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Revision of *Alloxysta* from the north-western Balkan Peninsula with description of two new species (Hymenoptera: Figitidae: Charipinae)

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Abstract. The aphid-associated Charipinae of Serbia, Montenegro and Slovenia have been studied. Nine species are recorded for the first time from these regions: *Alloxysta arcuata* (Kieffer, 1902), *A. brevis* (Thomson, 1862), *A. castanea* (Hartig, 1841), *A. fracticornis* (Thomson, 1862), *A. fuscicornis* (Hartig, 1841), *A. macrophadna* (Hartig, 1841), *A. mullensis* (Cameron, 1883), *A. pleuralis* (Cameron, 1879), and *A. salicicola* Belizin, 1973. Only *Alloxysta victrix* (Westwood, 1833) was previously recorded from this region. The important morphological characters of these species are briefly described and compared. Two new species, *Alloxysta kovilovica* Ferrer-Suay & Pujade-Villar sp. nov. and *A. slovenica* Ferrer-Suay & Pujade-Villar sp. nov., are described and their morphological characters are illustrated. A key for identification of the Charipinae already known from the north-western Balkan Peninsula is provided.

Key words. Hymenoptera, Cynipoidea, Figitidae, Charipinae, *Alloxysta*, new species, new records, aphid, parasitoids, Aphidiinae, hyperparasitoid, Balkan, Montenegro, Serbia, Slovenia, Palaearctic Region

Introduction

Many aphid species (Hemiptera: Aphididae) are considered serious pests of a variety of cultivated plants causing damage, either directly or by transmission of viruses (van Emden & Harrington 2007). Among natural enemies, parasitoids have a significant impact in reduction of aphid populations (Hughes 1989, Hagvar & Hofsvang 1991). The efficiency of primary parasitoids is generally impaired by the activity of different hyperparasitoids (Sullivan 1988). Members of the subfamily Charipinae (Hymenoptera: Figitidae) are considered the most common and specialized aphid hyperparasitoids (Carver 1992). They are biologically characterized by being hyperparasitoids of aphids via Aphidiinae (Hymenoptera: Ichneumonoidea: Braconidae) and Aphelininae (Hymenoptera: Chalcidoidea: Aphelinidae) (Menke & Evenhuis 1991). Activity of Charipinae hyperparasitoids can modify the efficiency of these biological control agents in at least three ways: (i) increasing mortality of the primary parasitoid; (ii) increasing the growth rate of the aphid population indirectly; and (iii) increasing the propensity for primary parasitoids to disperse (van Veen et al. 2001).

Species of the genus *Alloxysta* Förster, 1869 are the most numerous and taxonomically the most complicated group within the subfamily Charipinae. Until now, 111 valid species of this genus have been recognized (Ferrer-Suay et al. 2012). *Alloxysta* species are morphologically characterized by their small size, with a smooth and shiny body. The original descriptions for the majority of *Alloxysta* species are very superficial and mainly based on irrelevant features providing no diagnostic characters for separation of different species. Recent studies focused on this genus (Ferrer-Suay et al. 2011a,b, 2013, in press) have led to the improvement of taxonomic and distributional knowledge, providing new records, new synonyms and describing new species.

While many attempts have been performed on biosystematics of aphid primary parasitoids in Serbia, Montenegro and Slovenia (Starý et al. 1998; Kavallieratos & Tomanović 2001; Tomanović 2000; Tomanović & Brajković 2001; Tomanović & Kavallieratos 2004; Tomanović et al. 2005, 2007; Kos et al. 2011), very little information has been published about Charipinae (Tomanović et al. 2008). Up to now only one paper has focused on the Charipinae fauna from the Balkan Peninsula (Vasileva-Sumnalieva 1976). In this study seven Charipinae species were recorded: *Alloxysta erythrothorax* (Hartig, 1840), *A. macrophadna* (Hartig, 1841), *A. nigrita* (Thomson, 1862), *A. postica* (Hartig, 1841), *A. ullrichi* (Giraud, 1860), *Apocharips trapezoidea* (Hartig, 1841), and *Phaenoglyphis villosa* (Hartig, 1841). Additionally, the sporadically published information about Charipinae from the neighboring countries in southeastern Europe (Ferrer-Suay et al. 2012) clearly indicates the necessity for further investigation of this diverse but poorly known group.

The aim of this study is to survey the aphid hyperparasitoids of the Balkan Peninsula belonging to the *Alloxysta* genus from a wide range of habitats and when possible try to elucidate the patterns of host associations (host plant-aphid-primary parasitoid-hyperparasitoid). Here, we present new species records of the genus *Alloxysta* from the Balkan Peninsula as well as description of two new species from the region.

Materials and methods

Samples from plants bearing aphid colonies consisting of both live and mummified aphids were collected from 31 localities (Table 1) mainly from cultivated areas in Serbia, Montenegro and Slovenia. Samplings were performed irregularly over a period of thirteen years during 1999–2012. Plants were pressed, prepared on herbarium sheets and later identified. Aphids were preserved in 90% ethyl-alcohol and 75% lactic acid 2:1 (Eastop & van Emden 1972). Rearing boxes containing the samples were kept in an air-conditioned room (22°C) until emergence of primary parasitoids and hyperparasitoids. Emerged specimens were preserved in ethanol for further identification in the laboratory. All the associated material including host plants, host aphids and primary parasitoids were separately identified to prepare the background data for identification of *Alloxysta* specimens.

The external morphology of *Alloxysta* specimens was studied using a stereo-microscope (NIKON SMZ-1) and an environmental scanning electron microscope (FEI Quanta 200 ESEM). A field-emission gun environmental scanning electron microscope was also used for high-resolution imaging without gold-coating of the specimens. Material studied here is deposited in the University of Barcelona (UB) (coll. Pujade-Villar) or in the Institute of Zoology, Faculty of Biology, University of Belgrade (IZFBUB).

Terminology of the morphological characters follows Paretas-Martínez et al. (2007). Measurements and abbreviations include F1–F12, first and subsequent flagellomeres. The width of the forewing radial cell is measured from the margin of the wing to the beginning of Rs vein. The transfacial line is measured as the distance between the inner margins of compound eyes, measured across the face through the antennal sockets divided by the height of the eye. The malar space is measured by the distance from the lower part of the gena from the mouthparts to the ventral margin of the compound eye, divided by height of the eye. Females and males of all species are briefly described. General features of *Alloxysta* are shown in Figs 1–4. Variation in the morphology of the radial cell, antenna, pronotum and propodeum are shown in Figs 5–28, respectively. The important diagnostic characters of the two new species are presented in Figs 29 to 38.

Results

Twelve species of the genus *Alloxysta* were collected and identified from the Balkan Peninsula, of which nine species are here recorded for the first time. Two new species are also described and the diagnostic characters are discussed in detail. The newly recorded species are marked with an asterisk (*). These species are briefly described and compared with other similar species of *Alloxysta* which are present in this region.

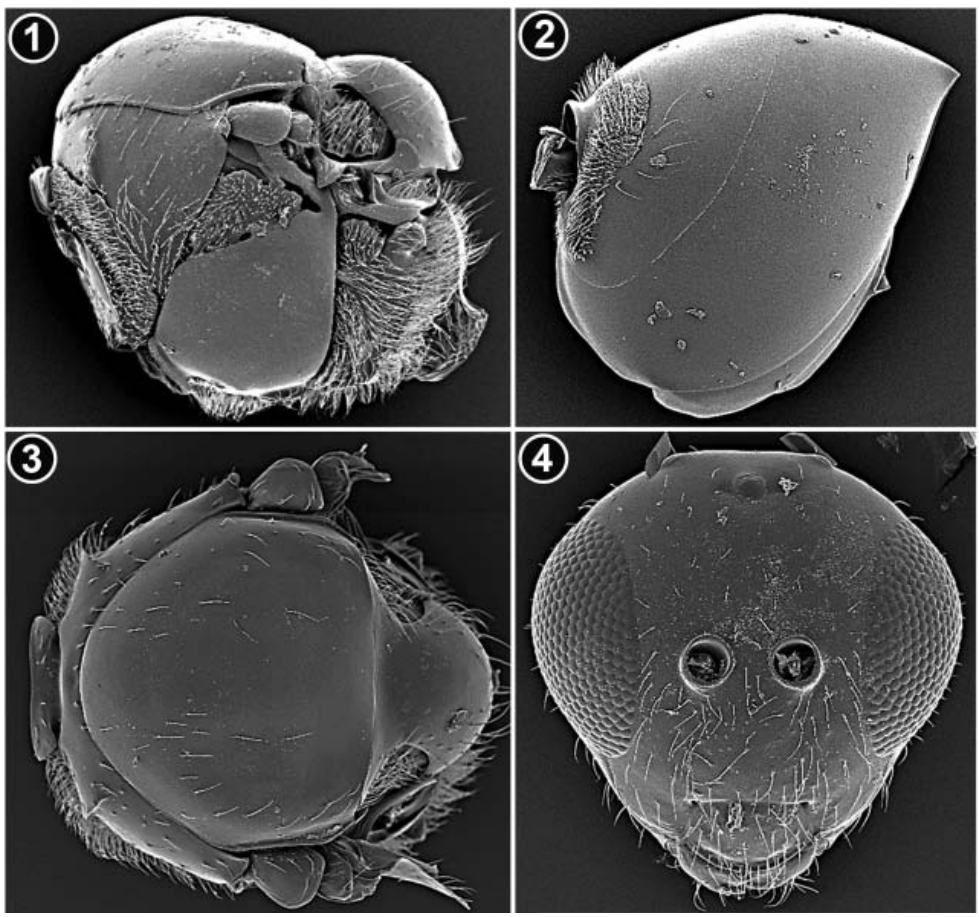
**Alloxysta arcuata* (Kieffer, 1902)

Material examined (14 ♂♂ 21 ♀♀). **SERBIA:** *Aphidius matricariae* Haliday, 1834 – *Brachycaudus helichrysi* (Kaltenbach, 1843) on *Stenactis annua*, Slanci-Brdo, 9.v.2007: 5 ♀♀; *Ephedrus plagiator* (Nees, 1811) – *Rhopalosiphum padi* (Linnaeus, 1758) on *Triticum aestivum*, Slanci-Brdo, 29.v.2007: 1 ♂ 1 ♀; *Monoctonus ligustri* van Achterberg, 1989 – *Myzus ligustri* (Mosley, 1841) on *Ligustrum vulgare*, Slanci-Brdo, 29.v.2007: 1 ♂; unknown

primary parasitoid – *Aphis craccivora* Koch, 1854 on *Medicago sativa*, Čenta, 5.vi.2011: 1 ♂ 1 ♀; Vodanj-Ralja, 8.vi.2012: 1 ♀; unknown primary parasitoid – *Aphis fabae* Scopoli, 1763 on *Cirsium arvense*, Umčari-Donji Kraj, 7.vi.2012: 3 ♂♂; Živkovac-Site 1, 8.vi.2012: 1 ♂ 6 ♀♀. **SLOVENIA:** *Aphidius* sp. – *Uroleucon* sp. on *Helianthus annuus*, Nova Gorica, 30.ix.2008: 6 ♂♂ 3 ♀♀; unknown aphid and primary parasitoids on *Tussilago farfara*, Slap-Vipava, 4.vi.2009: 1 ♀. [9 ♂♂ and 14 ♀♀ deposited in UB, 5 ♂♂ and 7 ♀♀ deposited in IZFBUB].

Diagnosis. *Alloxysta arcuata* is easily recognizable from the other Charipinae species present in the Balkan Peninsula based on its closed radial cell, carination of pronotum, and propodeal plate.

Short redescription. Head yellowish brown, mesosoma and metasoma dark brown; scape, pedicel, F1 and F2 light brown, rest of flagellomeres yellowish brown; legs yellow; veins yellowish brown. Female antennae 13-segmented; F1 and F2 smooth, thinner than remaining flagellomeres, F3–F11 club-shaped (more evident from F4), with rhinaria; F1 subequal to



Figs 1–4. General features of *Alloxysta* species. 1 – mesosoma, lateral view; 2 – metasoma, lateral view; 3 – mesoscutum, dorsal view; 4 – head, frontal view.

pedicel, F1 longer than F2, F2 subequal to F3, F3 shorter than F4 (Fig. 19). Male antennae 14-segmented; F1 smooth and thinner than remaining flagellomeres, F2–F12 with rhinaria, club-shaped; F1 straight, longer than pedicel and subequal to F2; F2 slightly curved, shorter than F3, F3 shorter than F4. Pronotal carinae present, clearly visible under the pubescence (Fig. 27). Propodeum covered with abundant setae; with two carinae forming a plate separated by few setae on top, with sides slightly curved (Fig. 25). Forewing longer than body; radial cell closed; 2.2 times as long as wide in both male and female (Fig. 11).
Distribution. Palaearctic and Neotropical Region. New record for Serbia and Slovenia.

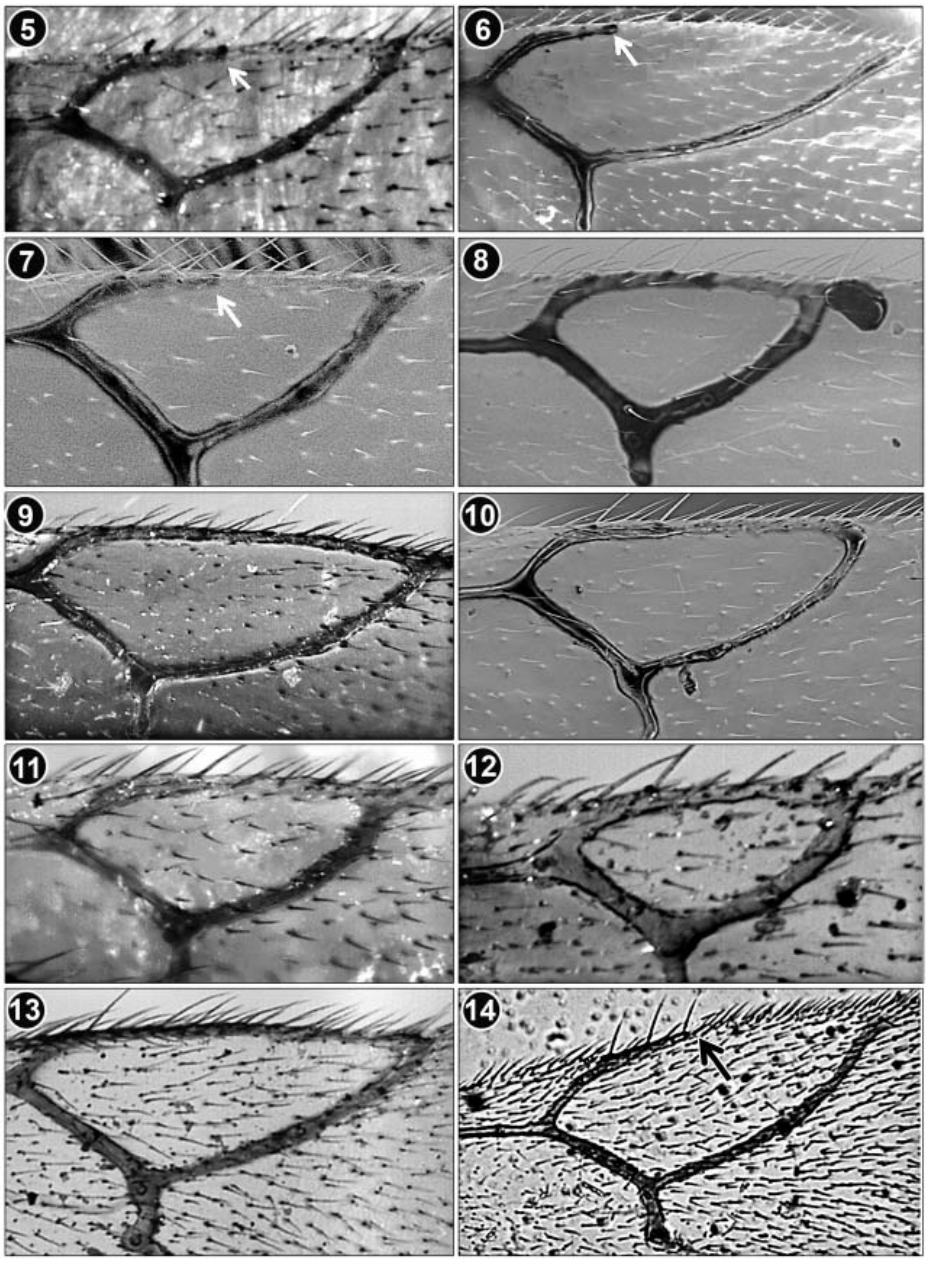
**Alloxysta brevis* (Thomson, 1862)

Material examined (22 ♂♂ 36 ♀♀). **SERBIA:** *Aphidius matricariae* – *Semiaphis dauci* (Fabricius, 1775) on *Daucus carota*, Slanci-Brdo, 8.v.2007: 5 ♀♀; *Lysiphlebus* sp. – *Aphis craccivora* on *Medicago sativa*, Baranda, 7.ix.2011: 1 ♀; *Lysiphlebus* sp. – *Aphis fabae cirsiiacanthoidis* Scopoli, 1763 on *Cirsium arvense*, Padinska Skela, 14.v.2007: 2 ♀♀; *Praon necans* Makacuer, 1959 – *Rhopalosiphum nymphaeae* (Linnaeus, 1761) on *Typha latifolia*, Padinska Skela, 14.v.2007: 13 ♂♂ 6 ♀♀; unknown primary parasitoid – *Aphis nasturtii* Kaltenbach, 1843 on *Rumex crispus*, Padinska skela, 8.vi.2007: 1 ♀; unknown primary parasitoid – *Aphis fabae cirsiiacanthoidis* on *Cirsium arvense*, Umčari-Donji Kraj, 8.vi.2012: 2 ♂♂ 4 ♀♀; Živkovac-Site 1, 8.vi.2012: 5 ♂♂ 11 ♀♀. **SLOVENIA:** *Aphidius rosae* Haliday, 1834 – *Macrosiphum rosae* (Linnaeus, 1758) on *Rosa cannina*, Nova Gorica, 8.v.2008: 1 ♂♂ 4 ♀♀; *Aphidius* spp. – *Sitobion avenae* (Fabricius, 1775) and *Rhopalosiphum padi* on *Zea mays*, Slap ob Idrijci, 16.vi.2009: 1 ♀; *Praon abjectum* (Haliday, 1833) – *Rhopalosiphum padi* on *Zea mays*, Koper, 17.vi.2009: 1 ♂; unknown primary parasitoid – *Uroleucon* sp. on *Cichorium endivia*, Brnik, 7.x.2008: 1 ♀. [14 ♂♂ and 26 ♀♀ deposited in UB, 8 ♂♂ and 10 ♀♀ deposited in IZFBUB].

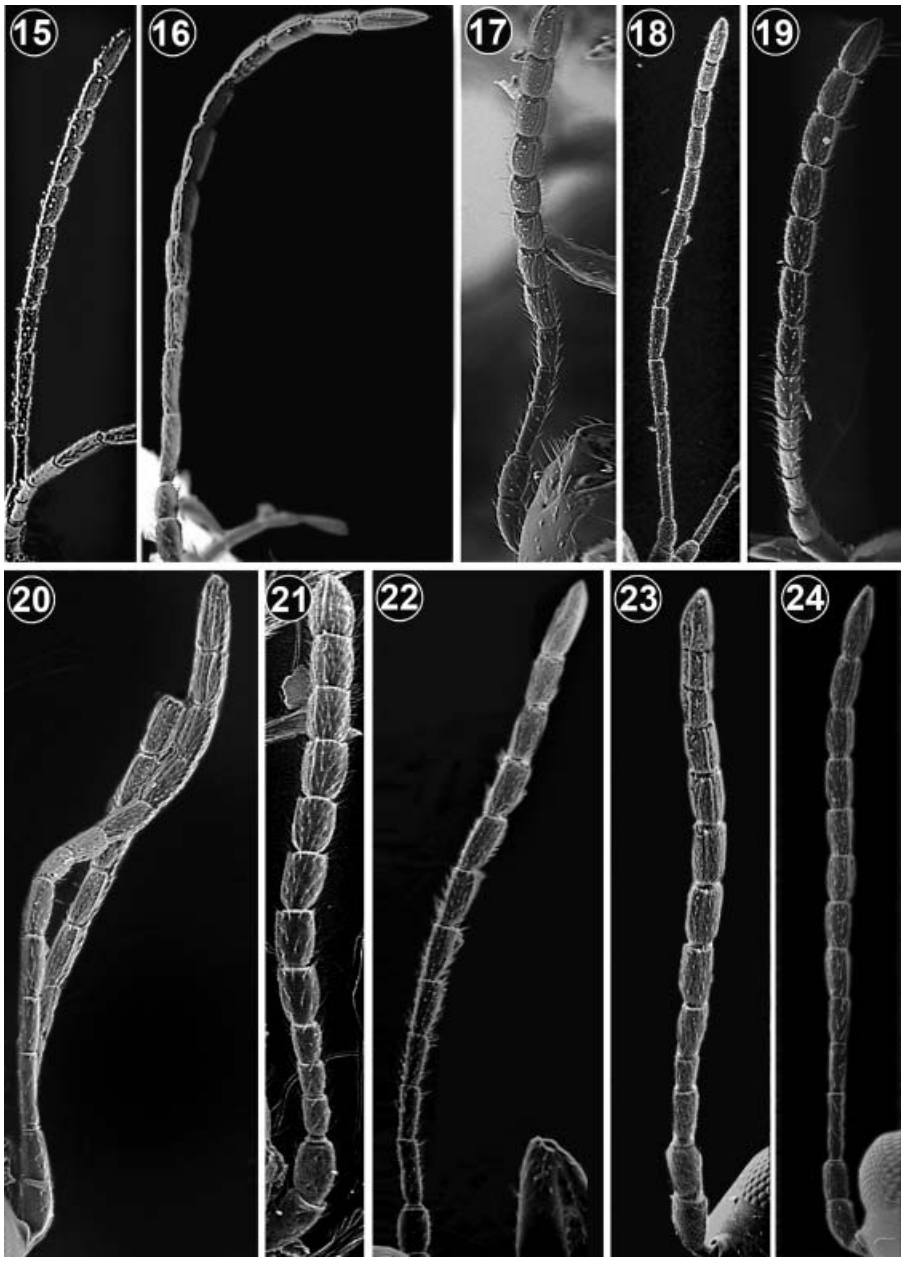
Diagnosis. *Alloxysta brevis* is easily distinguishable from the other Charipinae species present in the Balkans because it is the only species with closed radial cell that lacks pronotal carinae, F1 shorter than pedicel, and F1–F3 subequal in length.
Short redescription. Head yellowish brown, mesosoma and metasoma dark brown; scape, pedicel, F1–F3 yellow, F4–F11 brown; legs yellowish; veins yellowish brown. Female antennae 13-segmented; F1–F3 smooth and thinner than remaining ones, F4–F11 with rhinaria, club-shaped; F1 shorter than pedicel, F1–F3 subequal in width and length, F3 shorter than F4 (Fig. 21). Male antennae 14-segmented; as in female without any curved flagellomere. Pronotum covered with sparse setae, without carinae (Fig. 28). Propodeum covered with abundant pubescence with two carinae, separated by few setae and forming a plate in the lower two-thirds, sides slightly curved. Forewing longer than body; radial cell closed, 2.1 times as long as wide (Fig. 12).
Distribution. Palaearctic and Neotropical Region. New record for Serbia and Slovenia.

**Alloxysta castanea* (Hartig, 1841)

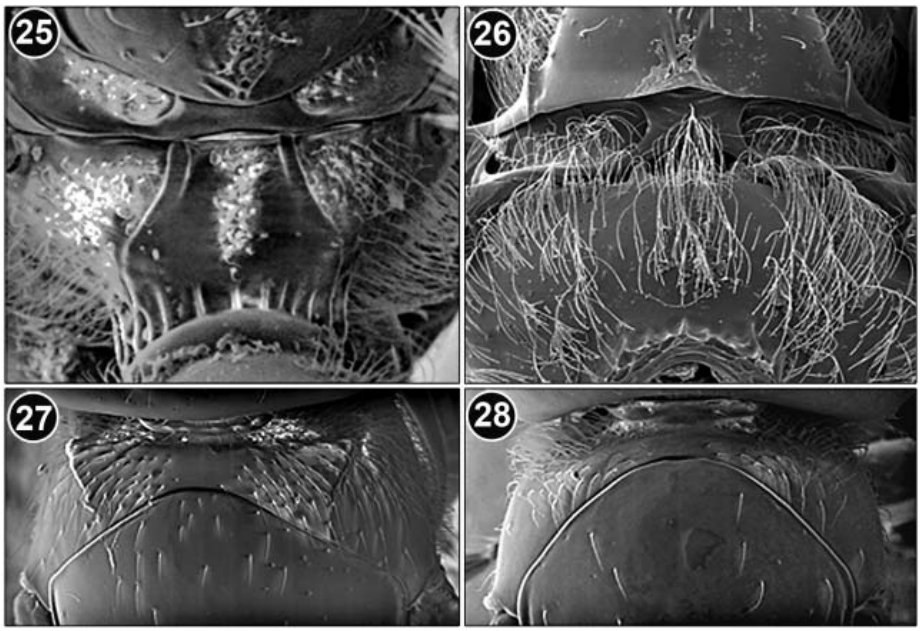
Material examined (9 ♀♀). **MONTENEGRO:** *Aphidius sussi* Pennacchio & Tremblay, 1989 – *Delphinobium junackianum* (Karsch, 1887) on *Aconitum toxicum*, Mt. Durmitor, Crno jezero, 15.viii.2000: 1 ♀; *Aphidius sussi* – *Delphinobium junackianum* on *Aconitum toxicum*, Mt. Durmitor, Crno jezero, 13.vii.2000, 19.vii.2000: 2 ♀♀. **SERBIA:** *Aphidius sussi* – *Delphinobium junackianum* on *Aconitum toxicum*, Mt. Kopaonik-Čeline, 2.vii.1999, 20.vii.1999: 2 ♀♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Umčari-Klaino, 13.vi.2012: 2 ♀♀. **SLOVENIA:** unknown primary parasitoid and host aphid on *Holcus lanatus*, Velika planina, 7.vi.2008: 1 ♀; *Binodoxys angelicae* (Haliday, 1833) – *Aphis pomi* de Geer, 1773 on *Malus domestica*, Kromberk, 8.v.2008: 1 ♀. [6 ♀♀ deposited in UB, 3 ♀♀ deposited in IZFBUB].



Figs 5–14. Types of radial cell in forewing of *Alloxysta* species. 5 – *A. castanea* (Hartig, 1841); 6 – *A. macrophadna* (Hartig, 1841); 7 – *A. pleuralis* (Cameron, 1879); 8 – *A. mullensis* (Cameron, 1883); 9 – *A. victrix* (Westwood, 1833); 10 – *A. fracticornis* (Thomson, 1862); 11 – *A. arcuata* (Kieffer, 1902); 12 – *A. brevis* (Thomson, 1862); 13 – *A. fuscicornis* (Hartig, 1841); 14 – *A. salicicola* Belizin, 1973.



Figs 15–24. Antenna of *Alloxysta* species. 15 – *A. castanea* (Hartig, 1841); 16 – *A. macrophadna* (Hartig, 1841); 17 – *A. mullensis* (Cameron, 1883); 18 – *A. victrix* (Westwood, 1833); 19 – *A. arcuata* (Kieffer, 1902); 20 – *A. fracticornis* (Thomson, 1862); 21 – *A. brevis* (Thomson, 1862); 22 – *A. fuscicornis* (Hartig, 1841); 23 – *A. pleuralis* (Cameron, 1879); 24 – *A. salicicola* Belizin, 1973.



Figs 25–28. Types of propodeum and pronotum in *Alloxysta* species. 25 – propodeum of *A. arcuata* (Kieffer, 1902); 26 – propodeum of *A. victrix* (Westwood, 1833); 27 – pronotum of *A. arcuata*; 28 – pronotum of *A. brevis* (Thomson, 1862).

Diagnosis. *Alloxysta castanea* has partially open radial cell (Fig. 5) and pronotal and propodeal carinae present. It is similar to *A. pleuralis*, but they can be easily differentiated by the shape of propodeal carinae, which form a plate in *A. castanea* but are well defined and reaches the base independently in *A. pleuralis*.

Short redescription. Head yellowish brown, mesosoma brown, metasoma dark brown; scape, pedicel, F1 and F2 yellow, F3–F11 brown; legs yellow; veins yellowish brown. Female antennae 13-segmented; F1 and F2 smooth and thinner than other segments, F3–F11 club-shaped, with rhinaria; F1 longer than pedicel and F2, F2–F4 subequal in length (Fig. 15). Male antennae 14-segmented; as female but with F1 and F2 slightly curved. Pronotum densely pubescent with two carinae clearly visible. Propodeum densely covered with long setae bearing a pair of carinae forming a plate with slightly curved lateral sides, sparsely setose on the top. Forewing longer than body, radial cell partially open, 2.4 times as long as wide (Fig. 5).

Distribution. Palaearctic Region. New record from Serbia, Slovenia and Montenegro.

**Alloxysta fracticornis* (Thomson, 1862)

Material examined (15 ♂♂ 31 ♀♀). **SERBIA:** *Aphidius funebris* Mackauer, 1961 – *Uroleucon* sp. on *Crepis* sp., Jakovački Ključ, 7.v.2007: 1 ♀; unknown aphid and primary parasitoid on *Medicago sativa*, Dunavac, 31.v.2011: 2 ♀♀; *Praon exsoletum* (Nees, 1811) – *Therioaphis trifolii* (Monell, 1882) on *Medicago sativa*, Besni fok, 13.vi.2011: 2 ♂♂; unknown aphid and primary parasitoid on *Medicago sativa*, Kovilovo, 15.ix.2011: 1 ♂; unknown aphid and

primary parasitoid on *Medicago sativa*, Padinska Skela, 26.v.2011, 9.vi.2010: 2 ♀♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Mihajlovac, 16.vi.2012: 1 ♀; Umčari-Donji Kraj, 10.vi.2012: 3 ♂♂ 1 ♀; 12.vi.2012: 2 ♂♂ 6 ♀♀; Umčari-Parloge, 10.vi.2012: 1 ♀; Umčari-Kotlova, 12.vi.2012: 2 ♂♂ 2 ♀♀; 15.vi.2012: 2 ♂♂ 1 ♀; Živkovac-Site 1, 14.vi.2012: 1 ♂ 2 ♀♀; 16.vi.2012: 1 ♀; Vodanj-Ralja, 18.vi.2012: 1 ♀; Živkovac-Site 1, 7.vi.2012: 1 ♀. **SLOVENIA:** *Aphidius ervi* Haliday, 1834, *Aphidius rhopalosiphi* de Stefani-Perez, 1902 and *Ephedrus plagiator* – *Sitobion avenae* on *Triticum aestivum*, Ljubljana, 20.v.2009: 1 ♀; *Aphidius funebris* – *Uroleucon cichorii* (Koch, 1855) on *Cichorium intybus*, Koper, 17.vi.2009: 2 ♀♀; *Aphidius* sp. – *Sitobion avenae* on *Avena sativa*, Koper, 17.vi.2009: 1 ♀; unknown primary parasitoid – *Phorodon humuli* (Schrank, 1801) on *Prunus domestica*, Nova Gorica, Kromberk, 8.v.2008: 1 ♂ 4 ♀♀; unknown aphid and primary parasitoid on *Leontodon hispidus*, Šempeter, 17.vi.2009: 1 ♂; unknown plant, aphid and primary parasitoid, Ljubljana, 3.vi.2011: 1 ♀. [13♂♂ and 24 ♀♀ deposited in UB, 2 ♂♂ and 7 ♀♀ deposited in IZFBUB].

Diagnosis. *Alloxysta fracticornis* has closed radial cell, propodeal plate and no pronotal carinae. It is similar to *A. mullensis*, but they can be easily differentiated by the proportions of the lengths of flagellomeres: F1 longer than pedicel and F1–F3 subequal in length in *A. fracticornis* (Fig. 20), while F1 subequal to pedicel, F1 longer than F2, and F2 subequal to F3 in *A. mullensis* (Fig. 17).

Short redescription. Head, mesosoma and metasoma brown; antennae yellow, darkening towards the end; legs yellow; veins nearly transparent. Female antennae 13-segmented; F1–F2 smooth and thinner than remaining ones, F3–F11 club-shaped, with rhinaria; F1 longer than pedicel. F1–F3 subequal in length, F3 shorter than F4 (Fig. 20). Male antennae 14-segmented; F1–F2 smooth and thinner than remaining ones, F3–F12 club-shaped, with rhinaria; F1 longer than pedicel. F1–F3 subequal in length, F3 longer than F4. Pronotum covered with abundant setae without visible carinae. Propodeum covered with abundant setae with two straight carinae joining at the base. Forewing longer than body; radial cell closed, 2.2 times as long as wide (Fig. 10).

Distribution. Palaearctic Region. New records from Serbia and Slovenia.

**Alloxysta fuscicornis* (Hartig, 1841)

Material examined (6 ♀♀). **SERBIA:** *Praon exsoletum* – *Therioaphis trifolii* (Monell, 1882) on *Medicago sativa*, Kovilovo, 16.vi.2010 and 3.vi.2011: 2 ♀♀; Umčari-Donji Kraj, 8.vi.2012: 1 ♀; Osipaonica, 11.vi.2012: 1 ♀; Živkovac-Site 1, 16.vi.2012: 1 ♀; unknown primary parasitoid – *Uroleucon* sp. on *Crepis* sp., Jakovački Ključ, 7.v.2007: 1 ♀. [5 ♀♀ deposited in UB and 1 ♀ deposited in IZFBUB].

Diagnosis. *Alloxysta fuscicornis* is mainly characterized by closed radial cell, pronotal carinae, and smooth propodeum. It is similar to *A. victrix*, but they can be easily differentiated by (i) the size of radial cell: the radial cell of *A. fuscicornis* is 2.7 times as long as wide (Fig. 13) while the radial cell is 3.0 times as long as wide in *A. victrix* (Fig. 9), and by (ii) the setation on propodeum: *A. fuscicornis* has the propodeum completely covered with dense setae while in *A. victrix* the propodeum lacks setae at the longitudinal area whereas the carinae are present in other Charipinae.

Short redescription. Head, mesosoma and metasoma brown; scape, pedicel, F1 and F2 yellow and F3–F12 yellowish brown; legs yellow; veins brown. Female antennae 13-segmented; F1–F3 smooth and thinner than remaining ones, F4–F12 club-shaped, with rhinaria; F1 longer than pedicel and F2, F2 longer than F3, F3 shorter than F4 (Fig. 22). Male antennae 14-segmented; with the same proportions as in female but F1–F3 bowed (F1 slightly bowed

while F2 and F3 clearly bowed). Pronotum covered with setae with two carinae present and clearly visible. Propodeum with abundant setae and without carinae. Forewing longer than body; radial cell closed, 2.7 times as long as wide (Fig. 13).
Distribution. Cosmopolitan. New record from Serbia.

Alloxysta kovilovica Ferrer-Suay & Pujade-Villar sp. nov.
(Figs 29–33)

Type locality. Serbia, Kovilovo, 44°54′48.87″ N, 20°25′43.31″ E.
Type specimens. Holotype: ♀, glued, deposited in UB. Original label: 14.vi.2010, alfalfa field, complex landscape, Kovilovo, Serbia, *Alloxysta brevis* (Thomson), ♀, det. A. Stojanović, 2012. The holotype was collected from mixed colony of *Therioaphis trifolii* and *Acyrthosiphon pisum* (Harris, 1776) on *Medicago sativa*. Paratypes: 1 ♂♂ 7 ♀♀. **SERBIA:** *Praon exsoletum – Therioaphis trifolii* on *Medicago sativa*, Živkovac-Site 2 , 3.vi.2012: 1 ♀; Same data, Umčari-Kotlova, 9.vi.2012: 1 ♂ 1 ♀; same data, Osipaonica, 11.vi.2012: 1 ♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Umčari-Donji Kraj, 12.vi.2012: 4 ♀♀. [All material deposited in UB].

Diagnosis. *Alloxysta kovilovica* sp. nov. is characterized by closed radial cell (Figs 29, 31), while pronotal (Fig. 32) and propodeal (Fig. 33) carinae are absent. It is similar to *A. aperta* (Hartig, 1841) but they can be easily differentiated by the relation between flagellomeres: F1 longer than F2 and F3 in *A. kovilovica* sp. nov. while F1–F3 subequal in length in *A. aperta*.
Description. ***Female.*** *Head*. Transversely ovate, smooth and shiny, slightly wider than its height in frontal view. Few setae present below, and between the toruli. The area above the toruli and vertex with few scattered setae, face with numerous setae. Transfacial line 1.0 times height of compound eyes. Malar space 0.4 times height of compound eyes.

Antenna. 13-segmented, filiform. All antennomeres with sparse setae. F1–F2 smooth and thinner than remaining flagellomeres; F3–F11 club-shaped, with rhinaria. Antennal formula: 3.5 (1.5); 4.0 (1.0); 3.5 (1.1); 3.5 (1.2); 4.0 (1.4) (Fig. 30).

Mesosoma. Pronotum covered with scattered setae, without carinae (Fig. 32). Mesoscutum smooth and shiny, round in dorsal view with few scattered setae, and two lines of setae on lateral sides. Scutellum smooth and shiny with scattered setae that are more abundant on apex of scutellum. Height of mesopleural triangle along anterior margin 1.4 times the height of mesopleuron. Propodeum covered with numerous setae; without carinae (Fig. 33).

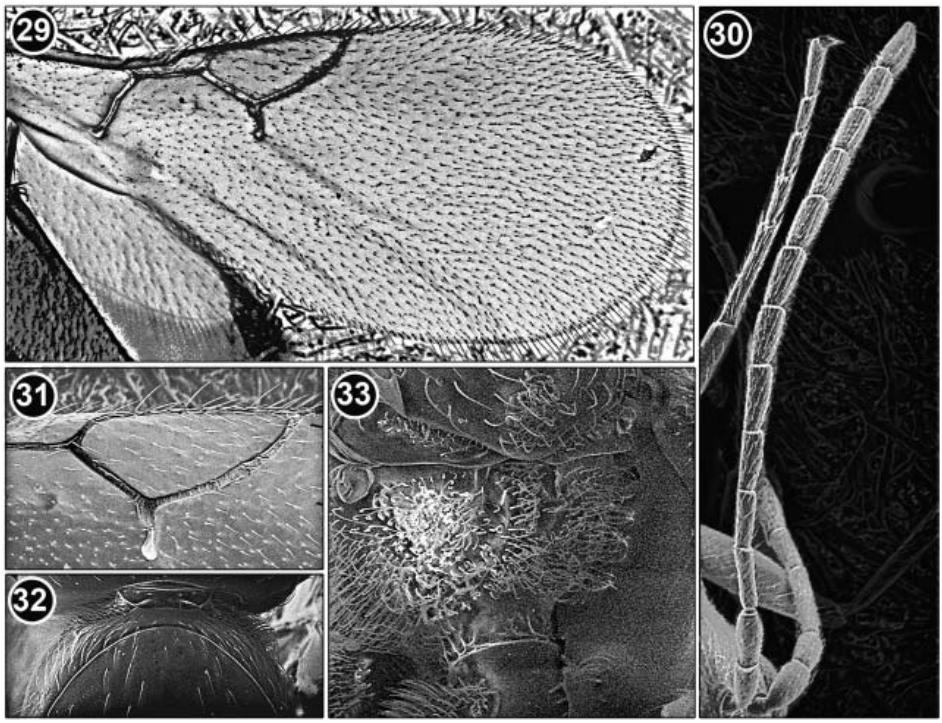
Forewing. Longer than body, 1.4 times as long as mesosoma and metasoma together; densely pubescent; marginal setae present (Fig. 29). Radial cell closed, 2.5 times as long as wide (Fig. 31). R1 short and slightly curved upward; Rs considerably elongated, slightly curved.

Metasoma. Proximal part with incomplete ring of setae, glabrous centrally, laterally broader. Remainder of metasoma smooth, shiny with clearly visible terga.

Body length. Female: 1.1 mm.

Coloration. Head, mesosoma and metasoma yellowish brown. Antennae yellow, darkening towards tip. Legs yellow. Veins yellowish brown.

Male. With the same features as female.
Etymology. The new species is named after Kovilovo, the suburban settlement of Belgrade; adjective.
Distribution. This species is only known from Serbia.



Figs 29–33. *Alloxysta kovilovica* Ferrer-Suay & Pujade-Villar sp. nov. 29 – forewing; 30 – antenna; 31 – radial cell; 32 – pronotum; 33 – propodeum.

Remarks. On the basis of extensive sampling in alfalfa and cereal agroecosystems, as well as in surrounding non-crop habitats, it seems that the new species was associated with cereal and alfalfa aphids.

**Alloxysta macrophadna* (Hartig, 1841)

Material examined (3 ♀♀). **MONTENEGRO:** *Aphidius sussi – Delphinobium junackianum* on *Aconitum toxicum* Crno jezero, 19.vii.2000: 1 ♀. **SERBIA:** unknown aphid and primary parasitoid on *Medicago sativa*, Besni Fok, 13.vi.2011, 6.x.2011: 2 ♀♀. [2 ♀♀ deposited in UB, 1 ♀ deposited in IZFBUB].

Diagnosis. *Alloxysta macrophadna* is characterized by partially open radial cell, presence of pronotal carinae, and absence of propodeal carinae. In Serbia and Montenegro it is similar to *A. salicicola*, but they can be easily differentiated by (i) the proportion of the lengths of flagellomeres: F2–F4 not subequal in *A. macrophadna* (Fig. 16) but subequal in *A. salicicola* (Fig. 24); and by (ii) size of radial cell: 3.3 times as long as wide in *A. macrophadna* (Fig. 6) whereas it is 2.6 times as long as wide in *A. salicicola* (Fig. 14).

Short redescription. Head yellowish red, mesosoma and metasoma dark brown; scape, pedicel and F1–F3 yellow, the remaining ones brown yellowish; legs yellow; veins dark brown.

Female antennae 13-segmented; F1–F3 smooth and thinner than remaining ones, F4–F11 club-shaped, with rhinaria; F1 longer than pedicel, F1 longer than F2, F2 shorter than F3, and F3 shorter than F4 (Fig. 16). Male antennae 14-segmented; F1–F2 smooth and thinner than remaining ones, F3–F12 club-shaped, with rhinaria; F2 and F3 clearly curved; F1 longer than pedicel, F1 subequal to F2, F2 longer than F3, and F3 longer than F4. Pronotum densely covered with short setae, with two long carinae under the pubescence. Propodeum without carinae, densely covered by setae. Forewing longer than body, radial cell partially open, 3.3 times as long as wide (Fig. 6).

Distribution. Palaearctic Region. New record from Montenegro.

**Alloxysta mullensis* (Cameron, 1883)

Material examined (1 ♂ 6 ♀♀). **MONTENEGRO**: *Aphidius* spp. – *Acyrthosiphon malvae* (Mosley, 1841) on *Salix retusa*, Mali Medjed, 18.vii.2000: 1 ♀. **SLOVENIA**: *Aphidius ervi*, *Aphidius rhopalosiphi* and *Ephedrus plagiator* – *Sitobion avenae* on *Triticum aestivum*, Ljubljana, 20.v.2009: 1 ♀; *Aphidius matricariae* – *Aphis intybi* Koch, 1855 on *Cichorium* sp., Zalog, 11.x.2008: 1 ♂; *Binodoxys angelicae* – *Aphis fabae solanella* Theobald, 1914 on *Solanum nigrum*, Zalog, 11.x.2008: 1 ♀; *Lysiphlebus testaceipes* (Cresson, 1880) – *Aphis nerii* Boyer de Fonscolombe, 1841 on *Nerium oleander*, Portorož, 17.vi.2009: 2 ♀♀. [1 ♂ and 4 ♀♀ deposited in UB, 2 ♀♀ deposited in IZFBUB].

Diagnosis. *Alloxysta mullensis* has a closed radial cell, a propodeal plate, and no pronotal carinae. It is similar to *A. fracticornis*, but they can be easily differentiated by the proportions of the length of flagellomeres: F1 subequal to pedicel, F1 longer than F2, and F2 subequal to F3 in *A. mullensis* (Fig. 17), while F1 longer than pedicel, F1–F3 subequal in length in *A. fracticornis* (Fig. 20).

Short redescription. Head brown, mesosoma and metasoma dark brown; scape, pedicel and F1–F3 dark yellow, F4–F11 yellowish brown; legs and veins yellow. Female antennae 13-segmented; F1–F3 smooth and thinner than remaining ones, F4–F11 club-shaped, with rhinaria; pedicel subequal to F1, F1 longer than F2, F2 subequal to F3, F3 shorter than F4 (Fig. 17). Male antennae 14-segmented; as female without any flagellomere curved. Pronotum covered with sparse setae, carinae absent. Propodeum with abundant pubescence, two carinae present forming a plate with sides slightly curved. Forewing longer than body, radial cell closed, 2.2 times as long as wide (Fig. 8).

Distribution. Palaearctic Region. New record from Slovenia and Montenegro.

**Alloxysta pleuralis* (Cameron, 1879)

Material examined (9 ♂♂ 38 ♀♀). **SERBIA:** *Aphidius matricariae* – *Aphis triglochinis* Theobald, 1926 on *Rorripa silvestris*, Padinska Skela, 8.vi.2007: 5 ♂♂ 14 ♀♀; *Lysiphlebus fabarum* (Marshall, 1896) – *Aphis urticata* Gmelin, 1790 on *Urtica dioica*, Slanci-Brdo, 29.v.2007: 2 ♀♀; *Lysiphlebus fabarum* and *Binodoxys angelicae* – *Aphis fabae* Scopoli, 1763 on *Galium aparine*, Padinska Skela, 14.v.2007: 1 ♂; *Lysiphlebus* sp. – *Aphis fabae cirsiiacanthoidis* on *Cirsium arvense*, Padinska Skela, 8.vi.2007: 1 ♀; unknown primary parasitoid – *Aphis nasturtii* on *Rumex crispus*, Padinska Skela, 8.vi.2007: 1 ♀; unknown primary parasitoid – *Brachycaudus helichrysi* on *Matricaria tenuifolia*, Padinska Skela, 14.v.2007: 1 ♂; unknown primary parasitoid – *Aphis craccivora* on *Medicago sativa*, Vodanj-Ralja, 7.vi.2012: 1 ♀; unknown primary parasitoid – *Aphis fabae* on *Cirsium arvense*, Živkovac-Site 1, 8.vi.2012: 2 ♂♂ 17 ♀♀. **SLOVENIA:** *Aphidius rosae* – *Macrosiphum rosae* on *Knautia arvensis*, Radovljica, 14.vii.2009: 1 ♀; unknown primary parasitoid – *Periphyllus* sp. on *Acer campestre*, Koper, 17.vi.2009: 1 ♀. [6 ♂♂ and 28 ♀♀ deposited in UB, 3 ♂♂ and 10 ♀♀ deposited in IZFBUB].

Diagnosis. *Alloxysta pleuralis* has partially open radial cell (Fig. 7), and pronotal and propodeal carinae. It is similar to *A. castanea*, but can be easily differentiated by the shape of the propodeal carinae, which are well defined and reach the base independently in *A. pleuralis,* but form a plate in *A. castanea*.

Short redescription. Head dark yellow, mesosoma yellowish brown and metasoma dark brown; scape, pedicel, F1–F3 dark yellow and F4–F12 yellowish brown; legs and veins yellowish brown. Female antennae 13-segmented; F1 and F2 smooth and thinner than remaining ones, F3–F11 club-shaped, with rhinaria; F1 subequal to pedicel, F1 longer than F2, F2 shorter than F3, F3 shorter than F4 (Fig. 23). Male antennae 14-segmented; F1–F12 club-shaped, with rhinaria; F1–F3 slightly curved; F1 longer than pedicel, F1–F4 subequal in length. Pronotum covered with setae with two thick carinae clearly visible. Propodeum covered with setae, with two thick well defined carinae reaching the base independently and with curved lateral sides. Forewing longer than body; radial cell partially open, 2.1 times as long as wide (Fig. 7).

Distribution. Palaearctic Region. New record from Serbia and Slovenia.

**Alloxysta salicicola* Belizin, 1973

Material examined (1 ♀). **SLOVENIA:** unknown aphid and primary parasitoid on *Leontodon hispidus*, Šempeter, 17.vi.2009: 1 ♀ deposited in UB.

Diagnosis. *Alloxysta salicicola* is characterized by partially open radial cell (Fig. 14), pronotal carinae, and smooth propodeum. It is similar to *A. macrophadna*, but can be easily differentiated by (i) the proportion of the lengths of flagellomeres: F2–F4 subequal in *A. salicicola* (Fig. 24), but not subequal in *A. macrophadna* (Fig. 16); and by (ii) size of radial cell: 2.6 times as long as wide in *A. salicicola* (Fig. 14) whereas it is 3.3 times as long as wide in *A. macrophadna* (Fig. 6).

Short description. Head, mesosoma and metasoma brown; scape, pedicel and F1 dark yellow, F2–F11 yellowish brown; legs yellow; veins yellowish brown. Female antennae 13-segmented; F1–F2 thinner and smoother than remaining flagellomeres, F3–F11 club-shaped, with rhinaria; F1 longer than pedicel, F1 longer than F2, F2–F4 subequal (Fig. 24). Male unknown. Pronotum covered with numerous setae, with two carinae present. Propodeum smooth, densely haired. Forewing longer than body; radial cell partially open, 2.6 times as long as wide (Fig. 14).

Distribution. Palaearctic Region. New record from Slovenia.

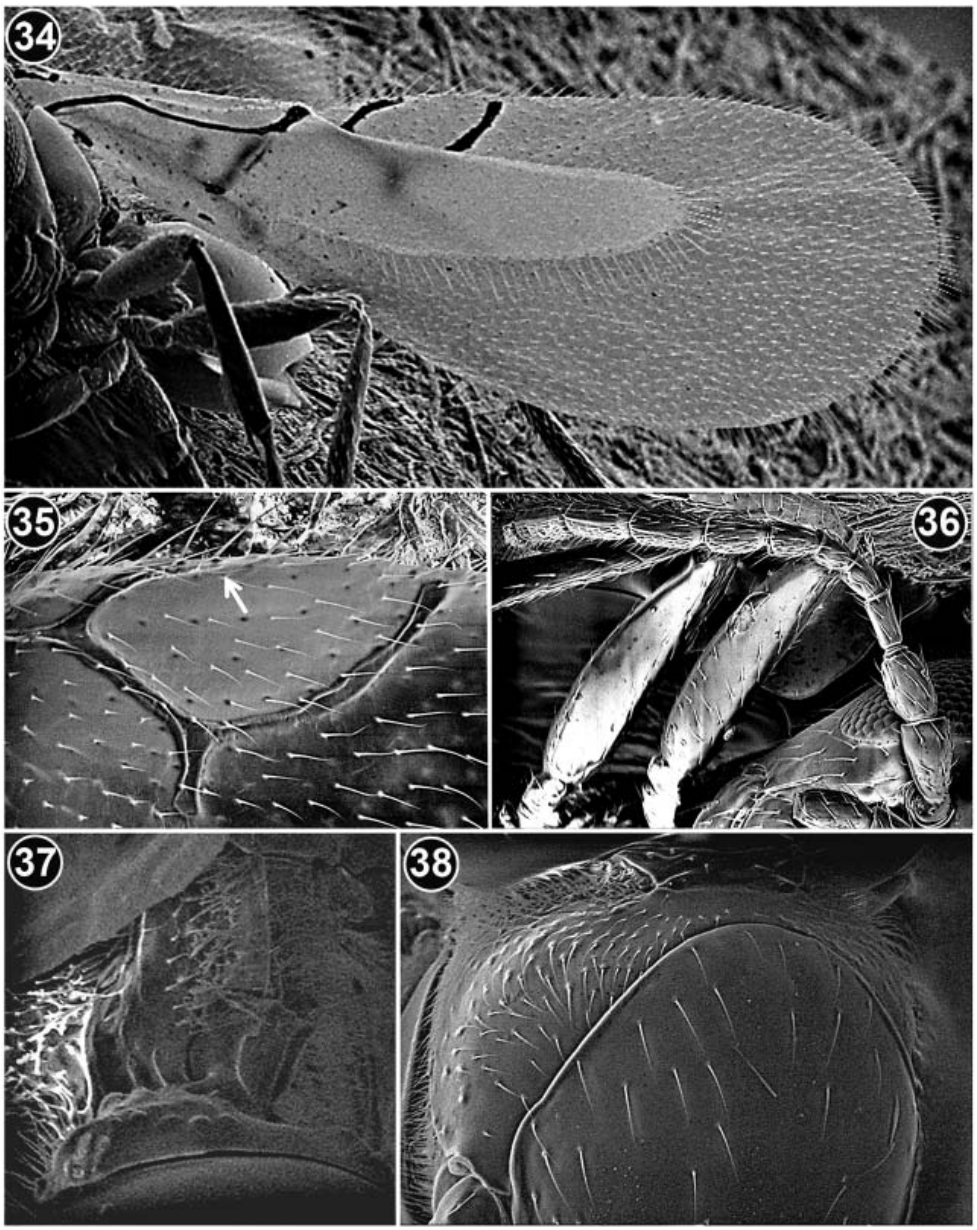
Alloxysta slovenica Ferrer-Suay & Pujade-Villar sp. nov.

(Figs 34–38)

Type locality. Slovenia, Velika planina, 46°18′15.33″ N, 14°38′54.46″ E.

Type specimen. Holotype: ♀, glued, deposited in UB. Original label: VP3 (handwritten), *Alloxysta* sp. det. A. Stojanović. 2011. The holotype was reared from unknown primary parasitoid of *Brachycaudus cardui* (Linnaeus, 1758) on *Cirsium eriophorum*.

Diagnosis. *Alloxysta slovenica* sp. nov. is characterized by partially open radial cell, absence of pronotal carinae, and presence of propodeal carinae which are forming a plate. It is similar



Figs 34–38. *Alloxysta slovenica* Ferrer-Suay & Pujade-Villar sp. nov. 34 – forewing; 35 – radial cell; 36 – antenna; 37 – propodeum; 38 – pronotum.

to *A. rufiventris* (Hartig, 1840) but they can be easily differentiated by the proportion between flagellomeres: F1 shorter than pedicel but longer than F2 and F3 in *A. slovenica* sp. nov. while pedicel and all F1–F3 are subequal in length in *A. rufiventris*.

Description. ***Female.*** *Head*. Transversely ovate, smooth and shiny, slightly wider than high in frontal view. Setae present below and between toruli, the area above toruli without setae, vertex with scattered setae, face with numerous setae. Transfacial line 1.0 times height of compound eye. Malar space 0.4 times height of compound eye.

Antenna. 13-segmented, filiform. All antennomeres with sparse setae. F1–F3 smooth and thinner than remaining flagellomeres; F4–F11 club-shaped, with rhinaria. Antennal formula: 3.5 (2.2); 2.5 (1.2); 2.0 (1.3); 1.8 (1.3); 2.5 (1.5) (Fig. 36).

Mesosoma. Pronotum covered with setae, without carinae (Fig. 38). Mesoscutum smooth and shiny, round in dorsal view with few scattered setae, with two lines of setae on both sides. Scutellum smooth and shiny with scattered setae, which are more abundant on apex of scutellum. Height of mesopleural triangle along anterior margin 1.4 times height of mesopleuron. Propodeum covered with numerous setae; with two carinae forming a plate and few setae present only in the upper half (Fig. 37).

Forewing. Longer than body, 1.4 times as long as mesosoma and metasoma together; covered with dense pubescence; marginal setae present (Fig. 34). Radial cell partially open, 2.2 times as long as wide (Fig. 35). R1 short and slightly curved; Rs long, slightly curved.

Metasoma. Proximal part with incomplete ring of setae, glabrous centrally, laterally broader. Rest of metasoma smooth, shiny with clearly visible terga.

Body length. 1.0 mm.

Coloration. Head, mesosoma and metasoma yellowish brown. Scape yellowish brown, pedicel, F1–F3 dark yellow, F4–F11 yellowish brown. Legs yellow. Veins yellowish brown.

Male. Unknown.

Etymology. The new species is named after the country where it was first found; adjective.

Distribution. This species is known only from Slovenia.

Alloxysta victrix (Westwood, 1833)

Material examined (31 ♂♂ 49 ♀♀). **MONTENEGRO:** *Aphidius sussi – Delphinobium junackianum* on *Aconitum toxicum*, Crno jezero, 16.vii.2000: 1 ♂ 1 ♀. **SERBIA:** *Aphidius sussi – Delphinobium junackianum* on *Aconitum toxicum*, NP Kopaonik, Metodje, 2.vii.1999: 1 ♂ 2 ♀♀; unknown primary parasitoid – *Aphis fabae cirsiiacanthoidis* on *Cirsium arvense*, Malo Orašje, 7.vi.2012: 2 ♀♀; *Aphidius* sp. – *Sitobion avenae* on *Triticum aestivum*, Malo Orašje, 18.vi.2012: 1 ♀; Umčari-Donji Kraj, 12.vi.2012: 4 ♂♂ 7 ♀♀; 14.vi.2012: 1 ♀; Umčari-Kotlova, 12.vi.2012: 2 ♂♂ 1 ♀; Umčari-Parloge, 10.vi.2012: 1 ♂ 2 ♀♀; 13.vi.2012: 7 ♂♂ 8 ♀♀; Vodanj-Starnik, 15.vi.2012: 1 ♂; Vodanj-Ralja, 18.vi.2012: 1 ♂ 6 ♀♀; Živkovac-Site 1, 14.vi.2012: 1 ♂; 15.vi.2012: 3 ♂♂ 5 ♀♀; Živkovac-Site 2, 15.vi.2012: 3 ♂♂ 1 ♀; on *Hordeum sativum*, Umčari-Klaino, 13.vi.2012: 7 ♂♂ 13 ♀♀. [21♂♂ and 39♀♀ deposited in UB, 10 ♂♂ and 10 ♀♀ deposited in IZFBUB].

Diagnosis. *Alloxysta victrix* is mainly characterized by closed radial cell, presence of pronotal carinae, and absence of propodeal carinae. In Serbia and Montenegro it is similar to *A. fuscicornis*, but can be differentiated by (i) the size of radial cell, radial cell of *A. victrix* is longer (Fig. 9) than in *A. fuscicornis* (Fig. 13), and by (ii) the extent of propodeal pubescence (in

Table 1. Biogeographical information about each *Alloxysta* species present in Serbia, Montenegro and Slovenia.

Alloxysta species	Country	Locality	Geographical co-ordinates
A. arcuata	SERBIA	Čenta	45°06′39.43″ N, 20°23′28.45″ E
		Slanci-Brdo	44°48′11.01″ N, 20°34′00.23″ E
		Umčari-Donji Kraj	44°35′28.54″ N, 20°45′44.49″ E
		Vodanj-Ralja	44°35′19.87″ N, 20°50′33.61″ E
		Živkovac-Site 1	44°35′39.99″ N, 20°48′08.99″ E
	SLOVENIA	Nova Gorica	45°57′23.09″ N, 13°38′57.49″ E
		Slap-Vipava	45°50′26.78″ N, 13°56′02.41″ E
A. brevis	SERBIA	Baranda	45°05′19.85″ N, 20°27′02.40″ E
		Slanci-Brdo	44°48′11.01″ N, 20°34′00.23″ E
		Padinska Skela	44°58′04.16″ N, 20°25′54.29″ E
		Umčari-Donji Kraj	44°35′28.54″ N, 20°45′44.49″ E
		Živkovac-Site 1	44°35′39.99″ N, 20°48′08.99″ E
	SLOVENIA	Nova Gorica	45°57′23.09″ N, 13°38′57.49″ E
		Slap ob Idrijci	46°07′28.42″ N, 13°48′18.58″ E
		Koper	45°32′54.11″ N, 13°43′48.59″ E
		Brnik	46°14′10.53″ N, 14°29′14.50″ E
A. castanea	MONTENEGRO	Crno jezero	43°08′46.21″ N, 19°05′31.68″ E
	SERBIA	Čeline	45°56′28.04″ N, 15°22′25.76″ E
		Umčari-Klaino	44°35′32.23″ N, 20°44′37.68″ E
	SLOVENIA	Velika Planina	46°18′15.31″ N, 14°38′53.24″ E
		Kromberk	45°57′38.51″ N, 13°39′45.10″ E
A. fracticornis	SERBIA	Ključ	42°28′42.00″ N, 22°03′27.00″ E
		Dunavac	44°51′11.27″ N, 20°33′22.76″ E
		Besni Fok	44°59′57.52″ N, 20°24′05.64″ E
		Kovilovo	44°54′35.54″ N, 20°25′42.21″ E
		Mihajlovac	44°34′26.65″ N, 21°00′19.75″ E
		Padinska Skela	44°58′04.16″ N, 20°25′54.29″ E
		Umčari-Parloge	44°33′17.37″ N, 20°44′18.49″ E
		Umčari-Donji Kraj	44°35′28.54″ N, 20°45′44.49″ E
		Umčari-Kotlova	44°34′54.19″ N, 20°42′52.43″ E
		Vodanj-Ralja	44°35′21.21″ N, 20°50′24.57″ E
		Živkovac-Site 1	44°35′39.99″ N, 20°48′08.99″ E
	SLOVENIA	Ljubljana	46°03′40.76″ N, 14°30′26.81″ E
		Koper	45°32′54.11″ N, 13°43′48.59″ E
		Nova Gorica	45°57′23.09″ N, 13°38′57.49″ E
		Šempeter	45°55′44.21″ N, 13°38′24.15″ E
		Ljubljana	46°03′40.76″ N, 14°30′26.81″ E
A. fuscicornis	SERBIA	Kovilovo	44°54′35.54″ N, 20°25′42.21″ E
		Ključ	42°28′42.00″ N, 22°03′27.00″ E
		Osipaonica	44°32′25.70″ N, 21°01′34.92″ E
		Umčari-Donji Kraj	44°35′28.54″ N, 20°45′44.49″ E
		Živkovac-Site 1	44°35′39.99″ N, 20°48′08.99″ E

(continues on the next page)

Alloxysta species	Country	Locality	Geographical co-ordinates
A. kovilovica	SERBIA	Kovilovo	44°54′35.54″ N, 20°25′42.21″ E
		Osipaonica	44°32′25.70″ N, 21°01′34.92″ E
		Umčari-Donji Kraj	44°35′28.54″ N, 20°45′44.49″ E
		Umčari-Kotlova	44°34′54.19″ N, 20°42′52.43″ E
		Živkovac-Site 2	44°35′10.22″ N, 20°48′17.93″ E
A. macrophadna	MONTENEGRO	Crno jezero	43°08′46.21″ N, 19°05′31.68″ E
	SERBIA	Besni Fok	44°59′57.52″ N, 20°24′05.64″ E
A. mullensis	MONTENEGRO	Mali Medjed	43°08′36.33″ N, 19°04′22.97″ E
	SLOVENIA	Ljubljana	46°03′40.76″ N, 14°30′26.81″ E
		Zalog	46°04′09.48″ N, 14°36′17.59″ E
		Portorož	45°30′53.60″ N, 13°35′26.79″ E
A. pleuralis	SERBIA	Padinska Skela	44°58′04.16″ N, 20°25′54.29″ E
		Slanci-Brdo	44°48′11.01″ N, 20°34′00.23″ E
		Vodanj-Ralja	44°35′21.21″ N, 20°50′24.57″ E
		Živkovac-Site 1	44°35′39.99″ N, 20°48′08.99″ E
	SLOVENIA	Radovljica	46°20′39.13″ N, 14°10′26.07″ E
		Koper	45°32′54.11″ N, 13°43′48.59″ E
A. salicicola	SLOVENIA	Šempeter	45°55′43.35″ N, 13°38′23.53″ E
A. slovenica	SLOVENIA	Velika Planina	46°18′15.95″ N, 14°38′54.48″ E
A. victrix	MONTENEGRO	Crno jezero	43°08′46.21″ N, 19°05′31.68″ E
	SERBIA	Malo Orašje	44°34′05.50″ N, 20°49′17.81″ E
		NP Kopaonik-Metodje	43°18′46.95″ N, 20°48′05.88″ E
		Umčari-Donji Kraj	44°35′28.54″ N, 20°45′44.49″ E
		Umčari-Klaino	44°35′32.23″ N, 20°44′37.68″ E
		Umčari-Kotlova	44°34′54.19″ N, 20°42′52.43″ E
		Umčari-Parloge	44°33′17.37″ N, 20°44′18.49″ E
		Živkovac-Site 1	44°35′39.99″ N, 20°48′08.99″ E
		Živkovac-Site 2	44°35′10.22″ N, 20°48′17.93″ E
		Vodanj-Ralja	44°35′21.21″ N, 20°50′24.57″ E
		Vodanj-Starnik	44°36′15.50″ N, 20°48′45.51″ E

A. victrix the propodeum lacks setae in the longitudinal area where the carinae are present in Charipinae, while *A. fuscicornis* has the propodeum completely covered with dense setae).
Short redescription. Head dark yellow, mesosoma and metasoma dark brown; scape, pedicel, F1 and F2 yellow and F3–F12 yellowish brown; legs yellow and veins brown. Female antennae 13-segmented; F1 and F2 smooth and thinner than remaining flagellomeres, F3–F12 club-shaped, with rhinaria; F1 longer than pedicel and F2, F2–F4 subequal (Fig. 18). Male antennae 14-segmented similar to female but with F1–F3 curved (F1 slightly curved while F2 and F3 distinctly curved). Pronotum covered with sparse setae, with a pair of carinae clearly visible. Propodeum without carinae, abundantly pubescent; setae are absent at the longitudinal area where carinae are present in other Charipinae (Fig. 26). Forewing longer than body, radial cell closed, 3.0 times as long as wide (Fig. 9).
Distribution. Cosmopolitan. New record for Serbia and Montenegro.

Key to *Alloxysta* species from Balkan Peninsula

1. Radial cell closed (Figs 8–13). 2
– Radial cell partially open (Figs 5–7, 14). 8
2. Pronotal carinae absent (Fig. 28). 3
– Pronotal carinae present and clearly visible (Fig. 27). 6
3. Propodeal carinae absent (Figs 26, 33). ..... ***A. kovilovica*** Ferrer-Suay & Pujade-Villar **sp. nov.**
– Propodeal carinae present (Fig. 25). 4
4. F1 shorter than pedicel, F1–F3 subequal in length (Fig. 21). ..... ***A. brevis*** (Thomson, 1862)
– F1 subequal or longer than pedicel, F1–F3 not subequal. 5
5. F1 subequal to pedicel, F1 longer than F2 and F2 subequal to F3 (Fig. 17). ..... ***A. mullensis*** (Cameron, 1883)
– F1 longer than pedicel, F1–F3 subequal in length (as in Fig. 21). ..... ***A. fracticornis*** (Thomson, 1862)
6. Propodeal carinae present forming a plate (Fig. 19). ..... ***A. arcuata*** (Kieffer, 1902)
– Propodeal carinae absent. 7
7. Head brown. Propodeum completely covered with dense setae. Radial cell 2.7 times as long as width (Fig. 13). ..... ***A. fuscicornis*** (Hartig, 1841)
– Head yellowish. Propodeum without setae in the longitudinal area where the carinae are present in other Charipinae. Radial cell 3.0 times as long as width (Fig. 9). ..... ***A. victrix*** (Westwood, 1833)
8. Propodeal carinae absent (Fig. 26). 9
– Propodeal carinae present (Fig. 25). 10
9. F2–F4 not subequal; radial cell enlarged, 3.3 times as long as wide (Fig. 6). ..... ***A. macrophadna*** (Hartig, 1841)
– F2–F4 subequal; radial cell 2.6 times as long as wide (Fig. 14). ..... . ***A. salicicola*** Belizin, 1973
10. Two thick propodeal carinae well defined, reaching the base independently and curved. ..... ***A. pleuralis*** (Cameron, 1879)
– Propodeal carinae present, forming a plate. 11
11. Pronotal carinae present; F1 longer than pedicel (Fig. 15); radial cell 2.4 times as long as wide (Fig. 5). ..... ***A. castanea*** (Hartig, 1841)
– Pronotal carinae absent (Fig. 38); F1 shorter than pedicel (Fig. 36); radial cell 2.2 times as long as wide (Fig. 35). ..... ***A. slovenica*** Ferrer-Suay & Pujade-Villar **sp. nov.**

Discussion

The whole assemblage of the Balkan Charipinae identified in this study can be categorized based on their distribution into three groups: cosmopolitan species (*A. fuscicornis* and *A. victrix*), Palaearctic species (*A. castanea*, *A. fracticornis*, *A. macrophadna*, *A. mullensis*, *A. pleuralis*, *A. salicicola*), and up to now endemic species (*A. kovilovica* sp. nov. and *A. slov-*

enica sp. nov.). However, most of the Palaearctic species have been recently cited also from the Neotropical Region (Ferrer-Suay et al. 2011a, 2012). This fact emphasizes the need to continue with the collecting and revisions of the Charipinae fauna from different biogeographic regions to improve the knowledge about its taxonomy, biodiversity and distribution.

The species previously recorded from the Balkan Peninsula (Vasileva-Sumnalieva 1976) have also been cited from other Eastern and Central European countries (Ferrer-Suay et al. 2012). It seems that the extensive host range pattern in majority of *Alloxysta* species (Andrews 1978, Carver 1992), as well as their affinity to widely distributed host aphids can be an important reason for such a uniform distribution pattern. The distribution of each species within the studied area is shown in Table 1.

Based on the specific biogeographical position of the Balkan territory, the occurrence of more geographically isolated species can be expected. Biogeographically, Serbia is located at the crossroads of Central and Southeast Europe, covering the southern part of the Pannonian plain and the central part of the Balkans. On the other hand, Montenegro and Slovenia with their unique position on the Adriatic coast of the Balkan Peninsula are indicated, by their high level of biodiversity, as "hot-spots". In this respect, presence of elements of the Mediterranean flora and fauna extending through river valleys and canyons into the mountains in the continental part of the Balkan Peninsula, increases biodiversity of the region (Griffiths et al. 2004).

The morphological variability (Andrews 1978) as well as the small size of the Charipinae resulted in an ambiguity in discerning the significance of diagnostic characters. We used a few but reliable diagnostic characters for identification of *Alloxysta* species as well as for determination of the two new species, *A. kovilovica* Ferrer-Suay & Pujade-Villar sp. nov. and *A. slovenica* Ferrer-Suay & Pujade-Villar sp. nov. They are: i) proportion of the lengths of flagellomeres; ii) presence or absence of pronotal carinae; iii) presence or absence of propodeal carinae, and their shape; iv) size and shape of radial cell. The same characters were also used in our previous studies (Ferrer-Suay et al. 2011b, 2013). According to these features the twelve *Alloxysta* species present in the Balkans can be differentiated by the key presented.

While the majority of Charipinae species are known from the Palaearctic Region, there was only a single study on the fauna of Charipinae from the Balkan Peninsula (Vasileva-Sumnalieva 1976). In comparison, more species have been described and recorded from Western Europe than from Eastern Europe. According to the worldwide Charipinae catalogue (Ferrer-Suay et al. 2012); of the 167 species considered as valid, only 58 have been recorded in countries of Eastern Europe. These records highlight the necessity to focus on and improve the knowledge of Charipinae from these poorly studied countries. In spite of these new records, deeper studies on Charipinae fauna from south-eastern Europe are needed to improve the knowledge of distribution and host association of this subfamily. Furthermore, due to the important effect on biological control of aphids, more studies on Charipinae should be carried out as the first steps.

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