

## Contribution to the taxonomy of *Dicyphus constrictus* (Boheman, 1852) (Heteroptera: Miridae)

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**Abstract.** *Dicyphus constrictus eduardi* ssp.n. is described from the high mountains in Bulgaria. The taxon is obligatorily stuck to karst regions and is associated with *Geranium sylvaticum* var. *glanduligerum* and *Geranium macrorrhizum*.

**Key words:** *Dicyphus constrictus eduardi* ssp.n., Heteroptera, Miridae, Bulgaria

In his work on the taxonomy of the genus *Dicyphus* the prominent European heteropterist Eduard Wagner supposed that the populations of *Dicyphus constrictus* (Boheman, 1852) from the mountains in Middle and Southern Europe most probably represent a separate subspecies (WAGNER, 1951). However, in the same work, or later in his monograph on Mediterranean mirids (WAGNER, 1974) he refrained from designating it as a subspecies, most probably because of lack of sufficient material.

During the investigation of true bug fauna in karst regions in Bulgaria, differences were found between the diagnostic characters mentioned in the description and the diagnosis of *Dicyphus constrictus* (WAGNER, 1952, 1961, 1974; WAGNER & WEBER, 1964) and the characters of Bulgarian specimens. To clarify whether these differences are reliable, we compared material from Northern Europe with material from the high Bulgarian mountains.

Abundant material of *Dicyphus constrictus* collected by the authors in Northern Europe (33 males and 48 females – Bornholm Island, Gudhjem, 20.08.1966, M. Josifov leg.) and in the high Bulgarian mountains, stored at the collections of the Institute of Zoology and National Museum of Natural History – BAS, was investigated. The indices published in Wagner's works (WAGNER, 1951, 1974), and Univariate Statistics – ANOVA test were used. The results give us reason to determine the populations of *Dicyphus constrictus* inhabiting the coniferous belt of high mountains in Bulgaria as a separate subspecies.

### *Dicyphus constrictus eduardi* ssp. n.

Holotype: 1 male, Bulgaria, Rila Mts., 1400 m a.s.l., village of Borovets, Varnika Site, 20.08.1971, leg. M. Josifov

Paratypes: 32 males and 24 females, same locality as holotype; 1 male Bulgaria, Rila Mts., 1400 m a.s.l., village of Borovets, Varnika Site, 31.07. – 03.08.1958, leg. M. Josifov; 5 males and 3 females Bulgaria, Rila Mts., 1400 m a.s.l., village of Borovets, Varnika Site, 06.09.1980, leg. M. Josifov; 7 males and 1 female Bulgaria, Rila Mts., 1400 m a.s.l., village of Borovets, Varnika Site,

16.08.1975, leg. M. Josifov; 13 males and 1 female Bulgaria, Slavyanka/ Alibotush Mts., 1600 m, 12.08.1979, leg. M. Josifov; 1 male and 8 females Bulgaria, Pirin Mts., 1800 m a.s.l, Bayuvi Dupki Reserve, 13.08.1980, leg. M. Josifov; 6 males and 13 females Bulgaria, Pirin Mts., 1800 m a.s.l, Bayuvi Dupki Reserve, 14.08.1979, leg. M. Josifov; 2 males Bulgaria, Pirin Mts., 1800 m a.s.l, near hut P. Yavorov, 30.08.2001, leg. N. Simov; 15 males and 6 females Bulgaria, Pirin Mts., 1800 – 1900 m a.s.l, Bayuvi Dupki Reserve, 31.08.2001, leg. N. Simov

The type material is deposited in the National Museum of Natural History, Sofia (NMNHS).

### Diagnosis

Differs from *Dicyphus constrictus constrictus* (Boheman, 1852) by larger body size (Fig. 1 and 2), longer antennae and hind tibia, wider vertex, bigger value of the synthlipsis / eye width ratio, lower value of head width / length first antennal article ratio, bigger value of second antennal article length / head width ratio, bigger value of pronotum width / head width ratio, bigger value of hind tibia length / head width ratio and by differences in the curve of left paramere. For the levels of significance of the differences between the morphometric characters and the ratios used in the comparison of *Dicyphus constrictus eduardi* ssp.n. and *Dicyphus constrictus constrictus* (Boheman, 1852) see Table 4.

### Description

#### Males

Predominantly macropterous. Greenish-yellow, dry specimens yellowish. Parallel. Body about 1.6 (macropterous) as long as hind tibia. Head brown to black. Longitudinal stripes on the frons and vertex, medial longitudinal stripe on the clypeus, spots on maxillary and mandibular

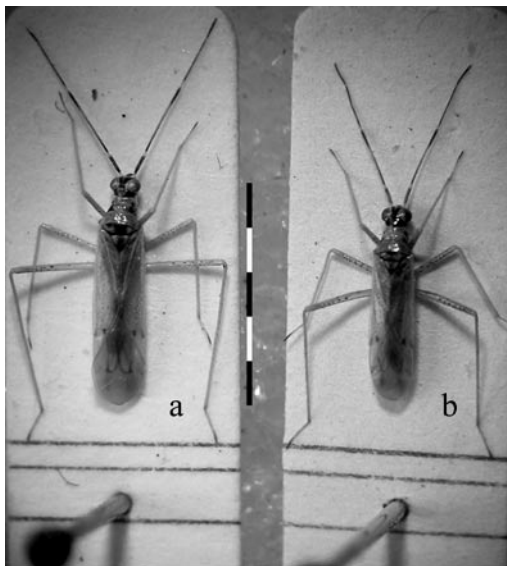


Fig. 1. Males – a: *Dicyphus constrictus eduardi* ssp.n.; b: *Dicyphus constrictus constrictus* (Boheman, 1852). (scale bar, 1mm)

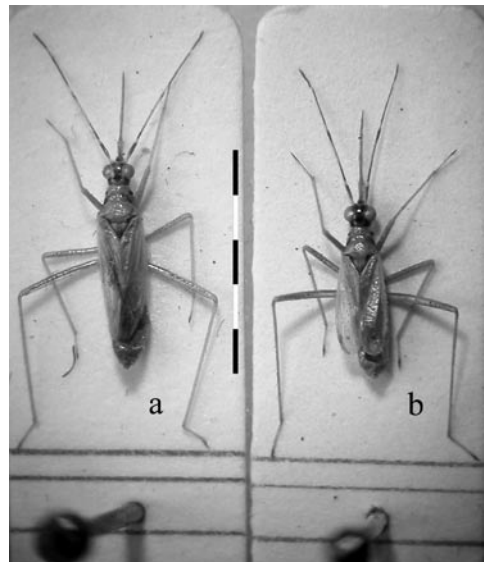


Fig. 2 Females – a: *Dicyphus constrictus eduardi* ssp. n.; b: *Dicyphus constrictus constrictus* (Boheman, 1852). (scale bar, 1mm)

plates (in pale specimens entire maxillary and mandibular plates), gula and bucculae yellowish. Synthlipsis about 1.13 (macropterous), 1.03 (brachypterous) as wide as eye. Head width is about 1.36 (macropterous), 1.77 (brachypterous) bigger than length of 1<sup>st</sup> antennal article. 1<sup>st</sup> antennal article reddish, in some dark specimens brown. 2<sup>nd</sup> antennal article yellowish with brownish apical and basal parts, about 3.14 (macropterous), 2.53 (brachypterous) as long as 1<sup>st</sup> antennal article and about 1.43 (macropterous), 1.58 (brachypterous) as long as 3<sup>rd</sup> antennal article. Length of 2<sup>nd</sup> antennal article about 2.3 (macropterous), 1.43 (brachypterous) bigger than head width and about 1.7 (macropterous), 1.29 (brachypterous) bigger than pronotum width. 3<sup>rd</sup> and 4<sup>th</sup> antennal article brownish, except for yellowish basal part of 3<sup>rd</sup>.

Collar white-grayish with brownish spots on lateral sides.

Pronotum white grayish on dorsal side, about 1.33 (macropterous), 1.11 (brachypterous) as wide as head. Calli yellowish-brown. Propleuron with big brown spots. Scutellum yellowish – brown with brown medial stripe and spots near basal corners.

Hemelytra slightly transparent, grayish-yellow with brownish spots on the apices of exocorium, corium, cuneus and posterior of claval commissure. Membrane transparent, light smoky. Veins yellowish to brown.

Legs yellowish. Femurs with reddish-brown spots on the dorsal side. Apical part of 3<sup>rd</sup> tarsal article brownish. Hind tibia length about 4.53 (macropterous), 3.36 (brachypterous) times bigger than head width.

Abdomen greenish, in dry specimens yellowish to brownish.

Male genitalia like in nominotypical subspecies with differences in curve of left paramere: see Figs. 3 and 4, see also fig. 12 A, B in WAGNER (1951).

Measurements. – see Table 1 and Table 3.

### Females

Predominantly brachypterous. Greenish-yellow, dry specimens yellowish. Parallel. Body about 1.4 (brachypterous), 1.7 (macropterous) as long as hind tibia. Head brown to black. Longitudinal stripes on the frons and vertex, medial longitudinal stripe on the clypeus, spots on maxillary and mandibular plates (in pale specimens entire maxillary and mandibular plates), gula and bucculae yellowish. Synthlipsis about 1.2 (brachypterous), 1.16 (macropterous) as wide

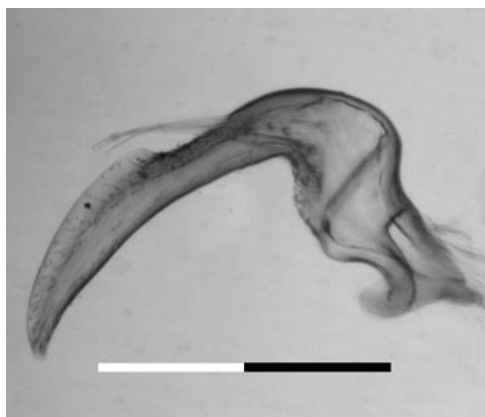


Fig. 3. Left paramere of *Dicyphus constrictus eduardi* ssp.n. (scale bar, 0,1mm)



Fig. 4. Left paramere of *Dicyphus constrictus constrictus* (Boheman, 1852). (scale bar, 0,1mm)

Table 1  
 Measurements (in mm, dried specimens) of macropterous males of *Dicyphus constrictus eduardi* ssp.n. and *Dicyphus constrictus constrictus* (Boheman, 1852).

	<i>Dicyphus constrictus eduardi</i> ssp. n.						<i>Dicyphus constrictus constrictus</i>					
	Valid N	Mean	Min.	Max.	Std. Dev.	Valid N	Mean	Min.	Max.	Std. Dev.		
Head width	32	0.691	0.65	0.737	0.025798	21	0.711	0.675	0.762	0.020918		
Synthlipsis	32	0.250	0.225	0.275	0.012453	21	0.238	0.225	0.275	0.016527		
Length 1 <sup>st</sup> antennal article	32	0.512	0.45	0.575	0.033592	21	0.457	0.425	0.475	0.016091		
Length 2 <sup>nd</sup> antennal article	32	1.603	1.375	1.9	0.117217	21	1.482	1.3	1.675	0.093255		
Length 3 <sup>rd</sup> antennal article	30	1.123	1	1.3	0.072024	20	1.038	0.975	1.15	0.047642		
Length 4 <sup>th</sup> antennal article	32	0.505	0.4	0.6	0.042587	21	0.537	0.45	0.6	0.040788		
Eye width	32	0.221	0.206	0.244	0.009971	21	0.237	0.225	0.244	0.006018		
Pronotum width	32	0.920	0.85	1.05	0.062681	21	0.912	0.85	1.025	0.043746		
Hind tibia length	32	3.139	2.82	3.47	0.141526	20	3.029	2.825	3.25	0.135305		
Length 1 <sup>st</sup> tarsal article	19	0.15	0.15	0.15	0	10	0.178	0.15	0.2	0.02189		
Length 2 <sup>nd</sup> tarsal article	19	0.480	0.45	0.525	0.022942	12	0.494	0.45	0.525	0.024133		
Length 3 <sup>rd</sup> tarsal article	19	0.243	0.225	0.275	0.014006	12	0.244	0.225	0.275	0.021651		
Body length	32	5.04	4.5	5.6	0.240777	21	4.619	3.9	5	0.24004		
Synthlipsis / eye width	32	1.134	0.974	1.273	0.065163	21	1.005	0.923	1.189	0.072716		
Length 2 <sup>nd</sup> antennal article / length 1 <sup>st</sup> antennal article	32	3.136	2.773	3.389	0.13325	21	3.228	2.737	3.555	0.222891		
Length 2 <sup>nd</sup> antennal article / length 3 <sup>rd</sup> antennal article	30	1.425	1.311	1.561	0.066049	20	1.436	1.268	1.561	0.069256		
Head width / length 1 <sup>st</sup> antennal article	32	1.357	1.227	1.472	0.062192	21	1.547	1.447	1.639	0.051209		
Length 2 <sup>nd</sup> antennal article / head width	32	2.301	2.115	2.571	0.10325	21	2.086	1.704	2.285	0.138485		
Length 2 <sup>nd</sup> antennal article / pronotum width	32	1.748	1.524	1.861	0.075742	21	1.625	1.268	1.765	0.102995		
Pronotum width / head width	32	1.327	1.207	1.5	0.062918	21	1.283	1.214	1.357	0.046059		
Body length / hind tibia length	32	1.606	1.446	1.742	0.057364	20	1.533	1.219	1.769	0.095795		
Hind tibia length / head width	32	4.526	4.13	4.815	0.166209	20	4.260	3.705	4.536	0.191891		

as eye. Head width is about 1.5 (brachypterous), 1.43 (macropterous) bigger than length of 1<sup>st</sup> antennal article. 1<sup>st</sup> antennal article reddish, in some dark specimens brown. 2<sup>nd</sup> antennal article yellowish with brownish apical and basal parts, about 2.68 (brachypterous), 2.81 (macropterous) as long as 1<sup>st</sup> antennal article and about 1.23 (brachypterous), 1.37 (macropterous) as long as 3<sup>rd</sup> antennal article. Length of 2<sup>nd</sup> antennal article about 1.78 (brachypterous), 1.96 (macropterous) bigger than head width and about 1.53 (brachypterous), 1.34 (macropterous) bigger than pronotum width. 3<sup>rd</sup> and 4<sup>th</sup> antennal article brownish, except for yellowish basal part of 3<sup>rd</sup>.

Collar white-grayish with brownish spots on lateral sides.

Pronotum yellowish, about 1.17 (brachypterous), 1.47 (macropterous) as wide as head. Calli yellowish – brown. Propleuron with big brown spots. Scutellum yellowish – brown with brown medial stripe and spots near basal corners.

Hemelytra slightly transparent, greyish – yellow with brownish spots on the apices of exocorium, corium, cuneus (macropterous) and posterior of claval commissure (macropterous). Membrane (macropterous) transparent, light smoky. Veins yellowish to brown.

Legs yellowish. Femurs with reddish-brown spots on the dorsal side. Apical part of 3<sup>rd</sup> tarsal article brownish. Hind tibia length about 4.03 (brachypterous), 4.2 (macropterous) times bigger than head width.

Abdomen greenish, in dry specimens yellowish to brownish. Dorsal side darker than ventral.

Measurements. – see Table 2 and Table 3.

### Etymology

The new subspecies is dedicated to Eduard Wagner who first reported the differences between the populations of *Dicyphus constrictus* from Northern and Southern Europe.

### Distribution

Up to now the new subspecies was known only from the Balkan Peninsula – Bulgaria: Rila, Pirin and Slavyanka/ Alibotush Mts. The records of *Dicyphus constrictus* for Bulgarian fauna (JOSIFOV, 1969, 1970, 1976, 1983, 1986, 1990; HEISS & JOSIFOV, 1990; GUEORGUIEV et al., 1998; KERZHNER & JOSIFOV, 1999) refer to new subspecies. Other records from the Balkan countries (Slovenia and Croatia) (GOGALA & MODER, 1960; GOGALA & GOGALA, 1986, 1989; HORVÁTH, 1900) are from territories outside of the Balkan Peninsula. The records from Slovenia (GOGALA & MODER, 1960; GOGALA & GOGALA, 1986, 1989) are erroneous, misidentifications with *Dicyphus stachidis wagneri* Tamanini, 1956 (GOGALA, 2006). The record from Croatia: Breze (Brezje) (HORVÁTH, 1900) is doubtful in the light of the above cited new results of the investigation of mirid fauna of Slovenia (GOGALA, 2006). The locality Brezje is close to Slovenian localities and is at a very low altitude (200 m a.s.l.) compared to the altitude preference of *Dicyphus constrictus* in Southern and Central Europe – above 1000 m (WAGNER, 1958, 1961; WACHMANN et al., 2004; own data).

### Biology

*Dicyphus constrictus eduardi* ssp. n. is obligatory stuck to karst regions and is associated with *Geranium sylvaticum* var. *glanduligerum* (Fig. 5) and *Geranium macrorrhizum* (Fig. 6). Records of *Salvia* and *Digitalis* like food plants of *Dicyphus constrictus* in Bulgarian (JOSIFOV, 1969, 1983) are erroneous. In contrast to *Dicyphus constrictus eduardi* ssp. n., a nominotypical subspecies was recorded on *Stachys sylvatica*, *Stachys* sp., *Melandryum* sp., *Lychnis* sp., *Galeopsis*

Table 2  
Measurements (in mm, dried specimens) of brachypterous females of *Dicyphus constrictus eduardi* ssp.n. and *Dicyphus constrictus constrictus* (Boheman, 1852).

Females	<i>Dicyphus constrictus eduardi</i> ssp. n.						<i>Dicyphus constrictus constrictus</i>					
	Valid N	Mean	Min.	Max.	Std. Dev.	Valid N	Mean	Min.	Max.	Std. Dev.		
Head width	22	0.764	0.7	0.8	0.027359	19	0.758	0.725	0.775	0.018743		
Synthipsis	24	0.285	0.275	0.3	0.012032	19	0.274	0.25	0.3	0.015829		
Length 1 <sup>st</sup> antennal article	23	0.512	0.45	0.575	0.028072	19	0.453	0.425	0.475	0.016446		
Length 2 <sup>nd</sup> antennal article	24	1.366	1.25	1.475	0.063764	19	1.291	1.225	1.375	0.038379		
Length 3 <sup>rd</sup> antennal article	23	1.111	1.025	1.25	0.063437	19	1	0.95	1.05	0.026352		
Length 4 <sup>th</sup> antennal article	21	0.531	0.425	0.625	0.052384	17	0.543	0.475	0.6	0.035984		
Eye width	22	0.239	0.212	0.25	0.011751	19	0.241	0.225	0.262	0.008928		
Pronotum width	24	0.893	0.825	0.975	0.040027	19	0.825	0.775	0.875	0.028868		
Hind tibia length	23	3.114	2.82	3.35	0.132964	19	2.909	2.65	3.075	0.107436		
Length 1 <sup>st</sup> tarsal article	11	0.166	0.125	0.2	0.02311	10	0.215	0.175	0.25	0.021082		
Length 2 <sup>nd</sup> tarsal article	13	0.481	0.45	0.525	0.020801	10	0.48	0.45	0.5	0.015811		
Length 3 <sup>rd</sup> tarsal article	13	0.254	0.225	0.3	0.022468	10	0.25	0.225	0.275	0.016667		
Body length	19	4.389	3.7	5.1	0.417525	19	4.021	3.6	4.5	0.320727		
Synthipsis / eye width	22	1.196	1.1	1.333	0.072566	19	1.137	0.952	1.297	0.089193		
Length 2 <sup>nd</sup> antennal article / length 1 <sup>st</sup> antennal article	23	2.667	2.523	2.83	0.07254	19	2.783	2.289	3.059	0.211188		
Length 2 <sup>nd</sup> antennal article / length 3 <sup>rd</sup> antennal article	23	1.234	1.133	1.39	0.061544	19	1.291	1.219	1.368	0.038474		
Head width / length 1 <sup>st</sup> antennal article	22	1.498	1.391	1.67	0.074284	19	1.672	1.526	1.824	0.070613		
Length 2 <sup>nd</sup> antennal article / head width	22	1.783	1.645	1.896	0.073244	19	1.704	1.612	1.833	0.05947		
Length 2 <sup>nd</sup> antennal article / pronotum width	24	1.533	1.333	1.676	0.075934	19	1.571	1.485	1.67	0.059777		
Pronotum width / head width	22	1.168	1.097	1.3	0.047453	19	1.089	1	1.206	0.051235		
Body length / hind tibia length	18	1.415	1.209	1.738	0.148342	19	1.382	1.22	1.525	0.095825		
Hind tibia length / head width	21	4.057	3.68	4.321	0.176267	19	3.84	3.548	4.103	0.13957		

Table 3  
Measurements (in mm, dried specimens) of brachypterous males and macropterous females of *Dicyphus constrictus eduardi* sp.n.

	<i>Dicyphus constrictus eduardi</i> sp. n. brachypterous males			<i>Dicyphus constrictus eduardi</i> sp. n. macropterous females		
	Valid N	Minimum	Maximum	Valid N	Minimum	Maximum
Head width	1	0.663	0.663	1	0.75	0.75
Synthipsis	1	0.225	0.225	1	0.275	0.275
Length 1 <sup>st</sup> antennal article	1	0.375	0.375	1	0.525	0.525
Length 2 <sup>nd</sup> antennal article	1	0.95	0.95	1	1.475	1.475
Length 3 <sup>rd</sup> antennal article	1	0.55	0.55	1	1.075	1.075
Length 4 <sup>th</sup> antennal article	1	0.35	0.35	1	0.475	0.475
Eye width	1	0.219	0.219	1	0.237	0.237
Pronotum width	1	0.737	0.737	1	1.1	1.1
Hind tibia length	1	2.23	2.23	1	3.15	3.15
Length 1 <sup>st</sup> tarsal article	1	0.15	0.15	1		
Length 2 <sup>nd</sup> tarsal article	1	0.425	0.425	1	0.5	0.5
Length 3 <sup>rd</sup> tarsal article	1	0.225	0.225	1	0.25	0.25
Body length	1	3.7	3.7	1	5.4	5.4
Synthipsis / eye width	1	1.029	1.029	1	1.158	1.158
Length 2 <sup>nd</sup> antennal article / length 1 <sup>st</sup> antennal article	1	2.533	2.533	1	2.81	2.81
Length 2 <sup>nd</sup> antennal article / length 3 <sup>rd</sup> antennal article	1	1.583	1.583	1	1.372	1.372
Head width / length 1 <sup>st</sup> antennal article	1	1.767	1.767	1	1.428	1.428
Length 2 <sup>nd</sup> antennal article / head width	1	1.434	1.434	1	1.967	1.967
Length 2 <sup>nd</sup> antennal article / pronotum width	1	1.288	1.288	1	1.340	1.340
Pronotum width / head width	1	1.113	1.113	1	1.467	1.467
Body length / hind tibia length	1			1	1.714	1.714
Hind tibia length / head width	1	3.358	3.358	1	4.2	4.2

Table 4

Levels of significance of differences between morphometric characters and ratios used in comparison between *Dicyphus constrictus eduardi* ssp.n. and *Dicyphus constrictus constrictus* (Boheman, 1852).

<i>Dicyphus constrictus eduardi</i> ssp.n. / <i>Dicyphus constrictus constrictus</i> (Boheman, 1852)		
	Males	Females
Head width	p<0.01	
Synthlipsis	p<0.01	p<0.05
Length 1 <sup>st</sup> antennal article	p<0.001	p<0.001
Length 2 <sup>nd</sup> antennal article	p<0.001	p<0.001
Length 3 <sup>rd</sup> antennal article	p<0.001	p<0.001
Length 4 <sup>th</sup> antennal article	p<0.01	
Eye width	p<0.001	
Pronotum width		p<0.001
Hind tibia length	p<0.01	p<0.001
Length 1 <sup>st</sup> tarsal article	p<0.001	p<0.001
Length 2 <sup>nd</sup> tarsal article		
Length 3 <sup>rd</sup> tarsal article		
Body length	p<0.001	p<0.01
Synthlipsis / eye width	p<0.001	p<0.05
Length 2 <sup>nd</sup> antennal article / length 1 <sup>st</sup> antennal article		p<0.05
Length 2 <sup>nd</sup> antennal article / length 3 <sup>rd</sup> antennal article		p<0.01
Head width / length 1 <sup>st</sup> antennal article	p<0.001	p<0.001
Length 2 <sup>nd</sup> antennal article / head width	p<0.001	p<0.001
Length 2 <sup>nd</sup> antennal article / pronotum width	p<0.001	
Pronotum width / head width	p<0.05	p<0.001
Body length / hind tibia length	p<0.01	
Hind tibia length / head width	p<0.001	p<0.001

sp., *Aconitum* sp., *Salvia* sp. and *Urtica* sp. (WAGNER, 1958, 1961, 1974; WACHMANN et al., 2004).

The new subspecies inhabits karsts regions in the coniferous belt (Fig. 7) of the above-cited mountains, between 1400 to 1900 m above sea level.





Fig. 5. *Geranium sylvaticum* var. *glanduligerum* – host plant of *Dicyphus constrictus eduardi* ssp.n.



Fig. 6. *Geranium macrorrhizum* – host plant of *Dicyphus constrictus eduardi* ssp.n.



Fig. 7. Typical habitat of *Dicyphus constrictus eduardi* ssp.n.

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Принос към таксономията на *Dicyphus constrictus* (Boheman, 1852)  
(Heteroptera: Miridae)

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(Резюме)

Описва се новия подвид *Dicyphus constrictus eduardi* ssp.n. от Рила, Пирин и Славянка планина. Новия подвид е калцифил, трофично свързан с *Geranium sylvaticum* var. *glanduligerum* и *Geranium macrorrhizum*. Обитава карстови райони в иглолистния пояс на споменатите планини между 1400 и 1900 m надморска височина.