



Is *Siro carpaticus* Rafalski, 1956 (Arachnida: Opiliones) really a rare harvestmen species?

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Abstract: *Siro carpaticus* (Arachnida: Opiliones: Cyphophthalmi) is a harvestman endemic to the Eastern Carpathian Mountains. Although the species was known only from a few localities in Poland and Slovakia and was considered as a rare species, 51 new records from the Bieszczady Mountains are newly presented. This expands the species' range to the Ukrainian border. The search results suggest that *Siro carpaticus* occurs quite commonly in Bieszczady National Park but is difficult to find due to their specific habitat.

Key words: *Siro carpaticus*, Opiliones, distribution, Poland, Carpathians

INTRODUCTION

Siro carpaticus RAFALSKI, 1956 (Arachnida: Opiliones) is a small harvestman (1,5–1,6 mm in length) that lives in spaces under stones and in thick leaf litter of beech and mixed forests from about 300 to 1200 m above sea level (Rafalski 1958, Staręga 1976, Stašiov 2008). The area occupied by this species is a small part of the Carpathians (the East Beskid, the Slonne Mountains, the Bieszczady, the Vihorlat Mountains) situated on border between Poland and Slovakia (Rafalski 1956, 1958, 1961, Mašán 1998, 2005, Mihál et al. 2003, Stašiov et al. 2003) (Fig. 1). The distribution of *Siro carpaticus* is strongly disjunct from other European species of *Siro* LATREILLE, which have been recorded from the Balkans (*S. crassus* NOVAK & GIRIBET, 2006), Lombardy Alps (*S. valleorum* CHEMINI, 1990), and Massif Central and South France (*S. rubens* LATREILLE, 1804) (Karaman 2009). *S. carpaticus* is the northernmost member of the suborder Cyphophthalmi, which is represented in the European fauna by four additional genera occurring on the area from Portugal to the Balkans along the northern coast of the Mediterranean Sea (Staręga 1976, Giribet 2000, Błaszak 2004, Karaman 2009). Such a strong isolation of *Siro carpaticus* from other Cyphophthalmi (see Giribet 2000, fig. 2) suggests a relictual distribution of this species. *Siro carpaticus* was known only from four localities in Poland until now. The localities were in the Low Beskid and the Bieszczady Mountains, on the foothills of these mountain chains (Rafalski 1956, 1958, 1961). Subsequently, the species was found in the Slovakian part of the Bieszczady and the Beskid Mountains (Mašán 1998, Mihál et al. 2003, Stašiov et al. 2003) and in Vihorlat chain (Mašán 2005) (Fig. 1).

However, in the last 50 years in Poland there were no new records on *Siro carpaticus* and our knowledge on the distribution of the species was based on the old data only (Staręga 1976, 2000, Błaszak 2004). Current search for *Siro carpaticus* and overview of all data allow to set the new view on actual distribution of this species.

STUDY METHODS

The intensive search for *Siro carpaticus* have been carried out in 2010–2011 in Bieszczady Mountains, especially in the Bieszczady National Park (permissions: 57/11 and 8/11)

(Rozwałka 2012). I was looking for it under the stones mainly, because such places were considered as its appropriate habitat (Rafalski 1958, Starega 1976). Repeated attempts to use the entomological sieve turned out to be less effective. Only a few specimens were collected with help of this method, considering also the samples provided by other researchers.

RESULTS

New localities

The Sanocko-Turczańskie Mountains

[1] – “Góra Sobień” Nature Reserve, (49°31'37"N, 22°19'45"E; UTM EV 98), under stone in beech-sycamore forest, ca 325–330 m. el., leg. et det. R. Rozwałka; 10.06.2011 – 1♂;

The Słonne Mountains

[2] – Dział Żydowski Massif (49°32'50"N, 22°22'48"E; UTM EV 98), sample of damp moss and litter on the blackthorn scrubs on overgrown meadow, ca 420 m el., leg. J. Radwański, det. R. Rozwałka; 12.06.2005 – 1 juv.;

[3] – “Dyrbek” Nature Reserve (49°31'03"N, 22°25'29"E; UTM FV 08), beech-fir forest, in a very moist leaf litter and rotting, ca 630 m el., leg. J. Radwański, det. R. Rozwałka; 11.06.2005 – 1♀ (remains; carapace with retained ovipositor and 1 chelicerae); 1 juv.;

The Bieszczady Mountains (all materials leg. et det. R. Rozwałka)

[4] – near the road Muczne–Tarnawa Niżna (49°07'28"N, 22°46'08"E; UTM FV 24), in humid leaf litter in a beech-fir forest, sieving litter, ca 770–775 m el.; 27.05.2010 – 1♀ (remains of carapace);

[5–7] – Roztoka stream valley, (49°07'01"N, 22°47'03"E; UTM FV 34), in layer of litter in fir-beech forest, sieving litter, ca 740–745 m el.; 3.05.2010 – 1♂; [6] – (49°06'33"N, 22°47'01"E), under stone in a beech forest, 795–800 m el.; 30.04.2011 – 1♂; 1♀; [7] – (49°06'20"N, 22°47'08"E), under stone in beech-fir forest, ca 825–830 m el.; 17.07.2010 – 1♂;

The Bieszczady Mts., the Bieszczady National Park

[8–9] – coming down the Smerek Massif to Kalnica (49°11'31"N, 22°27'55"E; UTM FV 05), under stone in beech forest, ca 960–970 m el.; 18.08.2010 – 1♂; 2♀♀; [9] – (49°11'13"N, 22°26'45"E; UTM FV 04), under stones in spruce-beech forest, ca 740–750 m el.; 18.08.2010 – 2♂♂; 4♀♀;

[10–11] – Wielki Lutowy stream valley (49°06'18"N, 22°28'16"E; UTM FV 04), under stones in beech forest, ca 933 m el.; 15.08.2011 – 1♂; [11] – (49°07'00"N, 22°27'34"E), under stones in beech forest, ca 875–880 m el.; 15.08.2011 – 1♀;

[12–13] – Górna Solinka stream valley (49°08'10"N, 22°29'13"E; UTM FV 04), under stones in hazel-sycamore forest, ca 695–700 m el.; 17.08.2011 – 1♂; [13] – (49°08'00"N, 22°29'16"E), under stones in beech-sycamore forest, ca 720–725 m el.; 17.08.2011 – 1♂; 1♀;

[14] – north hillside of Borsuk Mt. (49°06'08"N, 22°28'18"E; UTM FV 03), under stones in beech-sycamore forest, ca 1100 m el.; 15.08.2011 – 1♂;

[15–17] – Beskidnik stream valley (49°06'04"N, 22°28'34"E; UTM FV 03), under stones in beech forest, ca 985–990 m el.; 15.08.2011 – 1♂; [16] – (49°06'10"N, 22°28'47"E; UTM FV 04), under stones in beech forest, ca 930–940 m el.; 15.08.2011 – 2♂♂; [17] – (49°06'15"N, 22°29'16"E; UTM FV 04), under stones in beech forest, ca 930–940 m el.; 15.08.2011 – 3♂♂; 2♀♀;

[18] – coming down the Mała Rawka Massif to Wetlina (49°08'08"N, 22°29'46"E; UTM FV 04), under stones in beech forest, ca 850–860 m el.; 17.08.2010 – 1♂;

[19] – around Szypowaty Mt., (49°06'17"N, 22°30'19"E; UTM FV 04), under stones in beech forest, ca 970–975 m el.; 14.08.2011 – 1♂;

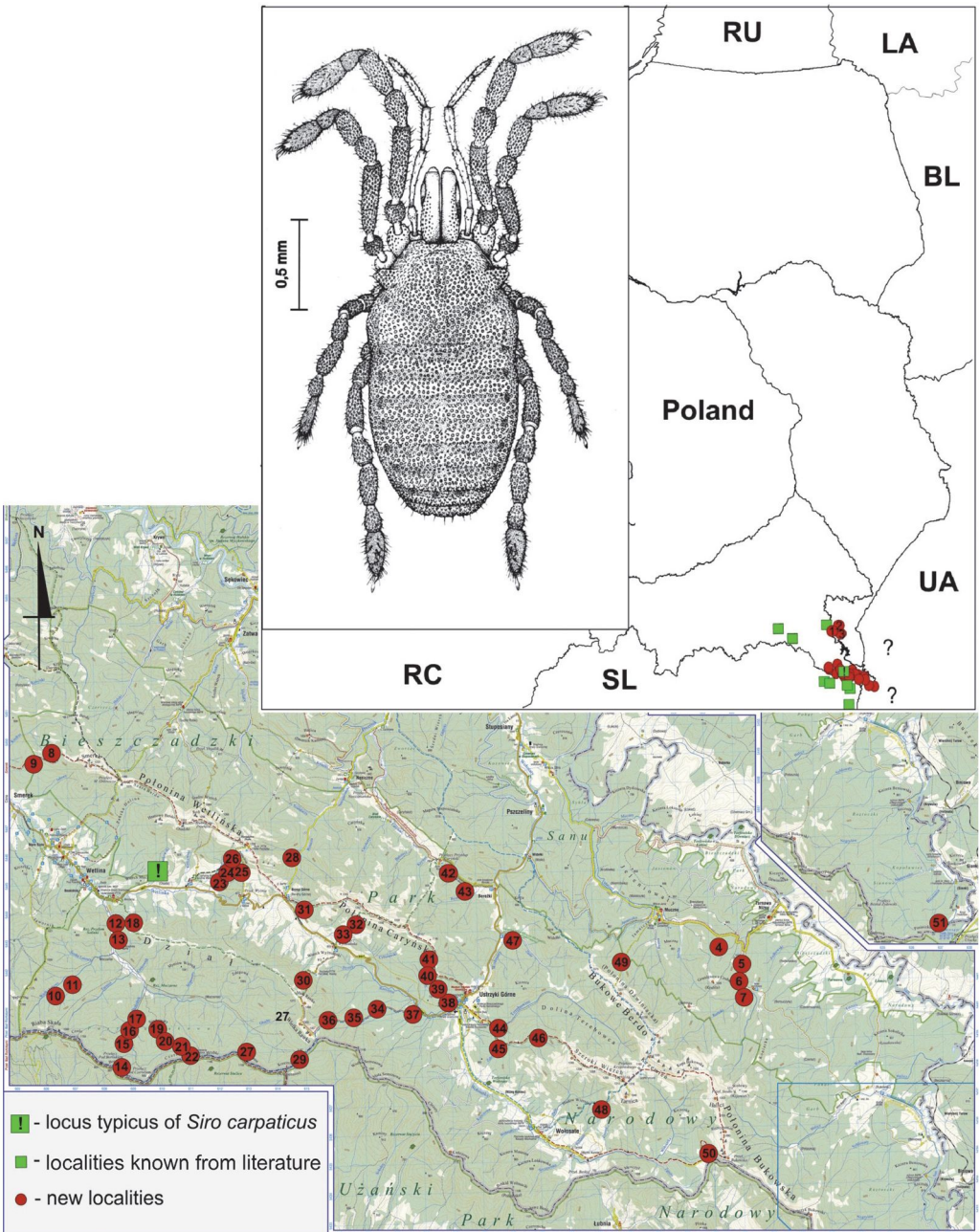


Fig. 1. Distribution of currently known localities of *Siro carpaticus* Rafalski, 1956 in the Bieszczady NP, in Poland and in Slovakia; male habitus by Rafalski, 1958. The localities 1–3 in the text are shown on the map of Poland only, the other (4–51) – on a topographic map of the Bieszczady NP.

[20] – forest between Szypowaty Mt. and Mogilki Mt., (49°06'08"N, 22°30'28"E; UTM FV 14), under stones in beech-sycamore forest, ca 1000–1005 m el.; 19.08.2011 – 1♂;

[21] – around Mogilki Mt. (49°05'55"N, 22°28'01"E; UTM FV 13), under stones in beech-sycamore forest, ca 1050–1060 m el.; 14.08.2011 – 1♂;

[22] – forest between Mogilki Mt. and Czerteż Mt. (49°05'45"N, 22°31'03"E; UTM FV 13), under stones in beech-sycamore forest, ca 1050–1055 m el.; 19.08.2011 – 1♀;

[23] – margins of the Patarczowski stream valley (49°08'55"N, 22°32'11"E; UTM FV 14), under stone in beech forest, ca 810–815 m el.; 18.08.2010 – 1♀;

[24–26] – approach to the Polonina Wetlińska Massif (49°09'04"N, 22°32'57"E; UTM FV 14), under stone in beech forest, ca 970–980 m el.; 18.08.2010 – 1♀; [25] – (49°09'00"N, 22°32'16"E) under stone in beech forest, ca 840–850 m el.; 18.08.2010 – 1♂; [26] – (49°09'14"N, 22°32'50"E) under stone in beech forest, ca 1050–1060 m el.; 18.08.2010 – 1♀;

[27] – north hillside of Kamienna Mt. (49°05'28"N, 22°32'55"E; UTM FV 13), under stones in scrubby ("Krummholz") beech-sycamore forest, ca 1150–1160 m el.; 19.08.2011 – 1♀;

[28] – around Brzegi (Berehy) Górne (49°09'22"N, 22°34'35"E; UTM FV 14), under stone in beech-sycamore forest near road Brzegi (Berehy) Górne – Dwernik, ca 730–735 m el.; 18.08.2010 – 1♂;

[29] – mountain pass between the Wielka Rawka Mt. and Krzemieniec Mt. (49°05'33"N, 22°34'24"E; UTM FV 13), under stones in the scrubby ("Krummholz") beech forest, ca 1140–1150 m el.; 17.08.2010 – 1♂;

[30] – coming down the Mała Rawka Massif (49°07'02"N, 22°34'39"E; UTM FV 14), under stones from beech forest, ca 1000 m el.; 19.07.2010 – 1♀;

[31] – approach to the Polonina Caryńska Massif, from the Brzegi (Berehy) Górne (49°08'24"–49°08'26"N, 22°34'28"–22°35'00"E; UTM FV 14), under stones in beech forests from about 790 to about 900 m el.; 26.05.2010 – 19♂♂; 16♀♀;

[32–33] – coming down the Polonina Caryńska Massif in the direction of Wyzniańska mountain pass (49°07'40"N, 22°35'39"E; UTM FV 14), under stones in "Krummholz" beech forest at the upper forest limit, ca 1130–1135 m el. – 3♂♂; 4♀♀; 29.04.2011; [33] – (49°07'40"N, 22°35'39"E), under stone in clump of spruces, ca 925–930 m el.; 29.04.2011 – 5♂♂; 2♀♀;

[34–36] – approach to the Wielka Rawka Massif (49°06'13"N, 22°36'27"E; UTM FV 14), 790–800 m el., beech forest, under stones; 19.07.2010 – 1♂; [35] – (49°06'08"N, 22°36'02"E), beech forest, under stones, ca 850–860 m el.; 17.08.2010 – 1♂; [36] – (49°06'06"N, 22°35'56"E), under stones in beech forest, ca 900–910 m el.; 19.07.2010 – 1♀; 17.08.2010 – 1♂;

[37] – Rzczyca stream valley; (49°06'28"N, 22°37'30"E; UTM FV 14), Rzczyca stream valley near the entrance to the tourist trail from Wielka Rawka Massif, under stones in fir-beech forests, ca 680–690 m el.; 19.07.2010 – 5♂♂; 6♀♀;

[38] – approach to the Polonina Caryńska Massif (49°06'24"N, 22°38'26"E; UTM FV 14), under stone in beech forest (Fig. 2), ca 720–730 m el.; 26.05.2010 – 1♂; [39] – (49°06'45"N, 22°38'18"E), under stone in beech forest, ca 850–860 m el.; 7.10.2010 – 1♀; [40] – (49°07'10"N, 22°38'24"E), under stones in beech forests (Fig. 3); ca 960–980 m el.; 26.05.2010 – 1♀; 7.10.2010 – 1♂; 1♀; 28–29.04.2011 – 13♂♂; 19♀♀; [41] – approach to the Polonina Caryńska Massif (49°07'16"N, 22°38'17"E), under stone in beech forest, near the upper limit of forest, ca 1050–1070 m el.; 26.05.2010 – 1♂; 28.04.2011 – 1♀;

[42] – around Bereżki village (49°08'44"N, 22°39'12"E; UTM FV 24), under stone in beech forest, ca 710–730 m el.; 21.07.2010 – 2♂♂; 3♀♀;

[43] – Bereżki, valley of the Bystry stream (49°08'30"N, 22°39'39"E; UTM FV 24), under stones in anthropogenic spruce woodlands, ca 630–635 m el.; 28.04.2011 – 5♂♂; 4♀♀;

[44] – valley margins of the Terebowiec stream (49°05'52"N, 22°39'55"E; UTM FV 23), in beech litter, sieving litter, ca 700–705 m el. leg. et det. R. Rozwalka; 20.07.2010 – 1♂;

[45–46] – approach to the Szeroki Wierch Massif (49°05'32"N, 22°39'19"E; UTM FV 23), under stone in beech forest, ca 790 m el.; 20.07.2010 – 1♂; [46] – (49°05'39"N, 22°41'17"E), under stones in beech forests, ca 960–980 m el.; 24.05.2010 – 1♂; 1♀; 20.07.2010 – 1♀;

[47] – Wolosaty stream valley, (49°07'33"N, 22°40'16"E; UTM FV 24), ca 630–635 m el., under stone in the ruin sites, leg et det. R. Rozwalka; 28.04.2011 – 1♂;

[48] – approach to the Tarnica Massif (49°04'22"N, 22°42'35"E; UTM FV 23), under stone in beech forest, ca 950–960 m el.; 15.08.2010 – 1♂;

[49] – approach to the Bukowe Berdo Massif (49°07'24"N, 22°43'5"E; UTM FV 24), under stone in beech-spruce forest, ca 840–850 m el.; 16.07.2010 – 1♂;

[50] – coming down the Rozsypaniec Massif (49°03'20"N, 22°45'57"E; UTM FV 23), under stone in beech forest, ca 1050 m el.; 20.07.2010 – 1♂;

[51] – around the sources of the San River (49°00'25"N, 22°52'51"E; UTM FV 33), about 200 meters from the source of the San River and 100–120 meters from the border of Ukraine, under stone in beech forest, ca 875–880 m el.; 17.07.2010 – 1♀.

In summ, 172 specimens of *Siro carpaticus*: 89 ♂♂; 79 ♀♀; 2 juv., and 2 remains of specimens (carapace of females) discovered in 51 new locations (Fig. 1).



Figs 2–3. Carpathian beech forests on slopes of the Polonina Caryńska Massif – typical habitat of *Siro carpaticus*. Fot. R. Rozwalka.

DISCUSSION

Previously, *Siro carpaticus* was known only from four localities and some specimens (Rafalski 1958, Staręga 1976). There are marked five localities of *Siro sarpaticus* on the map in the Polish Red Book of Animals (Błaszak 2004) but the fifth locality was placed additionally as a result of graphic approach adopted by the authors (double marking the location situated on the UTM grid line). Furthermore, the occurrence of *S. carpaticus* in Slovakia (Mašán 1998, Mihál et al. 2003, Stašiov et al. 2003) had not been considered there.

According to all earlier Polish and Slovakian literature data, *Siro carpaticus* is a very rare harvestman known from only a few specimens (Rafalski 1956, 1958, 1961, Staręga 1966, 1976, Mašán 1998, Mihál et al. 2003, Stašiov et al. 2003, Błaszak 2004). However, this paper presents 51 new localities and over 170 collected specimens, indicating that the species is actually relatively common. The species may be even more common than would appear from these data because the studies were mainly focused on the search for new localities. For

example, 26.05.2010, during purposely exploration, in district of Brzegi (Berehy) Górne 35 specimens were found in two hours. Previous opinion about rarity of this species may be a consequence of inadequate sampling. Moreover, *Siro carpaticus* is very difficult to find due to the small size, its cryptic habitat and presumably sedentary life style (Rafalski 1958, Staręga 1976). *S. carpaticus* is found under deeply embedded stones in beech (Fig. 2, 3) and mixed forests from the elevation about 300 to 1200 m (Rafalski 1958, 1961, Stašiov 2008, present data). The upper elevation limit of *S. carpaticus* occurrence coincides with the upper forest limit, although the harvestman is rarely found in the zone of dwarf beech forests ("Krummholz") (about 1000–1200 m el.). It is worth noting that, specimens were observed near abandoned burrows of earthworms (*Oligochaeta*), on several occasions. This suggests that the harvestmen might be inhabit (or move through) earthworm tunnels. Other observations show that specimens of *S. carpaticus* accumulates in large numbers under stones, probably because of a more stable and moderate microclimate. The species also occurs in deep layer of forest litter and in upper parts of strongly cultivated soil in woods (Rafalski 1958, 1961, present data). Also, *S. carpaticus* is found in turf (moss) on open spaces, being found on overgrowth by blackthorn meadows in the Slonne Mountains (locality 2) or on ruderal sites (Mihál et al. 2003).

The more complete knowledge on distribution of this species require further study. The present data suggest that *Siro carpaticus* occurs also in the Ukrainian part of the Bieszczady (the Eastern Bieszczady), but it is not known whether the distribution extends to east, to the Czarnohora and the Gorgany Mountains. However, the species range probably does not extends to Romania, because the opilionofauna is well known there (Babalean 2005).

SUMMARY

1. *Siro carpaticus* is a relatively common species, in contrast to previously published information.

2. Typical habitats of *S. carpaticus* are undersurfaces of deeply imbedded stones in beech and mixed forests from about 300 m to 1200 m. The species occurs also in forest litter, on ruderal sites and maybe in turf of lover located meadows.

3. Present data show that *S. carpaticus* occurs in the Eastern Carpathians where the species was found in Poland and Slovakia. Probably *S. carpaticus* also occurs in the Ukrainian part of the Carpathian Mountains.

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STRESZCZENIE

[Czy *Siro carpaticus* RAFALSKI, 1956 (Arachnida: Opiliones) jest naprawdę rzadkim gatunkiem kosarza?]

Siro carpaticus (Arachnida: *Opiliones: Cyphophthalmi*) jest endemicznym gatunkiem wschodniokarpackim, który znany był dotychczas z bardzo nielicznych okazów i nielicznych stanowisk położonych w Polsce i Słowacji. W wyniku badań przeprowadzonych w 2010 i 2011 roku na terenie Bieszczad i Bieszczadzkiego Parku Narodowego zebrano ponad 170 egzemplarzy i stwierdzono 51 nowych stanowisk *S. carpaticus*. Prezentowane wyniki badań, wskazują, że *S. carpaticus* na terenie Bieszczad jest kosarzem stosunkowo częstym, ale ze względu na skryty tryb życia i małe rozmiary ciała bardzo trudnym do odszukania w terenie. Badania potwierdziły, że *S. carpaticus* występuje najczęściej pod głęboko tkwiącymi w glebie kamieniami w strefie lasów bukowych i mieszanych położonych na wysokości od 300 do 1200 m.n.p.m. Rozmieszczenie *S. carpaticus* w Polsce i na Słowacji wskazuje także, że ten kosarz, musi występować także w ukraińskiej części Bieszczad, choć dotychczas nie został stamtąd wykazany.

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