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CHARIPINAE (HYMENOPTERA: FIGITIDAE) OF SERBIA – DISTRIBUTION AND TROPHIC INTERACTIONS

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Abstract

The distribution and trophic interactions of aphid associated Charipinae of Serbia are presented. In total, 77 different trophic associations (plant-aphid-primary parasitoid-hyperparasitoid) have been reported. Four Charipinae species are recorded for the first time from Serbia: *Alloxysta citripes* (Thomson, 1862), *Alloxysta mullensis* (Cameron, 1883), *Alloxysta pusilla* (Kieffer, 1902), and *Alloxysta sawoniewiczi* (Kierych, 1988).

KEY WORDS: *Alloxysta*, *Phaenoglyphis*, hyperparasitoids, parasitoids, aphids

Introduction

The subfamily Charipinae (Hymenoptera: Figitidae) consists of over 180 species with worldwide distribution (Ferrer-Suay *et al.* 2012a; 2012b; 2013a; 2013b; 2013c; 2013d; 2013e; 2013f; 2013g; 2014; 2018), 75 of which are recorded in the Palearctic region (Ferrer-Suay *et al*. 2018). Charipinae species are solitary hyperparasitoids of aphids (Aphididae) and psyllids (Psyllidae) (Menke & Evenhuis, 1991). Moreover, Charipinae are obligatory hyperparasitoids that parasitize Aphidiinae (Braconidae), Aphelinidae (in aphids) and Encyrtidae (in psyllids). As with all obligatory hyperparasitoids, Charipinae always develop at the expense of parasitoids and are likely to limit top-down control of aphids and psyllids (van Veen *et al*. 2001; Boivin & Brodeur, 2006; Sampaio *et al*. 2017). Despite obvious biological, ecological and economical importance, the Charipinae has been poorly studied until recently. Although both aphid and Aphidiinae fauna are very well studied in Serbia (see Petrović-Obradović 2003; Kavallieratos *et al*. 2004; Žikić *et al*. 2012), very little information has been published about Charipinae so far (Tomanović *et al*. 2008; Ferrer-Suay *et al*. 2013b; 2018).

The aim of this study was to present all known data (both from literature and unpublished) about Charipinae species' composition and distribution in Serbia as well as patterns of host associations (host plant – aphid – primary parasitoid – hyperparasitoid).

Materials and Methods

Samples were collected during long-term research of aphid parasitoids in Serbia in the period 1999-2013. Aphid colonies consisting of both live and mummified aphids were collected together with plant parts (leaves, stems, etc.) and placed in rearing boxes covered with muslin. Rearing boxes were kept in the growth cabinet at 22° C with a photoperiod L:D 16:8 h until the emergence of primary parasitoids and hyperparasitoids. Host plants were identified in the field or herbarized for later identification. Aphids were preserved in a solution containing 2 parts of 90 % ethyl-alcohol and one part of 75 % lactic acid (Eastop & van Emden, 1972). Upon emergence, both primary parasitoids and hyperparasitoids were preserved in 96 % ethyl-alcohol. Host plants, host aphids and primary parasitoids were identified to genus or species level prior to Charipinae identification. Charipinae identification was performed using the identification keys of Ferrer-Suay *et al.* (2013b; 2013c; 2018). Literature data were taken from Ferrer-Suay *et al.* (2013b; 2018), while new records are indicated with an asterisk.

Results

In total, 16 Charipinae species (15 *Alloxysta* species and 1 *Phaenoglyphis villosa*) were recorded from Serbia. Four *Alloxysta* species are recorded here for the first time: *Alloxysta citripes, Alloxysta mullensis, Alloxysta pusilla,* and *Alloxysta sawoniewiczi*. Trophic associations (plant – aphid – primary parasitoid – hyperparasitoid) are presented below. Despite the incomplete data about primary parasitoids and some aphid hosts, 77 different trophic associations were established, including 38 plant species, 27 aphid species, 19 species of primary parasitoids (Aphidiinae) and 16 Charipinae species. Among these, 36 associations were new for Serbia.

Trophic (Charipinae-primary parasitoid-host aphid-plant) relationships and distribution in Serbia

Alloxysta arcuata (Kieffer, 1902) (Fig. 1)

Material examined: *Aphidius matricariae* Haliday, 1834 – *Brachycaudus helichrysi* (Kaltenbach, 1843) on *Stenactis annua*, Slanci-Brdo, 09.05.2007, 5 ♀♀; *Ephedrus plagiator* (Nees, 1811) – *Rhopalosiphum padi* (Linnaeus, 1758) on *Triticum aestivum*, Slanci-Brdo, 29.05.2007, 1 ♂, 1 ♀; *Monoctonus ligustri* van Achterberg, 1989 – *Myzus ligustri* (Mosley, 1841) on *Ligustrum vulgare*, Slanci-Brdo, 29.05.2007, 1 ♂; unknown primary parasitoid – *Aphis fabae* Scopoli, 1763 on **Galium aparine*, Vrbovski 03.06.2008; **Lysiphlebus cardui* (Marshall, 1896) – *Brachycaudus klugkisti* (Börner, 1942) on *Melampyrum album*, Galovica, 22.05.2011; unknown primary parasitoid – *Aphis craccivora* Koch, 1854 on *Medicago sativa*, Čenta, 05.06.2011, 1 ♂, 1 ♀; Vodanj-Ralja, 08.06.2012, 1♀; unknown primary parasitoid – *Aphis fabae*, Scopoli, 1763 on *Cirsium arvense*, Umčari-Donji Kraj, 07.06.2012, 3 ♂♂; Živkovac-Site 1, 08.06.2012, 1♂, 6 ♀♀; **Binodoxys acalephae* (Marshall, 1896) – *Aphis* sp. on *Aegopodium podagraria*, Niš, 18.06.2012.

Alloxysta brevis (Thomson, 1862)

Material examined: Malaise trap, Draževac, 27-28.06.1981, 2 ♀♀; unknown primary parasitoid – **Aphis spiraecola* Patch, 1914 and *Aphis pomi* de Geer, 1773 on *Spirea media*, Belgrade, 02.05.2006; unknown primary parasitoid and aphid on **Tanacetum vulgare*, Mt. Vlasina, 12.08.2006; *Aphidius matricariae* Haliday, 1834 – *Semiaphis dauci* (Fabricius, 1775) on *Daucus carota*, Slanci-Brdo, 08.05.2007, 5 ♀♀; *Lysiphlebus* sp. – *Aphis craccivora* Koch, 1854 on *Medicago sativa*, Baranda, 07.09.2011, 1 ♀; *Lysiphlebus* sp. – *Aphis fabae cirsiiacanthoidis* Scopoli, 1763 on *Cirsium arvense*, Padinska Skela, 14.05.2007, 2 ♀♀; *Praon necans* Mackauer, 1959 – *Rhopalosiphum nymphaeae* (Linnaeus, 1761) on *Typha latifolia*, Padinska Skela, 14.05.2007, 13 ♂♂, 6 ♀♀; unknown primary parasitoid – *Aphis nasturtii* Kaltenbach, 1843 on *Rumex crispus*, Padinska skela, 08.06.2007, 1 ♀; unknown primary parasitoid – *Uroleucon cichorii* (Koch, 1855) on **Crepis acetosa*, Ilićevo, 12.05.2011; **Aphidius microlophi* Pennacchio & Tremblay, 1987 and *Binodoxys acalephae* – *Aphis urticata* Gmelin, 1790 and *Microlophium carnosum* (Buckton, 1876) on *Urtica dioica*, Ilićevo, 12.05.2011; **Lysiphlebus fabarum* (Marshall, 1896) and *Binodoxys angelicae* (Haliday, 1833) – *Aphis* sp. on *Rubus caesius*, Niš, 31.05.2011; unknown primary parasitoid – **Aphis affinis* del Guercio, 1911 on *Mentha* sp., Galovica, 02.06.2011, 1♀; unknown primary parasitoid – *Aphis fabae cirsiiacanthoidis* Scopoli, 1763 on *Cirsium arvense*, Umčari-Donji Kraj, 08.06.2012, 2 ♂♂, 4 ♀♀; Živkovac, 08.06.2012, 5 ♂♂, 11 ♀♀; **Binodoxys acalephae* – *Myzus* sp. and *Aphis* sp. on *Aegopodium podagraria*, Niš,18.06.2012.

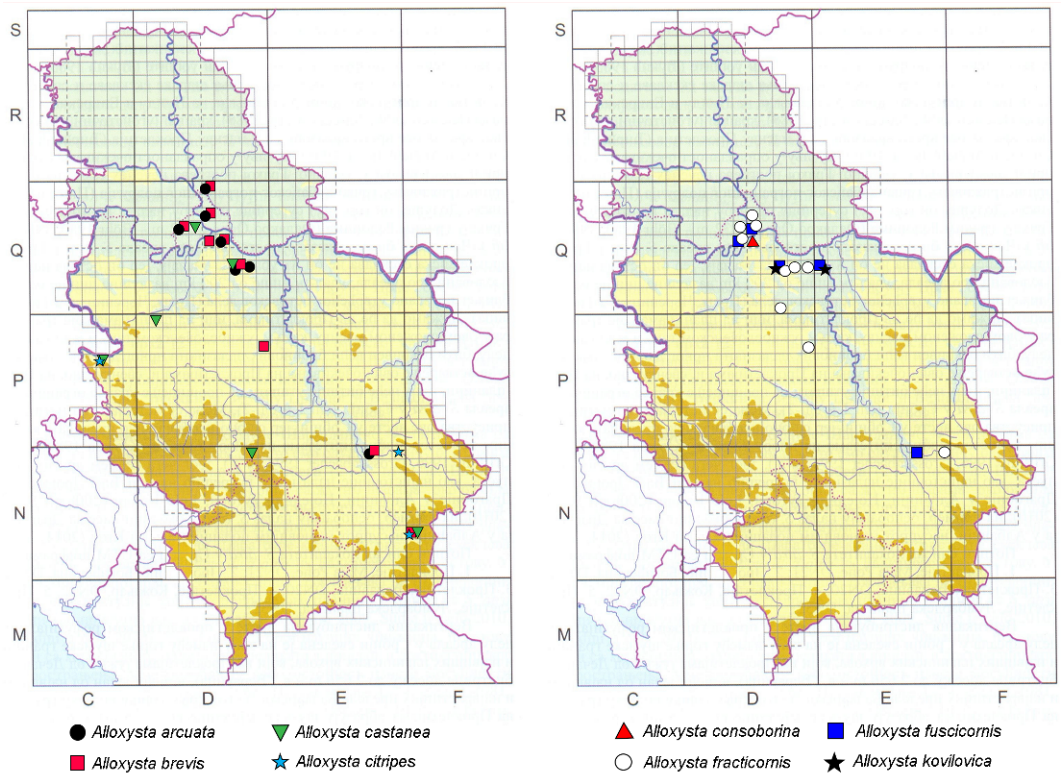

Figure 1. Distribution of Charipinae in Serbia: *Alloxysta arcuata*, *A. brevis*, *A. castanea*, *A. citripes*, *A. consobrina*, *A. fracticornis*, *A. fuscicornis* and *A. kovilovica*.

Alloxysta castanea (Hartig, 1841)

Material examined: *Aphidius sussi* Pennacchio & Tremblay, 1989 – *Delphinobium junackianum* (Karsch, 1887) on *Aconitum toxicum*, Mt. Kopaonik-Čeline, 02.07.1999, 20.07.1999, 2 ♀♀; unknown primary parasitoid – **Macrosiphum funestum* (Macchiati, 1885) on *Rubus* sp., Petnica, 06.06.2006; **Monoctonus crepidis* (Haliday 1834) – *Nasonovia* sp. on *Hieracium pilosella*, Vlasina, 04.08.2010; **Aphidius funebris* Mackauer, 1961 – *Uroleucon* sp. on *Carduus acanthoides*, Zemun, 09.05.2011; *Aphidius* sp. – *Sitobion avenae* (Fabricius, 1775) on *Triticum aestivum*, Umčari-Klaino, 13.06.2012, 2 ♀♀; **Aphidius hortensis* Marshall, 1896 – unknown aphid on *Berberis vulgaris*, Tara – Perućac, 03.07.2012.

**Alloxysta citripes* (Thomson, 1862)

Material examined: *Aphidius hortensis*- unknown aphid on *Berberis vulgaris*, Tara - Perućac, 03.07.2012; *Trioxys pallidus* (Haliday, 1833) – *Panaphis juglandis* (Goeze, 1778) on *Juglans regia*, Sićevo gorge, 14.07.2012.

Alloxysta consobrina (Zetterstedt, 1838)

Material examined: unknown primary parasitoid and aphid on *Medicago sativa*, Belgrade, 23.05.1962, 1♂, 1♀.

Alloxysta fracticornis (Thomson, 1862)

Material examined: *Aphidius funebris* – *Uroleucon* sp. on *Crepis* sp., Jakovački Ključ, 07.05.2007, 1♀; **Aphidius funebris* – *Uroleucon* sp. on *Carduus acanthoides*, Zemun, 09.05.2011; unknown primary parasitoid – *Uroleucon cichorii* on **Crepis acetosa*, Ilićevo, 12.05.2011; **Aphidius funebris* – *Uroleucon* sp. on *Sonchus asper*, Dobanovci, 25.05.2011; unknown primary parasitoid and aphid on *Medicago sativa*, Dunavac, 31.05.2011, 2♀♀; *Praon exsoletum* (Nees, 1811) – *Therioaphis trifolii* (Monell, 1882) on *Medicago sativa*, Besni fok, 13.06.2011, 2 ♂♂; **Aphidius funebris* – *Uroleucon cichorii* on *Sonchus* sp., Sićevo gorge, 25.6.2011; unknown primary parasitoid – **Uroleucon cichorii* on *Cichorium* sp., Topola- Svetinja, 04.08.2011; unknown primary parasitoid and aphid on *Medicago sativa*, Kovilovo, 15.09.2011, 1♂; unknown primary parasitoid and aphid on *Medicago sativa*, Padinska Skela, 26.05.2011, 09.06.2010, 2♀♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Mihajlovac, 16.06.2012, 1♀; Umčari-Donji Kraj, 10.06.2012, 3♂♂, 1♀; 12.06.2012, 2 ♂♂, 6 ♀♀; Umčari-Parloge, 10.06.2012, 1♀; Umčari-Kotlova, 12.06.2012, 2 ♂♂, 2 ♀♀; 15.06.2012, 2 ♂♂, 1 ♀; Živkovac, 14.06.2012, 1 ♂, 2 ♀♀; 16.06.2012: 1 ♀; Vodanj-Ralja, 18.06.2012, 1 ♀; Živkovac, 07.06.2012, 1 ♀.

Alloxysta fuscicornis (Hartig, 1841)

Material examined: unknown primary parasitoid – *Uroleucon* sp. on *Crepis* sp., Jakovački Ključ, 07.05.2007, 1 ♀; *Praon exsoletum – Therioaphis trifolii* on *Medicago sativa*, Kovilovo, 16.06.2010 and 03.06.2011, 2 ♀♀; Umčari-Donji kraj, 08.06.2012, 1 ♀; Osipaonica, 11.06.2012, 1 ♀; Živkovac, 16.06.2012, 1 ♀; **Diaeretiella rapae* (M'Intosh, 1855) – *Brevicorynae brassicae* (Linnaeus, 1758) on *Raphanus raphanistrum*, Niš, 27.06.2012.

Alloxysta kovilovica Ferrer-Suay & Pujade-Villar, 2013

Material examined: *Praon exsoletum – Therioaphis trifolii* on *Medicago sativa*, Živkovac, 03.06.2012, 1 ♀; Umčari-Kotlova, 09.06.2012, 1 ♂, 1 ♀; Osipaonica, 11.06.2012, 1 ♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Umčari-Donji Kraj, 12.06.2012, 4 ♀♀.

Alloxysta macrophadna (Hartig, 1841) (Fig. 2)

Material examined: **Aphidius urticae* Haliday, 1834 and *Praon* sp. – *Macrosiphum funestum* on *Rubus* sp., Mt. Golija, 21.07.2011; unknown primary parasitoid and aphid on *Medicago sativa*, Besni Fok, 13.06.2011, 06.10.2011, 2 ♀♀.

**Alloxysta mullensis* (Cameron, 1883)

Material examined: *Aphidius microlophi* and *Binodoxys acalephae* – *Aphis urticata* and *Microlophium carnosum* on *Urtica dioica*, Ilićevo, 12.05.2011.

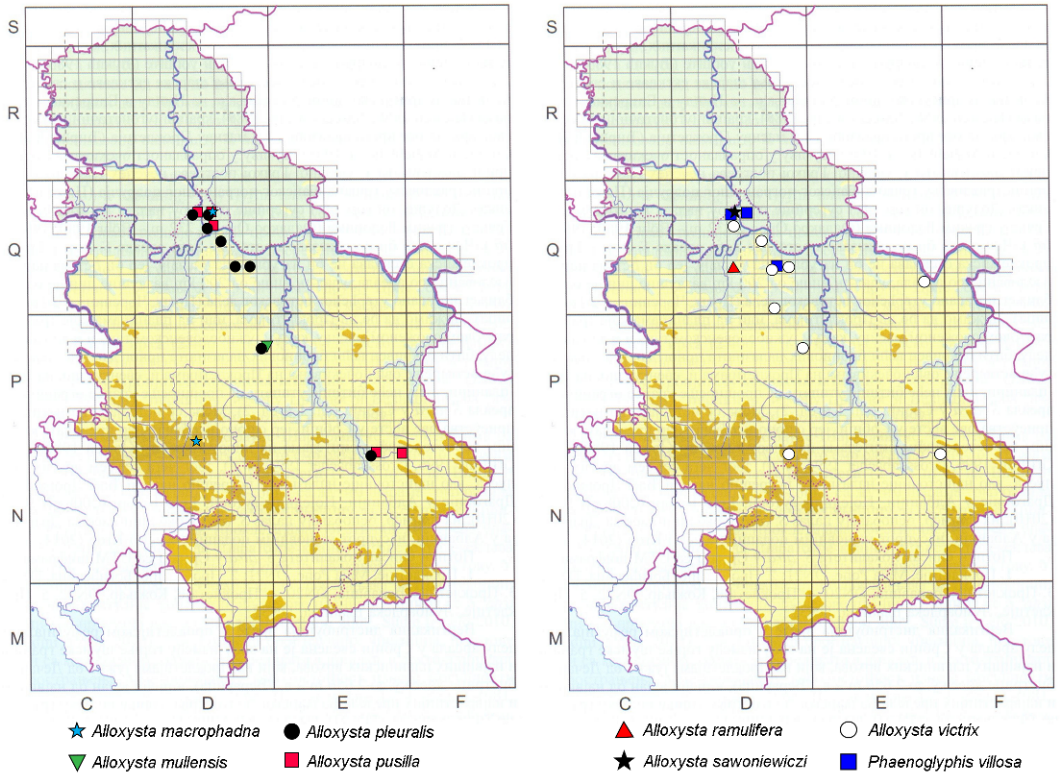

Figure 2. Distribution of Charipinae in Serbia: *Alloxysta macrophadna*, *A. mullensis*, *A. plauralis*, *A. pusilla*, *A. ramulifera*, *A. sawoniewiczi*, *A. victrix* and *Phaenoglyphis vilosa*.

Alloxysta pleuralis (Cameron, 1879)

Material examined: *Aphidius matricariae* – *Aphis triglochinis* Theobald, 1926 on *Rorripa silvestris*, Padinska Skela, 08.06.2007, 5 ♂♂, 14 ♀♀; *Lysiphlebus fabarum*– *Aphis urticata* on *Urtica dioica*, Slanci-Brdo, 29.05.2007, 2 ♀♀; *Lysiphlebus fabarum* and *Binodoxys angelicae* – *Aphis fabae* on *Galium aparine*, Padinska Skela, 14.05.2007, 1 ♂; *Lysiphlebus* sp. – *Aphis fabae cirsiiacanthoidis* on *Cirsium arvense*, Padinska Skela, 08.06.2007, 1 ♀; unknown primary parasitoid – *Aphis nasturtii* on *Rumex crispus*, Padinska Skela, 08.06.2007, 1 ♀; unknown primary parasitoid – *Brachycaudus helichrysi* on *Matricaria tenuifolia*,

Padinska Skela, 14.05.2007, 1 ♂; **Binodoxys angelicae* – *Aphis fabae* on *Matricaria tenuifolia*, Kovilovo, 21.05.2008; unknown primary parasitoid and aphid on **Cirsium arvense*, Vrbovski, 03.06.2009; **Lysiphlebus fritzmuelleri* Haliday, 1834 and *Binodoxys acalephae* – *Aphis craccae* L. 1758 on *Vicia cracca*, Niš- Popovac, 04.07.2010; **Aphidius microlophii* and *Binodoxys acalephae* – *Aphis urticata* and *Microlophium carnosum* on *Urtica dioica*, Ilićevo, 12.05.2011; unknown primary parasitoid – *Aphis craccivora* on *Medicago sativa*, Vodanj-Ralja, 07.06.2012, 1 ♀; unknown primary parasitoid – *Aphis fabae* on *Cirsium arvense*, Živkovac - Site 1, 08.06.2012, 2 ♂♂, 17♀♀.

**Alloxysta pusilla* (Kieffer, 1902)

Material examined: unknown primary parasitoid – *Aphis fabae* on *Matricaria tenuifolia*, Vrbovski, 21.05.2008; *Lysiphlebus cardui* – unknown aphid on *Galium aparine*, Niš- Pantelej, 04.06.2011, 1♂; *Lysiphlebus cardui* – unknown aphid on *Evonymus europaeus*, Niš- Pantelej, 04.06.2011; unknown primary parasitoid – *Schizaphis scirpi* (Passerini, 1874) on *Typha* sp., Padinska Skela, 03.08.2008; unknown primary parasitoid and aphid on *Matricaria inodora*, Padinska Skela, 15.05.2008; unknown primary parasitoid and aphid on *Cirsium arvense*, Vrbovski, 03.06.2008; unknown primary parasitoid and aphid on *Stenactis annua*, Niš-PMF, 19.05.2009; *Lipolexis gracilis* Foerster, 1862 – unknown aphid host on *Brassica rapa*, Sićevo gorge, 15.05.2011; *Lysiphlebus fritzmuelleri* and *Binodoxys acalephae* – *Aphis craccae* on *Vicia cracca*, Niš-Popovac, 04.07.2010; *Lysiphlebus fabarum* and *Binodoxys angelicae* – *Aphis* sp. on *Rubus caesius*, Niš, 31.05.2011.

Alloxysta ramulifera (Thomson, 1862)

Material examined: Malaise trap, Draževac, 27-28.6.1981: 2 ♀♀.

**Alloxysta sawoniewiczi* (Kierych, 1988)

Material examined: unknown primary parasitoid and aphid on *Cirsium arvense*, Vrbovski, 21.05.2008, 1 ♀.

Alloxysta victrix (Westwood, 1833)

Material examined: *Aphidius sussi* – *Delphinobium junackianum* on *Aconitum toxicum*, NP Kopaonik, Metođe, 02.07.1999, 1 ♂, 2 ♀♀; **Aphidius funebris* – *Uroleucon* sp. on *Stenactis annua*, Donji Milanovac, 29.05.2011; **Aphidius funebris* – *Uroleucon cichorii* on *Crepis biennis*, Kragujevac, 01.6.2011; *unknown primary parasitoid – *Hyperomyzus lactucae* (L. 1758) on *Sonchus oleraceus*, Višnjica, 15.06.2011; **Aphidius* sp. – *Myzus persicae* (Sulzer, 1776) on *Silene alba*, Zemun, 20.09.2011; unknown primary parasitoid – *Aphis fabae cirsiiacanthoidis* on *Cirsium arvense*, Malo Orašje, 07.06.2012, 2 ♀♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Malo Orašje, 18.06.2012, 1 ♀; Umčari-Donji Kraj, 12.06.2012, 4 ♂♂, 7 ♀♀; 14.06.2012, 1 ♀; Umčari-Kotlova, 12.06.2012, 2 ♂♂, 1 ♀; Umčari-Parloge, 10.06.2012, 1 ♂, 2 ♀♀; 13.06.2012, 7 ♂♂, 8 ♀♀; Vodanj-Starnik, 15.06.2012, 1 ♂; Vodanj-Ralja, 18.06.2012, 1 ♂, 6 ♀♀; Živkovac, 14.06.2012, 1 ♂; 15.06.2012, 3 ♂♂, 5 ♀♀; Živkovac, 15.06.2012, 3 ♂♂, 1 ♀; on *Hordeum sativum*, Umčari-Klaino, 13.06.2012, 7 ♂♂, 13 ♀♀; unknown primary parasitoid and aphid on **Aconitum pentheri*, Kopaonik- Veliki Krš, 07.08.2008; unknown primary parasitoid and aphid, Sićevo gorge, 23.06.2012.

Phaenoglyphis villosa (Hartig 1841)

Material examined: unknown primary parasitoid – **Aphis fabae* on *Matricaria tenuifolia*, Vrbovski, 21.05.2008, 1♀; unknown primary parasitoid – *Schizaphis scirpi* on *Typha* sp., Padinska Skela, 03.08.2008; **Lipolexis gracilis* – *Dysaphis* sp. on *Malus* sp., Umčari, 12.06.2013.

Host Aphidiinae-parasitoid Charipinae associations:

Aphidius funebris: *Alloxysta castanea*, *Alloxysta fracticornis*, *Alloxysta victrix.*
Aphidius hortensis: *Alloxysta castanea*, *Alloxysta citripes.*
Aphidius matricariae: *Alloxysta arcuata*, *Alloxysta brevis*, *Alloxysta pleuralis.*
Aphidius microlophii: *Alloxysta brevis*, *Alloxysta mullensis*, *Alloxysta pleuralis.*
Aphidius sussi: *Alloxysta castanea*, *Alloxysta victrix.*
Aphidius urticae: *Alloxysta macrophadna.*
Aphidius sp.: *Alloxysta castanea*, *Alloxysta fracticornis*, *Alloxysta kovilovica*, *Alloxysta victrix.*
Binodoxys acalephae: *Alloxysta arcuate*, *Alloxysta brevis*, *Alloxysta mullensis*, *Alloxysta pleuralis*, *Alloxysta pusilla.*
Binodoxys angelicae: *Alloxysta brevis*, *Alloxysta pleuralis*, *Alloxysta pusilla.*
Diaeretiella rapae: *Alloxysta fuscicornis.*
Ephedrus plagiator: *Alloxysta arcuata.*
Lipolexis gracilis: *Alloxysta pusilla*, *Phaenoglyphis villosa.*
Lysiphlebus cardui: *Alloxysta arcuata, Alloxysta pusilla.*
Lysiphlebus fabarum: *Alloxysta brevis*, *Alloxysta pleuralis*, *Alloxysta pusilla.*
Lysiphlebus fritzmuelleri: *Alloxysta pleuralis*, *Alloxysta pusilla.*
Lysiphlebus sp.: *Alloxysta brevis*, *Alloxysta pleuralis.*
Monoctonus crepidis: *Alloxysta castanea*.
Monoctonus ligustri: *Alloxysta arcuata.*
Praon exsoletum: *Alloxysta fracticornis*, *Alloxysta fuscicornis*, *Alloxysta kovilovica*.
Praon necans: *Alloxysta brevis.*
Trioxys pallidus: *Alloxysta citripes.*

Host Aphid - Charipinae associations:

Aphis affinis: *Alloxysta brevis*.
Aphis craccae: *Alloxysta pleuralis*, *Alloxysta pusilla*.
Aphis craccivora: *Alloxysta arcuata*, *Alloxysta brevis*, *Alloxysta pleuralis*.
Aphis fabae: *Alloxysta arcuata*, *Alloxysta pleuralis*, *Alloxysta pusilla*, *Phaenoglyphis villosa.*
Aphis fabae cirsiiacanthoidis: *Alloxysta brevis*, *Alloxysta pleuralis*, *Alloxysta victrix.*
Aphis nasturtii: *Alloxysta brevis*, *Alloxysta pleuralis.*
Aphis spirecola: *Alloxysta brevis.*
Aphis pomi: *Alloxysta brevis*.
Aphis triglochinis: *Alloxysta pleuralis*.

Aphis urticata: *Alloxysta brevis*, *Alloxysta mullensis*, *Alloxysta pleuralis.*

Aphis sp.: *Alloxysta arcuata*, *Alloxysta brevis*, *Alloxysta pusilla.*

Brachycaudus helichrysi: *Alloxysta arcuata*, *Alloxysta pleuralis.*

Brachycaudus klugkisti: *Alloxysta arcuata.*

Brevicorinae brassicae: *Alloxysta fuscicornis*.

Delphinobium junackianum: *Alloxysta castanea*, *Alloxysta victrix*.

Dysaphis sp.: *Phaenoglyphis villosa.*

Hyperomyzus lactucae: *Alloxysta victrix*.

Macrosiphum funestum: *Alloxysta castanea*, *Alloxysta macrophadna*.

Microlophium carnosum: *Alloxysta brevis*, *Alloxysta mullensis*, *Alloxysta pleuralis*.

Myzus ligustri: *Alloxysta arcuata*.

Myzus persicae: *Alloxysta victrix*.

Myzus sp.: *Alloxysta brevis*.

Nasonovia sp.: *Alloxysta castanea*.

Panaphis juglandis: *Alloxysta citripes*.

Rhopalosiphum nymphaeae: *Alloxysta brevis*.

Rhopalosiphum padi: *Alloxysta arcuata*.

Schizaphis scirpi: *Alloxysta pusilla*, *Phaenoglyphis villosa.*

Semiaphis dauci: *Alloxysta brevis*.

Sitobion avenae: Alloxysta castanea, *Alloxysta fracticornis*, *Alloxysta kovilovica*, *Alloxysta victrix.*

Therioaphis trifolii: *Alloxysta kovilovica*, *Alloxysta fracticornis*, *Alloxysta fuscicornis.*

Discussion

Recently, Ferrer-Suay *et al*. (2013b) revised the genus *Alloxysta* from the northwestern Balkan Peninsula and reported nine species from Serbia. An additional two species (*A. consobrina* and *A. ramulifera*) were reported by Ferrer-Suay *et al*. (2018). With the present study, the total number of Charipinae in Serbia is raised to 16, with the following four species recorded for the first time: *Alloxysta citripes, Alloxysta mullensis, Alloxysta pusilla, Alloxysta sawoniewiczi*. According to Ferrer-Suay *et al*. (2018), all recorded species can be categorized into four groups, based on their distribution: cosmopolitan (*Alloxysta consobrina*, *A. fuscicornis*, *A. victrix* and *Phaenoglyphis villosa*), Holarctic (*A. brevis*, *A. macrophadna*), Palearctic (*A. arcuata*, *A. castanea*, *A. citripes*, *A. fracticornis*, *A. mullensis*, *A. pleuralis*, *A. pusilla*, *A. ramulifera*, *A. sawoniewiczi*) and endemic (*A. kovilovica*). Some of the Palaearctic species were also recorded in Neotropical (*A. castanea*, *A. mullensis*,) and Oriental regions (*A. pusilla*) or even in both (*A. arcuata*) (Ferrer-Suay *et al*. 2018). Although huge efforts have been made in the last several years to clarify the taxonomy and distribution of Charipinae worldwide (see Ferrer-Suay *et al*. 2018 for references), data about species distribution are still scarce in most countries and areas. Based on the results of this study, where almost a third of the recorded species is new for Serbia, we can conclude that the real distribution for the majority of Charipinae species is much broader

than is shown in current data. In most countries (including Serbia), there has been no separate systematic research into Charipinae, and almost all data were acquired from aphid or aphid parasitoid research.

There is a clear need for the systematic sampling of Charipinae all over the world. Gaps in knowledge of trophic interactions need to be filled in order to determine the effect of Charipinae on the performance of primary parasitoids, and hence its potential role in aphid biocontrol programs (Sampaio *et al*. 2017).

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CHARIPINAE (HYMENOPTERA: FIGITIDAE) СРБИЈЕ – РАСПРОСТРАЊЕЊЕ И ТРОФИЧКЕ ИНТЕРАКЦИЈЕ

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Извод

Представљени су рапсростарањење и трофичке интеракције врста потфамилије Charipinae које су у асоцијацији са биљним вашима. Укупно је регистровано 77 резлачитих трофичких интеракција (биљка-биљна ваш-примарни паразитоид-хиперпаразитоид) које су приказане по абецедном реду. Четири врсте потфамилије Charipinae су по први пут регистроване на територији Србије и то: *Alloxysta citripes, Alloxysta mullensis, Alloxysta pusilla* и *Alloxysta sawoniewiczi*.

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