Endemism among the Heteroptera on the Balkan Peninsula[1]

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Abstract: Data on the distribution of 92 endemic and 34 subendemic species on the Balkan Peninsula are summarized. Different problems on taxonomy, phenology, trophic specialization, chorology, origin and distribution of the Balkan Heteroptera are discussed. Two new taxa are described: *Platycranus* (*Genistocapsus*) *rumelicus* Simov nov.sp. and *Orthotylus* (*Orthotylus*) *tenellus meridionalis* Josifov nov.ssp.

Key words: Heteroptera, Zoogeography, Endemics, Balkan Peninsula, Bulgaria, Greece, Miridae, new taxa, *Platycranus* (*Genistocapsus*) *rumelicus* nov.sp., *Orthotylus* (*Orthotylus*) *tenellus meridionalis* nov.ssp.

Introduction

To determine if a genus or species is endemic to the Balkan Peninsula we use a single formal criterion – whether or not its range is completely within its borders. Actually, the ranges of the endemic species include only a part of the total territory of the peninsula and many of these are known from only one or a few closely situated localities. However, there are species initially considered endemic, whose ranges include neighbouring territories – most often those to the east. This is understandable, considering the connection between the fauna of Asia Minor and the Balkan Peninsula in the past, interrupted by the submerging of the Aegean land and the forming of the Bosporus. Such species and genera can be considered subendemics and they are also taken into account in this work.

Results

So far 92 endemic and 34 subendemic species and subspecies of Heteroptera are known from the territory of the Balkan Peninsula (Tab. 1 and Tab. 2). During the present study, two new taxa were discovered.

Platycranus (*Genistocapsus*) *rumelicus* Simov nov.sp.

Holotype: ♂, Bulgaria, Rila Mts., 1050 m alt., Belishka River Valley above Belitsa Village, on *Genista rumelica*, 06.07.2003, leg. N. Simov. (At the collection of the National Museum of Natural History, Sofia, Bulgaria). Paratypes: 10♂♂, 9♀♀, Bulgaria, Rila Mts., 1050 m alt., Belishka River Valley above Belitsa Village, on *Genista rumelica*, 06.07.2003, leg. N. Simov, 1♂, 2♀♀, Bulgaria, Rila Mts., 1050 m alt., Belishka River Valley above Belitsa Village, on *Genista rumelica*, 12.07.2005, leg. N. Simov. (At the collection of the National Museum of Natural History, Sofia, Bulgaria)

Description. Green. Head, the anterior half of pronotum, scutellum basally, sternal part of body and legs, yellowish. 1st antennal segment green, 2nd antennal segment ochraceous, 3rd and 4th antennal segments brownish yellow. Membrane light smoky. The apical part of the tibia darker, apical part of the tarsus dark brown.

Elongate. The body is 4-4.7x (♂), 3.5-4.2x (♀) as long as the pronotum is wide. Vertex with a slightly curved basal ridge, 2.3-2.7 (♂), 2.8-3.5 (♀) as long as eye. Proportion of antennal segments ♂ I (17-19): II (52-60): III (42-54): IV (20-22), ♀ I (17-18): II (50-55): III (45-47): IV (21-22). 1st

[1]The authors dedicate this work to the prominent expert on Family Aradidae, Prof. Ernst Heiss, on the occasion of his 70th anniversary and in recognition of his remarkable contributions to the investigation of the Balkan fauna of Heteroptera.

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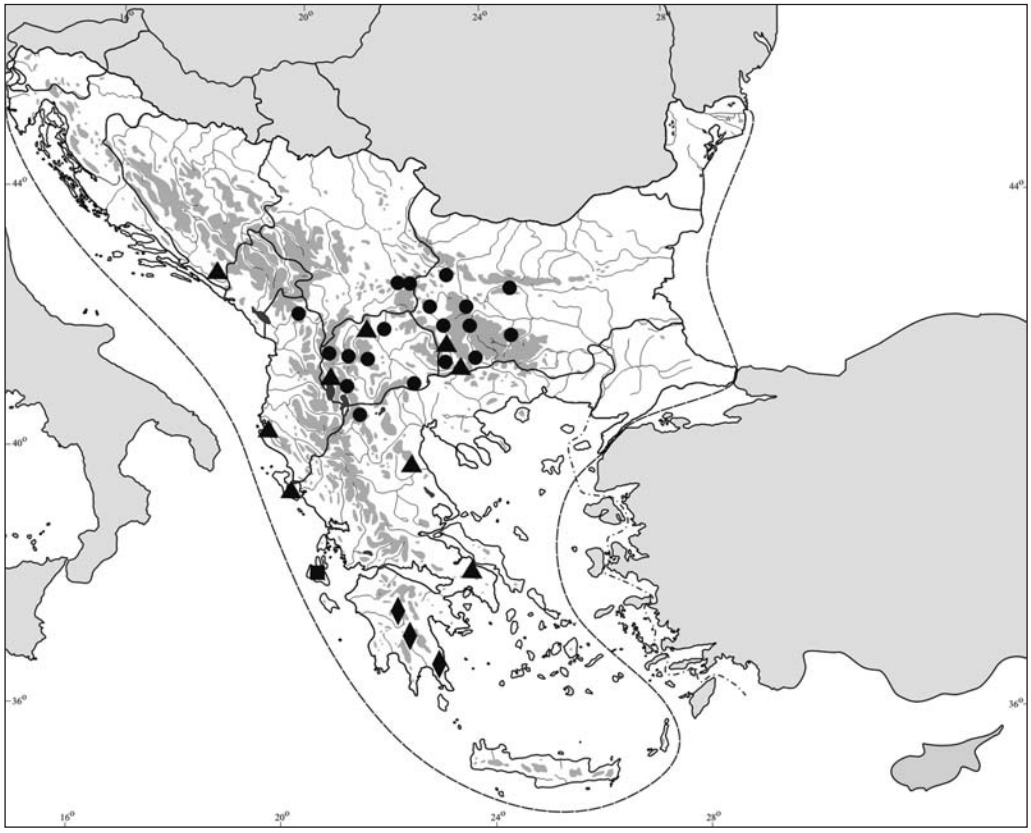


Fig. 1: Map of distribution of endemic genera on Balkan Peninsula:
● – *Adelphophylus* Wagner 1959
▲ – *Cremnorrhinus* Reuter 1880
◆– *Metastenothorax* Reuter 1884
■ – *Singeria* Wagner 1955.

antennal segment 0.9-1 (♂), 0.7-0.8 (♀) as long as vertex. 2nd antennal segment 1.20-1.43x (♂), 1.10-1.38x (♀) as long as the pronotum wide and 1.09-1.25x (♂), 1.1-1.2 (♀) as long as 3rd antennal article. Rostrum reaches mesocoxae, greenish yellow with black apex. 1st segment of rostrum 2x as thick as the 2nd. Proportion of segments I

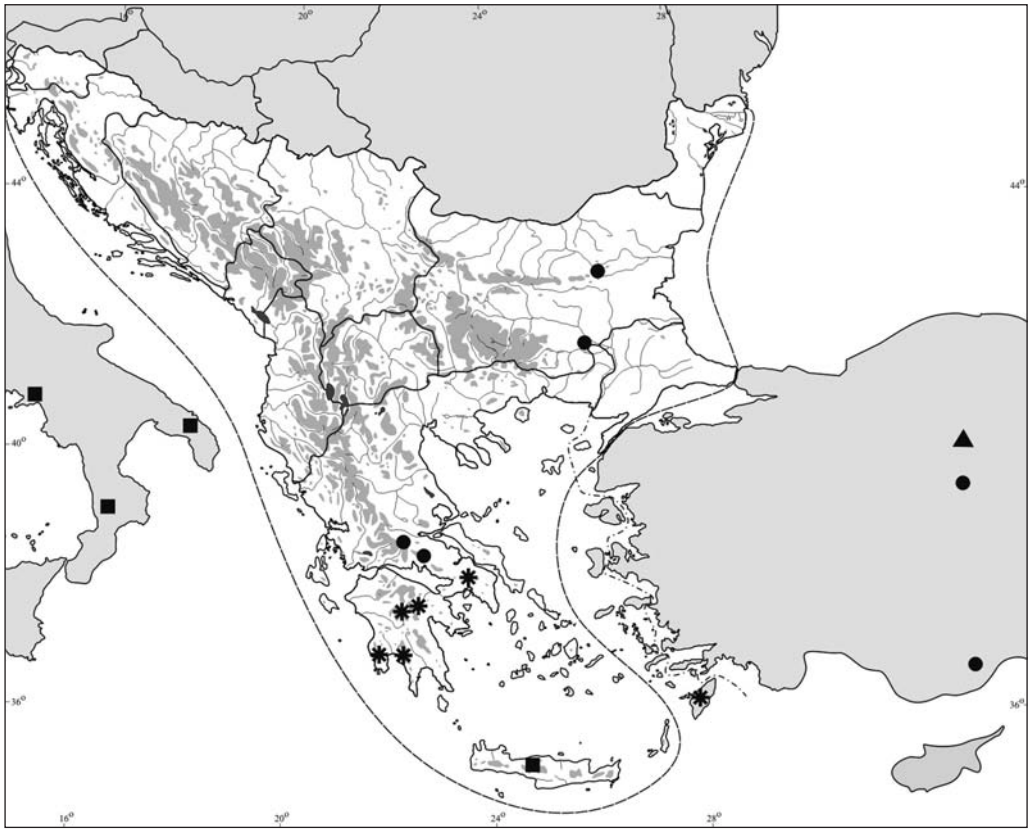


Fig. 2: Map of distribution of subendemic genera on Balkan Peninsula: ● – *Saundersiella moerens* (Reuter 1876) ▲ – *Saundersiella hirta* Wagner 1968 ■ – *Myrmicomimus variegatus* (A. Costa 1843) ❋ – *Paravoruchia dentata* Wagner 1959.

(13): II (11-13): III (5): IV (9-11). Pronotum 0.70-0.81x (♂), 0.77-0.90x (♀) as broad as head. Proportion of tarsal segments 5: 10: 10.

The male genital capsule with a characteristic triangular impression in the wall dorsally between the genital orifice and base of the capsule. Left paramere as in Fig. 8. Right paramere in different aspects as in Fig. 6 and Fig. 7. Aedeagus as in Fig. 9.

Measurements (in mm). Width: head: ♂ 0.82-0.87, ♀ 0.87-0.92; vertex: ♂ 0.47-0.49, ♀ 0.50-0.57; eye: ♂ 0.17-0.20, ♀ 0.16-0.20; pronotum: ♂ 1.05-1.12, ♀ 1.00-1.12. Length: body: ♂ 4.6-5.1, ♀ 3.9-4.4; pronotum: ♂ 0.55-0.60, ♀ 0.52-0.58; antennal segments: ♂ I (0.42-0.47): II (1.3-1.5): III (1.05-1.35): IV (0.50-0.55), ♀ I (0.42-0.45): II (1.25-1.40): III (1.12-1.17): IV (0.52-0.55); tarsal segments: I (0.12): II (0.25-0.27): III (0.25). Number of measured specimens: 12♂♂, 11♀♀.

The new species is similar in genitalic structure to *Platycranus remanei* WAGNER 1955 and *P. orientalis* LINNAVUORI 1965, in having the triangular impression between the genital orifice and capsular base as in *Platycranus jurineae* PUTSHKOV 1985 and *P. boreae* GOGALA 2002, and in the antennal length to *P. metriorrhynchus* REUTER 1883. *Platycranus remanei*, *P. orientalis*, *P. metriorrhynchus* differ from the new species by the lack of triangular impression between the genital orifice and capsular base. *Platycranus jurineae* and *P. boreae* are distinctly smaller and differ from the new species by the shorter antennae (1st antennal segment 0.62-0.67x (♂) or 0.52-0.54x (♀) (*P. boreae*) and 0.58-0.67x (♂) or 0.45-0.51x (♀) (*P. jurineae*) as long as vertex).

Etymology. The new species is named after its host plant *Genista rumelica* VELEN.

Ecological remarks. The new species lives on the plant *Genista rumelica* (Fig. 10) which is endemic to the eastern part of the Balkan Peninsula. *Platycranus* (*Genistocapsus*) *rumelicus* nov.sp. has only one generation per year. Nymphs appear in early June, when *Genista rumelica* is in blossom. The adults occur from end of June to end of July and feed on the green pods of *G. rumelica*.

Orthotylus (*Orthotylus*) *tenellus meridionalis* JOSIFOV nov.ssp.

Holotype: ♀, Bulgaria, South Pirin Mts., 450 m alt., Rhozhen Monastery, on *Quercus pubescens*, 01.06.1989, leg. M. Josifov. (At the collection of the Institute of Zoology, Sofia, Bulgaria). Paratypes: 4♀♀, Greece, Samothraki Island, 30m alt., Pahia Amos, on *Quercus pubescens* 31.06.2005, leg. N. Simov. (At the collection of the National Museum of Natural History, Sofia, Bulgaria). Specimens not included in the type series: about 20♂♂ and ♀♀ individuals, Greece, Crete, 500 m alt., Moni Arkadion, 24 km SE of Rethimnon, on *Quercus pubescens*, 26.05.1982, leg. J.P. Duffels. (At the collection of the Zoölogisch Museum, University of Amsterdam, Amsterdam, The Netherlands).

Description. Orange-yellow, with light grayish-yellow reclining hairs. Elongate. The body is 4x (♂), 3.5x (♀) as long as the pronotum is wide. Eyes big. Vertex 1.14x (♂), 1.7-1.8x (♀) as long as eye. 1st antennal segment orange-yellow, 2.-4. antennal segments grayish-yellow. Proportion of antennal segments ♂ I (12): II (65): III (30): IV (13), ♀ I (13): II (54-55): III (29-30): IV (14). 1st antennal segment slightly longer (♂) or shorter (♀) than vertex and 0.38-0.43x as long as the head is wide, 2nd antennal segment 1.08-1.40x as long as the pronotum is wide. Pronotum trapezoidal, 2.0-2.1 as broad as medial length. Membrane tansparent grey, veins pale yellowish. Ventral side yellowish. Abdomen in some individuals greenish-yellow. Rostrum with black apex slightly surpassing the distal end of mesocoxae. Legs orange-yellow, in some individuals femora pale greenish-yellow. Apical part of 3rd tarsal segment brownish-yellow.

Measurements (in mm). Width: head: ♂ 0.79, ♀ 0.76-0.80; vertex: ♂ 0.29, ♀ 0.36-0.38; eye: ♂ 0.25, ♀ 0.20-0.22; pronotum: ♂ 1.17, ♀ 1.25. Length: body: ♂ 4.70, ♀ 4.30-4.45; pronotum: ♂ 0.57, ♀ 0.60; antennal segments: ♂ I (0.30): II (1.62): III (0.75): IV (0.32), ♀ I (0.32): II (1.35-1.37): III (0.72-0.75): IV (0.35); tibia: tarsus: I (0.10): II (0.10): III (0.17). Number of measured specimens: 3♂♂, 8♀♀.

Male genitalia as in nominotypical subspecies (males at the collection of Zoölogisch Museum, University of Amsterdam).

The nominotypical subspecies differs from *Orthotylus tenellus meridionalis* nov.ssp.

Fig. 3: *Dicyphus digitalidis* Josifov 1958.

Fig. 4: *Adelphophylus balcanicus* (Kormilev 1939).

Fig. 5: *Velia saulii serbica* Tamanini 1951.

by the larger size, and different proportions: vertex width/eye width (♂ 1.2-1.3; ♀ 1.9-2.2), 1st antennal segment/head width (0.47-0.50), 2nd antennal segment/pronotum width (1.50-1.54), by the predominantly green coloration of the legs and the ventral side of the body and by the paler coloration of rest of the body.

Etymology. From Latin meridionalis, southern, after the southern distribution of the new subspecies in the Balkan Peninsula.

Ecological remark. In Bulgarian localities (Plana Mt. and Balkan Mts.), *Orthotylus tenellus tenellus* has not been found below 800 m a.s.l. (Josifov 1978) and it feeds on *Quercus cerris*, *Q. fraineto*, *Q. sessiliflora*. So far the new subspecies has been found in southern parts of Balkan Peninsula only on *Q. pubescens* not higher than 500 m a.s.l. It is very likely that the record of *O. tenellus* from Greece – Peloponnissos, Mt. Killini (Linnavuori 1999) and Rhodes Island (Wagner 1974b) refers to *O. tenellus meridionalis* nov.ssp.

Discussion

1. Faunistic and taxonomic problems

Until the beginning of the 20th century the Balkan Peninsula was largely neglected by European entomologists. Concerned with investigating the Mediterranean entomofauna, their attention was focused mainly on the Apennine and the Iberian Peninsulas. The earliest records on the Heteroptera of the Balkan Peninsula are from the end of the 19th century. These concern only its most southern parts, dating from when Greece became independent from the Ottoman Empire after 1830. From 1870 to the end of the 19th century, only seven of the endemic Heteroptera species from the Balkan Peninsula were described (Tab. 1).

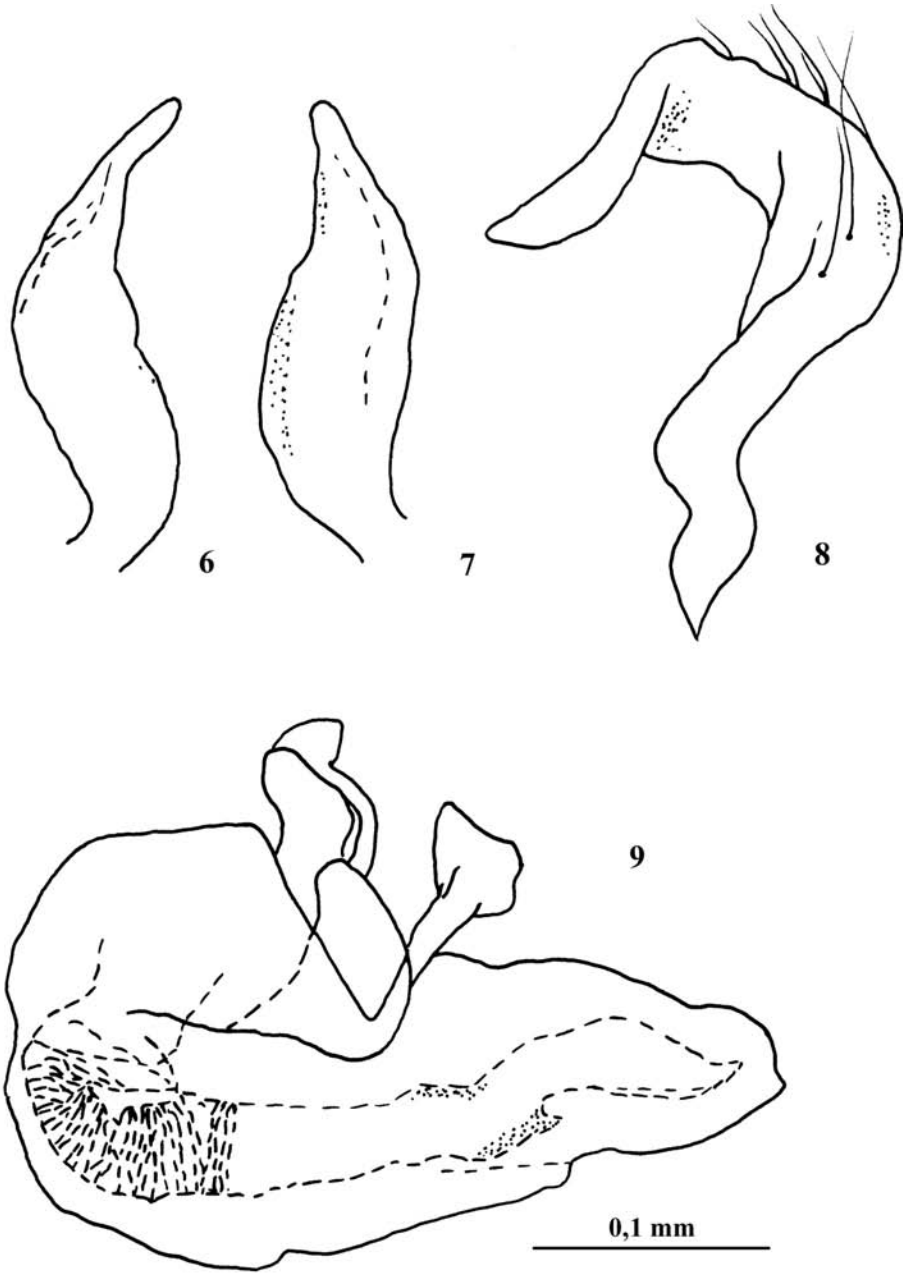
A considerable increase in faunistic and taxonomic studies on the Balkan Peninsula took place during the second half of the 20th century. About 80% of all endemic or subendemic Heteroptera species and subspecies were described during the second half of the 20th and the beginning of the 21st century. Further research in the Mediterranean may prove that many of the putatively en-

demic Balkan species actually have wider distributions, and that species described from Asia Minor might also be found on the Balkan peninsula or in other Southeastern European countries as well. Examples are numerous. *Psallus asthenicus* SEIDENSTÜCKER 1966, *Psallus anaemicus* SEIDENSTÜCKER 1966 and *Psallus lentigo* SEIDENSTÜCKER 1972 were described from Central Asia Minor (Sultan-Dagh, nr. Aksehir) but were subsequently found in Bulgaria as well (JOSIFOV 1974b). Later, *P. anaemicus* was found in Italy (RIZZOTTI VLACH 1995) including Sicily (CARAPEZZA 1988), Hungary (KERZHNER & JOSIFOV 1999), Slovakia (HERCZEK & HALGOŠ 1991; GÜNTHER 2000), Czech Republic (KMENT & BRYJA 2001) and Austria (RABITSCH 2003a). *Psallus lentigo* was found in Czech Republic (BRYJA & KMENT 2002) and Austria (RABITSCH 2003b). Apparently, these are species of Ponto-Mediterranean distribution, or species expanding their ranges westward. *Psallus milenae* JOSIFOV 1974, described from Bulgaria (Kresna Gorge), was found in Asia Minor, and *Psallus faniae* JOSIFOV 1974 described from the Bulgarian Black Sea coast to the north of Primorsko, was found in Sicily as well (CARAPEZZA 1988).

Ischnocoris bureschi JOSIFOV 1976, described from several Balkan countries (Bulgaria, Macedonia, Albania and Greece) has been reported recently from Asia Minor and southern Romania (PÉRICART 1998; KMENT et al. 2005).

Even more striking is the case of *Chorosoma gracile* JOSIFOV 1968, described from Bulgaria (Pobitite kamani site, 20 km west of Varna). This species has now been found in several other countries in Central and Eastern Europe and in Asia as well including: the Czech Republic, Slovakia and Hungary in the west, and through the Ukraine, Kazachstan and Asia Minor to the east, including Middle Asia.

Of particular interest is the case of *Dimorphocoris fuscus* JOAKIMOV 1909, until now considered a Bulgarian endemic. More than 60 species of the ancient Palaeomediterranean genus *Dimorphocoris* REUTER 1890, distributed in North Africa, southern part of Europe, Asia Minor and Central Asia have been described. Most probably the genus existed prior to the development of the Alpo-Himalayan mountain system. After the end of the Tertiary many species from that genus persisted at high to mid-elevations in the mountains of this system and thus many of them became endemics. For the first time the species was described from the Balkan Peninsula by JOAKIMOV (1909) who describes *D. fuscus* from Vitosha Mt. above 1800 m a.s.l. Later the same species was found above the upper limit of the forest in Rila and Pirin Mts. It was considered a Bulgarian endemic until 1961 when JOSIFOV (1961) placed it in synonymy with *D. ribauti* WAGNER 1954, described from the Pyrenees. WAGNER (1965b)



Figs 6-9: *Platycranus rumelicus* nov.sp. (**6-7**) right paramere in different aspects (**8**) left paramere (**9**) aedeagus.

did not accept this synonymy and his major argument was the remoteness of the Pyrenees from the mountains of the Balkan Peninsula. But KERZHNER (1964, 1970) found *D. fuscus* in northwestern Mongolia (Altai, Ust'-Kan), and EHANNO (1997) confirmed the synonymy of *D. ribauti* with *D. fuscus* in his comprehensive paper on the species of the genus *Dimorphocoris* in Pyrenees. *D. fuscus* was later found in the mountains of Western and Eastern Siberia (Tuva) (VINOKUROV & KANYUKOVA 1995). Thus, *D. fuscus*, considered for a long time a Bulgarian endemic, turned out in fact to be one of the widest longitudinally distributed representatives of the genus, although with a quite fragmented range.

Other species initially considered endemic for the region might prove synonymous with species described from neighbouring countries. For example, the above mentioned *Psallus asthenicus* was synonymised (JOSIFOV 1986) with *Psallus amitinus* WAGNER 1975 described from Greece, and *Psallus helenae* JOSIFOV 1969 described from Bulgaria was synonymised (JOSIFOV 1973) with *P. appeninicus* WAGNER 1970. Furthermore, *Psallus balcanicus* JOSIFOV 1969 was found to be a junior synonym of the Italian *P. lucanicus* WAGNER 1968 (CARAPEZZA 1988).

Another peculiar case is the "species" *Cyllecoris marginatus* (FIEBER 1870). It is described based on only a few individuals from Greece (Parnassus Mts.) and like *C. histrionius* (LINNAEUS 1767), is probably trophically associated with oaks. From the latter species, widely distributed on the Balkan Peninsula and throughout Europe, *C. marginatus* differs only in the thickened fusiform second antennal segment. The nodular surface of this segment observed in well-preserved individuals leads us to suspect that the enlargement may be of teratological origin. If so, *Cyllecoris marginatus* and *C. histrionius* are probably conspecific. This suspicion is supported by the fact that since the time of its discovery, *C. marginatus* has not been reported by any other specialist. Of course, this hypothesis remains unproven.

Only four genera are endemic to the Balkan Peninsula: *Metastenothorax* REUTER 1884, *Cremnorrhinus* REUTER 1880, *Adelphophylus* WAGNER 1959 and *Singeria* WAGNER 1955. The type species of the genus *Amixia* REUTER 1883 considered endemic until 1957 was transferred to *Orthonotus* STEPHENS 1829 (WAGNER 1957). On the other hand, it is possible that *Paredrocoris seidenstueckeri* JOSIFOV 1965 known from Bulgaria (northern slopes of Belasitsa Mt. and lower slopes of Southern Pirin) (JOSIFOV 1965) and from southern slopes of the Rhodopes and Peloponnissos in Greece (LINNAVUORI 1997, 1999) may belong to a separate genus. In any case, we may consider the endemism among the Heteroptera of the Balkan Peninsula at the generic as well as the species level as low. A comparison between the Balkan Peninsula on one hand, and the other two southern European peninsulas, the Apennine and Iberian on the other, indicates that despite the poorer level of knowledge of the Balkan Peninsula, the number of endemic true bugs there is higher. Taking into consideration the endemic Miridae, their number on the Balkan Peninsula is 68, that means equal to that on the Iberian Peninsula (68 species) and considerably higher than on the Apennine Peninsula together with Sicily and Sardinia (21 species). This is most probably due to the fact that during most of the Tertiary the Apennine peninsula was a sea floor. Regarding Asia Minor, the number of endemic Miridae there (71 species and subspecies) is insignificantly higher than on the Balkan Peninsula. However, the number of the subendemic species is considerably higher, since Asia Minor is widely opened eastwards towards the neighbouring Asian regions with a rich Mediterranean fauna. The comparatively low amount of information on Asia Minor, especially its central and northern coastal regions, should also be taken into consideration.

2. Phenology and trophic specialization

Some Balkan countries (e.g., Albania, Macedonia, Greece), lack taxonomic specialists on the Heteroptera. Faunistic and taxonomic contributions based on materials from these countries result from the efforts of foreign specialists. Thus, the Heteroptera fauna of these countries remains insufficiently known. As a practical matter, it is

difficult to do reliable field research in the absence of local specialists. In particular, seasonal changes in the composition of the fauna tend to be missed. The following two examples illustrate this point.

The genus *Saundersiella* REUTER 1890 (initially *Saundersia* REUTER 1876, nomen praeoccupatum) has *Saundersiella moerens* (REUTER 1876) as a type species, which was described from a single individual collected in Greece (Parnassus Mt). Nothing was said about the size of the type series of *Saundersiella moerens* in either the original description of the species, or in the following publication by REUTER (1890), in which the author changes the preoccupied name of the genus. This gave WAGNER (1968) a reason to choose the single preserved female individual in Reuter's collection in Helsinki as the lectotype.

No collector encountered the species *S. moerens* over the next seventy years following its description. During all that time it has been considered an endemic for Greece. However, in 1960 during one of his expeditions to Asia Minor Dr. Hans Eckerlein (Coburg) found it in the Taurus Mts. near Namrun. Two years later he found this species 65 km northwards from Ankara together with another undescribed species from the same genus, and for the first time collected the males. WAGNER (1968) used the collected material for a redescription of *S. moerens* and for description of a new species named by him *Saundersiella hirta*. However, after its discovery in Greece, *S. moerens* was found in mid-May 1971 for the second time on the Balkan Peninsula near Kotel, in the Eastern Balkan Mts., on *Quercus cerris* trees with scarce foliage (JOSIFOV 1974b). Because only females were collected on this occasion, the conclusion was made that the generation should be near the end of its development. Later the same author revisited the locality near Kotel at the beginning of May (unpubl. data) and found males. The conclusion was that the imago of the species appears for only a very short period each year (i.e., 15-20 days in May for the aforementioned locality).

The species was found for the third time on the Balkan Peninsula in the Eastern Rhodopes Mts. near the village of Dabovets at the end of April and the beginning of May 1992 (JOSIFOV 1993b). In late May no trace of the population was found. Therefore, if a collector is not present at the locality during the short period of two weeks when the imago appears, the species will not be found there at all. For this reason, field studies were carried out in April and May, in different regions of Bulgaria where a great diversity of true bugs trophically associated with oaks occurs. However, *S. moerens* wasn't found anywhere west of the localities in the Eastern Balkan Mts. and the Eastern Rhodopes. The apparent situation, given the known distribution of *Saundersiella* (Fig. 2), is that it is a subendemic genus whose single representative on the Balkan peninsula is distributed only in its eastern and southernmost parts. Of course, finding one or both species might be expected in Asia Minor, or in other localities east of those known to date.

Another example demonstrating the importance of constant field research for expanding knowledge of regional faunas and species phenology is *Cremnorrhinus basalis* REUTER 1880, a monotypic genus described from Olympus Mt. The species' narrow range includes the northern part of Greece, southwestern Bulgaria northwards to Kresna gorge, as well as Macedonia, Albania and parts of Bosnia and Herzegovina. In Bulgaria it can be found along the Struma river valley to the south of Kresna gorge only on *Geranium rotundifolium* – an ephemeral plant species which blooms in late May and early June. On the lowest northern slopes of Belasitsa Mt., above Petrich, *Geranium rotundifolium* has a fragmentary distribution among the dense overgrowths of another ephemeral species from the same genus – *Geranium lucidum*. However, the strictly monophagous *Cremnorrhinus basalis* does not occur on *Geranium lucidum* and can be found only on *Geranium rotundifolium*. Both ephemeral species completely disappear in late May or early June and reappear the following spring. If the collector is not present during the short vegetation period (second half of May), he or she would not be able to collect *Cremnorrhinus basalis*.

Similarly, the other endemic Miridae can be found predominantly during the

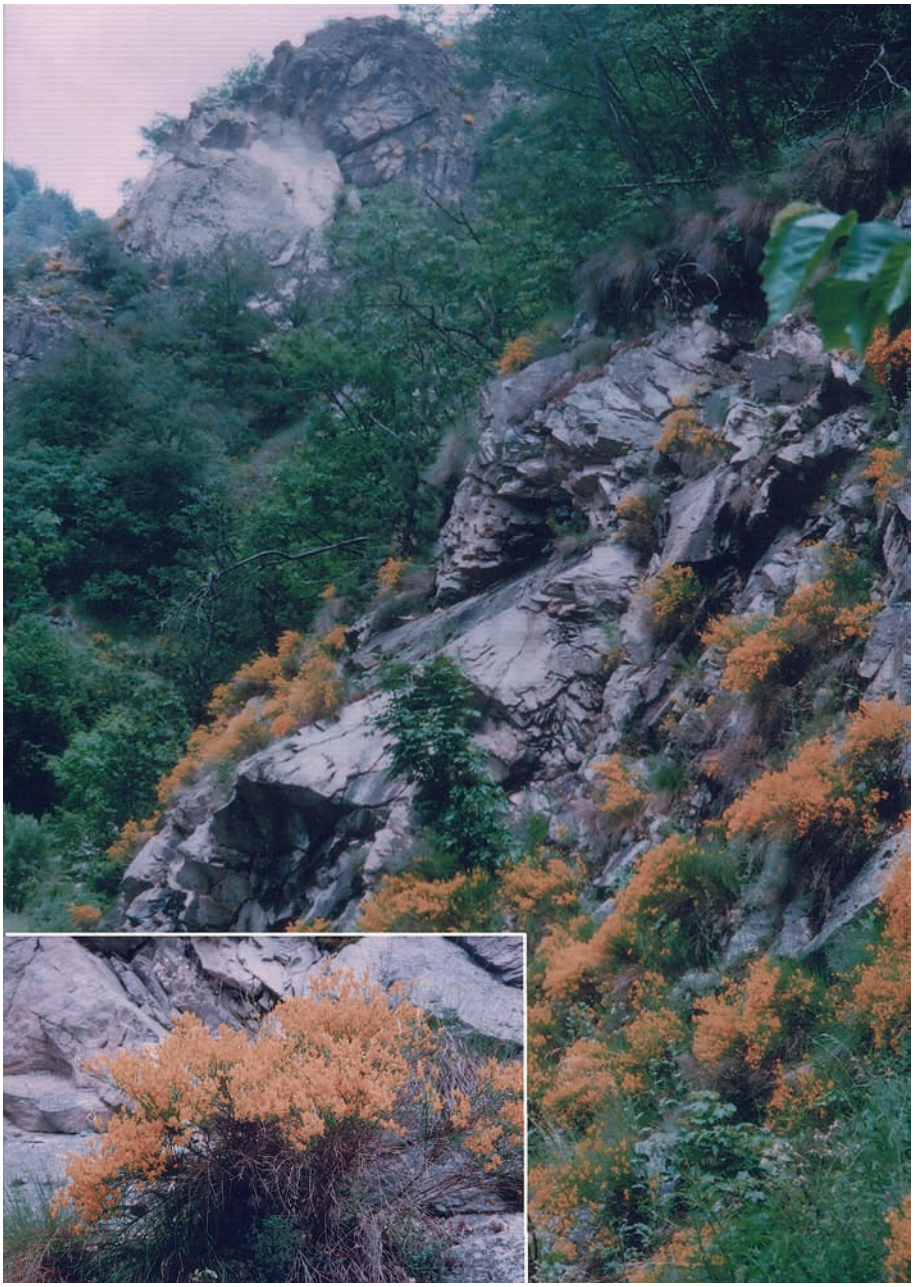


Fig. 10: Type locality of *Platycranus rumelicus* nov.sp. with the host plant *Genista rumelica*.

spring months, which is characteristic for the Mediterranean species (JOSIFOV 1991), whose phenology was formed under the conditions of the Mediterranean climate (mild and wet winter, warm and wet spring, hot and dry summer).

However, the species whose phenology formed outside of the Mediterranean make an exception. Such is *Dicyphus* (*Mesodicyphus*) *martinoi* JOSIFOV 1958. This species was described from a single female caught in August near Bachkovo monastery (northern slopes of Central Rhodopes Mts.) by means of a light trap. Later it was found in Macedonia (WAGNER 1962). In Bulgaria the species has been regularly collected in Kresna gorge but only in August on ultraviolet light. It seems that this species is not particularly rare but all attempts to collect it in daylight were unsuccessful. For this reason nothing is yet known about its trophic relations. Its phenology is characteristic of species of Middle Asian origin that have secondarily penetrated into the Eastern Mediterranean. Their phenology was formed under the conditions of the Middle Asian climate (dry and cold winter, which inhibits embryogenesis of eggs laid during that season). The closest relative of *D. martinoi*, *Dicyphus* (*Mesodicyphus*) *testaceus* REUTER 1876 (type species of the subgenus (WAGNER 1951a)), is distributed only in Middle Asia. It is highly probable that *D. martinoi* might be found in suitable habitats in Asia Minor as well.

Often, endemic species are found rarely or as single individuals, with the consequence that there is insufficient knowledge about their trophic relationships. Such data are available only for a few representatives of the family Miridae. Currently, we suspect that the endemic Miridae species are monophagous or stenophagous, as for example, the aforementioned strict monophagy of *Cremnorrhinus basalis*. The affiliation to only one plant species is characteristic even for species known to be predominantly zoophagous. Such is the case with *Dicyphus* (*Brachyceroea*) *digitalidis* JOSIFOV 1958 (Fig. 3). In Bulgaria it is found in the conifer belt in the mountains but only where *Digitalis viridiflora* is present since it is strictly associated with it. In Vitosha Mt. and Balkan Mts. where the plant is absent, it could not be found despite the presence of the related plant species *Digitalis lutea*.

Another strict monophagous species is *Dichrooscytus bureschi* JOSIFOV 1974. For the first time it was recorded from Kresna gorge (South Western Bulgaria), where a significant community of Grecian juniper (*Juniperus excelsa*) is preserved in Tisata reserve. Around and within the reserve, *Juniperus oxycedrus* occurs among the Grecian juniper. Many of true bugs trophically associated with the genus *Juniperus* (*Orsillus depressus* MULSANT & REY 1852; *Gonocerus juniperi* HERRICH-SCHÄFFER 1839; *Holcogaster exilis*

HORVÁTH 1903; *Cyphostethus tristriatus* (FABRICIUS 1787)) can be found on *J. excelsa* as well as on *J. oxycedrus*, but *Dichrooscytus bureschi* is strictly associated with *J. excelsa*. Recently, *D. bureschi* was found in the Central Rhodopes Mts. (unpubl. data), in a small relict locality of *J. excelsa*, and also in Greece (GÜNTHER 1990; LINNAVUORI 1994). It is likely that this species will be found in other regions on the Balkan Peninsula where *J. excelsa* is present.

3. Chorology of the endemic Balkan Heteroptera

The ranges of most endemic Heteroptera are limited in size and often involve a small number of adjacent localities. Their monophagy and characteristic phenology together with their limited ranges indicate their relictual character. These are presumably ancient Mediterranean species, whose former range has been gradually strongly reduced. One of the extreme examples is the range of *Gampsocoris lilianae* JOSIFOV 1958. The original description of the species was made after a single male collected near a cart track along the slopes of Belasitsa Mt., between Petrich and the border between Bulgaria and Greece. The locality had a limited area of several square metres overgrown with low grass. Despite all efforts, no more material was collected from the nearby slopes of the mountain. The following year one female was collected from the same limited area, and another a year later. One individual was collected from the same place by ŠTUSÁK (1976). Subsequently this grass patch was destroyed during construction work and road extension. Efforts to find this species again on the slopes of Belasitsa Mt. have been unsuccessful. The same species was also found in the vicinity of Melnik (Southern Pirin Mt.) by ŠTUSÁK (1976) where he managed to collect three individuals. No one has found *Gampsocoris lilianae* since then and to date this is all that is known of its distribution.

The peculiar myrmecomorphous species *Metastenothorax punctatipennis* REUTER 1884, was described from Pelopónnisos with no subsequent records until recently (1969-1994) when it was collected again, but again only on the Peloponnese (PÉRICART 1998). Its range is probably limited to this Greek peninsula. Similarly, *Singeria brevipennis* WAGNER 1955, described from an individual from Kefallonia Island, has not been reported since.

The same holds true for many other species described at the end of 19th and first half of the 20th century (*Cyllecoris marginatus* (FIEBER 1870), *Orthotylus stratensis* WAGNER 1963, *Elatophilus pachycnemis* HORVÁTH 1907, *Sciocoris pentheri* WAGNER 1953, etc.) as well as for most of the recently described species (e.g., *Cyllecoris ernsti* MATOCQ & PLUOT-SIGWALT 2006).

The ranges of *Cremnorrhinus basalis*, *Adelphophylus balcanicus* (KORMILEV 1939) (Fig. 1) and *Closterotomus princeps* (REUTER 1880) are relatively large. We previously discussed the distribution of the first. *Adelphophylus balcanicus* (Fig. 4) has a wider vertical distribution. It can be found up to the altitude where *Verbascum niveum pannosiforme*, *V. longifolium pannosum* and *V. speciosum* occur, since it is directly or indirectly trophically associated with them. *Adelphophylus balcanicus* was collected in Macedonia at 1500 m a.s.l. in the Shar Mts. (KORMILEV 1939), in Serbia at 1200 m in Vlassina Mt. (KORMILEV 1939), and at 1550 m on Chemernik Mt. (PROTIĆ 1998). In Bulgaria the species is distributed up to 1500 m on the slopes of the mountains along the Struma river valley, the southern slopes of the Central Balkan Mts. and on the northern slopes of the Western Rhodopes Mts. (unpubl. data).

Closterotomus princeps has the widest distribution. It is trophically associated with species of *Quercus* and for this reason it cannot be found above 1000 m a.s.l. As with most endemic species, the range of *C. princeps* is limited to the southern, central, and western part of the Balkan Peninsula. So far, the species has not been found in the eastern parts of the peninsula, although significant areas covered by oak forests are present in these parts (e.g., Strandzha Mt.).

4. Origin of the endemic Balkan fauna of Heteroptera

As previously mentioned, most of the Balkan endemic species are presumptively relicts though their possible age can only be speculative. It can be supposed that species

like *Dimorphocoris beieri* WAGNER 1965 and *Myrmecophyes montenegrinus* WAGNER 1976, which are trophically associated with grasses in the high mountain steppes, are probably Tertiary relicts. *Dicyphus digitalidis*, a species associated with the coniferous belt, is most probably a Pleistocene relict from the time when the coniferous belt dominated by *Picea abies* was formed in the high mountains of the Balkan Peninsula.

The complex and variable climate during the second half of the Pleistocene led to the penetration and isolation in the higher parts of the South European mountains of a great number of Euro-Siberian species. However, this isolation apparently resulted in speciation events only in a few cases. From the coniferous belt of the high mountains in Bulgaria, only two subspecies, a result of such isolation, are described: *Psallus* (*Apocremnus*) *betuleti montanus* JOSIFOV 1973 and *Mecomma ambulans montanus* JOSIFOV 1969. The first was found later to occur throughout Europe (and probably introduced to North America, Rabitsch in litt.) and the second is still regarded as a Balkan endemic though it may have a wider distribution. A similar case of mountain speciation from an Euro-Siberian form might be *Velia saulii serbica* TAMANINI 1951 (JOSIFOV 1999) (Fig. 5), but this hypothesis is doubtful. This is a taxon belonging to the ancient Mediterranean genus *Velia* whose species and subspecies are typically Mediterranean, except for *Velia saulii* TAMANINI 1947. Most of these taxa are characterized by a limited distribution in some Mediterranean regions, with a few species reaching eastwards to Middle Asia. *Velia saulii* has the widest range, including the whole of Europe north of the Alps and the Balkan Peninsula, i.e. the Euro-Siberian part of Europe. However, it is unknown east of the Ural Mts. Apparently, it is an ancestral species which penetrated from the south and adapted to areas of cooler climate. After the elevation of the Alps and Pyrenees it became isolated from its Mediterranean relatives. With the cooling of the climate during the second half of the Pleistocene, the Alps and the Pyrenees became an insuperable barrier for its penetration to the Apennine and Pyrenean peninsulas. However, the absence of such a barrier made its penetration to the Balkan Peninsula possible. After the end of the glaciation, populations of *V. saulii* withdrew to cooler mountain regions, similar to numerous other Euro-Siberian species that had penetrated from the north. Today, in almost all of the mountains in the central part of the peninsula, the subspecies *V. saulii serbica* occurs. The following (unpublished) facts support the view that *V. saulii serbica* is a subspecies preferring lower water temperatures: in the relatively low Plana Mt. (located near Vitosha Mt. where *V. saulii serbica* is a common species), at about 1100 m a.s.l., numerous individuals of this subspecies were observed swimming in a spring with a water temperature of 10 °C. Other individuals were observed downstream from the spring, but only to the point where the water temperature reached 12 °C, where instead of this taxon several *Gerris* species appeared. In the kettles around Vitosha Mt. and Pirin Mt., *V. saulii serbica* has been regularly found early in spring when the rivers and streams flowing down the slopes are cool enough, but rapidly disappears when the water temperature surpasses 12 °C.

Tamanini described *Velia saulii serbica* as a subspecies of *Velia saulii*. Later he elevated it to a species (TAMANINI 1959), as it appears in Vol. 1 of the Catalogue of the Heteroptera of the Palaearctic Region (ANDERSEN 1995). However, we believe that Tamanini's initial view was correct. This is supported by the considerable morphological similarity between the two taxa and their allopatry.

There is a small group of endemic subspecies, which we refer to as taxa that evolved from Mediterranean ancestors, by Meditarranean speciation. Typically, it is supposed that most Mediterranean species, being older, show no speciation trends. However, in conditions of long isolation some of their populations do evolve, forming separate subspecies. Among the Balkan endemics, examples include *Dionconotus confluens creticus* HEISS 1984 and *Orthotylus junipericola balcanicus* JOSIFOV 1974.

Tab. 1: List of endemic Heteroptera of Balkan Peninsula. AL – Albania; B&H – Bosnia and Herzegovina; BG1 – zone of *Quercus*-forests south of Balkan Mts., except mountain regions in Southwest Bulgaria; BG2 – zone of *Quercus*-forests north of Balkan Mts., BG3 – mountainous regions above upper limit of *Quercus* (above 800–1000m); CR – Croatia; Dalm – Dalmatia; Dobr. – Romanian Dobrogea; ET – European Turkey; GR – Greece without Crete; IT – the part of Balkan Peninsula between Trieste, Monfalcone and Gorizia west to Isonzo (Italian province Friuli Venezia Giulia); MC – Macedonia; MN – Montenegro; SL – Slovenia; SB – Serbia.

Species	AL	B&H	BG1	BG2	BG3	CR	Crete	Dalm	Dobr	ET	GR	IT	MC	MN	SL	SB
Nepa anophthalma Decu, Gruia, Keffer & Sarbu 1994									+							
Sigara (Pseudovermicorixa) nigrolineata mendax Heiss & Jansson 1986							+									
Ilyocoris cimicoides jonicus (Lindberg 1922)											+					
Velia (*Plesiovelia*) *pelagonensis* Hoberlandt 1941	+		+					+			+		+	+		
Velia (*Plesiovelia*) *rhadamantha rhadamantha* Hoberlandt 1941			+				+				+					
Velia (*Plesiovelia*) *saulii serbica* Tamanini 1951					+								+			+
Halosalda coracina Cobben 1985											+					
Saldula pilosella hirsuta (Reuter 1888)											+	+			+	
Kalama cretica (Péricart 1979)							+									
Isometopus longirostris Josifov 1993			+													
Dicyphus (*Brachyceroea*) *digitalidis* Josifov 1958					+								+			
Dicyphus (s.str) *josifovi* Rieger 1995			+	+			+									
Dicyphus (*Mesodicyphus*) *martinoi* Josifov 1958			+								+		+			
Macrolophus klotho Linnavuori 1992											+					
Alloeotomus pericarti Matocq 1998							+									
Capsodes robustus Wagner 1951								+								
Closterotomus biclavatus dalmatinus (Wagner 1957)								+								
Closterotomus princeps (Reuter 1880)			+	+				+			+		+			+
Dichrooscytus bureschi Josifov 1974			+								+					
Dichrooscytus dalmatinus Wagner 1951								+					+			
Dichrooscytus impos Heiss 1988							+									
Dionconotus confluens creticus Heiss 1984							+									
Dionconotus parnisanus Hoberlandt 1945											+					
Phytocoris (*Compsocerocoris*) *strymonensis* Josifov 1990			+													
Phytocoris (*Exophytocoris*) *parvuloides* Wagner 1961						+										
Phytocoris (*Ktenocoris*) *acuminatus* Carapezza 1984											+					
Phytocoris (*Ktenocoris*) *adiacritus* Rieger 1989											+					
Phytocoris (*Ktenocoris*) *conifer* Wagner 1959							+									
Phytocoris (*Ktenocoris*) *crux* Wagner 1959							+				+					
Phytocoris (*Ktenocoris*) *pyrounakifer* Rieger 1989											+					
Phytocoris (s.str.) *cephalonicae* Rieger 1989											+					
Phytocoris (s.str.) *malickyi* Rieger 1995							+									
Phytocoris (s.str.) *trichopterus* Rieger 1989											+					
Phytocoris (*Stictophytocoris*) *eduardi* Kerzhner & Schuh 1998							+									
Polymerus (*Poeciloscytus*) *hirtulus* Wagner 1959							+									
Dimorphocoris (s.str.) beieri Wagner 1965														+		

Species	AL	B&H	BG1	BG2	BG3	CR	Crete	Dalm	Dobr	ET	GR	IT	MC	MN	SL	SB
Dimorphocoris (s.str.) sari Linnavuori 1992											+					
Dimorphocoris (s.str.) saulii Wagner 1965												+				
Halticus henschii Reuter 1888												+			+	
Myrmecophyes (s.str.) *latus* Wagner 1975																+
Myrmecophyes (s.str.) *montenegrinus* Wagner 1976						+								+		
Cyllecoris ernsti Matocq & Pluot-Sigwalt 2006							+									
Cyllecoris marginatus (Fieber 1870)											+					
Globiceps (s.str.) *handlirschi* Reuter 1912							+									
Globiceps (s.str.) *novaki* Wagner 1950								+				+	+			
Globiceps (*Kelidocoris*) *holtzi* Reuter 1912											+					
Heterocordylus (*Bothrocranum*) *erythropthalmus rhamni* Wagner 1955								+								
Heterocordylus (s.str.) *heissi* Carapezza 1990							+									
Mecomma (s.str) *ambulans montanum* Josifov 1969					+								+			
Orthothylus (*Melanotrichus*) *creticus* Wagner 1977							+									
Orthothylus (*Melanotrichus*) *josifovi* Wagner 1959			+													
Orthothylus (s.str) *stratensis* Wagner 1977											+					
Orthothylus (s.str) *tenellus meridionalis* Josifov nov.ssp.			+				+				+					
Orthothylus (*Parapachylops*) *bureschi* Josifov 1969			+								+					
Orthothylus (*Parapachylops*) *junipericola balcanicus* Josifov 1974			+													
Orthothylus (*Parapachylops*) *mariagratiae* Carapezza 1984							+									
Orthotylus (*Pinocapsus*) *thaleia* Linnavuori 1999											+					
Platycranus (*Genistocapsus*) *boreae* Gogala 2002															+	
Platycranus (*Genistocapsus*) *rumelicus* Simov nov.sp.					+											
Pilophorus benjamin Rieger 1984											+					
Pilophorus dianae, Josifov 1989			+								+					
Cremnocephalus kariae Rieger 1983											+					
Adelphophylus balcanicus (Kormilev 1939)	+		+								+		+			+
Compsidolon (*Apsinthophylus*) *balcanicum* Josifov 1993					+											
Compsidolon (s.str) *bicolor* (Reuter 1883)											+					
Cremnorrhinus basalis Reuter 1880	+	+	+					+			+		+			
Macrotylus (s.str) *bernadettae* Matocq 1995											+					
Macrotylus (s.str) *phlomidis* Rieger 1984											+					
Maurodactylus fulvus (Reuter 1904)							+									
Orthonotus creticus Wagner 1974							+									
Orthonotus graecus Rieger 1985											+					
Orthonotus magnieni Matocq 2002											+					
Orthonotus pseudoponticus Josifov 1964			+	+	+	+					+		+			
Paredrocoris seidenstueckeri Josifov 1965			+								+		+			
Psallus (*Hylopsallus*) *drosopoulosi* Linnavuori 1992											+					
Psallus (*Phylidea*) *pseudoquercus* Josifov 1974				+												

Species	AL	B&H	BG1	BG2	BG3	CR	Crete	Dalm	Dobr	ET	GR	IT	MC	MN	SL	SB
Tuponia (*Chlorotuponia*) *linnavuorii* WAGNER 1961			+								+		+			
Elatophilus (*Euchadrocerus*) *pachycnemis* HORVÁTH 1907										+						
Holotrichius tenebrosus BURMEISTER 1835											+					
Aradus graecus HEISS 1997											+					
Quilnus discedens (HORVÁTH 1911)		+														
Lasiocoris antennatus MONTANDON 1889	+	+	+	+			+			+	+					
Metastenothorax punctatipennis REUTER 1884											+					
Plinthisus (*Nanoplinthisus*) *perpusillus* WAGNER 1963											+					
Gampsocoris lilianae JOSIFOV 1958			+													
Pyrrhocoris niger REUTER 1888							+									
Coriomeris brevicornis LINDBERG 1923							+									
Sciocoris (s.str.) *pentheri* WAGNER 1953														+		
Acrosternum malickyi JOSIFOV & HEISS 1989							+									
Singeria brevipennis WAGNER 1955											+					
Byrsinus balcanicus (JOSIFOV 1986)			+				+				+		+			
Thyreocoris ohridanus KORMILEV 1936			+	+									+			

Tab. 2: List of subendemic Heteroptera of Balkan Peninsula. AL – Albania; AM – Asia Minor; B&H – Bosnia and Herzegovina; BG1 – zone of Quercus-forests south of Balkan Mts., except mountain regions in Southwest Bulgaria; BG2 – zone of Quercus-forests north of Balkan Mts., BG3 – mountainous regions above upper limit of Quercus (above 800–1000m); CR – Croatia; CY – Cyprus; Dalm – Dalmatia; Dobr. – Romanian Dobrogea; ET – European Turkey; GR – Greece without Crete; IT – the part of Balkan Peninsula between Trieste, Monfalcone and Gorizia west to Isonzo (Italian province Friuli Venezia Giulia); MC – Macedonia; MN – Montenegro; RO – Romania without Dobrogea; SL – Slovenia; SB – Serbia; UK – Ukraine **Distr** – Distribution outside Balkan Peninsula.

Species	AL	B&H	BG1	BG2	BG3	CR	Crete	Dalm	Dobr	ET	GR	IT	MC	MN	SL	SB	Distr.
Hebrus (s.str) *fulvinervis* Horváth 1929		+															RO
Velia (*Plesiovelia*) *muelleri* Tamanini 1947								+									Malta
Dicyphus (*Brachyceroea*) *montandoni* Reuter 1888									+	+							UK, AM
Closterotomus picturatus (Reuter 1880)										+							AM
Phytocoris (*Exophytocoris*) *scituloides* Lindberg 1948							+										CY
Saundersiella moerens (Reuter 1876)			+								+						AM
Camponotidea saundersi (Puton 1874)	+					+		+		+	+		+	+	+	+	Rhodes, AM, Italy
Orthocephalus parvulus Reuter 1891			+				+				+		+			+	AM
Platycranus (*Genistocapsus*) *wagneri* Carapezza 1997							+				+						Rhodes
Myrmicomimus variegatus (A. Costa 1843)						+											Italy
Atractotomus brunomassai Carapezza 1982											+						Italy
Atractotomus persquamosus Seidenstücker 1961											+						AM
Excentricoris oophorus (Horváth 1888)				+							+		+				AM
Eurycolpus bipunctatus Wagner 1974			+								+						Rhodes
Heterocapillus cavinotum Wagner 1974							+				+						Rhodes
Macrotylus (*Alloeonycha*) *dentifer* Wagner 1969			+														AM
Macrotylus (s.str) *soosi* Josifov 1962							+										Rhodes
Orthonotus longiceps (Reuter 1883)											+						Naxos, Rhodes
Paravoruchia dentata Wagner 1959											+						Rhodes
Placochilus seladonicus mediterraneus Josifov 1969			+				+				+						Rhodes
Psallus (*Phylidea*) *quercicola* (Reuter 1904)										+							AM
Psallus (s.str) *asthenicus* Seidenstücker 1966			+								+						AM
Psallus (s.str) *milenae* Josifov 1974			+										+				AM
Salicarus pusillus Reuter 1887											+						Italy, Sicily
Tinicephalus picticornis Wagner 1966											+						CY
Tuponia (*Chlorotuponia*) *simplex* Wagner 1974							+										CY
Homoscelis ruficollis Horváth 1884											+						AM, Lebanon
Eremocoris pellitus Seidenstücker 1965			+				+				+		+				AM
Ischnocoris bureschi Josifov 1976	+		+	+		+					+		+	+			AM, RO
Emblethis robustus Josifov 1965							+										CY
Pterotmetus parnassius Horváth 1882											+						CY
Stygnocoris hellenicus Péricart 1996											+						AM
Graphosoma creticum Horváth 1909							+			+							AM
Eurydema eckerleini Josifov 1961							+				+						AM

5. Distribution of the endemic Heteroptera on the territory of the Balkan Peninsula

The distribution of the endemic true bugs within the territory of the Balkan Peninsula shows the same trends as that of the Mediterranean species: their number tends to increase from the north to the south and from the east to the west and decreases from lowlands to the higher parts of the mountains. This supports the concept that most Balkan endemics have Mediterranean origins.

The only endemic species known from Romanian Dobrogea is the stygobiotic *Nepa anophthalma* DECU, GRUIA, KEFFER & SARBU 1994, described from the sulfurous cave Movile. There are only three endemic species known in the territory of Bulgaria north of the Balkan Mts. Their number increases to 22 in southern Bulgaria. In Greece the endemic species are 44, and within the territory of this country, excluding Crete, there are 24. The island of Crete, which is the southernmost territory of the Balkan Peninsula, is characterized by the highest percentage of endemic species in comparison to the total number of Heteroptera. Twenty-five of the species on Crete are Balkan endemics, and 20 of them are so far known only from Crete. The high endemism on Crete, not only with respect to the Heteroptera, was a reason to consider the island an exceptional "centre of speciation" (DE LATTIN 1967). Of course, speciation is a permanent process, taking place in Crete as well, especially as far as it is an isolated territory. Most probably *Dionconotus confluens creticus*, described from Crete, is a product of such speciation. However, we consider the endemism on this island to be mainly of relictual character. If the percentage is highest here, it is because Crete is the southernmost territory of the Balkan Peninsula and the southernmost territory of the former Aegean Land which was the richest in Mediterranean species.

As for the observed increase in the number of endemics from the east to the west, it must be noted that many territories of the peninsula are still insufficiently studied. Only two endemic species are known from its eastern coast: *Byrsinus balcanicus* (JOSIFOV 1986) and *Thyreocoris ohridanus* KORMILEV 1936. Similarly, only two endemic species are known from the European part of Turkey (Tab. 1). In the Struma river valley, south of the Kresna gorge, at roughly the same geographical latitude as European Turkey, the number of endemics is already 16 (JOSIFOV 1999). Westwards from Struma river valley, from the Republic of Macedonia 13 endemic species are known but the actual number is certainly higher. Regarding the Adriatic coast, eight species and subspecies of endemic true bugs are known from Dalmatia, which is at the same latitude as the northern Bulgarian Black Sea coast, for which only the two endemic species noted above are known.

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Zusammenfassung

Die Verbreitung von 92 endemischen und 34 subendemischen Wanzenarten der Balkanhalbinsel wird zusammengefasst. Verschiedene Probleme zur Taxonomie, Phänologie, trophischen Spezialisation und zur Verbreitung der Wanzen am Balkan werden diskutiert. Zwei neue Taxa werden beschrieben: *Platycranus* (*Genistocapsus*) *rumelicus* SIMOV nov.sp. und *Orthotylus* (*Orthotylus*) *tenellus meridionalis* JOSIFOV nov.ssp.

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