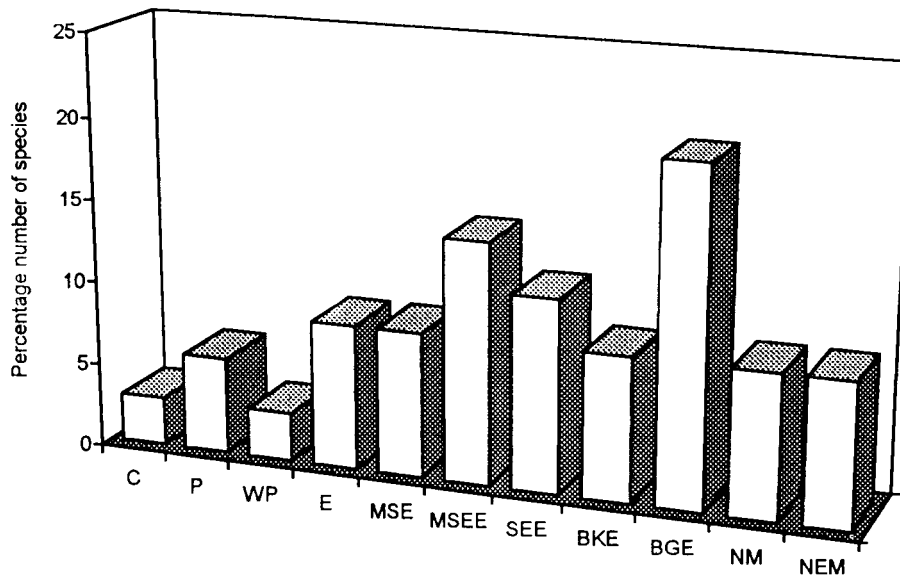


Fig. 3. Zoogeographical characteristics of Bulgarian agelenid spiders.

Zoogeographical analysis

According to their known distribution, Bulgarian agelenid spiders can be classified in 11 zoogeographical categories, grouped into 5 complexes (Figs 3–5).

The Southeast European complex is the best represented (40.00%, SEE + BKE + BGE) and seems to be complicated in composition. Bulgarian endemic species are dominant (20%), followed by Southeast European species (11.43%) and Balkan endemic species (8.57%). The Bulgarian endemic species are distributed in mountains only (Fig. 5), being widespread in the montane-deciduous and montane-coniferous belts. The single species which is characteristic of the high mountain zone is *C. pirini*, known from subalpine and alpine belts only. Perhaps the high proportion of the above representatives can be accounted for by the special geographical position of the country in the Balkan peninsula and to the refugial character of the mountains. With further progress of araneological investigations in other Balkan countries, quite a number of Bulgarian endemic species may be expected to join the group of Balkan endemic species. This group is small, also distributed in mountains, and only *T. regispyrrhi* occurs in the lowland-submediterranean zone. The group of Southeast European species is complicated in composition, because some of them (*C. longispinus*, *C. microlepidus*, *H. luxurians*) extend to Middle and South Europe (Austria, North Italy) but are widespread in Southeastern Europe. Curious is the distribution of *C. microlepidus*, known from a single locality in Italy (Garda lake region) and a single locality in Bulgaria (Zemen gorge region).

The European complex forms the second largest set of particularly widespread spiders in woods and mountains of Europe (31.42%, E + MSE + MSEE). Middle Southeast European species are dominant (14.29%), most of them being distributed in Middle and Southeastern Europe and occurring mainly in the forest belt of mountains, with *C. angustiarum* extending to the high altitude zone. The Middle South European species (8.57%) are also

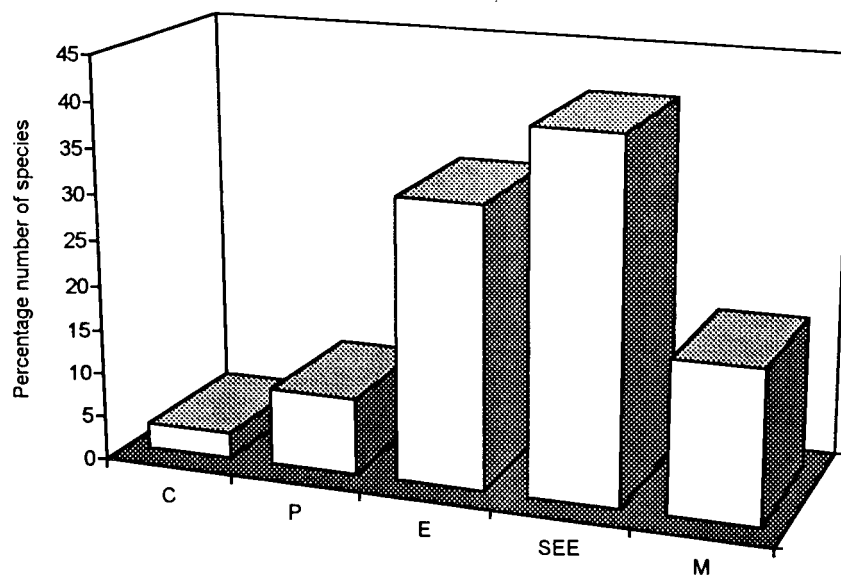


Fig. 4. Characteristics of Bulgarian agelenid spiders, grouped into zoogeographical complexes.

widespread, *A. gracilens* and *T. agrestis* being well represented in lowland habitats. The species with Holo-European distribution are characteristic elements of the mountain fauna and *C. cicur* reaches the alpine belt.

A third complex comprises the spiders occurring in the Mediterranean area (or part of it). This complex forms 17.14% of the total agelenid fauna of Bulgaria. There are two groups with equal representation (8.57%): North Mediterranean and Northeast Mediterranean. These elements are distributed in lowlands and in the woodland belt of mountains. Quite obscure is the distribution pattern of *T. bithyniae*, known only from one locality on Strandzha mountain (Bulgaria) and from one locality on Bolu mountain (Turkey). This species can be regarded as a local element of the Balkan peninsula and Asia Minor.

The Palearctic complex forms a minor proportion (8.57%) and comprises especially widespread spiders (*A. labyrinthica*, *T. parietina*) associated strictly with lowlands, buildings and woodland belt of mountains.

The cosmopolitan complex is represented solely by *T. domestica*. Because of its small proportion and obscure (synanthropic) zoogeography this group will be ignored in the analyses below.

Vertical distribution

The vertical belts are very well represented in Bulgaria, due to the relief and climate, and are characterized by specific vegetation and fauna.

The agelenid fauna is best represented in the montane-deciduous belt (Fig. 5C), where the Southeast European complex occupies a dominant position. Characteristic are here the endemic species *Coelotes jurinitschi*, *C. kulczynskii* and *C. karlinskii*. The European complex is also well represented, with *Tegenaria campestris*, *T. silvestris* and *Histoipona torpida* being widespread. The proportion of Mediterranean species is not high (13%) but *Tegenaria bithyniae* is a characteristic element. The montane-coniferous belt presents a similar picture (Fig. 5D), but here there is only one Mediterranean element – *Lycosoides coarctata*.

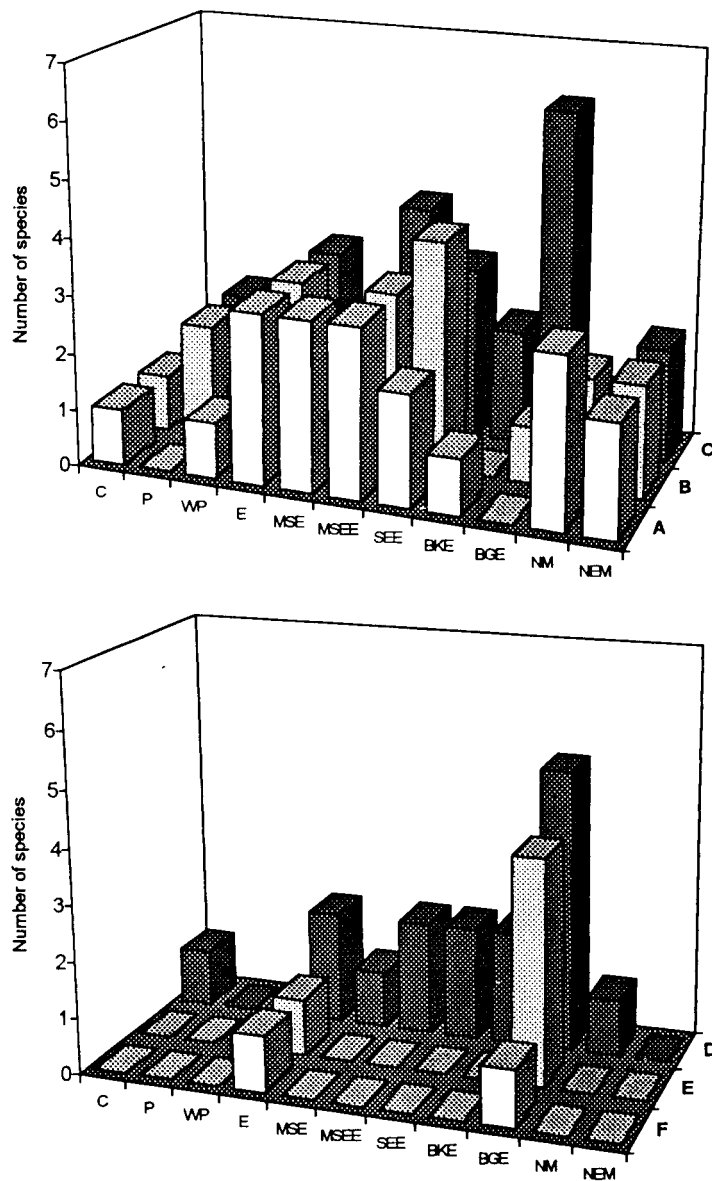


Fig. 5. Distribution of agelenid spiders by zoogeographical categories in different mountain belts in Bulgaria. A - Submediterranean: *Quercetum* (0-700 m); B - Submontane: *Quercetum*, *Carpinetum* (600-1,000 m); C - Montane-deciduous: *Fagetum* (900-1,500 m); D - Montane-coniferous: *Piceetum*, *Pinetum* (1,300-2,000 m); E - Subalpine: *Pinetum*, *Juniperetum* (2,000-2,500 m); F - Alpine: *Caricetum*, *Seslerietum* (2,500-2,925 m).

The Mediterranean elements are best represented in the submediterranean and submontane belts in South Bulgaria (Fig. 5A-B). Comparatively widespread is *Agelena orientalis*, while *Tegenaria nemorosa* and *T. zinzulusensis* are known only from single localities. The best represented in these belts are the European and Southeast European complexes.

The high altitude zone (subalpine and alpine belts) is reached by only one European (*Cicurina cicur*) and 4 endemic Bulgarian species (*Coelotes kulczynskii*, *Cryphoeca pirini*, *Tegenaria montana*, *T. rilaensis*) (Fig. 5E-F). Only *Cryphoeca pirini* is characteristic of the alpine belt.

CONCLUSIONS AND DISCUSSION

Agelenid spiders are well represented in Bulgaria (35 species) and distributed in all regions and districts of the country (Table 1). Comparisons with other agelenid faunas in the Balkan peninsula show that the Bulgarian and Macedonian faunas are very similar and form a faunistic complex, which is related (50%)

to the complex of Croatian, Slovenian and Serbian agelenid faunas (Fig. 2). The similarity with Greek (23%) and Turkish (10%) faunas is at a low level.

Regarding the composition of the fauna, the largest part is the Southeast European faunistic complex (40%), followed by the European (31.42%), Mediterranean (17.14%), Palaearctic (8.57%) and Cosmopolitan (2.85%) complexes (Fig. 3). The high percentage (28.57%) of endemic species (Bulgarian and Balkan) shows that the process of autogenesis is essential.

As to their distribution by altitude, the Southeast European complex is best represented in the montane-deciduous, montane-coniferous and submontane belts; the European complex in the montane-deciduous, submediterranean and submontane belts; and the Mediterranean complex in the submediterranean and submontane belts. The alpine belt is occupied by only a local element (*Cryphoeca pirini*) and a European element (*Cicurina cicur*).

Finally it should be noted that the composition of the faunal elements shows the Middle Southeast European character of the Bulgarian agelenid fauna. The endemic species show the local character of this fauna and the main role of the Balkan peninsula in its origin and formation.

ACKNOWLEDGEMENTS. I am especially indebted to my colleagues G. Blagoev, L. Penev and D. Dobrev for help with computerising the data.

REFERENCES

- BAEV P. & PENEV L. 1993: *BIODIV – A Program for Calculating Biological Diversity Parameters, Similarity, Niche Overlap and Cluster Analysis. Version 4.1*. Pensoft publishers, Sofia, Moscow, 87 pp.
- BRIGNOLI P.M. 1976: Ragni di Grecia IX. Specie nuove o interessanti delle famiglie Leptonetidae, Dysderidae, Pholcidae ed Agelenidae (Araneae). *Rev. Suisse Zool.* **83**: 541–578.
- DELTSHEV C. 1967: On the studies of spiders (Araneae) in the Vitosha mountain. *Bull. Inst. Zool. Mus. (Sofia)* **24**: 51–56 (in Bulgarian, English abstr.).
- DELTSHEV C. 1972a: A review of spiders (Araneae) from Bulgarian caves. *Proceedings of the Fifth International Congress on Arachnology*. Inst. Vert. Zool., Czechosl. Acad. Sci., Brno, pp. 99–103.
- DELTSHEV C. 1972b: A contribution to the study of spiders (Araneae) from the caves of Bulgaria. *Bull. Inst. Zool. Mus. (Sofia)* **34**: 171–175 (in Bulgarian, English abstr.).
- DELTSHEV C. 1973: A contribution to the study of spiders (Araneae) from the caves of Bulgaria III. Ecological notes on spiders (Araneae) from the entrance parts of caves. *Bull. Inst. Zool. Mus. (Sofia)* **38**: 39–47 (in Bulgarian, English abstr.).
- DELTSHEV C. 1976: On the spiders (Araneae) in the Loudogoric. *Terrestrial Fauna of Bulgaria*. Bulg. Acad. Sci., Sofia, pp. 251–260 (in Bulgarian, English abstr.).
- DELTSHEV C. 1982: New data on the distribution of cave spiders (Araneae) in Bulgaria. *Acta Zool. Bulg.* **19**: 100–103 (in Bulgarian, English abstr.).
- DELTSHEV C. 1990a: A critical review of genus *Coelotes* Blackwall in Bulgaria with description of a new species (*Coelotes drenskii* sp. n.) (Araneae, Agelenidae). *Acta Zool. Bulg.* **40**: 29–43.
- DELTSHEV C. 1990b: The high-altitude spiders (Araneae) in the Pirin Mountains, Bulgaria. *Acta Zool. Fenn.* **190**: 111–115.
- DELTSHEV C. & BLAGOEV G. 1992: A faunistic and zoogeographic analysis of spiders (Araneae) in Zemen gorge (Southwestern Bulgaria). *Acta Zool. Bulg.* **45**: 26–35.
- DELTSHEV C. 1993: The genus *Tegenaria* Latreille in Bulgaria: A critical review with description of two sibling species (Arachnida, Araneae: Agelenidae). *Ber. Naturw.-Med. Ver. Innsbruck* **80**: 167–174.
- DRENSKY P. 1936: Katalog der echten Spinnen (Araneae) der Balkanhalbinsel. *Sb. Bulg. Akad. Nauk.* **32**: 1–223.
- DRENSKY P. 1942: Die Spinnen Fauna Bulgariens. V. Unterordnung Arachnomorphae, 2. Gruppe Trionichia, Familie Agelenidae. *Mitt. K. Naturw. Inst. Sofia* **15**: 33–60.
- MAURER R. 1992: *Checkliste der Europäischen Agelenidae nach der Roewerischen Systematik 1954 – unter Berücksichtigung angrenzender östlicher Gebiete*. Polycopie Naturhist. Museum, Basel, 28 pp.
- NIKOLIC F. & POLENEC A. 1981: *Catalogus Faunae Jugoslaviae*. Slov. Acad. Znan. Um., Ljubljana, 135 pp.
- PLATNICK N. 1993: *Advances in Spider Taxonomy 1988–1991. With Synonymies and Transfers 1940–1980*. New York Entomological Society, American Museum of Natural History, New York, 846 pp.

Received December 13, 1994; accepted March 23, 1995