

DIVERSITY OF THE GENUS *COTESIA* CAMERON (BRACONIDAE: MICROGASTRINAE) IN SERBIA

VLADIMIR ŽIKIĆ^{1*}, MAJA LAZAREVIĆ¹, MARIJANA ILIĆ MILOŠEVIĆ¹,
ALEKSANDRA TRAJKOVIĆ¹, BOŽENKA HRIC², SAŠA S. STANKOVIĆ¹

¹ Faculty of Sciences and Mathematics, Department of Biology and Ecology,
University of Niš, Višegradska 33, 18000 Niš, Serbia

*E-mail: zikicvladimir@gmail.com

² Jovana Popovića 72, 22300 Stara Pazova, Serbia

Abstract

The diversity of species of *Cotesia* Cameron, 1891 for the territory of Serbia is given as a faunistic survey. The paper presents the results of research in the period from 1902 to 2021. Literature, databases and new, unpublished records were combined for a comprehensive list of species, with notes on localities, dates, number and sexes of individuals. In total, 35 species are presented, of which 11 were registered in Serbia for the first time. The species most often collected were *Cotesia ofella* and *C. tibialis*.

KEY WORDS: faunistic survey, parasitoids, databases

Introduction

Cotesia Cameron, 1891 is one of the largest genera within the subfamily Microgastrinae (Braconidae) with about 320 species described worldwide (Fernandez-Triana *et al.*, 2020). They are present on all continents in almost all types of terrestrial habitats (Yu *et al.*, 2012). All *Cotesia* species are exclusive internal parasitoids of Lepidoptera. They may be solitary, such as *C. hyphantriae* (Riley), *C. risilis* (Nixon) or *C. vestalis* (Haliday), but the vast majority are gregarious. Eggs are laid in the early instars of caterpillars, while the emergence of parasitoids due to pupation occurs mostly in the last larval stage. The manner of spinning, colour and the location of parasitoid cocoons are very different, and these phenomena are taken as significant factors in general identification. Many species have been reported to be broadly oligophagous or even polyphagous, but this is most likely due to misidentification. It is thought that most *Cotesia* species act as specialists or

narrow oligophagous by attacking closely related species of Lepidoptera that most often belong to the same genus or tribe, less frequently to the same family (Mark R. Shaw personal communication, 2020). Of course, there are always exceptions when a species parasitizes completely unrelated species. In this case, it may be that our methods still cannot detect species from the complexes of cryptic taxa such as *C. melitaeorum* (Wilkinson) (Kankare *et al.*, 2005) or *C. tibialis* (Curtis) (Nixon, 1974).

The diversity of Microgastrinae, and therefore the genus *Cotesia*, in Serbia, was researched by Papp (1973; 1975; 1977; 1998; 2009) and Žikić *et al.* (2015). The presentation of *Cotesia* diversity offers a compilation of data collected from Papp's works, which are mostly cited in two large databases, Fauna Europaea (van Achterberg, 2013) and TaxaPad (Yu *et al.*, 2012), and a substantial amount of original data collected by the authors of this study.

Materials and Methods

The literature and new data were used for this study to give a final overview of all *Cotesia* species that have been found and identified in the territory of Serbia to date. For a certain number of findings, data on hosts are also given. New species for the investigated territory are marked by asterisks (*), and new, unpublished records are written in brackets []. Unpublished data from the period 1954-1974 were collected by Dr. Konstantin Vasić. Parasitoids were identified by Jenö Papp, Mark R. Shaw and Vladimir Žikić. Most of the specimens (99%) are deposited in the collection of the Department of Biology and Ecology, Faculty of Sciences and Mathematics, University of Niš, Serbia.

In addition to the dry insect collection, which includes specimens pinned on cards, there is also material that is preserved in 96% alcohol. Some specimens were subjected to molecular identification methods and thus part of the COI (cytochrome c oxidase subunit I) gene was amplified and sequenced. Subsequently, the sequences were compared and matched with existing ones that are deposited in two gene banks: BOLD Systems (Ratnasingham & Hebert, 2007) and GenBank (<https://www.ncbi.nlm.nih.gov/genbank/>). Additionally, many microscopic slides were made to detect morphological details that may be missed when individuals are studied only under a binocular stereomicroscope.

Results

In summarizing the collected data to make a faunal list of species of the genus *Cotesia* in the territory of Serbia, 36 species were established. We note that the data listed in Brajković (1989) do not contain details on the location, collector and a few of the collected specimens, therefore some are presented in this paper. By reviewing Brajković's collection, we found specimens that were published in his work.

***Cotesia affinis* (Nees, 1834)**

1 ♀, Pančevački rit, 20.06.1954, leg. M. Tadić (Papp, 2009); [1 ♂, Jagodina, 13.05.1963, leg. K. Vasić; 1 ♀, 3 ♂♂, Pećinci, Kupinovski Kut, 12.05.1969, leg. K. Vasić].

***Cotesia analis* (Nees, 1834)**

The only data on this species comes from Papp (1986), cited in Yu *et al.* (2012), also from the Fauna Europaea website (van Achterberg, 2013).

***Cotesia astrarches* (Marshall, 1889)**

Data taken from Brajković (1989), cited in Yu *et al.* (2012.)

***Cotesia bignellii* (Marshall, 1885)**

Data taken from Papp (1987), cited in Yu *et al.* (2012); van Achterberg (2021); [13 ♀♀, 1 ♀, Vlasinsko Jezero (lake), 27.05.2020, ex *Euphydryas aurinia* (Denis & Schiffermüller) (Nymphalidae), leg. M. Djurić].

***Cotesia callimone* (Nixon, 1974)**

1 ♀, Beograd, Ada Ciganlija, 08.08.1956, leg. D. Čubrilović (Papp, 2009); [1 ♀, Obrenovac, 22.09.1954, leg. Ž. Adamović].

***Cotesia capucinae* (Fischer, 1961)**

1 ♀, 1 ♂, Čuprija, 20.06.1974, leg. K. Dobrivojević (Papp, 2009); [10 ♂♂, Sićevačka Klisura (gorge), 31.05.2016, on *Thalictrum minus* ex *Calyptra thalictri* (Borkhausen) (Erebidae), leg V. Žikić].

***Cotesia corylicola* (Tobias, 1986)**

[1 ♀, Beograd, Mala Moštanica, 15.05.1989, ex *Biston* sp. (Geometridae), leg. M. Ristić, (Papp, 2009)].

****Cotesia gastropachae* (Bouché, 1834)**

[2 ♀♀, 2 ♂♂, Mt. Radan, 10.06.2017, ex *Macrothylacia rubi* (L.) (Lasiocampidae), leg. S. Stanković].

***Cotesia glabrata* (Telenga, 1955)**

2 ♂♂, Priština, 17.05.1972, leg. L. Purrini (Papp, 2009); [6 ♀♀, 2 ♂♂, Farkaždin, 28.07.2016, ex *Carcharodus alceae* (Esper) (Hesperiidae), leg. A. Jovanov; 1 ♀, 1 ♂, Niš, Pantelej, 18.09.2018, 10 ♀♀, 4 ♂♂, 10.09.2019, on *Alcea rosea* ex *C. alceae*, leg. V. Žikić; 13 ♀♀, Niš, Doljevac, 01.10.2018, on *A. rosea* ex *C. alceae*, leg. V. Žikić].

***Cotesia glomerata* (Linnaeus, 1758)**

1 ♂, Priština, 17.05.1972; 1 ♂, 17.07.1972, leg. L. Purrini (Papp, 1973; 2009); [2 ♂♂, Priština, 14.07.1960, ex *Pieris brassicae* (L.) (Pieridae), leg. K. Vasić; 7 ♂♂, 25 ♀♀, Niš, Delijski Vis, 03.05.2018, on *Pyrus communis* ex *Aporia crataegi* (L.) (Pieridae), leg. V. Žikić; 2 ♂♂, 10 ♀♀, Gadžin Han, 30.04.2019, on *Pyrus spinosa* ex *A. crataegi*, leg. S. Stanković; 10 ♀♀, Vlasinsko Jezero (lake), 22.06.2019, ex *A. crataegi*, leg. V. Žikić; 5 ♂♂, 11 ♀♀, Mt. Rujan, 04.05.2021, ex *A. crataegi*, leg. A. Trajković].

****Cotesia hispanica* (Oltra & Falco, 1996)**

[3 ♂♂, 6 ♀♀, Vlasinsko Jezero (lake), 27.05.2018, on *Centaurea jacea* ex *Melitaea didyma* (Esper) (Nymphalidae), leg. V. Žikić].

***Cotesia hyphantriae* (Riley, 1887)**

1 ♀, Vršac, 07.1973, ex *Leucoma salicis* (L.) (Erebidae), leg. unknown (Papp, 2009); [1 ♂, Sremska Rača, 26.05.1962, 1 ♀, 22.05.1969, ex *Lymantria dispar* (L.) (Erebidae), leg. K. Vasić; 4 ♀♀, 2 ♂♂, Sićevačka Klisura (gorge), Gradište, 01.05.2019, on *Quercus frainetto* ex *Orthosia miniosa* (Denis & Schiffermüller) (Noctuidae), leg. V. Žikić].

***Cotesia jucunda* (Marshall, 1885)**

1 ♂, Kupinovo, Lošinci, 12.04.1992, ex *Operophtera brumata* (L.) (Geometridae), emerged on 26.04.1992, leg. M. Glavendekić (Papp, 2009); [25 ♀♀, 25 ♂♂, Niš, G. Matejevac, 25.05.2014, ex *Melitaea didyma*, leg. V. Žikić].

***Cotesia limbata* (Marshall, 1885)**

1 ♀, Veliko Gradište, 06.07.1953, leg. M. Tadić; 1 ♀, Kupinovo, Lošinci, 12.05.1992, ex *Phigalia pilosaria* (Denis & Schiffermüller) (Geometridae), emerged on 15.05.1992, leg. M. Glavendekić (Papp, 2009); [1 ♀, Jakovački Ključ, 13.06.1962, leg. K. Vasić].

****Cotesia lineola* (Curtis, 1830)**

[1 ♀, Lazarevac, 09.05.1964, ex *Eriogaster lanestrís* (L.) (Lasiocampidae), leg. K. Vasić].

****Cotesia lycophron* (Nixon, 1974)**

[2 ♀♀, 28 ♂♂, Mt. Zlatibor, Čavlovac, 27.06.2013, ex *Melitaea* sp., leg. S. Stanković].

***Cotesia melanoscela* (Ratzeburg, 1844)**

1 ♀, Kragujevac, ex *Nycteola asiatica* (Krulikovsky) (Nolidae), leg. unknown; 1 ♀, Obrenovac, 22.04.1954, ex *N. asiatica*, leg. Ž. Adamović (Papp, 2009); [1 ♂, Jakovački Ključ, 24.05.1956, 1 ♀, 1 ♂, 01.06.1957, ex *Lymantria dispar*, leg. K. Vasić; 1 ♀, Prokuplje, Tovrljane, 15.06.1975, leg. M. Brajković].

****Cotesia melitaeorum* (Wilkinson, 1937)**

[40 ♀♀, 10 ♂♂, Niš, G. Matejevac, 25.05.2014, on *Linaria macedonica* ex *Melitaea didyma*, leg. V. Žikić; 5 ♀♀, 12 ♂♂, Zrenjanin, Farkaždin, 05.06.2015, ex *Melitaea* sp., leg. A. Jovanov].

***Cotesia memnon* (Nixon, 1974)**

Data taken from Papp (1987), cited in Yu *et al.* (2012); van Achterberg (2021).

****Cotesia neustriæ* (Tobias, 1986)**

[1 ♂, Gadžin Han, 30.04.2019, on *Prunus spinosa* ex *Malacosoma neustria* (L.) (Lasiocampidae), leg. S. Stanković].

***Cotesia ocnæriæ* (Ivanov, 1898)**

1 ♂, Železnik, Date and leg. unknown (Papp, 2009); [1 ♀, 3 ♂♂, Jakovački Ključ, 24.05.1956, ex *Lymantria dispar*, leg. K. Vasić].

****Cotesia ofella* (Nixon, 1974)**

7 ♀♀, 6 ♂♂, Novi Sad, 20.05.1968, ex *Acronicta rumicis* (L.) (Noctuidae), leg. K. Vasić; 2 ♀♀, Deliblatska Peščara, Korn, 20.05.1986, 4 ♀♀, Novi Sad, 20.05.1986, ex *A. rumicis*, leg. M. Brajković; [11 ♀♀, 2 ♂♂, Sićevačka Klisura (gorge), 13.04.2014, leg. V. Žikić; 66 ♀♀, 2 ♂♂, Kruševac, 03.05.2014, leg. M. Lazarević; 50 ♀♀, Vlasinsko Jezero (lake), 06.08.2015, leg. V. Žikić; 88 ♀♀, 4 ♂♂, Niš, Palilula, 13.11.2015, on *Cichorium intybus*, leg. M. Lazarević; ~ 1000 ♀♀, Svrlijig, 16.10.2018, (ex 17 mass cocoons), leg. S. Stevčić; 155 ♀♀, 12 ♂♂, Svrlijig, 15.11.2018, leg. S. Stevčić; 37 ♀♀, 42 ♂♂, Niš, PMF, 09.04.2019, ex *Noctua*

comes Hübner (Noctuidae), leg. M. Lazarević; 78 ♀♀, 48 ♂♂, Niš, Palilula, 17.04.2019, ex *A. rumicis*, leg. M. Lazarević; 36 ♂♂, Niš, Brzi Brod, 26.04.2019, leg. V. Žikić; 5 ♀♀, 14 ♂♂, Kruševac, Donji Stepoš, 28.04.2019, leg. M. Lazarević; 50 ♀♀, 6 ♂♂, Kruševac, Donji Stepoš, 28.04.2019, ex *A. rumicis*, leg. M. Lazarević; 50 ♀♀, 5 ♂♂, Prohor Pčinjski, 29.04.2019, leg. S. Stanković; 53 ♀♀, 5 ♂♂, Gadžin Han, 30.04.2019, leg. S. Stanković; 20 ♀♀, Niš, 19.10.2019, ex *A. rumicis*, leg. A. Petrović; 29 ♀♀, 4 ♂♂, Niš, Medijana, 07.10.2020, ex *A. rumicis*, leg. A. Petrović; 21 ♀♀, 20 ♂♂, Niš, Pantelej, 04.05.2021, leg. V. Žikić; 31 ♀♀, 11 ♂♂, Niš, Pantelej, 06.05.2021, leg. V. Žikić].

***Cotesia ordinaria* (Ratzeburg, 1844)**

The only data is available on Fauna Europaea website (van Achterberg, 2013).

****Cotesia praepotens* (Haliday 1834)**

[1 ♀, Mt. Stara planina, 03.07.1979, leg. M. Brajković; 1 ♂, Mt. Kopaonik, Srebrnac 1675 m a.s.l., 12.08.1986, leg. A. Rakić].

***Cotesia rubripes* (Haliday, 1834)**

Data taken from Brajković (1989), cited in Yu *et al.* (2012).

****Cotesia ruficrus* (Haliday, 1834)**

[1 ♂, Obedska Bara, 14.09.1951, leg. D. Čubrilović; 1 ♀, Alibunar, 28.09.1975, leg. M. Brajković; 26 ♂♂, Stara Pazova, 16.07.2013, ex *Autographa gamma* (L.) (Noctuidae), leg. B. Hric; 1 ♀, Farkaždin, 22.05.2015, leg. A. Jovanov; 5 ♀♀, Trgovište, Vražji Kamen, 29.04.2019, leg. V. Žikić; 13 ♀♀, 20 ♂♂, Gadžin Han, 30.04.2019, ex *Arctia villica* (L.) (Erebidae), leg. S. Stanković; 37 ♀♀, Niš, Bedem, 19.03.2020, ex *Agrotis segetum* (Denis & Schiffermüller) (Noctuidae), leg. A. Petrović].

****Cotesia saltatoria* (Balevski, 1980)**

[2 ♂♂, Zaječar, 25.07.1980, leg. M. Brajković].

***Cotesia scabricula* (Reinhard, 1880)**

[1 ♀, 1 ♂, Beograd, 14.05.1985, ex larva *Erannis defoliaria* Clerck (Geometridae), leg. unknown; 1 ♂, Jamena, Radenovci, 10.05.1991, leg. M. Ristić; 1 ♂, Kupinovo, Obrež, 07.05.1992, ex larva *Orthosia* sp. (Noctuidae), emerged on 14.05.1992, leg. M. Glavendekić (Papp, 2009).

***Cotesia sessilis* (Geoffroy, 1785)**

[1 ♂, Peć, Pećka Banja, 18.05.1972, leg. S. Horvatovich & J. Papp; 1 ♂, Mt. Šar planina, Brezovica, 20-23.05.1971, leg. J. Papp].

***Cotesia spuria* (Wesmael, 1837)**

1 ♀, Sremska Rača, 10.06.1962, leg. K. Vasić (Papp, 1973); [1 ♂, Jelašnička Klisura (gorge), 15.06.2013, on *Pyrus eleagnifolia* ex *Diloba caeruleocephala* (L.) (Noctuidae), leg. V. Žikić].

***Cotesia tenebrosa* (Wesmael, 1837)**

[1 ♀, Niš, 09.1902, leg. Horvath (Papp, 1973); [1 ♂, Beograd, Mali Mokri Lug, 23.06.1976, leg. M. Brajković].

****Cotesia tetrica* (Reinhard, 1880)**

[40 ♀♀, Stara Pazova, 13.10.2019, on Poaceae ex *Lasiommata megera* (L.) (Nymphalidae), leg. B. Hric].

***Cotesia tibialis* (Curtis, 1830)**

1 ♂, Novi Sad, 20.05.1969, ex *A. rumicis* L., leg. unknown; 1 ♀, Leskovac, 13.05.1977, leg. L. Zombori (Papp, 2009); [1 ♂, Topčider, 28.07.1940, leg. V. Martino; 1 ♀, 4 ♂♂, Kragujevac, Košutnjak, 22.06.1958, leg. K. Vasić; 1 ♀, 1 ♂, Šid, Višnjićevo, 15.05.1960, leg. K. Vasić; 4 ♀♀, 4 ♂♂, Pećinci, Kupinovo, 19.09.1969, leg. K. Vasić; 2 ♀♀, Obrenovac, 22.09.1984, leg. M. Brajković; 1 ♀, Deliblatska Peščara, Korn, 20.05.1986, ex *Euxoa temera* (Hübner) (Noctuidae), leg. M. Brajković (Papp, 2009); 60 ♀♂, Zlatibor, Bela Zemlja, 02.07.2000, leg. Ž. Tomanović; 5 ♀, Vlasinsko Jezero (lake), 11.08.2006, leg. V. Žikić; 1 ♂, Jelašnička Klisura (gorge), 14.07.2012, leg. S. Stanković; 15 ♀♀, 2 ♂♂, Vlasinsko Jezero (lake), 21.07.2013, on Poaceae, leg. S. Stanković; 13 ♀♀, Sićevačka Klisura (gorge), 13.04.2014, leg. V. Žikić; 23 ♀♀, 3 ♂♂, Vlasinsko Jezero (lake), 06.06.2014, leg. S. Stanković; 69 ♀♀, 16 ♂♂, Tara, Derventa, 25.06.2015, leg. V. Žikić; 71 ♀♀, 6 ♂♂, Zlatibor, Čavlovac, 27.06.2015, leg. M. Ilić Milošević; ~ 1000 ♀♂, Vlasinsko Jezero (lake), 06-07.08.2015, (ex 22 mass cocoons) leg. S. Stanković, leg. V. Žikić; 25 ♀♀, 3 ♂♂, Vlasinsko Jezero (lake), 22.06.2017, leg. S. Stanković; 70 ♀♀, 27 ♂♂, Vlasinsko Jezero (lake), 27.05.2018, leg. V. Žikić; 180 ♀♀, 66 ♂♂, Vlasinsko Jezero (lake), 27.05.2018, ex *Mythimna conigera* (Denis & Schiffermüller) (Noctuidae), leg. V. Žikić; 2 ♀♀, 1 ♂, Vlasinsko Jezero (lake), 20.06.2019, leg. V. Žikić; 112 ♀♀, 29 ♂♂, Zlatibor, Čavlovac, 25.06.2019, leg. V. Žikić; 50 ♀♂, Niš, Donje Vlase, 01.05.2020, leg. V. Žikić; 14 ♂♂, Vlasinsko Jezero (lake), 21.09.2020, leg. S. Stevčić; 104 ♀♀, 2 ♂♂, Niš, Donja Vrežina, 11.10.2020, leg. A. Petrović; ~ 500 ♀♂, Vlasinsko Jezero (lake), 22.06.2021, (ex 16 mass cocoons) leg. M. Lazarević, leg. S. Stanković, leg. V. Žikić].

***Cotesia vestalis* (Haliday, 1834)**

1 ♂, Peć, Rugovo 16.05.1971, leg. S. Horvatovich & J. Papp (Papp, 1973); 1 ♂, Obrenovac, Draževac, 03.08.1987, leg. M. Brajković; 1 ♂, Kovačica, Padina, 10.10.1987, leg. M. Brajković (Papp, 2009).

***Cotesia zyaenarum* Marshall, 1885**

500 ♀♂, Sićevačka Klisura (gorge), Sićevo, 01.06.2012, on *Lotus corniculatus* ex *Zygaena filipendulae* (L.) (Zygaenidae), leg. V. Žikić (Žikić et al., 2013).

Discussion

As noted, most of the early data on *Cotesia* (until 2009) originated from the Hungarian entomologist Jenő Papp who worked on the braconid fauna of Former Yugoslavia continuously. We checked and, where necessary, corrected Papp's data and provide the final list of species collected in the territory of Serbia. Papp himself made several corrections in his last publication, and some data and identifications were also corrected by the authors of this study. For example, Papp (2009) listed the species *Cotesia clepta* (Tobias, 1986) as being from Serbia, collected at the locality Posnanski Jezero, which is actually in Montenegro.

It is noticeable that the two species *C. ofella* and *C. tibialis* were found very often and disproportionately in relation to all the others. So far, we do not have a proper explanation for such disproportionate results because the collection of material was random. Moreover, the field research was done throughout the vegetation season. Both species are known as parasitoids of caterpillars that feed on low vegetation, such as *Acrionicta rumicis* or *Simyra* sp., which are confirmed hosts for *C. ofella*, or even on underground grass

shoots such as *Agrotis segetum* and *Euxoa temera*, which are parasitized by *C. tibialis*. By researching the available material from Serbia and other European countries, we noticed that in the case of *C. tibialis*, it is probably an aggregation, as well as *C. flavipes* (Muirhead *et al.*, 2012) and *C. melitaeorum* (Kankare, 2005; Lei & Camara, 1999), and possibly some more (e.g., Bredlau *et al.*, 2019).

Of the total of 35 registered species presented in this study, 11 species were recorded for the first time for the investigated area. Bearing in mind that 109 species of *Cotesia* have so far been reported from Europe (i.e., Fauna Europaea area; van Achterberg, personal communication, 2021), of which at least 70 inhabit the mainland of the continent, it is expected that most of them can be found in Serbia, given that their hosts have long been registered for this area (van Achterberg, 2013). In support of this opinion is the fact that in a well-researched territory, such as Hungary, which was explored by Papp himself, as many as 74 species were registered. When it comes to the genus *Cotesia*, based on the available data, with the exception of Bulgaria, the fauna of other countries in the region has not been sufficiently researched. Through overlapping data on the diversity of the genus *Cotesia* in surrounding countries, approximately 60 species were identified: Bulgaria 44, Romania 24, Greece 20, Montenegro 10, Croatia 4, North Macedonia 3, Albania 2 and Bosnia and Herzegovina 1 (van Achterberg, 2013). Considering that we have started comprehensive research of this genus in Serbia, and also in the Balkans, we expect that the picture of species diversity will soon be more complete.

Acknowledgement

We would like to thank our colleagues Kees van Achterberg, Jenő Papp (†) and Mark R. Shaw who helped us identify species of the genus *Cotesia*, but also helped us in the first steps when we tackled the group Microgastrinae, which is one of the largest in the family Braconidae. We also thank Slobodan Stevčić, Aleksandra Petrović, Aleksandra Jovanov, Miloš Popović and Milan Djurić for collecting the material. This work was financially supported by the Ministry of Education, Science and Technological Development of the Republic of Serbia (contract number: 451-03-9/2021-14/200124).

References

- Brajković, M. (1989). Knowledge of the Braconidae (Hymenoptera) fauna in Yugoslavia. *Glasnik Prirodnjačkog muzeja, B* (43/44), 127-138.
- Bredlau, J. P., Kuhar, D., Gundersen-Rindal, D. E., & Kester, K. M. (2019). The parasitic wasp, *Cotesia congregata* (Say), consists of two incipient species isolated by asymmetric reproductive incompatibility and hybrid inability to overcome host defenses. *Frontiers in Ecology and Evolution*, 7, 187.
- Fernandez-Triana, J., Shaw, M. R., Boudreault, C., Beaudina, M., Broad, G. (2020). Annotated and illustrated world checklist of Microgastrinae parasitoid wasps (Hymenoptera, Braconidae). *ZooKeys*, 920, 1-1089.
- Kankare, M., Van Nouhuys, S., & Hanski, I. (2005). Genetic divergence among host-specific cryptic species in *Cotesia melitaeorum* aggregate (Hymenoptera: Braconidae), parasitoids of checkerspot butterflies. *Annals of the Entomological Society of America*, 98(3), 382-394.
- Lei, G. C., & Camara, M. D. (1999). Behaviour of a specialist parasitoid, *Cotesia melitaeorum*: from individual behaviour to metapopulation processes. *Ecological Entomology*, 24(1), 59-72.
- Muirhead, K. A., Murphy, N. P., Sallam, N., Donnellan, S. C., & Austin, A. D. (2012). Phylogenetics and genetic diversity of the *Cotesia flavipes* complex of parasitoid wasps (Hymenoptera: Braconidae), biological control agents of lepidopteran stemborers. *Molecular Phylogenetics and Evolution*, 63(3), 904-914.

- Nixon, G. E. J. (1974). A revision of the north-western European species of the *glomeratus*-group of *Apanteles* Förster (Hymenoptera, Braconidae). *Bulletin of Entomological Research*, 64(3), 453-524.
- Papp, J. (1973). Contributions to the braconid fauna of Yugoslavia (Hymenoptera, Braconidae) I. *Acta Musei Macedonici Scientiarum Naturalium*, 14(1), 1-23.
- Papp, J. (1975). New *Apanteles* Foerster species from Hungary (Hymenoptera, Braconidae: Microgasterinae), IV. *Annales historico-naturales Musei nationalis Hungarici*, 67, 237-255.
- Papp, J. (1977). Papp J (1977b) New *Apanteles* Först. species from Hungary (Hymenoptera, Braconidae: Microgasterinae), V. *Annales historico-naturales Musei nationalis Hungarici*, 69, 201-217.
- Papp J. (1986). A survey of the European species of *Apanteles* Först. (Hymenoptera, Braconidae: Microgastrinae). IX. The *glomeratus*-group, 1. *Annales historico-naturales Musei nationalis Hungarici*, 78, 225-247.
- Papp, J. (1987). A survey of the European species of *Apanteles* Först. (Hymenoptera, Braconidae: Microgastrinae), X. The *glomeratus*-group 2 and the *cultellatus*-group. *Annales historico-naturales Musei nationalis Hungarici*, 79, 207-258.
- Papp, J. (1998) A survey of the European species of *Apanteles* Först. (Hymenoptera, Braconidae:Microgastrinae). XI. "Homologization" of the species-groups of *Apanteles* s.l. with Mason's generic taxa. Checklist of genera. Parasitoid/host list 1. *Annales historico-naturales Musei nationalis Hungarici*, 80, 145-175.
- Papp, J. (2009). Contribution to the braconid fauna of the former Yugoslavia, V. Ten subfamilies. *Entomofauna*, 30(1), 1-36.
- Ratnasingham, S. & Hebert, P. D. N. (2007). BOLD: The Barcode of Life Data System (www.barcodinglife.org). *Molecular Ecology Notes*, 7, 355-364. DOI: 10.1111/j.1471-8286.2006.01678.x
- van Achterberg, C. (2013). Fauna Europaea: Braconidae. Fauna Europaea version 2017.06. Retrieved from: <https://fauna-eu.org/> [Accessed on: September 2021].
- Yu, D. S., van Achterberg, C., & Horstmann, K. (2012). Taxapad 2012, Ichneumonoidea 2011. Database on flash-drive. Ottawa, Ontario, Canada.
- Žikić, V., Lazarević, M., Stanković, S. S., & Ilić Milošević, M. (2015). New data on Microgastrinae in Serbia and Montenegro (Hymenoptera: Braconidae) and their hosts. *Biologica Nyssana*, 6(1), 41-48.
- Žikić, V., Stanković, S. S., Petrović, A., Ilić Milošević, M., & van Achterberg, K. (2013). Parasitoid complex of *Zygaena filipendulae* L. (Lepidoptera: Zygaenidae). *Archives of Biological Sciences*, 65(3), 1027-1035.

ДИВЕРЗИТЕТ РОДА *COTESIA* CAMERON (BRACONIDAE: MICROGASTRINAE) У СРБИЈИ

ВЛАДИМИР ЖИКИЋ, МАЈА ЛАЗАРЕВИЋ, МАРИЈАНА ИЛИЋ МИЛОШЕВИЋ,
АЛЕКСАНДРА ТРАЈКОВИЋ, БОЖЕНКА ХРИЦ И САША С. СТАНКОВИЋ

Извод

У овом раду дат је фаунистички преглед диверзитетa врста из рода *Cotesia* Cameron, 1891 за територију Србије. Приказани су резултати истраживања у периоду од 1902. до 2021. године. Литературни и подаци из постојећих база допуњени су необјављеним подацима у циљу израде свеобухватне листе врста са напоменама о локалитетима, датумима, броју и полу јединки. Укупно је представљено 35 врста од којих је 11 први пут регистровано у Србији. Од свих су најчешће сакупљане *Cotesia ofella* и *C. tibialis*.

Received: October 12th, 2021
Accepted: November 18th, 2021