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Original paper

New addition to the Serbian hoverfly fauna (Diptera, Syrphidae) and annotated checklist

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Summary. In the present study as part of the revision of the hoverfly collection deposited at the Department of Biology and Ecology, Faculty of Sciences, University of Novi Sad, Serbia (FSUNS) and as a result of new field investigations, seven species: *Cheilosia faucis* Becker, 1894; *Chrysotoxum lessonae* Giglio-Tos, 1890; *Ferdinandea aurea* Rondani, 1844; *Neocnemodon verrucula* (Collin, 1931); *Paragus hyalopteri* Marcos-García et Rojo, 1994; *Paragus medeae* Stănescu, 1991 and *Pipizella speighti* Verlinden, 1999 are recorded for the first time for the country. Among the new data, here we highlight *P. medeae*, which is considered very rare in Europe, with only a few records documented until now. The checklist of hoverfly fauna in Serbia has been updated and revised here. Formerly missed *Paragus bradescui* Stănescu, 1981 and *Paragus pecchiolii* (Rondani, 1857), as well as *Cheilosia luteicornis* (Zetterstedt, 1838) should be included in the checklist, as they have also been recorded in the fauna. *Eupeodes tirolensis* (Dušek et Láska, 1973), *Paragus punctulatus* Zetterstedt, 1838, should be removed from the checklist, as their presence has not been confirmed in Serbia. Additionally, specimens previously identified as *Pipiza lugubris* (Fabricius, 1775), *Cheilosia morio* (Zetterstedt, 1838) and *Merodon haemorrhoidalis* Sack, 1913 from Serbia, actually belong to different taxa. The updated checklist of hoverflies now comprises 442 species from 87 genera.

Key words. first record, pollinators, rare species, Serbia, syrphids, taxonomy.

INTRODUCTION

With over 6000 species described worldwide, of which more than 900 occur in Europe, hoverflies (Syrphidae) represent one of the most abundant families within the order Diptera (Rotheray and Gilbert, 2011; Vujić A. et al. 2022). Adults of hoverflies feed on pollen and nectar and are considered one of the most important groups of pollinators (Thompson and Rotheray 1998; Petanidou et al. 2011; Klecka et al. 2018; Lucas et al. 2018a, 2018b; Doyle et al. 2020).

A decline in biodiversity including pollinators is occurring worldwide (Biesmeijer et al. 2006; Butchart et al. 2010; Vanbergen and Initiative 2013; Pimm et al. 2014; Gatter et al. 2020; Dicks et al. 2021; Barendregt et al. 2022). Given the importance and economic value of pollination in ecosystems (Porto et al. 2020), the European Union (EU) launched a comprehensive EU Pollinators Initiative to address the decline of pollinators, including hoverflies (European Commission 2021).

The importance of reversing pollinator decline and conserving pollinators are the focus of the ongoing national project Serbian Pollinator Advice Strategy – for the next normal (SPAS). The main goal of this project is to enhance the understanding of pollinators by the reputation of the Pollinator Monitoring Scheme (EUPoMS). Within this project, the status and trend of wild insect pollinators, including hoverflies, in Serbia is monitored according to EUPoMS protocol.

Serbia is located in southeastern Europe, specifically in

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the central and western parts of the Balkan Peninsula. It is bordered by several countries: Hungary, Romania, Bulgaria, North Macedonia, Albania, Montenegro, Bosnia and Herzegovina, and Croatia. This country is one of the centers of biodiversity in Europe thanks to its geology, climate conditions, and its role as a refuge during the glacial periods (Amidžić et al. 2014).

The checklist of Serbian hoverfly fauna was initially published by Vujić et al. (2018a), where a total of 412 species from 83 genera were reported. After this, 25 new findings were published in the following publications: Miličić et al. (2018); van Steenis et al. (2019); Vujić (2020); Vujić and Tot (2020); Vujić et al. (2020a); Vujić et al. (2021); Grković et al. (2021); Vujić M. et al. (2022); Janković Milosavljević et al. (2024) and Žoralski and van de Meutter pers. comm., increasing the recorded number of hoverflies in Serbia.

With 436 recorded hoverfly species, Serbia is among the most species-rich countries in Europe compared with others, such as – France with 566, Italy with 513, Switzerland with 492, Germany with 467, Austria with 465 and Spain with 417 species (Ssymank et al. 2011; Burgio et al. 2015; Ricarte and Marcos-García 2017; Speight et al. 2018; Reverté et al. 2023). The hoverfly fauna of Serbia is extensively studied. The most significant contribution to the knowledge of hoverfly fauna in Serbia was made by the following researchers: Glumac (1955, 1956, 1959); Vujić (Vujić and Glumac 1994; Vujić and Šimić 1994; Vujić et al. 1998a, 1998b, 2002); Šimić (Šimić and Vujić 1984, 1996; Šimić et al. 2008, 2009); Radenković (Radenković et al. 2004) and Nedeljković (Nedeljković et al. 2009). Additionally, van Steenis et al. (2015); Miličić et al. (2018); Tot et al. (2018) and Janković Milosavljević et al. (2024) have also made significant contributions to the understanding of hoverfly fauna of Serbia.

Despite the hoverfly fauna of Serbia being extensively investigated, thanks to its diverse landscapes and ecosystems new taxa continue to be discovered. The current study aims to represent species, which have been recorded for the first time in the hoverfly fauna of this country. Checklists of countries periodically have to be revised to ensure accuracy and reflect updated information. In this paper, we illustrate the changes that have occurred since the last published checklist related to Syrphidae.

MATERIAL AND METHODS

Based on the revision of the hoverfly collection deposited at the Department of Biology and Ecology, Faculty of Sciences, University of Novi Sad, Serbia (FSUNS) and as a result of new field investigations, new species for the hoverfly fauna of Serbia were identified. Specimens collected during field investigations were typically caught using the standard method of entomological netting (Fig. 1A). On the other hand, *Ferdinandea aurea* Rondani, 1844 was discovered in pan traps, as one of the components of the collecting methods of the ongoing national project SPAS. Within this project according to the EUPoMS, 10 pan traps per locality were set. Blue, white, and yellow colored bowls filled with soapy water were used to attract the insects, spaced at a distance of 50 m (Fig. 1B). The traps were emptied after 6-8 hours, and collected specimens were transported to the laboratory for further identification.

The identification of specimens collected by pan traps, entomological nets, and also by re-examination of specimens deposited in FSUNS was conducted based on external morphological features and male genitalia, using Nikon SMZ745T and NIKON SMZ18 stereomicroscopes. The specimens were identified according to the following publications: Barkalov and Ståhls (1997); Verlinden (1999); Sommaggio (2001); Bartsch et al. (2009); van Steenis and Lucas (2011); Speight and Sarthou (2017) and Tot (2021).

Photos of the new species were captured by a Nikon Digital Sight 10 camera attached to a Nikon SMZ18 stereomicroscope.

Information about the locality, date, and collector for each new species is provided. Additionally, notes with diagnostic characters, as well as details about their distribution and biology are provided.

RESULTS

New species for the hoverfly fauna of Serbia

1. *Cheilosia faucis* Becker, 1894 (Fig. 2A)

New data. Serbia: 1♂, 1♀, Zlatibor, Raskrsnica za Vodice, 43.664227N 19.708292E, 04 May 2021, leg. Vujić A, Miličić M, Janković M (FSUNS).

Notes. The species belongs to the subgenus *Taeniocheilosia* Oldenberg, 1916. Of those species that have been recorded in Serbia, *Cheilosia faucis* is morphologically most similar to *C. antiqua* (Meigen, 1822). Both species have hairs on the arista that are shorter than the maximum diameter of the arista, as well as shiny frons. *C. faucis* can be distinguished from *C. antiqua* by the scutum, which is dusted in *C. faucis*, but shining in *C. antiqua* as well as based on male genitalia structure. Additionally, *C. faucis* can be differentiated by its basoflagellomere, which is orange on its inner side, whereas *C. antiqua* has a completely dark brown basoflagellomere (Barkalov and Ståhls 1997).

Range. In Europe, the presence of this Endangered (EU) species according to the IUCN Red List of Hoverflies (Vujić A. et al. 2022), has been confirmed in France, Spain, Switzerland, Germany, Austria, Italy, Czech Republic, Montenegro and Romania (Speight 2020). In Serbia, *C. faucis* has

Fig. 1. Collecting methods. **A**, entomological net; **B**, pan traps (Photo by: A - Tamara Tot, B - Snežana Radenković).

only been recorded in one locality, on Zlatibor Mountain.

Biology. *Cheilosia faucis* occur in open areas within *Picea* forests, beside streams, and flies several meters from the ground, very often around *Salix* (Speight 2020). In Serbia, this species was found on Zlatibor Mountain in an open area within *Pinus* forest on the catkins of *Salix* in early spring.

2. *Chrysotoxum lessonae* Giglio-Tos, 1890 (Fig. 2B)

New data. Serbia: 2♂♂, 1♀, Kopaonik, Klisura Samokovske reke, 43.354134N 20.744149E, 24 May 1992, leg. Vujić A (FSUNS).

Notes. Sommaggio (2001) recognized and described differences between Mediterranean species and species from Central European Mountains, which were previously identified under the same name, *Chrysotoxum intermedium* Meigen, 1822. In recent literature, *Ch. intermedium* and *Ch. lessonae* Giglio-Tos, 1890 are cited as two valid species based on the publication of Sommaggio (2001). The larger size, ranging from 12 to 16 mm, longer arista than the length of the basoflagellomere, dusted stripes on the scutum that are distinctly wider than the distance between them, longer hairs on the mesonotum in females, and a wider abdomen are features to distinguish *Ch. lessonae* from *Ch. intermedium*. On the other hand, *Ch. intermedium* is smaller in size, about 9 to 12mm, the arista is as long as, or shorter than the length of the basoflagellomere, dusted stripes on the scutum narrower than the distance between them or only slightly wider, females have shorter hairs on the mesonotum and the abdomen is comparatively narrower than in *Ch. lessonae* in both sexes (Sommaggio 2001; Speight and Lebard 2022).

Range. The range of *Chrysotoxum lessonae* is uncertain due to confusion with the species *Ch. intermedium*. *Chrysotoxum lessonae* is widely distributed, mostly in countries of Central Europe, while *Ch. intermedium* is predominantly restricted to the Mediterranean region (Speight 2020). In Serbia, both species occur – *Ch. lessonae* on Kopaonik, while the majority of *Ch. intermedium* records are from the northern part of Serbia (Vršačke planine, Obedska bara, Koviljki rit, Mokrin, Sivac, Deliblatska peščara), with additional records from Pčinja valley.

Biology. *Chrysotoxum lessonae* in Europe occurs in

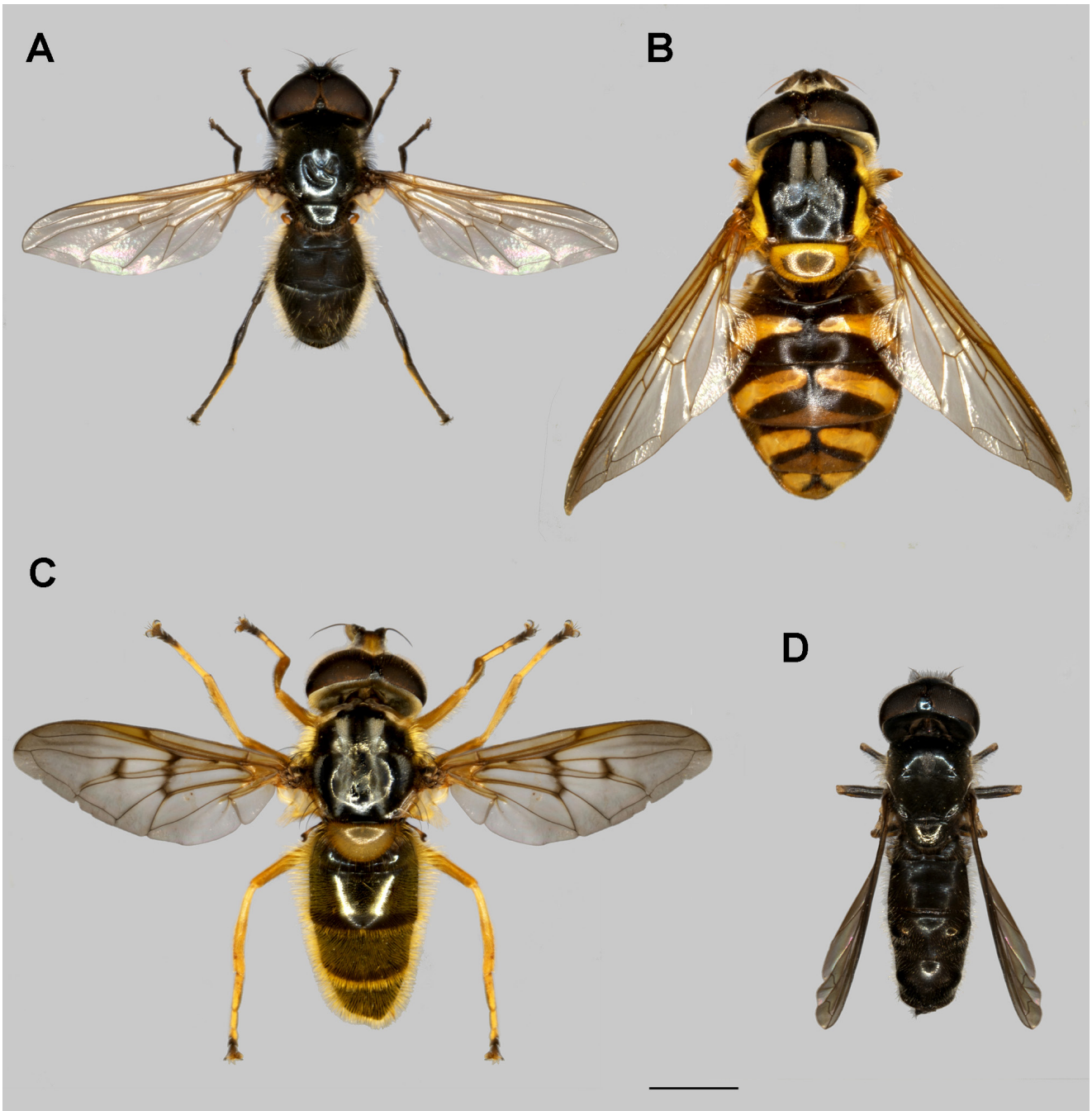

Fig. 2. Dorsal view of males. **A**, *Cheilosia faucis*; **B**, *Chrysotoxum lessonae*; **C**, *Ferdinandea aurea*; **D**, *Neocnemodon verrucula*. (Scale bar: A, B, D = 0.5 cm, C = 0.7 cm.)

open areas in the *Fagus*/*Picea* forests, while *Ch. intermedium* is largely confined to the Mediterranean zone and can be found in evergreen oak forests, but also in more open habitats (Speight 2020).

3. *Ferdinandea aurea* Rondani, 1844 (Fig. 2C)

New data. Serbia: 1♀, Pčinja, Vražji kamen, 42.383772N 22,052763E, 21 September 2022, white pan trap (FSUNS); 3♂♂, Pčinja, Vogance, 42.34356N 21.921485E, 22 September 2022, yellow pan trap (FSUNS); 1♀, Pčinja, Vražji kamen, 42.383772N 22,052763E, 08 September 2023, yellow pan trap (FSUNS); 1♀ Suva planina, Bojanine vode, 43.226012N 22.106778E, 11 September 2023, yellow pan trap (FSUNS).

Notes. The species can easily be distinguished from *Ferdinandea cuprea* (Scopoli, 1763) and *F. ruficornis* (Fabricius,

1775) previously recorded in Serbia, by the presence of black stripe on the face in both sexes, extending from the oral margin to the base of the antenna (in *F. cuprea* and *F. ruficornis* the face is completely yellow, without black medial stripe) (Speight and Sarthou 2017).

Range. In Europe, *F. aurea* is recorded mainly in countries of the Mediterranean zone, such as Spain, Portugal, Italy, and Greece (Speight 2020). The discovery of this species in Serbia in Pčinja valley is not surprising, considering the Mediterranean influence in this region.

Biology. The larvae of this species are saprophagous and can be found in sap runs of deciduous trees. Adults usually occur in or near forests, often resting in the sun on tree trunks, but they also visit flowers nearby (Ball and Morris 2015; Speight 2020). The preferred habitats of this species are over-mature forests of *Quercus pubescens*, *Q. ilex,* or *Q. suber* (Ricarte et al. 2010).

4. *Neocnemodon verrucula* (Collin, 1931) (Fig. 2D)

New data. Serbia: 1♂, 5♀♀, Zlatibor, Raskrsnica za Vodice, 43.664227N 19.708292E, 04 May 2021, leg. Vujić A, Miličić M, Janković M (FSUNS).

Notes. Males of *N. verrucula* can be distinguished from other *Neocnemodon* species occurring in Serbia by medially convex sternite 4. The identification of females is difficult. They are often identified by association with males and genetic data (Bartsch et al. 2009).

Range. *Neocnemodon verrucula* in Europe is predominantly recorded in countries of the northern and central parts of the continent, such as Norway, Sweden, Finland, Denmark, Britain, Netherlands, and Germany, as well as the European parts of Russia (Speight 2020). In Serbia, it has only been recorded on Zlatibor Mountain so far.

Biology. This species is primarily found in forests, including both mixed and coniferous forests, as well as in clearings. *N. verrucula* is an early spring species that flies from the end of April to the end of June. It can be observed visiting spring-flowering shrubs such as *Salix* sp. Adults fly close to the ground and move swiftly among low vegetation (Ball and Morris 2015; Speight 2020).

5. *Paragus hyalopteri* Marcos-García et Rojo, 1994 (Fig. 3A)

New data. Serbia: 1♀, Opovo, Gajger jezero, 45.049968N 20.426737E, 23 July 2017, leg. Vujić (FSUNS); 1♀, Subotica, Palić-prirodni lokalitet [natural site], 46.079529N 19.707993E, 26 May 2021, leg. Miličić M, Janković M (FSUNS).

Published data. 1♀, okolina Beograda [the vicinity of Belgrade], Makiš, livada pored reke Save [meadow by the Sava River], 21 July 1953, leg. Glumac S (FSUNS), det. Glumac S as *Paragus pulcherrimus*.

Notes. The species was originally published by Glumac (1955) as *Paragus pulcherrimus* Strobl, 1893 for Serbian fauna. In Peck (1988) *P. pulcherrimus* was designated as junior synonym of *P. quadrifasciatus* Meigen, 1822. *Paragus hyalopteri* is morphologically very similar to *P. quadrifasciatus*. Males of these two species can differentiate by male genitalia structure. Females can be separated by the shape of tergite 7, which is medially convex in *P. hyalopteri* and with two distinct tooth-like protuberances in *P. quadrifasciatus* (Tot 2021).

Range. In Europe, *P. hyalopteri*, a Vulnerable (VU) species according to the IUCN Red List of Hoverflies (Vujić A et al. 2022), has been recorded in Spain, Italy, Greece and Ukraine (Speight 2020; Vujić et al. 2020b). Due to its similarity with the species *P. quadrifasciatus*, this species is probably more widespread across European countries, but has been frequently misidentified in collections. So far, this species has been recorded in Serbia in only three localities, above mentioned.

Biology. At the European level, there is scarce data available about the biology of this species. Most of the information comes from specimens reared from larvae. *Paragus hyalopteri* larvae feed on aphids found on fruit trees of the genus *Prunus*, as well as on *Arundo* and *Phragmites* (Marcos-García and Rojo 1994; Rojo and Marcos-García 1998). By examining the localities where this species has been recorded in Serbia, we can see that they are near water bodies such as Lake Palić, and Lake Gajger and the meadows near the Sava River, where *Arundo* and *Phragmites* are present. Since their larvae primarily feed on aphids from *Arundo* and *Phragmites*, this correlates with their recorded locations.

6. *Paragus medeae* Stănescu, 1991 (Fig. 3B)

New data. Serbia: 1♂, Mokrin, Pašnjaci velike droplje [Special Nature Reserve "Pastures of great bustard"], 45.921667N 20.303333E, 28 May 2024, leg. Mudri-Stojnić S (FSUNS).

Notes. *Paragus medeae* is morphologically similar to *P. strigatus* Meigen, 1822 and *P. oltenicus* Stănescu, 1977. All three species have a stocky abdomen, with tergites, which are wider than long. The abdomen is predominantly orange. Tergites 2–4 mainly have a pair of black lateral markings. These species also have a characteristic shape of lingula of the male genitalia, which is wide at the base and tapering towards the apex. *Paragus medeae* is most closely related to *P. oltenicus*. Both species have a "flame-shaped" lateral lobe of the aedeagus of the male genitalia. They can be distinguished by the shape of postgonite, aedeagal apodeme, and the shape

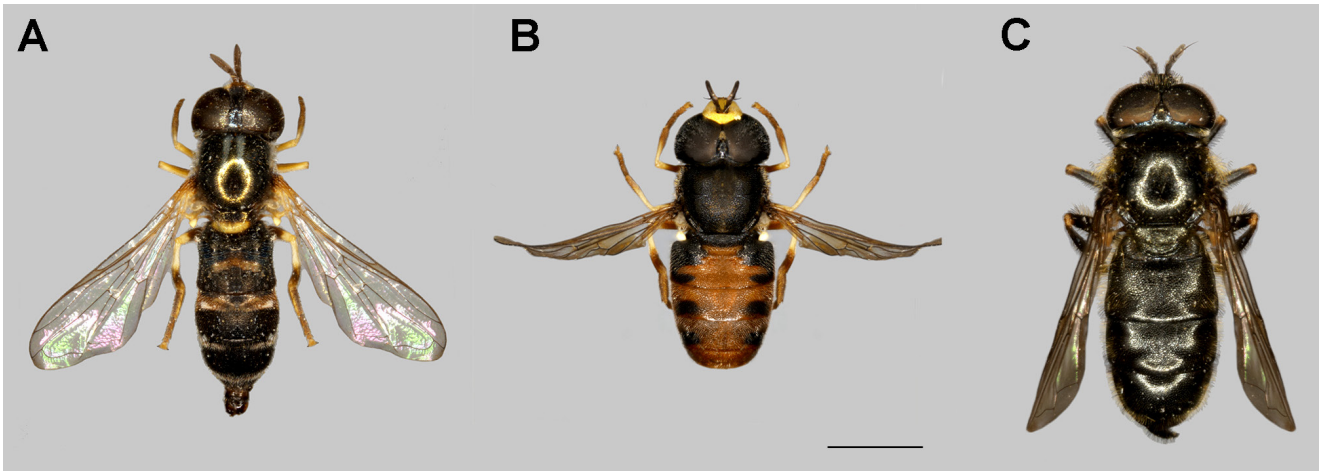

Fig. 3. Dorsal view of adults. **A**, *Paragus hyalopteri*, female; **B**, *Paragus medeae*, male; **C**, *Pipizella speighti*, male. (Scale bar: 0.5 cm.)

of surstylus of the epandrium (Tot 2021). The female of *P. medeae* has not been described yet.

Range. *Paragus medeae*, Endangered (EU) species in Europe according to the IUCN Red List of Hoverflies (Vujić A et al. 2022), has been recorded with a very low number of occurrences, documented only in Romania (Stănescu 1991) and Hungary (Tóth 2011). In Serbia, this species has been found in Mokrin, in the Special Nature Reserve "Pašnjaci velike droplje".

Biology. In the recent literature, the preferred environment is described as inland or estuarine dunes (Speight 2020). Based on the observations and records of *P. medeae* in the Special Nature Reserve "Pašnjaci velike droplje" and in similar habitats in Romania and Hungary, we can conclude that the species prefers Pannonian grassy steppe habitats.

7. *Pipizella speighti* Verlinden, 1999 (Fig. 3C)

New data. Serbia: 1♂, Kopaonik, Samokovska reka, 43.341210N 20.749421E, 22 May 1986, leg. Vujić A (FSUNS); 1♂, Kopaonik, Jasle-Jablanova ravan, 43.28081197N 20.79368301E, 1400 m.a.s.l., 14 June 1986, leg. Vujić A (FSUNS); 1♂, Kopaonik, Samokovska reka, 43.341210N 20.749421E, 16 June 1986, leg. Vujić A (FSUNS); 2♂♂, Kopaonik, Pajino preslo, 43.28348903N 20.80563102E, 18 June 1986, leg. Vujić A (FSUNS); 1♂, Kopaonik, Duboka reka, 43.28225102N 20.838448E, 06 July 1986, leg. Vujić A (FSUNS); 1♂, Šar planina, Durlov potok, 42.18497801N 21.0470159E, 18 July 1986, leg. Vujić A (FSUNS); 1♂, Zlot, Malinik, 44.001056671142599N 21.902072906494102E, 01 May 1989, leg. Vujić A (FSUNS); 1♂, Kukavica, 42.7540698N 21.967713E, 400 m.a.s.l., 06 June 1989, leg. Vujić A (FSUNS); 2♂♂, Kopaonik, Samokovska reka, 43.341210N 20.749421E, 21 June 1991, leg. Vujić A (FSUNS); 2♂♂, Kopaonik, Sunčana dolina, 43.281589N 20.796276E, 23 June 1991, leg. Vujić A (FSUNS); 2♂♂, Stara planina, Žarkova čuka, 43.383N 22.633E, 11 July 1991, leg. Vujić A (FSUNS); 1♂, Stara planina, Žarkova čuka, 43.383N 22.633E, 14 July 1991, leg. Vujić A (FSUNS); 5♂♂, 1♀, Stara planina, Golema reka, 43.36844397N 22.62853701E, 20 July 1991, leg. Vujić A (FSUNS); 1♂, Stara planina, Golema reka, 43.36844397N 22.62853701E, 23 July 1991, leg. Vujić A (FSUNS); 1♂, Šar planina, Durlov potok, 42.18497801N 21.0470159E, 04 August 1991, leg. Vujić A (FSUNS); 1♂, Dubašnica, Lunga, 44.0143198N 21.89387101E, 06 June 1993, leg. Radnović S (FSUNS); 1♂, Beljanica, Žagubica, 44.166275N 21.859971E, 1339 m.a.s.l., 14 July 1993, leg. Vujić A (FSUNS); 2♂♂, Šar planina, Durlov potok, 42.18497801N 21.0470159E, 26 July 1995, leg. Dožić N (FSUNS); 2♂♂, Šar planina, Muržica, 42.194066N 21.040304E, 12 July 1996, leg. Vujić A (FSUNS); 1♂, Šar planina, Muržica, 42.194066N 21.040304E, 12 July 1996, leg. Radišić M (FSUNS); 1♂, Kopaonik, Kadijevac, 43.331660N 20.755562E, 09 June 1998, leg. Milankov V (FSUNS).

Notes. Genus *Pipizella* Rondani, 1856 consists of small-sized hoverflies that are completely black, while their legs are partially yellow. In most species, only the males can be confidently identified, by examination of the genitalia. The male genitalia of *Pipizella speighti* is morphologically most similar to *P. viduata* (Linnaeus, 1758). Both, *P. speighti* and *P. viduata* have the epandrium dorsally narrowed in the apical third. However, in *P. speighti*, this part is as long as the surstylus, while in *P. viduata* it is shorter than the surstylus (Verlinden 1999). Female identification is challenging, due to non-existing reliable taxonomic characters for their distinction. They are often identified by association with males as well as by genetic data.

Range. *Pipizella speighti* has been recorded in France,

Switzerland, Italy, and Slovenia (Speight 2020; Kočić et al. 2023). However, due to the similarity of this species with *P. viduata*, this species has been either overlooked or misidentified in collections. Unlike *P. viduata*, which is the most common species of the genus *Pipizella* in Europe and can be found at various altitudes, *P. speighti* is commonly found in higher altitudes in mountainous zones. In Serbia, this species has been recorded in localities such as Dubašnica, Malinik, Kopaonik, Šar planina, and Stara planina.

Biology. The species can be found in the mountain forests of *Fagus* and *Abies*/*Picea*, as well as in open ground and grassy clearings. Adults fly close to the ground vegetation and they have been recorded on the flowers from Apiaceae (Speight 2020).

Updates and corrections on the checklist

- ***Eurimyia lineata* (Fabricius, 1787)**

previously *Anasimyia lineata* (Fabricius, 1787)

Previously this species has been placed within the genus *Anasimyia* Schiner, 1864. Distinctly anteriorly protruded lower part of the face made this species clearly different from all other European species within this genus. According to Skevington et al. (2019) based on genetic data, this taxon should be placed in a separate genus called *Eurimyia* Bigot, 1883.

- ***Sericomyia bequaerti* (Herve-Bazin, 1913), *Sericomyia bombiformis* (Fallén, 1810)** and ***Sericomyia superbiens* (Müller, 1756)**

previously *Arctophila bequaerti* Herve-Bazin, 1913, *Arctophila bombiformis* (Fallén, 1810) and *Arctophila superbiens* (Müller, 1756)

In previous literature, *Arctophila* Schiner, 1860 and *Sericomyia* Meigen, 1803 have been treated as separate genera. Skevington and Thompson (2012) revised the taxonomic status of these genera and concluded based on genetic data that *Arctophila* should be synonymized with *Sericomyia*. All species previously classified under *Arctophila*, including *A. bequaerti*, *A. bombiformis* and *A. superbiens*, are now considered to belong to the genus *Sericomyia*.

- ***Cheilosia luteicornis* (Zetterstedt, 1838) should be added and *Cheilosia morio* (Zetterstedt, 1838) should be deleted from the checklist.**

Dieter Doczkal and Claus Claussen (pers. comm.) studied the type material of *Cheilosia luteicornis* (Zetterstedt, 1838) and concluded that it is a valid species and not to be considered anymore as a synonym of *C. morio* (Zetterstedt, 1838), but these results are still not published. Bartsch et al. (2009) recognized the existence of two species of the subgenus *Neocheilosia* Barkalov, 1983 in Europe: *C. morio* A and *C. morio* B. Later on, in recent publications of Nilsson et al. (2012) and van Steenis (2016), *C. morio* A is cited as *C. morio* and *C. morio* B as *C. luteicornis* (Zetterstedt, 1838).

These two taxa can be distinguished based on characters mentioned in Bartsch et al. (2009). Specimens from Serbia, based on their size, the absence of hairs next to the facial knob and the color of hairs on the tergite 2 belong to *C. luteicornis*. *C. morio* has not been recorded in Serbia yet. Therefore, all the specimens from Serbia identified as *C. morio* belong to *C. luteicornis*.

- ***Eupeodes tirolensis* (Dušek et Láska, 1973) should be deleted from the checklist.**

This species has been erroneously added to the list of hoverflies of Serbia and has to be removed given the fact that the record is from Prokletije, which is in Montenegro.

- ***Fagisyrphus cinctus* (Fallén, 1817)**

previously *Meligramma cincta* (Fallén, 1817)

Scaeva cincta Fallén, 1817 has been classified under different genera, including *Meligramma* Frey, 1946 and *Fagisyrphus* Dušek et Láska, 1967. However, in most recent literature, this taxon is commonly referred to as *Meligramma cincta*. Mengual et al. (2008; 2015; 2018; 2023) using molecular data, established that *Fagisyrphus cinctus* is the sister taxon to *Meligramma* species. Therefore, the separation of this taxon into a distinct genus, *Fagisyrphus*, is supported by molecular data and differences in morphological characteristics. Láska et al. (2013) listed the morphological differences in adults between these genera.

- ***Matsumyia berberina* (Fabricius, 1805)**

previously *Criorhina berberina* (Fabricius, 1805)

Previously, this species has been classified within the genus *Criorhina* Meigen, 1822. Moran and Skevington (2021) conducted a phylogenetic analysis on taxa belonging to the subtribe Criorhinina. Based on genetic data as well as morphological characters, Moran and Skevington (2021) concluded that *Criorhina berberina* should be reclassified and placed into a separate genus called *Matsumyia* Shiraki, 1949.

- ***Merodon haemorrhoidalis* Sack, 1913 should be deleted from the checklist.**

Van Steenis et al. (2015) published *M. haemorrhoidalis* as a new record for the hoverfly fauna of Serbia, noting that the species is very similar to *M. constans* (Rossi, 1794), but differs by male genitalia. Vujić et al. (2020a) in the revision of *Merodon constans* group designated *M. haemorrhoidalis* as a junior synonym of *M. analis* Meigen, 1822 and recorded *M. analis* for the first time for Serbia. They also described a new species, namely *M. triangulum* Vujić, Radenković et

Hurkmans, 2021 different from *M. constans* and *M. analis* by the size (it is much bigger), color pattern, and male genitalia features. Vujić et al. (2020a) provided first time records of *M. triangulum* in Serbia without data published as *M. haemorrhoidalis* in van Steenis et al. (2015). The male genitalia drawings in the publication by van Steenis et al. (2015) for *M. haemorrhoidalis* completely fit with the species *M. triangulum* and the new field investigation confirms the existence of *M. triangulum* in the locality of Obedska bara marsh from where records of van Steenis et al. (2015) belong.

- ***Paragus bradescui* Stănescu, 1981 should be added to the checklist.**

Although Vujić et al. (1999) published records of *P. bradescui* for the first time in Serbia, these data were omitted in the checklist published by Vujić et al. (2018a).

- ***Paragus pecchiolii* Rondani, 1857 should be added to the checklist.**

Previously *Paragus pecchiolii* Rondani, 1857 was synonym of *P. majoranae* Rondani, 1857 (Peck 1988), but after Sommaggio (2002) studied the type material he realized that *P. pecchiolii* should be reinstated as a valid species. He also concluded that the species described by Vujić, Šimić et Radenković (1999) as *P. gorgus* is a synonym of *P. majoranae*. In the checklist of Vujić et al. (2018a) only species *P. majoranae* is listed (including records of *P. pecchiolii* as well). In Serbia, both species, *P. pecchiolii* and *P. majoranae* exist. *Paragus pecchiolii* is a common species, widely distributed in Serbia, whereas *P. majoranae* has up to now been recorded in the eastern part of Serbia – Dubašnica, Klisura Lazareve reke.

- ***Paragus punctulatus* Zetterstedt, 1838 should be deleted from the checklist.**

Paragus punctulatus is wrongly listed for Serbia in the literature (Nedeljković 2011; Vujić et al. 2018a). The data is actually from Montenegro (Prokletije). The presence of this species in Serbia has not been confirmed.

- ***Pipiza lugubris* (Fabricius, 1775) should be deleted from the checklist.**

The data published as *Pipiza lugubris* for Serbia belongs to *P. carbonaria* Meigen, 1822. Therefore, the species *P. lugubris* should be removed from the list.

- ***Pseudopelecocera latifrons* (Loew, 1856)**

previously *Pokornyia latifrons* (Loew, 1856)

Vujić et al. (2018b) revised the taxonomic status of *Pelecocera latifrons* in the revision of the tribe Rhingiini, suggesting that this species should be placed into a separate genus. Initially, the manuscript name for this new genus was *Pokornyia*, but in the final printed version, the name was changed to *Pseudopelecocera* Vujić et Radenković, 2018. However, the checklist by Vujić et al. (2018a) was published before the paper on the Rhingiini and this is the reason why the old name (*Pokornyia*) instead of the valid, printed name (*Pseudopelecocera*) appeared in it.

DISCUSSION

In Serbia, the study of hoverfly fauna has been ongoing since the 1950s. Since then, both national experts and foreign researchers have contributed to our understanding of hoverfly diversity in the country.

Checklists play an important role in presenting a country's fauna and ensuring comprehension of hoverfly diversity. As taxonomy evolves with new methods and techniques, checklists require periodic revisions. As a result of the update of the previous checklist of hoverflies in Serbia (Vujić et al. 2018a), a total of 442 species from 87 genera were identified.

Re-examination of old collection materials helps us to reveal species that were previously overlooked or misidentified. Examination of *Chrysotoxum* Meigen, 1803, and *Pipizella* collections deposited in FSUNS revealed new records – *Pipizella speighti* and *Chrysotoxum lessonae*, which were previously missed. Two species, *Paragus punctulatus,* easily recognizable by its protruded face, and *Eupeodes tirolensis*, both collected in the Prokletije Mountains, have been found to belong to Montenegro rather than Serbia based on their locality of collection: towards Ljubokući and Krošnje, respectively. Owing to the revisions and our extensive work on the genera *Merodon* Meigen, 1803 and *Cheilosia* Meigen, 1822 in Europe, we have resolved several taxonomic uncertainties and updated our species list records. Specimens previously identified in the FSUNS collection as *Cheilosia morio* and *Merodon haemorrhoidalis* from Serbia are now recognized as *Cheilosia luteicornis* and *Merodon triangulum*. *Pipiza carbonaria* and *P. lugubris* are morphologically very similar species. Although *P. lugubris* was recently noted in Serbia (Janković Milosavljević et al. 2024), it has been established that all specimens identified as *P. lugubris* from Serbia belong to *P. carbonaria*. *Pipiza lugubris* is found mainly in more northern parts of Europe.

New field investigations conducted in various localities, including Zlatibor Mountain, Palić, Opovo, Mokrin, and Pčinja, resulted in the discovery of new species for the Serbian hoverfly fauna, including *Cheilosia faucis*, *Paragus hyalopteri*, *Paragus medeae*, *Neocnemodon verrucula* and *Ferdinandea aurea*.

The study of hoverflies not only enhances our understanding of their taxonomy, distribution, ecology, and phylogeny, but is also important for both taxonomic research and biodiversity conservation efforts.

Zlatibor Mountain is one of the Prime Hoverfly Areas (PHA) in Serbia (Vujić et al. 2016). This region, with its prominent valleys of canyons and gorges and preserved ecosystems, hosts a diverse range of vegetation, including rocky areas and serpentinite cliff ecosystems (Aleksić and Jančić 2019). Newly recorded species such as *Neocnemodon verrucula* and *Cheilosia faucis*, along with protected species previously detected on Zlatibor – *Cheilosia pubera* (Zetterstedt, 1838) and *Pelecocera tricincta* Meigen, 1822, additionally underscore the conservation importance of this mountain.

The discovery of the rare species *Paragus medeae* is a significant contribution to biodiversity and biological importance of the Special Nature Reserve "Pašnjaci veliki droplje". It represents the best-preserved complex of steppe habitats in the Pannonian plain in Vojvodina. This Special Nature Reserve serves as crucial habitat not only for *P. medeae*, but also for other species, such as *Eumerus pannonicus* Ricarte, Vujić et Radenković, 2016, *Eumerus banaticus* Nedeljković, Grković et Vujić, 2019, *Chrysotoxum lineare* (Zetterstedt, 1819) and *Pipizella zloti* Vujić, 1997 in Serbia.

The Mediterranean region in Europe is important for hoverfly diversity (Petanidou et al. 2011). The Pčinja region, influenced by the Mediterranean climate, is crucial for some species, such as *Merodon testaceus* Sack, 1913, *M. euri* Vujić et Radenković, 2018, *M. constans* and the newly recorded *Ferdinandea aurea*. As Pčinja is one of the PHAs in Serbia (Vujić et al. 2016), finding a new species in this area highlights its importance in preserving hoverfly species, which are rare in Serbia and have a limited distribution. All these species, recorded up to now, have only been found in Pčinja.

Protecting these species and their habitats significantly contributes to biodiversity conservation efforts in these areas. With skilled taxonomists capable of adequately monitoring hoverflies and considering the landscape potential of the country, it is expected that knowledge of hoverfly fauna in Serbia will continue to expand in the future. Ongoing monitoring of hoverflies as good bioindicators (Sommaggio 1999) serves as an effective tool for detecting habitat destruction and helps us to prevent the disappearance of species from certain areas (Vujić A. et al. 2022).

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