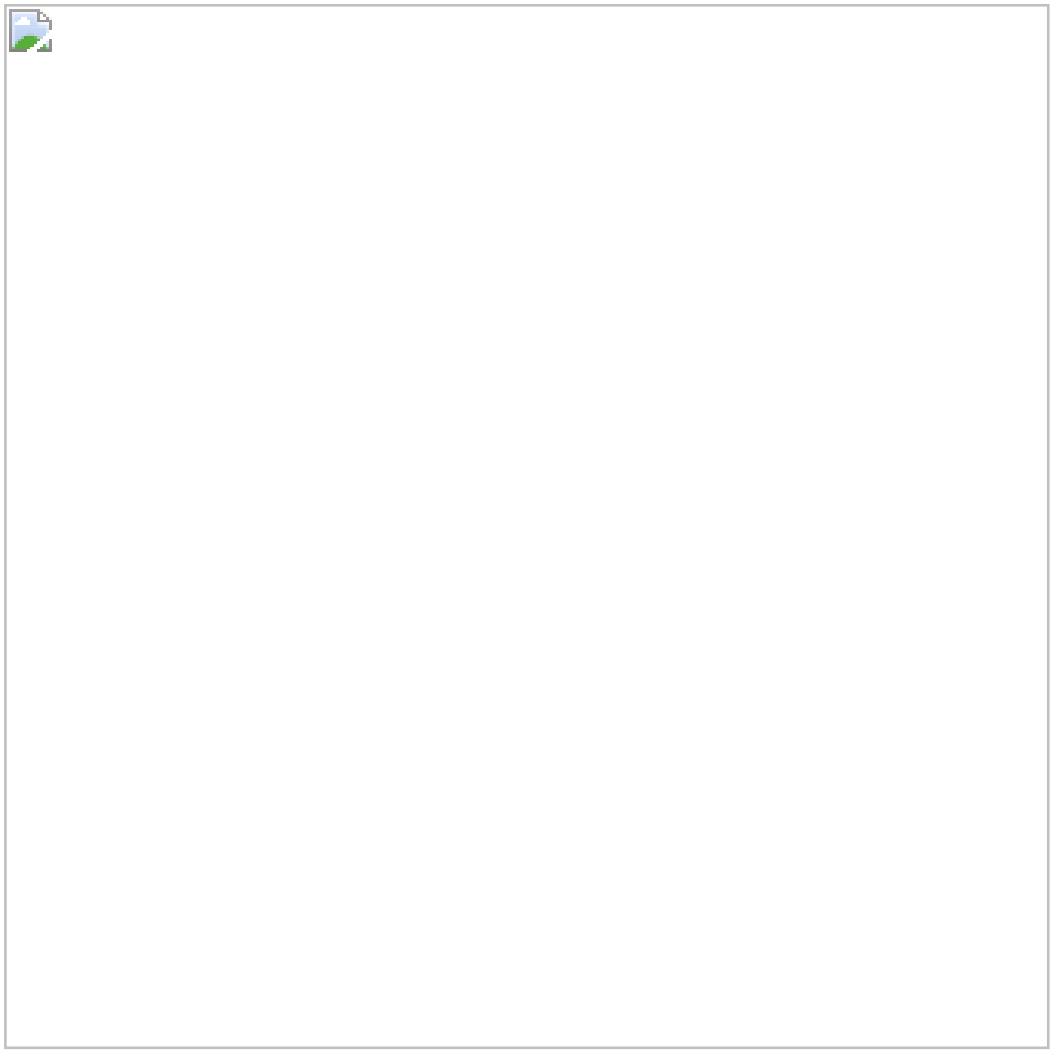

On some rare and newly recorded spider species for the Ukrainian Carpathians (Arachnida: Araneae)

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On some rare and newly recorded spider species for the Ukrainian Carpathians (Arachnida: Araneae)

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Abstract. This paper mentions six rare and understudied spider species from the Ukrainian Carpathian Mountains. Data on two species, *Clubiona saxatilis* L. Koch, 1867 and *Erigone cristatopalpus* Simon, 1884, also represent the first records for the Ukrainian fauna. This study also confirms the presence of *Zelotes similis* (Kulczyński, 1887), previously known from the Ukrainian Carpathians only through W. Kulczyński's file index – old unpublished records, stored at the Museum and Institute of Zoology of the Polish Academy of Sciences, Warsaw. Additionally, we provide supplementary data on the distribution and habitat preferences of *Iberina montana* (Blackwall, 1841), and *Taranucnus beskidicus* Hirna, 2018 in the Eastern Carpathians. In a separate note, the presence of *Cetonana laticeps* (Canestrini, 1868), an understudied element in the Ukrainian spider fauna, is mentioned and discussed. Over the last decades, this species has probably extended its range across the Transcarpathian Lowland of the Pannonian Plain and along the Vihorlat-Gutyn mountain ridge. The presented data on an urban record of *Cetonana laticeps* therefore provide insights into the dynamics and implications of its geographical expansion.

Keywords: *Cetonana laticeps*, *Clubiona saxatilis*, distribution, *Erigone cristatopalpus*, *Iberina montana*, *Taranucnus beskidicus, Zelotes similis*

Zusammenfassung. Bemerkungen zu einigen seltenen und neu nachgewiesenen Spinnenarten für die Ukrainischen Karpaten (Arachnida: Araneae). Diese Arbeit enthält Bemerkungen zu sechs seltenen und wenig erforschte Spinnenarten aus den Ukrainischen Karparten. Daten zu zwei Arten, *Clubiona saxatilis* L. Koch, 1867 and *Erigone cristatopalpus* Simon, 1884, stellen den Erstnachweis für die Ukrainische Fauna da. Diese Studie bestätigt zudem die Präsenz von *Zelotes similis* (Kulczyński, 1887), welche bisher in den ukrainischen Karpaten nur durch das Karteikartensystem alter, unpublizierter Nachweise von W. Kulczyński bekannt und am Zoologischen Institut der Polnischen Akademie für Wissenschaft in Warschau hinterlegt ist. Ergänzende Daten zur Verbreitung und Habitpräferenz von *Iberina montana* (Blackwall, 1841) und *Taranucnus beskidicus* Hirna, 2018 in den Östlichen Karpaten werden ebenfalls präsentiert. Eine separate Notiz betrifft die Präsenz von *Cetonana laticeps* (Canestrini, 1868), ein wenig erforschtes Element der ukrainischen Fauna. Die Art erweiterte ihr Verbreitungsgebiet wahrscheinlich über die letzten Jahrzehnte in die transkarpatische Ebene Pannoniens und entlang der Vihorlat-Gutin-Gebirgskette. Die präsentierten Daten zu einem urbanen Nachweis von *Cetonana laticeps* stellen daher weitere Erkenntnisse zur Dynamik und Auswirkung der Expansion des Verbreitungsareals dieser Art dar.

Анотація. Про рідкісні та нещодавно виявлені види павуків Українських Карпат (Arachnida: Araneae). У роботі згадуються шість рідкісних і маловивчених видів павуків Українських Карпат. Дані про два види, *Clubiona saxatilis* L. Koch, 1867 та *Erigone cristatopalpus* Simon, 1884, репрезентують перші їх знахідки для фауни України. Дослідження також підтверджує наявність *Zelotes similis* (Kulczyński, 1887), відомого раніше для Українських Карпатах лише за картотекою В. Кульчинського – старими неопублікованими записами, які зберігаються в Музеї та Інституті зоології Польської академії наук у Варшаві. Наведені додаткові дані щодо розповсюдження та оселищних преференцій *Iberina montana* (Blackwall, 1841) та *Taranucnus beskidicus* Hirna, 2018 у Східних Карпатах. Окремо варто відзначити знахідку *Cetonana laticeps* (Canestrini, 1868) – малознаного елемента у фауні України. Протягом останніх десятиліть цей вид, ймовірно, розширює свій ареал уздовж Паннонської рівнини та Вигорлат-Гутинського хребта. Наведені дані про знахідку *Cetonana laticeps* в урбанізованому ландшафті сприятимуть подальшому розумінню динаміки та наслідків його експансії.

The comprehensive "Spiders of Europe" database lists 1094 spider species from Ukraine (Nentwig et al. 2023). Meanwhile, the most recent checklist for spiders recorded in the Ukrainian Carpathians, established in 2014, includes 386 species (Gajdoš et al. 2014). However, these numbers are notably incomplete as wide expanses of distribution within the country, including the mountainous regions, remain largely unexplored. One of the problems hampering the creation of a comprehensive faunal inventory of the Ukrainian Carpathians pertains to old publications that fail to clearly define species´ localities, leaving it even ambiguous whether the samples were procured specifically within the mountainous region or from the neighbouring flatlands. Regrettably, in many cases the voucher material related to these papers has not been preserved, also a significant number of species remain unconfirmed by contemporary records.

This paper reports on the occurrence and habitat preferences of six rare and faunistically remarkable spider species discovered in the Ukrainian Carpathians, including data on four species absent from "The Spiders of Europe" database for Ukraine (Nentwig et al. 2023). Two of these species are new to the Ukrainian fauna, and four were previously known only from rarely cited regional faunal lists, an unpublished thesis, or the type locality.

Material and methods

The material (2016–2022) was collected by standard methods, mostly hand collection and pitfall trapping, from different regions within the Ukrainian Carpathians. Precise locations for each species are explained in the Results section and highlighted on the associated map. Specimens were preserved in 70% ethanol. Isolated male palps were dissected and cleared (via 10% KOH, maceration at ambient temperature for 24 hours), epigynes/vulvas were examined and photographed using a Nikon Coolpix 4500 camera attached to a Zeiss Stemi 2000 Stereo Microscope (Institute of Ecology of the Carpathians, NAS of Ukraine, Lviv). All measurements were conducted using a stereomicroscope fitted with an ocular micrometer. Adobe Photoshop software (version 23.5.0) was employed to generate scale lines. Taxonomic names follow the nomenclature of the WSC (2023). Material is deposited in the collections of the Institute of Ecology of the Carpathians NAS of Ukraine (Lviv).

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Results and discussion

***Clubiona saxatilis* L. Koch, 1867 (Clubionidae)** (Fig. 1)
Material examined. UKRAINE, Zakarpatska oblast, Uzhanskyi National Nature Park, vil. Stuzhytsia, Stinka mountain ridge, beech-dominated tree line: an ecotone between a pristine sycamore-beech forest on rocky outcrops and mountain meadow, 49.0036°N, 22.5536°E; 925–960 m a.s.l., pitfall trap, 30. May – 21. Jun. 2018: 1 ♂; mountain meadow with patches of dwarf *Vaccinium* heath, 49.0050°N, 22.5556°E; 945–965 m a.s.l., pitfall trap, 13. Aug. – 24. Oct. 2019: 1 ♂, leg. N. Koval, det. A. Hirna (Fig. 2).

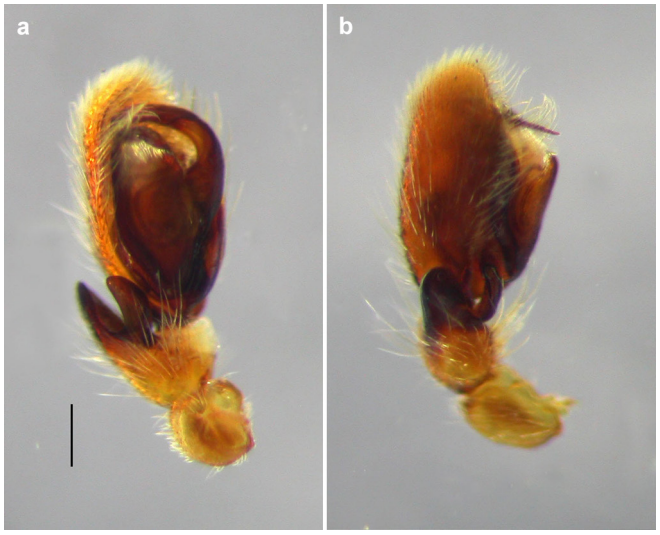

Fig. 1: Male palp of *Clubiona saxatilis* from the Ukrainian Carpathians. **a.** ventral view; **b.** retrolateral view. Scale bar: 0.2 mm

Distribution. The presence of *Clubiona saxatilis* has been confirmed in Western Europe (including France, Germany, Austria), Eastern Europe (Czechia, Slovakia, Poland, Romania, Bulgaria), and Southern Europe (Italy, Serbia, Montenegro, Nentwig et al. 2023). This paper introduces the first record of *Clubiona saxatilis* in Ukraine.
Remarks. Except for Bulgaria and Slovakia, *Clubiona saxatilis* has been found in a limited number of localities across most countries, rendering it a relatively rare species (Deltshev & Blagoev 1997, Gajdoš et al. 1999, Deltshev et al. 2012, Rozwałka & Stachowicz 2015). The species is typically found in low to mid-altitude mountain ranges, foothills, and hills, at altitudes spanning from 300 to 1500 m a.s.l. It inhabits a diverse range of ecosystems, from forests and grasslands to pastures, and is often discovered in rocky outcrops and scree slopes (Thaler 1981, Franc 2002, Rozwałka & Stachowicz 2015, Růžička et al. 2005, Růžička & Řezáč 2022).

Within the Carpathian region, *Clubiona saxatilis* has only been reported from two countries, namely Czechia and Slovakia. One of the locations for the species (Slovakia; Poloniny National Park: National Nature Reserve Stinska, Majkova, 960–1040 m a.s.l.) is located within the East Carpathian Biosphere Reserve (Svatoň et al. 2003). This transboundary protected area also encompasses the Uzhanskyi National Nature Park, where the species was subsequently discovered in Ukraine. Overall, *Clubiona saxatilis* is categorized as near-threatened (NT) in the Carpathian Red List (Gajdoš et al. 2014), with a status of least concern (LC) in Slovakia (Gajdoš et al. 1999), whereas in Czechia, the species is endangered (EN; Řezáč et al. 2015).

***Zelotes similis* (Kulczyński, 1887) (Gnaphosidae)** (Fig. 3)
Material examined. UKRAINE, Ivano-Frankivsk oblast, Syniohora National Natural Park, Syvula mountain ridge, Mt. Mala Syvula (Gorgany mt. massif), siliceous screes at the subalpine level, 48.5449°N 24.1291°E; 1795 m a.s.l., hand-collected under stones, 21. Jul. 2022: 1 ♀, leg. et det. A. Hirna (Fig. 2).
Distribution. The species occurs in the Alps of Central Europe and is widespread in the mountainous eastern regions of

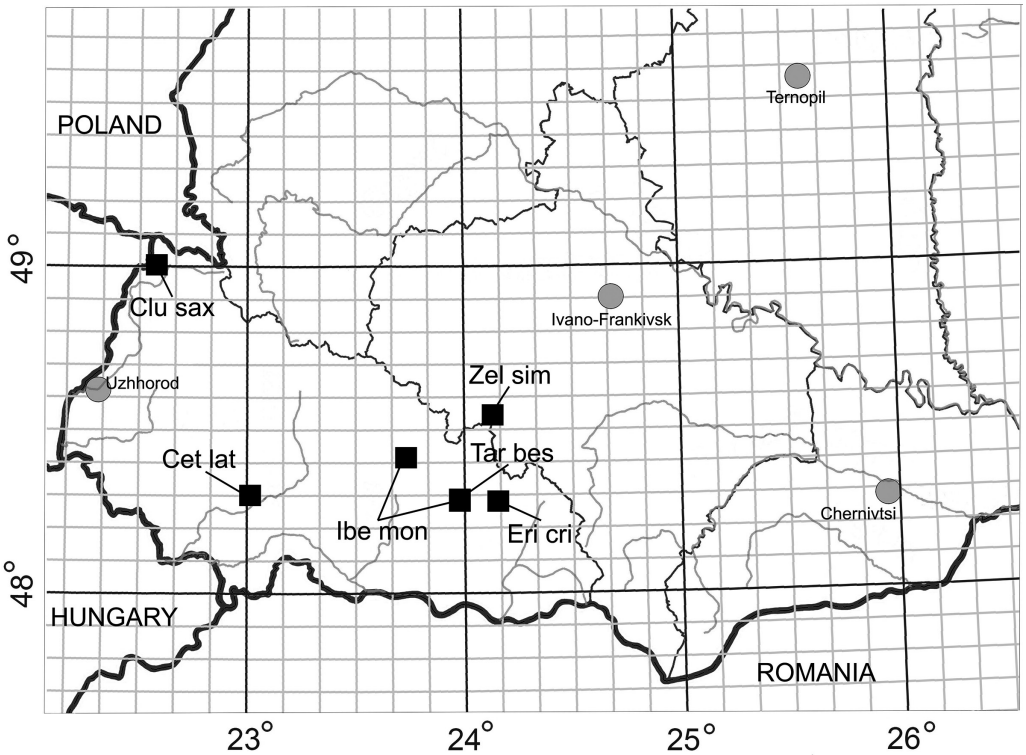

Fig. 2: Localities of species in the Ukrainian Carpathians: Clu sax – *Clubiona saxatilis,* Eri cri – *Erigone cristatopalpus,* Zel sim – *Zelotes similis,* Ibe mon – *Iberina montana,* Tar bes – *Taranucnus bescidicus,* Cet lat – *Cetonana laticeps*

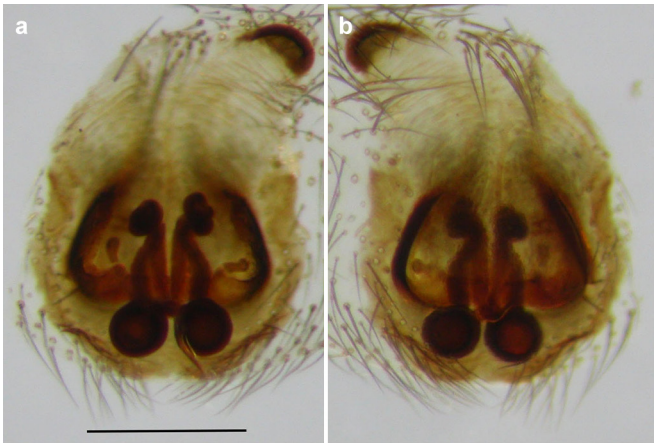

Fig. 3: Female of *Zelotes similis* from the Ukrainian Carpathians. **a.** a dissected end cleared vulva, dorsal view; **b.** dissected end cleared epigyne/vulva, ventral view. Scale bar: 0.5 mm

Fig. 4: Female of *Iberina montana* from the Ukrainian Carpathians. **a.** general appearance, with epigyne, ventral view; **b.** dissected end cleared vulva. Scale bars: 0.1 mm

Southern Europe, extending eastward to Bulgaria. It is also known in Romania and found in the Asian part of Türkiye (Grimm 1985, Nentwig et al. 2023).

Remarks. *Zelotes similis* was described by W. Kulczyński as *Prosthesima similis* from the Tyrolean Alps (Kulczyński 1887). Later, in 1897, this species was reported by him near Băile Herculane, a city in Romania within the Southern Carpathians (Herkulesfürdő; Chyzer & Kulczyński 1897). Władysław Kulczyński had a large card index in which he made notes regarding species he identified. Nonetheless, a substantial part of this data remains unpublished (Hirna & Zhukovets 2022), including the information from around 1900 concerning *Zelotes similis* in the Eastern Carpathians, specifically within the Chornohora mountain massif in Ukraine. Therefore, it is not listed in Nentwig et al. (2023) for the Ukraine. There is also a note on *Zelotes similis* from the Eastern Carpathians of Romania (Iacobeni, formerly known as Kászonfürdő), a record from a paper by Kolosváry and Loksa (1944: as *Zelotes similis hungaricus*). Since 1944, there have been no further reports of this species in the regions of the mountain system, and it was conspicuously absent from the Carpathians' Red List (Gajdoš et al. 2014; perhaps as doubtful).

In Europe, *Zelotes similis* is typically found on warm, stony slopes with dwarf shrub heath, and in sparsely vegetated woodlands (primarily up to 1500 m, although some specimens have been recorded higher, even exceeding 2100 m; Grimm 1985, Pantini et al. 2020, Nentwig et al. 2023). Its recent discovery within the Gorgany mountain massif of Ukraine aligns with its known habitat preferences. At the same time, the old record based on the material of Stanislaw Pilawski (1934–1957) from the plain part of Ukraine (Lviv: Briukhovychi, pine forest, 1 ♀; Woźny & Czajka 1993) remains doubtful (Hirna & Zhukovets 2022). The confirmation of *Zelotes similis* in the Eastern Carpathians underscores the necessity for a comprehensive review of materials from this region, especially given the marked morphological similarities between this species and *Zelotes subterraneus* (C. L. Koch, 1833) or *Zelotes clivicola* (L. Koch, 1870).

***Iberina montana* (Blackwall, 1841) (Hahniidae)** (Fig. 4)

Material examined. UKRAINE, Zakarpatska oblast, vil. Kolochava, the Tapesh mountain ridge, an old felled area with patches of siliceous screes on the southeast slope, 48.4205°N 23.6877°E, 600 m a.s.l., in leaf litter between stones, collected by hand, 27. Apr. 2014: 1 ♀; Ust-Chorna village, Polonyna Krasna mountain ridge, recently felled area with patches of siliceous screes on the south slope, 48.2883°N, 23.9544°E, 600 m a.s.l., in leaf litter between stones, collected by hand, 1. Oct. 2018: 2 ♀♀, leg. et det. A. Hirna (Fig. 2).

Distribution. *Iberina montana* is predominantly found in Europe, extending eastwards into Western European Russia and Romania. This species has also been recorded in the Asian part of Türkiye (Nentwig et al. 2023).

Remarks. This species poses considerable challenges to its accurate identification due to its morphological similarity to *I. difficilis* (Harm, 1966): their palpal structures are nearly indistinguishable, so only material containing females can be considered (Růžička 2022). Although *Iberina montana* has a wide geographical range across Europe, it remains a rare find in the Carpathian Mountains and is currently categorized as 'vulnerable' on the Red Carpathian List (VU; Gajdoš et al. 2014). In the Western Carpathians, this species has been known from the Tatra Mountains since Kulczyński (1882) described specimens from this region as *Hahnia parva*. Only recently was it possible to confirm the record of *Iberina montana* in these mountains in Poland (on a rocky slope with mountain pine, 1650 m a.s.l.; Wiśniewski et al. 2013). Furthermore, the species has been observed in several locations within the Fatra-Tatra Area in Slovakia, predominantly in forest ecosystems.

In the Eastern Carpathians, specimens of *Iberina montana* have been located in Slovakia's Bukovec Mountains near the borders with Poland and Ukraine (Gajdoš et al. 1999, Svatoň & Kovalčík 2006). In Ukraine, the species has been documented within mixed forests in the Gorgany mountain massif (650–900 m a.s.l.), and also in the old-growth beech forests of the Uholsko-Shyrokoluzhanskyi massif (511–821 m a.s.l.; Prokopenko & Chumak 2007). These habitats align with the typical environments known for this species (Růžička 2022, Nentwig et al. 2023). Therefore, the discovery of *Iberina montana* specimens within deforested areas featuring patches of siliceous screes on south-facing slopes was unexpected. These records enhance our understanding of the ecological preferences of *Iberina montana* and prompt revisions of the existing data on potential threats to this species within the Carpathians.

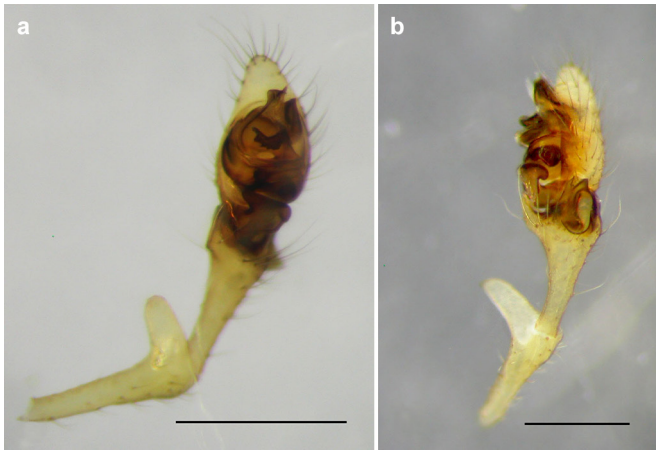

Fig. 5: Male palp of *Erigone cristatopalpus* from the Ukrainian Carpathians. **a.** ventral view; **b.** retrolateral view. Scale bars: 0.5 mm

***Erigone cristatopalpus* Simon, 1884 (Linyphiidae)** (Fig. 5)
Material examined. UKRAINE, Zakarpatska oblast, the Svydivets mountain massif, Troyaska f. n., raised bog and a mountain stream (empties into Apshynets Lake) at the bottom of the glacial cirque, 48.2811°N 24.1544°E, 1507 m a.s.l., in *Sphagnum*, collected by hand, 10. Aug. 2016: 1 ♂, leg. et det. A. Hirna (Fig. 2).
Distribution. *Erigone cristatopalpus* is a species native to both the Palaearctic and Nearctic regions. Within the Palaearctic, the species has a disjunct range that covers Europe in the west and Kazakhstan, Russia (from the Urals to the Far East), and Mongolia in the east (Nentwig et al. 2023). Our recent record of *Erigone cristatopalpus* in Ukraine is its easternmost presence in Europe.
Remarks. In Europe, *Erigone cristatopalpus* is restricted in distribution to the high-altitude mountain ranges, namely the Alps (Muster & Hänggi 2009), Carpathians (Tatras, Slovakia; Svatoň & Kovalčík 2006), and Sudetes (the Giant Mountains in Poland and Hrubý Jeseník Mountains in Czechia; Wiśniewski & Wesołowska 2016, Řezáč et al. 2021). The species' vertical distribution spans from the subalpine to the alpine zones, ranging approximately from 1300 to 2900 m a.s.l.

It predominantly resides in moist habitats (Muster & Hänggi 2009, Wiśniewski & Wesołowska 2016), a fact substantiated also by our recent observation from the Svydivets mountain massif in Ukraine. According to the Carpathian Red List (Gajdoš et al. 2014), *Erigone cristatopalpus* is currently classified as an endangered species (EN).

***Taranucnus beskidicus* Hirna, 2018 (Linyphiidae)**
Material examined. Ukraine, Zakarpatska oblast, Ust-Chorna village, Polonyna Krasna mountain ridge, recently felled area with patches of siliceous screes on the south slope, 48.2883°N 23.9544°E, 600 m a.s.l., under stones, collected by hand, 1. Oct. 2018: 1 ♂, leg. et det. A. Hirna (Fig. 2).
Distribution. Ukraine (the Carpathians; Nentwig et al. 2023).
Remarks. *Taranucnus beskidicus* is a little-known species, only recently described. It is the second record of this species from Ukraine, the other being the type locality in the Skole Beskids National Nature Park (Hirna 2018). The habitat where the specimen was located in the Polonyna Krasna mountain ridge diverges from the original habitat description, which included non-vegetated deposit beds of mountain streams in fir-beech forest, formed of gravels, boulders, and finer sediments bordering the shores of the stream and forming stream islands (Hirna 2018). The record of specimens within the siliceous screes on south-facing slopes suggests the species' adaptability to a relatively wide range of soil and air moisture conditions.

***Cetonana laticeps* (Canestrini, 1868) (Trachelidae)** (Fig. 6)
Material examined. UKRAINE, Zakarpatska oblast, Irschava city, inside a building, 48.3082°N, 23.0412°E, 132 m a.s.l., collected by hand, 24. Mar. 2022: 1 ♀, leg. et det. V. Yanul (Fig. 2).
Comparative material (examined per image). Germany, Baden-Württemberg, Karlsruhe, under bark of a dead willow tree along the river Alb in an urban area, 48.9886°N, 8.3998°E, collected by hand, 22. Mar. 2023, 1 ♀, leg et det. T. Bauer.
Distribution. This species is known from most Southern European countries (Spain, Italy, Serbia, Montenegro, Albania and North Macedonia). In Western Europe, it is known from all countries except for the Netherlands, with the northernmost known location being Aken (Elbe) in Saxony-Anhalt, Germany. Eastern Europe is also part of its range, encompass-

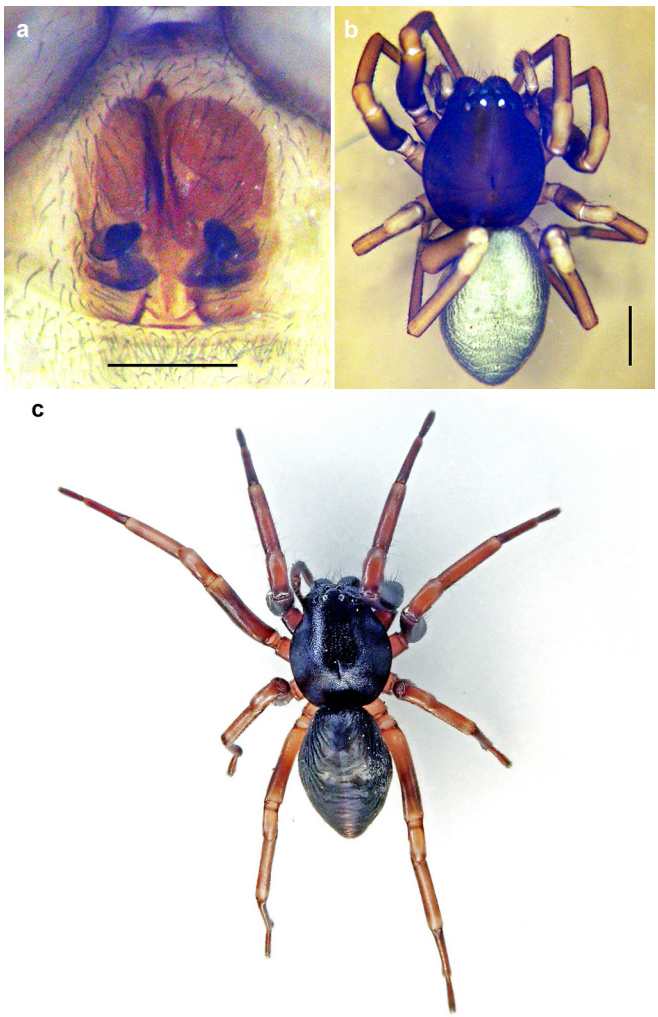

Fig. 6: Females of *Cetonana laticeps* from the Ukrainian Carpathians (a, b) and Germany (c). **a.** epigyne; **b.** general appearance; **c.** adult specimen (https://www.inaturalist.org/observations/152067938). Scale bars: 0.2 mm (a); 1 mm (b)

ing Romania, Bulgaria, Hungary, Czechia and Slovakia, with its northernmost boundary being Lublin in Poland (Nentwig et al. 2023, Arachnologische Gesellschaft 2023, Rozwałka 2012). Additionally, *Cetonana laticeps* has been recently recorded in the Asian region of Türkiye (Coşar 2021, Nentwig et al. 2023). According to Rozwałka (2012), "Grimm's (1986) information about the occurrence of *C. laticeps* in Russia was based on a misinterpretation of Tyshchenko's (1971) data, who described this species from Hungary and not from the area of the former USSR".

Remarks. *Cetonana laticeps* was first found in Ukraine in 2009, and again in 2016, in the city of Uzhhorod during a study on synanthropic spiders in the country's regional centres (Voloshyn 2018). Most of the territory of Uzhhorod is located within the Transcarpathian Lowland of the Pannonian Plain. Currently, the species was discovered within the Irshava foothills of the Vihorlat-Gutyn mountain ridge. Currently, there is no information available about the altitudinal distribution of this species in the Carpathians, leaving it uncertain whether the mountain ranges will impede its northeastern expansion.

An eastward spread of the species in the western regions of Ukraine could occur from the plains of Poland, particularly from Lublin where the species was recorded over a decade ago (Rozwałka 2012). To date, *Cetonana laticeps* has only been found sporadically within urban ecosystems of the Transcarpathian region, on external walls and indoors. Being a bark dweller that has been collected from various tree species (Grimm 1986; see material), it remains unclear if *Cetonana laticeps* populates natural habitats in this region as no systematic studies have been conducted within the Transcarpathian Plain and Volcanic Carpathians in recent decades. The species very likely inhabits crevices under the bark of urban trees in Ukraine and searching old orchard fruit and pine trees will probably reveal additional records in urban ecosystems and their vicinity (Arachnologische Gesellschaft 2023, Grimm 1986, T. Bauer pers. comm.). The species was not included in the list of synanthropic spiders of the Carpathian Basin Countries, even though it is known to exist here in Romania and Slovakia (Gajdoš et al. 2014, Szinetár et al. 2020).

Further remarks

Considering the aforementioned data, we can surmise that the number of records for certain species such as *Clubiona saxatilis*, *Iberina montana* and *Taranucnus beskidicus* is likely to increase when research expands to cover more of the Carpathian region. Given the morphological similarity between *Zelotes similis* and some other species of the genus, especially *Zelotes subterraneus* (C. L. Koch, 1833) or *Zelotes clivicola* (L. Koch, 1870), reviewing existing material on these species and gathering new data on their distribution within the Eastern Carpathians is imperative. *Erigone cristatopalpus*, an endangered species, inhabits oligotrophic *Sphagnum* bogs in high-altitude zones – a habitat particularly vulnerable to anthropogenic disturbances and transformation due to climate change. In the Ukrainian Carpathians, this type of habitat is decreasing in the subalpine zone due to shrub encroachment and substrate desiccation. Finally, the urban record of *Cetonana laticeps* is important for understanding the mechanisms driving this species' expansion into new territories.

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