

TAXONOMIC REVISION OF THE *ALLOXYSTA BREVIS* GROUP (HYMENOPTERA, CYNIPOIDEA, FIGITIDAE, CHARIPINAE)

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Abstract: The validity of *Alloxysta brevis* (Thomson, 1862) and its synonyms is investigated. After studying the relevant types, *Alloxysta arcuata* (Kieffer, 1902) and *A. mullensis* (Cameron, 1883) have been considered valid species and are removed from synonymy with *A. brevis*, while *A. castaneiceps* (Kieffer, 1904) is considered as a *nomen inquirendum*. Lectotypes of *A. arcuata*, *A. brevis* and *A. mullensis* are designated. *Alloxysta darci* (Girault, 1933) has been confirmed as a valid species. Finally, *Alloxysta ligustri* Evenhuis, 1976 is synonymized with *A. arcuata* n. syn. Morphological features of these species are discussed and illustrated. A key for all valid species involved in this study is given.

Key words: Hymenoptera, Figitidae, Charipinae, *Alloxysta brevis*, *Alloxysta arcuata*, *Alloxysta mullensis*, *Alloxysta darci*, taxonomy.

Revisión taxonómica del grupo *Alloxysta brevis* (Hymenoptera, Cynipoidea, Figitidae, Charipinae)

Resumen: Se analiza la validez de *Alloxysta brevis* (Thomson, 1862) y sus sinónimos. Tras el estudio de los tipos pertinentes, *Alloxysta arcuata* (Kieffer, 1902) y *A. mullensis* (Cameron, 1883) se consideran especies válidas y no como sinónimos de *A. brevis*, mientras que *A. castaneiceps* (Kieffer, 1904) se considera *nomen inquirendum*. Se designan lectotipos para *A. arcuata*, *A. brevis* y *A. mullensis*. Se confirma *Alloxysta darci* (Girault, 1933) como especie válida, y se sinonimiza *Alloxysta ligustri* Evenhuis, 1976 con *A. arcuata* n. syn. Se comentan e ilustran los rasgos morfológicos de estas especies, y se incluye una clave para todas las especies válidas implicadas en este estudio.

Palabras clave: Hymenoptera, Figitidae, Charipinae, *Alloxysta brevis*, *Alloxysta arcuata*, *Alloxysta mullensis*, *Alloxysta darci*, taxonomía.

Introduction

The members of subfamily Charipinae (Hymenoptera: Cynipoidea: Figitidae) are biologically characterized as hyperparasitoids of aphids (Hemiptera: Aphididae) via Aphidiinae (Hymenoptera: Ichneumonoidea: Braconidae) and Aphelininae (Hymenoptera: Chalcidoidea: Aphelinidae) and hyperparasitoids of psyllids (Hemiptera: Psyllidae) via Encyrtidae (Hymenoptera: Chalcidoidea). They are very small wasps widely distributed around the world. As hyperparasitoids, they have a significant harmful effect on biological control programs carried out by primary parasitoids on their hosts (Müller *et al.*, 1999).

The identification of Charipinae species is problematic because of their small size, usually smooth integument and low interspecific variability. *Alloxysta* Förster, 1869 is the most abundant, diverse and widely distributed genus within this subfamily, and sometimes misidentifications and erroneous synonymies occur. For this reason, we have embarked on the study of the type material of the Charipinae. *Alloxysta brevis* (Thomson, 1862) is one of the problematic cases and, in this paper, we clarify its status. Recently, the status of *Alloxysta fulviceps* (Curtis, 1838) was clarified (Pujade-Villar *et al.*, 2011).

Alloxysta brevis was described by Thomson (1862) as *Allotria brevis*. Dalla Torre & Kieffer (1910) transferred this species to *Charips* and Andrews (1978) to *Alloxysta*. Fergusson (1986) synonymized three species with *A. brevis*: *A. mullensis* (Cameron, 1883), *A. arcuata* (Kieffer, 1902) and *Charips (Charips) castaneiceps* (Kieffer, 1904). On the other hand, Evenhuis (1976) described *Alloxysta ligustri*, a species

which according to its author is morphologically similar to *A. arcuata*, now named *A. brevis* after Fergusson (1986).

Our studies indicate that the taxon *A. brevis* as currently delimited is heterogeneous and might include several species. For this reason, the type material was examined. This “*brevis* group” is defined by very small specimens, with small closed radial cells, small flagellomeres very similar to each other and a propodeal plate in the center of the propodeum.

Material and methods

Type material of *Alloxysta brevis*, *A. arcuata*, *A. mullensis*, *A. darci* (Girault, 1933) and *A. ligustri* has been examined. Unfortunately, the type material of *Charips castaneiceps*, deposited in the Muséum d'Histoire Naturelle (Amiens, France) according to Dessart (1969), is not currently available (Villemant pers. comm.). Also, we have examined specimens determined by Evenhuis as *A. arcuata*, *A. brevis* and *A. mullensis* and specimens collected in different countries related to the “*brevis* group”. Finally, we have examined the type material and additional material from Mary Carver’s collection of *A. darci*.

The institutions mentioned in this study and their abbreviations are:

ANIC: Australian National Insect Collection (CSIRO) (Canberra, Australia).

BMNH: The Natural History Museum (London, England).

MZLU: Lund Museum of Zoology (Lund, Sweden).

QM: Queensland Museum (Brisbane, Australia).

RMNH: Netherlands Centre for Biodiversity Naturalis, Leiden (Leiden, The Netherlands).

UB: Universitat de Barcelona (Barcelona, Spain).

All specimens were studied using a stereomicroscope.

To preserve the type material, the specimens were photographed by a Zeiss Discovery.V8 compound microscope with an attached INFINITYX-21C digital camera. The computer program DeltaPix View-Pro AZ was used to obtain a single in-focus image starting from a series of 20 focal planes (Fig. 1-4). Other specimens were photographed using a field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM) for high-resolution imaging without gold-coating of specimens (Fig. 5).

Traditionally the features used by authors to distinguish Charipinae species are very superficial; their small size and shiny-smooth body have made the taxonomy of Charipinae very complicated. There are two characters that are very important to separate species, which were not taken into account by the first authors who described a large number of species and established a lot of synonymies: pronotal carinae and propodeal carinae. These morphological structures should be given special attention. Charipinae rarely have a defined pronotal plate but many species have two lateral carinae of variable length, which correspond to the lateral limits of the pronotal plate. In some species these carinae are completely absent, so the pronotal plate is not defined. Propodeal carinae are also variable between Charipinae species and, as with the pronotal carinae, they have great taxonomic importance. Although these propodeal carinae are not present in some species, they are present in the majority of them. They can be narrow, straight or curved. In most *Alloxysta* species the propodeal carinae are widened and joined at the base, forming a more or less defined propodeal plate. We have especially used these features as a basis in order to revise the “*brevis* group” (*A. arcuata* = *A. brevis* = *A. castaneiceps* = *A. mullensis*) and the related species (*A. ligustri* and *A. darci*). Morphological features of *A. arcuata*, *A. brevis*, *A. darci* and *A. mullensis* are illustrated in Fig. 1-4. Fig. 5 shows the detail of the propodeum and pronotum of each valid species redescribed here.

Descriptions are based on type material and the range of geographical variability is included. The material from Andorra was collected by Dr. Juli Pujade-Villar [this material has been mentioned in Ferrer-Suay *et al.* (2011)]. The material from Iran was collected by E. Rakhshani; this material (including hosts) will be dealt with in Ferrer-Suay *et al.* (in prep.). The morphological terms used follow Paretas-Martínez *et al.* (2007); the most important taxonomic characters are: antennae (the number in brackets indicates the maximum width), radial cell, pronotal carinae and propodeal area (carinae or propodeal plate). Measurements and abbreviations include F1–F12, first and subsequent flagellomeres. The width of the forewing radial cell is measured from the wing margin to the beginning of the 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 the height of the eye. Females and males of the species described have the same characters except where indicated in redescrptions.

Due to historical confusion in the determination of the species included in this study, most hosts and distributions

mentioned by different authors over the years need to be revised. For this reason, this dubious information is indicated for each species.

Results and discussion

The “*brevis* group” is divided here into three valid species (*A. arcuata*, *A. brevis* and *A. mullensis*). *Alloxysta darci* is included in this study because it is very similar to *A. brevis*. They can be differentiated according to the following key, which works for both males and females.

- 1 Pronotal carinae present (Fig. 1g). Propodeal carinae strongly curved and very divergent anteriorly, angulated posteriorly (Fig. 5e) *A. arcuata* (Kieffer, 1902)
 - Pronotal carinae absent (Fig. 2e, 3c, 4c). Propodeal carinae slightly curved or subparallel or, less commonly, divergent anteriorly (Fig. 5f-h) 2
- 2 F1 subequal to pedicel and longer than F2; F2 subequal to F3 (Fig. 4e); propodeal carinae subparallel anteriorly and very slightly curved posteriorly (Fig. 5h)
 - *A. mullensis* (Cameron, 1883)
 - F1 shorter than pedicel, F1-F3 subequal or sometimes F1 very slightly longer than F2 and F2 equal to F3; propodeal carinae variable 3
- 3 Antennae subequal or longer than body length (Fig. 3f). Forewing with long setae in all marginal apices (Fig. 3a); propodeal carinae subparallel anteriorly and very slightly curved posteriorly (Fig. 5g) *A. darci* (Girault, 1933)
 - Antennae shorter than body length (Fig. 2d). Forewing with long setae in basal half of marginal apex (Fig. 2a); propodeal carinae slightly curved and divergent anteriorly (Fig. 5f) *A. brevis* (Thomson, 1862)

Alloxysta arcuata (Kieffer, 1902) stat. rev.

Fig. 1, 5.

Alloxysta minuta (Hartig, 1840) det. Cameron (misidentification).

Allotria (Allotria) arcuata Kieffer, 1902: 12.

Charips (Charips) arcuatus (Kieffer) Dalla Torre & Kieffer, 1910: 277.

Alloxysta ligustri Evenhuis, 1976: 142. **New synonymy**

Alloxysta arcuata (Kieffer) Evenhuis & Barbotin, 1977: 189.

MATERIAL EXAMINED.

Type material of *Allotria arcuata* Kieffer: **Lectotype** ♀ (deposited in BMNH) with the following labels: “Lectotype” (round label with blue in the margin), “Cameron. 96 – 76., Clober Wood”, “Clober” (handwritten), “*Allotria arcuata* Kieffer nec *Xystus minutus* Hartig” (handwritten, orange label), “LECTOTYPE ♀ of *Allotria arcuata* Kieffer. det. J. Quinlan, 1977” (white label), “B. M. TYPE HYM” (white label), “Lectotype *Allotria arcuata* Kieffer, 1902 ♀ design. Ferrer-Suay & J.P-V 2011” (red label), “*Alloxysta arcuata* (Kieffer) ♀, Ferrer-Suay & J.P-V det. 2011” (white label).

Type material of *Alloxysta ligustri* Evenhuis, deposited in RMNH: **Holotype** ♀ with the following labels: “♀”, “Bennekom, tuin, 30-5-1971, leg. H.H. Evenhuis”, “mummy of *Myzus ligustri* on *Ligustrum ovalifolium*”, “holotype” (orange label), “*Alloxysta ligustri* Evenhuis, det. H.H. Evenhuis 1976”, *Alloxysta arcuata* (Kieffer, 1902) ♀, Ferrer-Suay det 2011. **Paratypes** (2 ♂ & 1 ♀ examined): “Bennekom, Netherlands, 17-6-1971, leg. H.H. Evenhuis”, “mummy of *Myzus ligustri* on *Ligustrum ovalifolium* in garden”, “♂”, “paratype”

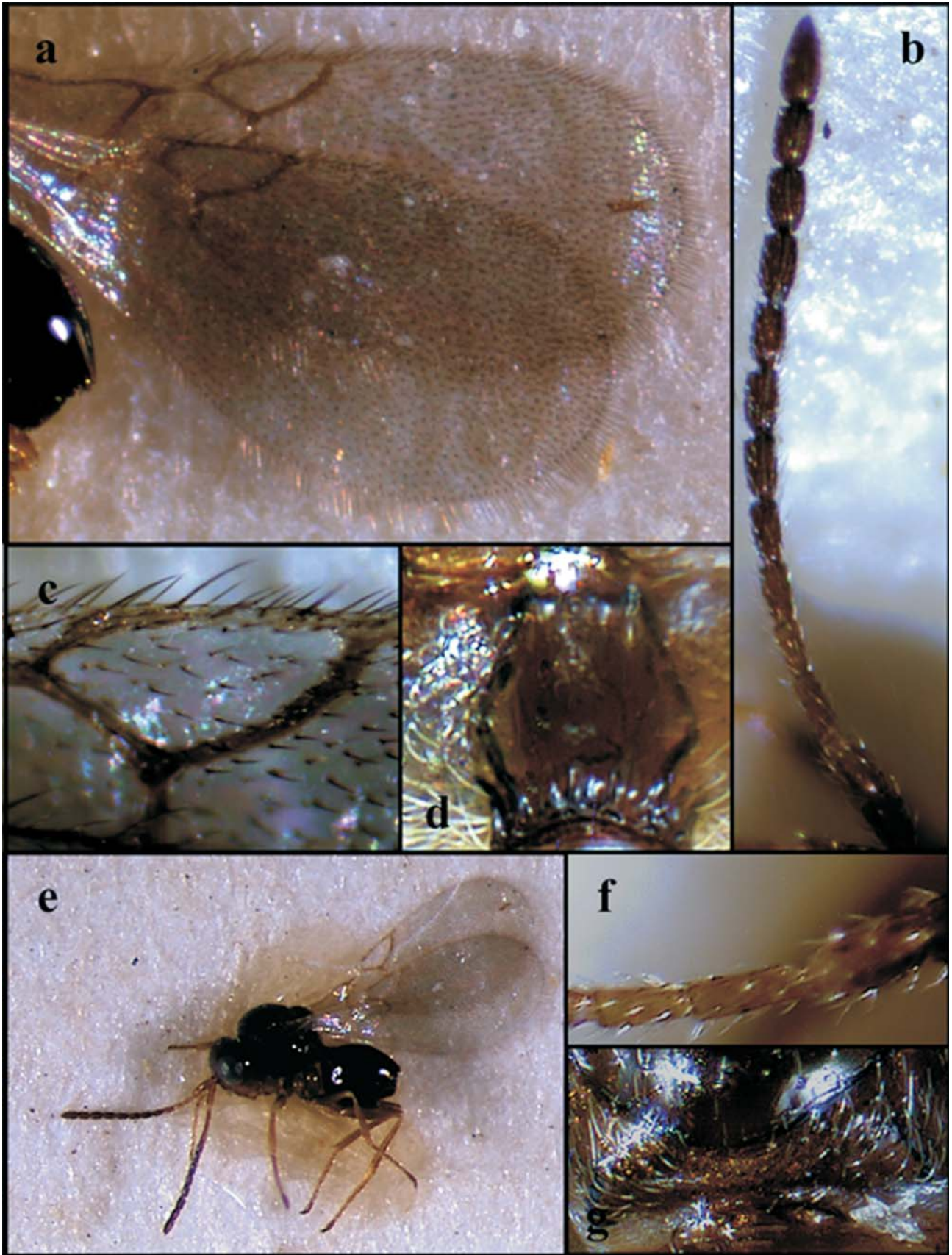


Fig. 1. *Alloxysta arcuata* (Kieffer, 1902), female: **a)** forewing; **b)** antenna; **c)** radial cell; **d)** propodeum; **e)** body; **f)** detail of antenna; **g)** pronotum.

Fig. 1. *Alloxysta arcuata* (Kieffer, 1902), hembra: **a)** ala anterior; **b)** antena; **c)** celda radial; **d)** propodeo; **e)** cuerpo; **f)** detalle de antena; **g)** pronoto.

(orange label), "*Alloxysta ligustri* Evenhuis, det. H.H. Evenhuis 1976", "*Alloxysta arcuata* (Kieffer, 1902) ♂, Ferrer-Suay det 2011; "Bennekom, 30-5-1971, mummie on *Ligustrum ovalifolium* in tuin", "♂", "paratype" (orange label), "*Alloxysta ligustri* Evenhuis, det. H.H. Evenhuis 1976", "*Alloxysta arcuata* (Kieffer, 1902) ♂, Ferrer-Suay det 2011; "Bennekom, 17-6-1971, mummie on *Ligustrum ovalifolium* in tuin", "♀", "paratype" (orange label), "*Alloxysta ligustri* Evenhuis, det. H.H. Evenhuis 1976", "*Alloxysta arcuata* (Kieffer, 1902) ♀, Ferrer-Suay det 2011.

Additional material (7♂ & 38♀). From RMNH, col. Evenhuis, Netherlands: ex mummy of *Myzus cerasi* on cultivated cherry, 25-5-1970: 1♂; ex mummy of *Dysaphis deverta* in gall on apple, 3-6-1960: 1♀; ex aphid mummy on cultivated *Prunus* sp., 31-3-89 or just before: 1♀; aphid host unknown, 29. 6. 1977: 1♀. From Santa Coloma (ANDORRA), Trampa Malaise, VIII.92: 1♀. IX.92: 1♂ & 3♀; X. 92: 1♀; 1-15.V.93: 1♀; 16-30.VI.93: 1♀; 16-31.VII.93: 1♀; 1-15.X.93: 1♀. From Tehran (IRAN), X-XI. 2004: 1♂ & 10♀; Kerman (IRAN) Nov. 2008: 1♂ & 2♀; Kerman (IRAN), V.2010: 3♀; Karaj (IRAN), XI. 2004: 1♂ & 9♀ Gorgan (IRAN), VI.2005: 2♂ & 2♀.

REDESCRIPTION

Length. Female: 0.9-1.2 mm. Male: 0.8-1.2 mm.

Coloration. Head yellowish brown to brown in females (more yellowish in males). Mesosoma and metasoma dark brown. Scape, pedicel, F1 and F2 dark yellow, rest of flagellomeres brown. Legs yellowish. Veins yellowish brown.

Head. Transversally ovate, smooth and shiny, slightly wider than high in front view. With setae below and between toruli and with a few setae above toruli. Setae scarce or absent on vertex but abundant on face. Transfacial line 1.2 times the height of compound eye. Malar space 0.5 times the height of compound eye.

Antennae. Female: 13-segmented, filiform. All antennomeres covered with sparse setae. Clava begin at F3 (more evident on F4); F4-F11 with rhinaria. Antennal formula: 6 (3.5); 6 (2); 5 (2); 5 (2.5); 5 (3) (Fig. 1b, 1f). Male: 14-segmented, filiform. All antennomeres covered with sparse setae. F1 smooth and thinner than remaining ones; F2-F12 with clava and rhinaria. Antennal formula: 6 (4.5); 7 (3); 7 (3.5); 8 (3.5); 9 (3.5).

Mesosoma. Pronotum covered with sparse setae except a small area of the center, few setae on distolateral corners; with two lateral carinae clearly visible (Fig. 1g, 5a). Mesoscutum smooth and shiny, round in dorsal view with few scattered setae. Scutellum also smooth and shiny, with setae which are more abundant at apex of scutellum. Height of mesopleural triangle along anterior margin 1.7 times the height of mesopleuron. Propodeum covered with abundant pubescence; two wide propodeal carinae, separated by setae at the top and forming a plate at the bottom, with sides much curved and very divergent anteriorly, angulated posteriorly (Fig. 1d, 5e).

Forewings. Longer than body, 1.5 times as long as mesosoma and metasoma together. Covered with dense pubescence; marginal setae present (Fig. 1a). Radial cell closed, 2.1-2.2 times as long as wide (Fig. 1c). R1 short and straight; Rs longer than R1 and slightly curved.

Metasoma. Proximal part with an incomplete ring of setae which is glabrous in the center and wider laterally. Remainder of metasoma smooth and shiny with terga clearly visible.

DIAGNOSIS. *Alloxysta arcuata* is mainly characterized by: a closed radial cell (Fig. 1c); pronotal carinae (Fig. 1g, 5a); a propodeal plate (Fig. 1d, 5e); female flagella, from F4 onwards, club-shaped and with rhinaria, in the male from F2 onwards; F1 subequal to pedicel in both sexes.

DISTRIBUTION:

Confirmed distribution. Western Palaearctic. Species known from Spain (Kieffer 1902: 12), the Netherlands (Evenhuis 1976: 143), Andorra (mentioned here), Iran (mentioned here), Germany (mentioned here) and Mexico (mentioned here).

Unconfirmed distribution. Romania (Ionescu 1969: 245, Prelipcean *et al.* 2004: 60).

CONFIRMED HOSTS. *Myzus ligustri* (Mosley) on *Ligustrum ovalifolium* Hassk (according to Evenhuis 1976: 143); unidentified aphids collected through *Ephedrus persicae* Froggatt and possibly also other *Ephedrus* species, and *Dysaphis plantaginea* (Passerini) through *Ephedrus persicae* Froggatt (according to Evenhuis & Barbotin 1977: 189). *Aphis fabae* Scopoli through *Lysiphlebus fabarum* (Marshall), *Aphis fabae* Scopoli on *Phaseolus vulgaris* Linnaeus, *Myzus cerasi* (Fabricius) on *Prunus cerasus* Linnaeus, *Prunus avium* Linnaeus, *Sitobion avenae* (Fabricius) through *Aphidius ervi* Haliday on *Triticum aestivum* Linnaeus, *Zea mays* Linnaeus, *Brachycaudus helichrysi* (Kaltenbach) through *Aphidius matricariae* Haliday on *Zinia elegans*, *Capitophorus similis* van der Goot on *Eleagnus angustifolia* Linnaeus, *Schizaphis graminum* (Rondani) through *Aphidius rhopalosiphii* De Stefani Pérez on *Triticum aestivum* Linnaeus, *Macrosiphum rosae* (Linnaeus) through *Aphidius rosae* Haliday on *Rosa* sp., *Aphis craccivora* Koch through *Binodoxys acalephae* (Marshall) on *Glycyrrhiza glabra* Linnaeus, *Brevicoryne brassicae* (Linnaeus) through *Diaeretiella rapae* (M'Intosh) on *Brassica oleracea* Linnaeus, *Rhopalosiphum padi* (Linnaeus) on *Zea mays* Linnaeus, *Aphis fabae* Scopoli through *Ephedrus persicae* Froggatt on *Solanum lycopersicum* Linnaeus, *Aphis craccivora* Koch through *Lysiphlebus fabarum* (Marshall) on *Glycyrrhiza glabra* Linnaeus, *Aphis gossypii* Glover on *Solanum melongena* Linnaeus, *Aphis idaei* van der Goot on *Rubus idaeus* Linnaeus, *Aphis nerii* Boyer de Fonscolombe on *Nerium oleander* Linnaeus, *Aphis urticata* Fabricius on *Urtica dioica* Linnaeus, *Aphis craccivora* Koch on *Robinia pseudoacacia* Linnaeus, *Therioaphis trifolii* (Monell) through *Praon exsoletum* (Nees) on *Medicago sativa* Linnaeus, *Aphis fabae* Scopoli through *Praon volucre* (Haliday) on *Solanum dulcamara* Linnaeus, *Uroleucon sonchi* (Linnaeus) on *Sonchus asper* (Linnaeus), *Macrosiphum* sp. on *Lilium* sp., *Macrosiphum euphorbiae* (Thomas) on *Canna* sp., *Aphis fabae* Scopoli, *Rhopalosiphum padi* (Linnaeus) on *Zea mays* Linnaeus, *Rhopalosiphum padi* (Linnaeus) on *Bromus* sp., *Lysiphlebus testaceipes* (Cresson), *Aphis gossypii* Glover on *Cassia* sp., *Myzus persicae* (Sulzer) on *Citrus limon* (Linnaeus), *Aphis gossypii* Glover on *Jacaranda*, *Chaitophorus* sp. on *Populus tremuloides* Michx., *Aphis nerii* Boyer de Fonscolombe on *Nerium oleander* Linnaeus, *Aphis* sp. on *Malva* sp., *Aphis gossypii* Glover through *Lysiphlebus testaceipes* (Cresson), *Dysaphis* sp. on *Iris* sp., *Mentha piperita* var. *citrate* Ehrh., *Mentha pulegium* Linnaeus, *Mentha spicata* var. *tashkent* Linnaeus (unpublished data).

COMMENTS. The type series of *Alloxysta arcuata* is represented by four specimens in BMNH, but only one of them is

considered to be *A. arcuata* according to the original description. Quinlan labelled a lectotype, but since the designation was not published, it is invalid, so we designate this specimen as a lectotype here. The other three specimens of the type series do not belong to *A. arcuata*; two of them (male and female) have an open radial cell which is completely incompatible with the description of this species and the third specimen (female) has a closed radial cell but differs in curvature of Rs vein and proportions of flagellomeres. These last three specimens are considered here to be non-conspecific paralectotypes.

The specimens determined by Cameron as *Allotria minuta* (Hartig) and deposited in the BMNH were considered by Kieffer (1902) as *Allotria arcuata* because he did not agree with Cameron's conception of *A. minuta*. The characters that Hartig gave for *A. minuta* were very few and therefore this species has been differently interpreted by various authors (Evenhuis & Barbotin 1977). For this reason, the type material of *A. arcuata* should be sought among Cameron's specimens in the London Museum (BMNH).

Alloxysta arcuata was synonymized by Fergusson (1986) with *A. brevis* without any explanation. After studying both type series we conclude that they are different species. *Alloxysta brevis* differs from *A. arcuata* by not having pronotal carinae (Fig. 5b) whereas *A. arcuata* does (Fig. 5a), and in antennae length, which is subequal or shorter than body length in *A. brevis*, but longer than body length in *A. arcuata*; the relative proportion of the antennomeres is also different in both species: F1-F3 are subequal and shorter in *A. brevis* (Fig. 2c) while in *A. arcuata* F1 is longer than F2 and F2 is subequal to F3 (Fig. 1b). Also, *A. arcuata* differs from *A. mullensis* having pronotal carinae, while *A. mullensis* does not (Fig. 5d).

Moreover, Evenhuis (1976) described *A. ligustri*, a species which looks similar to *A. arcuata*. According to Evenhuis & Barbotin (1977) both species were differentiated by their size, color and bent keels on the propodeal carinae. After studying the type series of *A. ligustri* in comparison with the type series of *A. arcuata*, we concluded that they are similar in: proportions of flagellomeres, presence of pronotal carinae, shape of propodeal carinae and size and shape of radial cell. Also, according to Evenhuis & Barbotin (1977:189) *A. arcuata* is a hyperparasitoid of *Myzus cerasi* through *Ephedrus* sp. and *Dysaphis plantaginea* through *Ephedrus persicae*, while *A. ligustri* is a hyperparasitoid of *Myzus ligustri* and might be a hyperparasitoid of various aphids through *Ephedrus persicae* and possibly also other *Ephedrus* species, so biologically they are also similar. Based on this evidence, we conclude that they are conspecific and designate *A. ligustri* as a synonym of *A. arcuata*.

Alloxysta brevis (Thomson, 1862)

Fig. 2, 5.

Allotria brevis Thomson, 1862: 408.

Allotria (Allotria) brevis Thomson: Dalla Torre & Kieffer, 1902: 40.

Charips (Charips) brevis (Thomson) Dalla Torre & Kieffer, 1910: 276.

Alloxysta brevis (Thomson) Andrews, 1978: 79.

MATERIAL EXAMINED.

Type material of *Allotria brevis* Thomson: Lectotype ♀ (deposited in MZLU) with the following labels: "Ld (Lund) 8/6" (white label, handwritten), "brevis" (white label,

handwritten), "Lectotype *Allotria brevis* ♀ Thomson, 1862 design. Ferrer-Suay & J.P.-V 2011" (red label), "*Alloxysta brevis* (Thomson) ♀, M. Ferrer-Suay & J.P.-V det." (white label). **Paralectotype** ♀ (deposited in MZLU) with the following labels: "L-d (Lund)" (white label), "8-toma" (white label, handwritten), "1984/405" (green label, loan code), "Paralectotype *Allotria brevis* ♀ Thomson, 1862" (red label), "*Alloxysta brevis* (Thomson) ♀, M. Ferrer-Suay & J.P.-V det." (white label).

Additional material (16♀). "Bas.", "*Alloxysta brevis* (Thomson) ♀, M. Ferrer-Suay & J.P.-V det." (white label): 1♀; "Hg", "*Alloxysta brevis* (Thomson) ♀, M. Ferrer-Suay & J.P.-V det." (white label): 1♀; "*Alloxysta brevis* (Thomson) ♀, M. Ferrer-Suay & J.P.-V det." (white label): 1♀; "Lund", "1984, 406" (green label), "*Alloxysta arcuata* (Kieffer, 1902) ♀, M. Ferrer-Suay det. 2011 (white label)": 1♀; "Bas.", "*Alloxysta arcuata* (Kieffer, 1902) ♀, M. Ferrer-Suay det. 2011 (white label)": 1♀; "Hg" (green label): 2♀.

Santa Coloma (ANDORRA), Trampa Malaise, VIII.92: 2♀; VI.93: 1♀; VII.93: 3♀; VIII.93: 1♀. Kerman (IRAN), X.2008: 1♀; Shanaq (IRAN), VI.2009: 1♀.

REDESCRIPTION.

Length. Female: 0.8-0.9 mm. Male: 0.6-0.7 mm.

Coloration. Head, mesosoma and metasoma brown to dark brown. Scape brown; pedicel, F1-F3 dark yellow, rest of flagellomeres brown. Legs yellowish brown. Veins yellowish brown.

Head. Transversally ovate, smooth and shiny, slightly wider than high in front view. With setae below and between toruli, absent above toruli. With few or no setae on vertex and with many setae on face. Transfacial line 1.1 times the height of compound eye. Malar space 0.5 times the height of compound eye.

Antennae. Female: 13-segmented, filiform. Antennae length subequal or shorter than body length. All antennomeres covered with sparse setae. F1-F3 smooth and thinner than remaining ones; F4-F11 with rhinaria and club-shaped. Antennal formula: 5 (2.5); 3 (1.6); 2.5 (1.6); 2.7 (1.6); 4 (2) (Fig. 2c). Male: as female, without any curved flagellomeres.

Mesosoma. Pronotum covered with sparse setae except for a small area in the center, few setae on distolateral corners; without carinae (Fig. 2e, 5b). Mesoscutum smooth and shiny, round in dorsal view with few scattered setae. Scutellum also smooth and shiny with setae present on lateral margins and on apex of scutellum. Height of mesopleural triangle along anterior margin more or less 1.4 times the height of mesopleuron. Propodeum covered with abundant pubescence; there are two wide carinae, separated by setae in the first third and forming a plate in the lower two thirds; sides of the plate slightly curved and divergent anteriorly (Fig. 2f, 5f).

Forewings. Longer than body, 1.5 times as long as mesosoma and metasoma together. Forewing covered by abundant pubescence; marginal setae present (Fig. 2a). Radial cell closed, 2.2 times as long as wide (Fig. 2b). R1 short and straight; Rs longer than R1 and curved.

Metasoma. Proximal part with an incomplete ring of setae which is glabrous in the center and wider laterally. Remainder of metasoma smooth and shiny with terga clearly visible.

DIAGNOSIS. *Alloxysta brevis* is mainly characterized by: a small closed radial cell (Fig. 2b); pronotal carinae absent (Fig. 2e, 5b); a propodeal plate (Fig. 2f, 5f); in both sexes flagellar

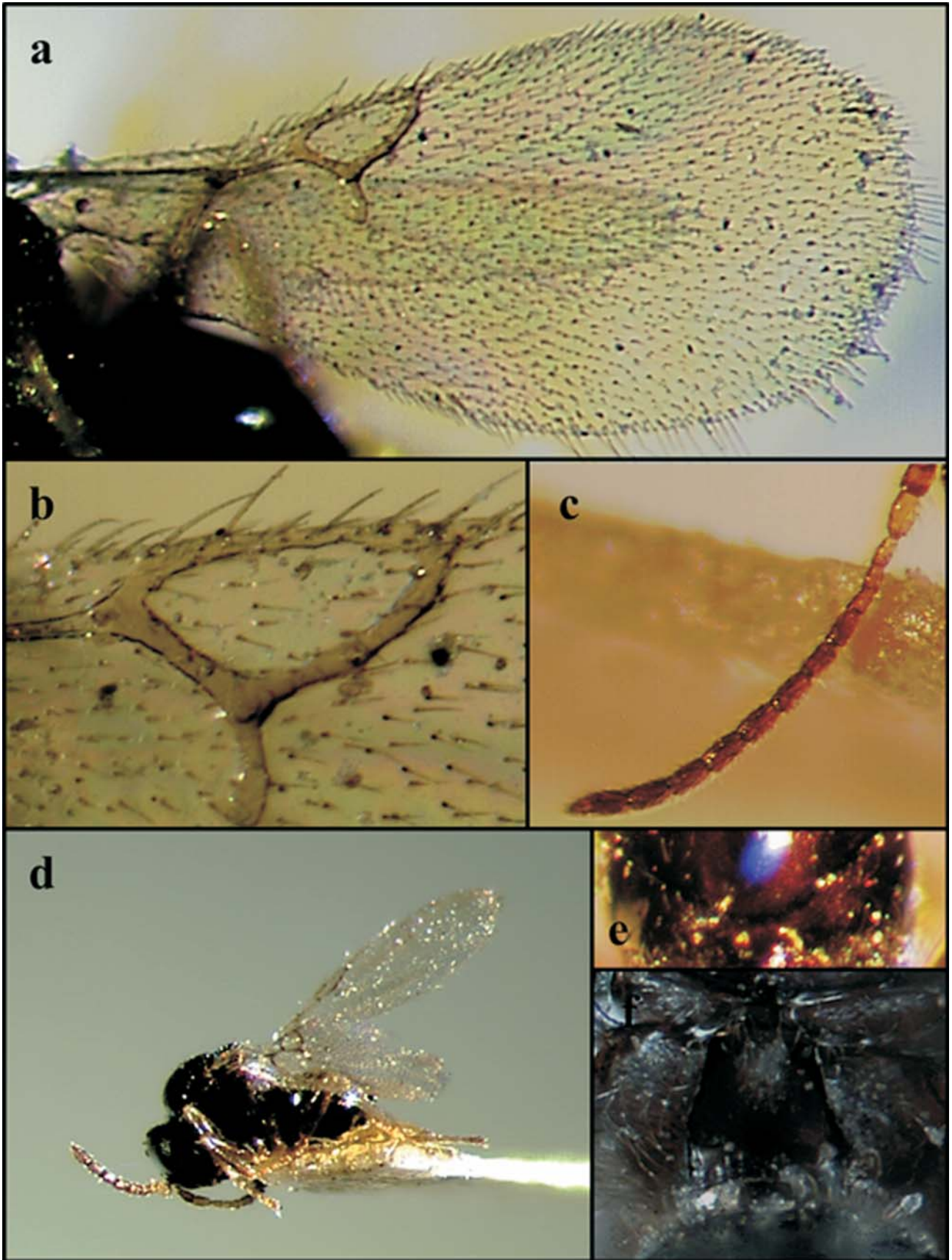


Fig. 2. *Alloxysta brevis* (Thomson, 1862), female: **a)** forewing; **b)** radial cell; **c)** antenna; **d)** body; **e)** pronotum; **f)** propodeum.
Fig. 2. *Alloxysta brevis* (Thomson, 1862), hembra: **a)** ala anterior; **b)** celda radial; **c)** antena; **d)** cuerpo; **e)** pronoto; **f)** propodeo.

segments, from F4 onwards, club-shaped and with rhinaria; F1 shorter than pedicel in both sexes; antennae subequal or shorter than body length in both sexes (Fig. 2c).

CONFIRMED DISTRIBUTION. Palearctic and Neotropical.

HOSTS:

Confirmed hosts. *Aphis* (*Protaphis*) *terricola* Rondani through *Lysiphlebus fabarum* (Marshall) on *Artemisia bienis* Willdenow, *Aphis craccivora* Koch through *Lysiphlebus fabarum* (Marshall) on *Vicia sativa* Linnaeus, *Rhopalosiphum padi* (Linnaeus), *Aphis fabae* Scopoli through *Lysiphlebus fabarum* (Marshall), *Citrus x-clementina*, *Aphis craccivora* Koch on *Medicago sativa* Linnaeus, Aphidoidea on *Zea mays* Linnaeus, *Euphorbia serrata* (Linnaeus), *Tamarix canariensis* Willdenow, *Olea europaea* Linnaeus, *Foeniculum vulgare* Miller, *Aphis gossypii* Glover on *Cassia* sp., *Aphis helianthi* (Monell) on *Yucca* sp. (unpublished data).

Unconfirmed hosts. *Aphis* spp. through *Lysephedrus* sp., *Myzus cerasi* (Fabricius) and *Dysaphis plantaginea* (Passerini) through *Ephedrus persicae* Froggatt (according to Fergusson 1986: 18); *Aphis* sp. through *Lysephedrus* sp., *Myzus cerasi* (Fabricius) and *Dysaphis plantaginea* (Passerini) through *Ephedrus* sp. (according to Barczak 1991: 92); *Hyperomyzus lactucae* (Linnaeus) through *Praon volucre* (Haliday) (according to Tizado & Núñez-Pérez 1993: 97); *Capitophorus carduinis* (sic) (Walter), *Sitobion* spp. (according to Müller *et al.* 1999: 346); *Aphis fabae* Scopoli through *Trioxys angelicae* (Haliday) on *Euonymus europaea* Linnaeus (according to Hübner *et al.* 2002: 508); *Uroleucon nigrotuberculatum* (Olive) through *Aphelinus albipodus* Hayat & Fatima on *Solidago altissima* (Linnaeus) (according to Takada & Nakamura 2010: 270).

COMMENTS. The type series of *Alloxysta brevis* is represented by nine specimens in MZLU. Only five of them are considered to be *A. brevis* because they match the original description, of which two are here established as a lectotype and a paralectotype respectively, because they were collected in Lund as mentioned in the original description. Two of them were also collected in Sweden, but in Båstad and Helsingborg, and the last one has no labels. As for the other four specimens, which cannot be considered as belonging to *A. brevis*, two of them are identified as *A. arcuata* and the other two have not been identified, but it is clear that they do not belong in the “*brevis* group” because the radial cell is longer, they have a different proportion of flagellomeres and one of them has pronotal carinae. Accordingly, the type series of *A. brevis* consists of the lectotype, the paralectotype, three *A. brevis* specimens and four non-conspecific paralectotypes.

Fergusson (1986) synonymized *Charips* (*Charips*) *castaneiceps* (Kieffer) with *A. brevis* without examining the type material. It is deposited in the Natural History Museum of Amiens (France) but it is not available for study (Villemant *pers. comm.*); after studying the description, we cannot say if this species belongs to *A. brevis*, *A. arcuata*, *A. mullensis* or any of them; for this reason we consider *A. castaneiceps* as a “*nomen inquirendum*”.

Alloxysta darci (Girault, 1933)

Fig. 3, 5.

Allotria d'arci Girault, 1933: 2.

Charips d'arci (Girault) Weld, 1952: 252.

Alloxysta d'arci (Girault) Andrews, 1978: 81.

Alloxysta darci (Girault) Carver, 1992: 777.

MATERIAL EXAMINED.

Type material of *Allotria d'arci* Girault: **Holotype** ♀ (deposited in QM) with the following labels, First label: “*Allotria d'arci* Girault ♀ type” (handwritten, in front), “Forest, Wynnum” (handwritten, behind), Second label: “*Charips d'arci* (Gir.) EF Riek det 1953”, Third label: “*Alloxysta darci* (Girault) Mary Carver det. 1992”.

Additional material (19♂ & 32♀). First label: “*Allotria darci* Gir. ♀, Paratypes” (handwritten, in front), “Indooroopilly, window, 4 May. 1930” (handwritten, behind), Second label: “Paratype” (Blue label), Third label: “Paratype” (Blue label), Fourth label: no type-status, locality not mentioned in orig. description”. ACT: Reld, Canberra, 9 Jun. 1955, M. Carver”, “ex *Hyalopterus pruni* / *Aphelinus flaviventris* on *Phragmites australis*”, “AUST. NAT. INS. COLL.” (green label); except: “b♂”: 1♂. “55/2”: 2♂. “♂”: 1♂. “c♀”: 1♀. “f♂”: 1♂. “TONGA: Fatai, Tongatapu, 19 October 1993, P. J. Hart, AN 20 7101”, “ex *Aphis gossypii* / *Aphelinus gossypii* on tarotonga”, “*Alloxysta darci* (Girault), det. M. Carver”, “AUST. NAT. INS. COLL.” (green label): 3♂ & 11♀. “Sydney N.S.W., Dec. 1950, A. Dyce” (handwritten), “bred from *Aphis crassivora* Kohl” (handwritten), “*Alloxysta d'arci* (Girault) ♂, Mary Carver det.”, “AUST. NAT. INS. COLL.” (green label): 1♂ & 1♀. “26.52S 151.35E, nr Paradise Falls, Bunya Mts Nat. Pk, 6 Oct. 1984 Qld, I. Naumann, J. Cardale, ex ethanol”, “AUST. NAT. INS. COLL.” (green label): 1♀ and “26.52S 151.34E, nr Westcott Plain, Bunya Mts Nat. Pk Qld, 6-7 Oct. 1984”: 2♀. “Gold Creek Rd., Brookfield Qld, 26 June 1985, Z. Liepa, ex ethanol”, “AUST. NAT. INS. COLL.” (green label): 1♀. “Bramston Beach, via Innisfail, NQ, 15 Aug. – 2 Sept. 1987, A. Walford-Huggins, coastal melaleuca, swamp/interc. trap”, “AUST. NAT. INS. COLL.” (green label): 2♀ and 2 Sept.- 18 Sept. 1987”: 1♀. “Orchard Hills, (W Sydney) NSW, 26 May 1982, K. Helm, Tray traps”, “AUST. NAT. INS. COLL.” (green label): 1♀. “Chipping Norton, (W Sydney) NSW, 12-26 May 1982, K. Helm, Tray traps”, “AUST. NAT. INS. COLL.” (green label): 1♀. “Sheepstation Cr., NSW 16 Km NE of Whangaree, 600m, 13 Jun- 24 Aug. 1982, S. & J. Peck SBP36”, “flight intercept trap rainforest”, “AUST. NAT. INS. COLL.” (green label): 1♀. “30.22S 152.45E, Dorrigo NP NSW, 2 Oct. 1984, I. Naumann, J. Cardale, ex ethanol”, “AUST. NAT. INS. COLL.” (green label): 1♀. “55/36.”, “AUST. NAT. INS. COLL.” (green label): 1♀. “*Alloxysta darci* (Girault), det. M. Carver”, “AUST. NAT. INS. COLL.” (green label): 6♂ & 3♀. “TONGA: Pa’hu, Nuku’alofa, 25 August 1992, P. J. Hart, D. Morneau”, “ex *Aphelinus gossypii* / *Aphis gossypii* on tarotonga”, “*Alloxysta darci* (Girault), det. M. Carver”, “AUST. NAT. INS. COLL.” (green label): 1♂. “TONGA: Ngeleia, Nuku’alofa, 17 August 1992, P. J. Hart, D. Morneau”, “ex *Aphelinus gossypii* / *Aphis gossypii* on tarotonga”, “*Alloxysta darci* (Girault), det. M. Carver”, “AUST. NAT. INS. COLL.” (green label): 1♀ and 19 August 1992”: 3♂ & 1♀. “Cudgegong, Grid Ref. 32° 49’ S 149° 49’ E, 30. vii. 1993, P. R. Sullivan”, “Reared from leaves and stems of *Echium*

plantagineum L., Wasp emerged 11.viii.1993”, “PC432”, “*Alloxysta darci* (Girault), det. I.D. Naumann 1994”, “ANIC” (green label): 1♀.

REDESCRIPTION.

Length. Female: 0.7-1.1 mm. Male 0.7-1.1 mm.

Coloration. Head yellowish brown, mesosoma and metasoma brown. Scape, pedicel, F1-F3 yellow, rest of flagellomeres brown. Legs yellowish. Veins yellowish brown.

Head. Transversally ovate, smooth and shiny, slightly wider than high in front view. With setae below and a few between toruli, absent above toruli. With few or no setae on vertex and with many setae on face. Transfacial line 1.2 times the height of compound eye. Malar space 0.5 times the height of compound eye (Fig. 3g).

Antennae. Female: 13-segmented, filiform. All antennomeres covered with sparse setae. F1-F3 smooth and thinner than remaining ones; F4-F11 with rhinaria and club-shaped. Antennal formula: 4.5 (1.8); 3.5 (1.3); 3 (1.3); 3 (1.3); 4 (1.7) (Fig. 3e). Male: 14-segmented, filiform. All antennomeres covered with sparse setae. F1-F3 smooth and thinner than remaining ones; F4-F11 with rhinaria and club-shaped. Antennal formula: 4 (2); 3.5 (1.2); 3.3 (1.2); 3.3 (1.4); 4.5 (1.7).

Mesosoma. Pronotum covered with setae, with few setae on distolateral corners; without carinae (Fig. 3c, 5c). Mesoscutum smooth and shiny, round in dorsal view, with few scattered setae. Scutellum also smooth and shiny, with setae present on lateral margins and abundant on apex of scutellum. Propodeum covered with abundant pubescence; with two wide carinae that form a plate, separated by few setae on anterior third and forming a plate on two posterior thirds; sides subparallel anteriorly and very slightly curved posteriorly (Fig. 3d, 5g).

Forewings. Longer than body, 1.4 times as long as mesosoma and metasoma together in both males and females. Forewing covered by abundant pubescence; marginal setae present (Fig. 3a). Radial cell closed, 2.4 times as long as wide in both males and females (Fig. 3b). R1 short and straight; Rs longer and curved.

Metasoma. Proximal part with an incomplete ring of setae which is glabrous in the center and wider laterally. Remainder of metasoma smooth and shiny with terga clearly visible.

DIAGNOSIS. *Alloxysta darci* is mainly characterized by: a small closed radial cell (Fig. 3b); pronotal carinae absent (Fig. 3c, 5c); a propodeal plate (Fig. 3d, 5g); in both sexes flagellar segments, from F4 onwards, club-shaped and with rhinaria; F1 shorter than pedicel in both sexes; antennae longer than body length in both sexes (Fig. 3e).

CONFIRMED DISTRIBUTION. Species known from Australia (Girault 1933: 2) and Tonga (Carver *et al.* 1993: 250). According to Carver *et al.* (1993) the specimens determined as *A. brevis* by Stechmann & Völkl (1990) from Tonga correspond to *A. darci*.

CONFIRMED HOSTS. *Aphis craccivora* Koch and *Hyalopterus pruni* (Geoffroy) through *Aphelinus flaviventris* Kurdjumov, *Macrosiphum euphorbiae* (Thomas) through *Aphelinus gossypii* Timberlake, *Myzus persicae* (Sulzer) through *Aphelinus gossypii* Timberlake, *Aphelinus varipes* (Förster) (according to Carver 1992: 770); *Rhopalosiphum maidis* (Fitch) through *Aphelinus varipes* (Förster) on *Sorghum bicolor* (Linnaeus), *Pachyneuron aphidis* (Bouché) (according to Carver 2004: 1).

Hyalopterus pruni (Geoffroy) through *Aphelinus flaviventris* Kurdjumov on *Phragmites australis* (Cavanilles), *Aphis gossypii* Glover through *Aphelinus gossypii* Timberlake, *Echium plantagineum* Linnaeus (unpublished data).

COMMENTS. The type series of *Alloxysta darci* is represented by two specimens in QM. One of them was established as a holotype by Girault. The other specimen considered by Girault as a paratype cannot have this status because its locality does not match the locality of the original description, so its information is included in the additional material section.

Studies have been carried out on the type material of *A. darci* deposited in QM and specimens of this species from Mary Carver collection deposited in ANIC. Mary Carver (1992) did an extended revision of the Charipinae present in Australia. In this work, she analyses the similarities and differences between *A. darci* and *A. brevis* and hence her specimens are relevant for this study. In total, 50 specimens (19♂ & 31♀) have been studied, all corresponding to the same species, *A. darci*. These specimens were collected from different regions of Australia and Tonga.

Alloxysta darci is morphologically very similar to *A. brevis*. In both species there are no pronotal carinae (Fig. 5b, 5c), the propodeal carinae form a plate (Fig. 5f, 5g), the radial cell is closed and very small (Fig. 2b, 3b) and F1-F3 are slightly subequal (Fig. 2c, 3e). Carver (1992: 778) mentions two characters to differentiate these species: the orange-brown coloration of *A. darci* (Fig. 3f), brown in *A. brevis* (Fig. 2d), and the longer apical marginal hairs in the anterior margin of the forewing of *A. darci* (Fig. 3a), shorter in *A. brevis* (Fig. 2a). After studying the material mentioned, other different features have appeared: *A. darci* has antennae longer or sometimes subequal to body length, while in *A. brevis* the antennae are shorter or subequal to body length; the relation between the length (from the midpoint) and the width of the forewing is bigger in *A. darci* than in *A. brevis* (Fig. 3a, 2a); in *A. darci* the forewing has long setae in all marginal apices (Fig. 3a) but in *A. brevis* the forewing has long setae only in the basal half of the marginal apices (Fig. 2a). For all these reasons, we conclude that these species are different and *A. darci* remains a valid species.

Alloxysta mullensis (Cameron, 1883) stat. rev.

Fig. 4, 5.

Allotria mullensis Cameron, 1883: 366.

Allotria (Allotria) mullensis Cameron: Dalla Torre & Kieffer, 1902: 40.

Charips (Charips) mullensis (Cameron) Dalla Torre & Kieffer, 1910: 284.

Alloxysta mullensis (Cameron) Quinlan, 1974: 8.

Alloxysta brevis (Thomson, 1862). Synonymized by Fergusson (1986: 10).

MATERIAL EXAMINED.

Type material of *Allotria mullensis* Cameron: **Lectotype** ♀ (deposited in BMNH) with the following labels: “Holotype” (round label with red in the margin), “mullensis” (handwritten), “mullensis Cam” (handwritten), “Cameron. 96 – 76., Mull, on the underside of this label is the name mullensis”, “Holotype ♀ of *Allotria mullensis* Cameron. det. J. Quinlan, 1973” (white label), “B. M. Type HYM. 7.125” (white label), “Lectotype *Allotria mullensis* ♀ Cameron, 1883 design. Ferrer-Suay & J.P.-V 2011” (red label), “*Alloxysta mullensis* (Cameron, 1883) ♀, Ferrer-Suay & J.P.-V det.” (white label).

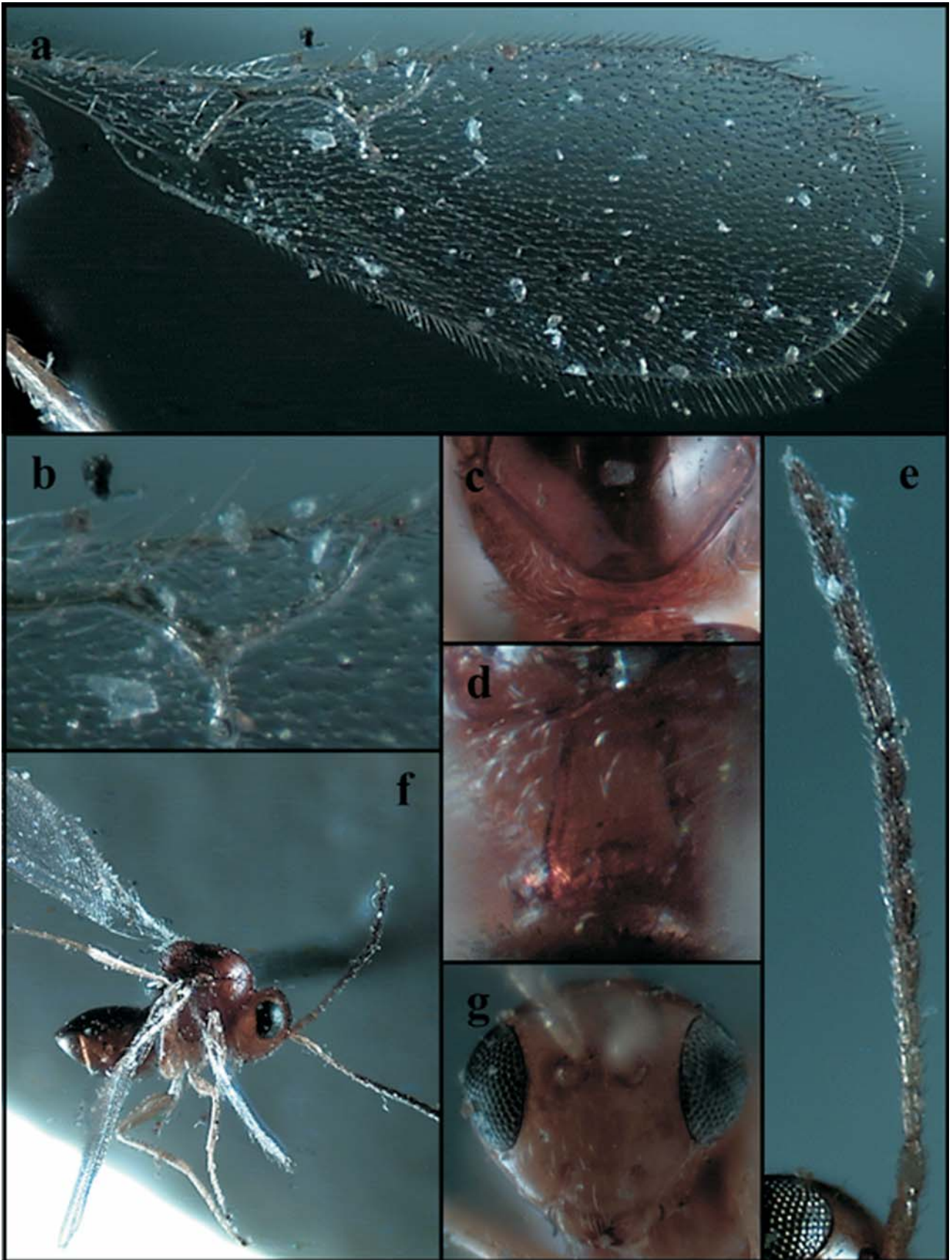


Fig. 3. *Alloxysta darci* (Girault, 1933), female: **a)** forewing; **b)** radial cell; **c)** pronotum; **d)** propodeum; **e)** antenna; **f)** body; **g)** head.

Fig. 3. *Alloxysta darci* (Girault, 1933), hembra: **a)** ala anterior; **b)** celda radial; **c)** pronoto; **d)** propodeo; **e)** antena; **f)** cuerpo; **g)** cabeza.

REDESCRIPTION.

Length. Female: 0.9-1.0 mm. Male: 0.8-0.9 mm.

Coloration Head brown, mesosoma and metasoma dark brown. Pedicel, scape and F1-F3 dark yellow; F4-F11 yellowish brown. Legs and veins yellow.

Head. Transversally ovate, smooth and shiny, wider than high in front view. With setae below and between toruli. Setae absent from vertex and abundant on face. Transfacial line 1.3 times the height of compound eye. Malar space 0.5 times the height of compound eye.

Antennae. Female: 13-segmented, filiform. All antennomeres covered with sparse setae. F1-F3 smooth and thinner than remaining ones; F4-F11 with rhinaria and club-shaped. Antennal formula: 3.7 (2); 3.5 (1.2); 2.5 (1.2); 2.5 (1.2); 3.5 (1.5) (Fig. 4e). Male: as female, without any curved flagellomeres.

Mesosoma. Pronotum covered by sparse setae except for a small area of the center, few setae on distolateral corners; without carinae (Fig. 4c, 5d). Mesoscutum smooth and shiny, round in dorsal view, with few scattered setae. Scutellum also smooth and shiny, and also with sparse setae. Height of mesopleural triangle along anterior margin more or less 1.3 times the height of mesopleuron. Propodeum covered by abundant pubescence; two wide propodeal carinae separated by few setae at the top and forming a plate at the bottom; sides subparallel anteriorly and very slightly curved posteriorly (Fig. 4d, 5h).

Forewing. Longer than body, 1.5 times as long as mesosoma and metasoma together. Forewing covered by abundant pubescence; marginal setae present (Fig. 4a). Radial cell closed, 2.2 times as long as wide (Fig. 4b). R1 short and straight; Rs longer than R1 and curved.

Metasoma. Proximal part with an incomplete ring of setae, setae absent in the center but present laterally. Remainder of metasoma smooth and shiny with tergites clearly visible

DIAGNOSIS. *Alloxysta mullensis* is mainly characterized by: a closed radial cell (Fig. 4b); pronotal carinae absent (Fig. 4c, 5d); a propodeal plate (Fig. 4d, 5h); in both sexes flagellar segments, from F4 onwards, club-shaped and with rhinaria; F1 subequal to pedicel in both sexes (Fig. 4e).

DISTRIBUTION:

Confirmed distribution. Species known from Scotland (Cameron 1883: 366, Cameron 1886: 86).

Unconfirmed distribution. Iran (Lotfalizadeh 2002: 36) and Russia (Bokina 1997: 435).

HOSTS:

Confirmed hosts. *Aphis urticae* Gmelin through *Lysiphlebus fabarum* (Marshall) on *Urtica dioica* Linnaeus, *Aphis fabae* Scopoli through *Lysiphlebus fabarum* (Marshall) on *Philadelphus coronarius* Linnaeus (according to Evenhuis 1978: 173); aphids on *Brassica aleracea* Linnaeus, *Sitobion avenae* (Fabricius) through *Aphidius ervi* Haliday on *Zea mays* Linnaeus,

Dysaphis pyri (Boyer de Fonscolombe) through *Aphidius matricariae* Haliday on *Pyrus communis*, *Aphis gossypii* Glover through *Lysiphlebus fabarum* (Marshall) on *Buxus hyrcana* Pojark (unpublished data).

Unconfirmed hosts. *Praon* sp. and *Ephedrus* sp. (according to Bokina 1997: 435).

COMMENTS. The type series of *Alloxysta mullensis* is represented by one specimen in BMNH. It was considered as a holotype by Quinlan (1974: 8) but we establish it here as a lectotype because the original description does not say that it was based on only one specimen, so there may have been more specimens under this name. This specimen is a female but, inexplicably, in his original description (1883: 366) Cameron established it as a male, and the description does not mention the number of flagellomeres. Nevertheless, this material is the type of this species (D. Notton, *pers. comm.*). The description and figures provided by Evenhuis (1978: 173) are very close to *A. brevis* (except shape of propodeal plate), so they may play an important role in the “*brevis* group” problem.

Alloxysta mullensis was synonymized by Fergusson (1986) with *A. brevis* without any explanation. After studying both type series, we concluded that they are different species. *Alloxysta brevis* differs from *A. mullensis* in the proportions of the antennomeres: F1 shorter than pedicel in *A. brevis* (Fig. 2c) but subequal to pedicel in *A. mullensis* (Fig. 4e), and F1 subequal to F2 in *A. brevis* (Fig. 2c) while longer than F2 in *A. mullensis* (Fig. 4e). Furthermore, *A. mullensis* differs from *A. arcuata* by the absence of pronotal carinae (Fig. 5d), present in *A. arcuata* (Fig. 5a).

Acknowledgements

We are very grateful to Dr. David Notton, curator of the Natural History Museum (London, England), Dr. Guido O. Keijl, curator of the National Museum of Natural History (Leiden, The Netherlands), Dr. Roy Danielsson, curator of the Lund Museum of Zoology (Lund, Sweden) and to Dr. Susan Wright, collection manager of entomology at the Queensland Museum (Brisbane, Australia) for lending us all the type material mentioned here. We also want to thank Adriana G. Trejo-Loyo (Universidad Autónoma del Estado de Morelos, Mexico), Refugio Lomeli (Colegio de Postgraduados, Mexico), Alejandro Gonzalez (Universidad de Nuevo León, México) and Ehsan Rakhshani (University of Zabol, Iran) for the loan of material included in this paper. In addition, we want to thank Matt Buffington (USNM; Washington, USA), George Melika (PDL; Budapest, Hungary) and Leopoldo Castro (Hymenoptera co-editor of “*Boletín de la Sociedad Entomológica Aragonesa*”, Spain) for their comments and criticisms that greatly improved the manuscript. This research was supported by projects CGL2008-00180 and CGL2011-22889 of the Spanish Ministry of Science and Innovation and grant AP2009-4833 of the Spanish Ministry of Education.

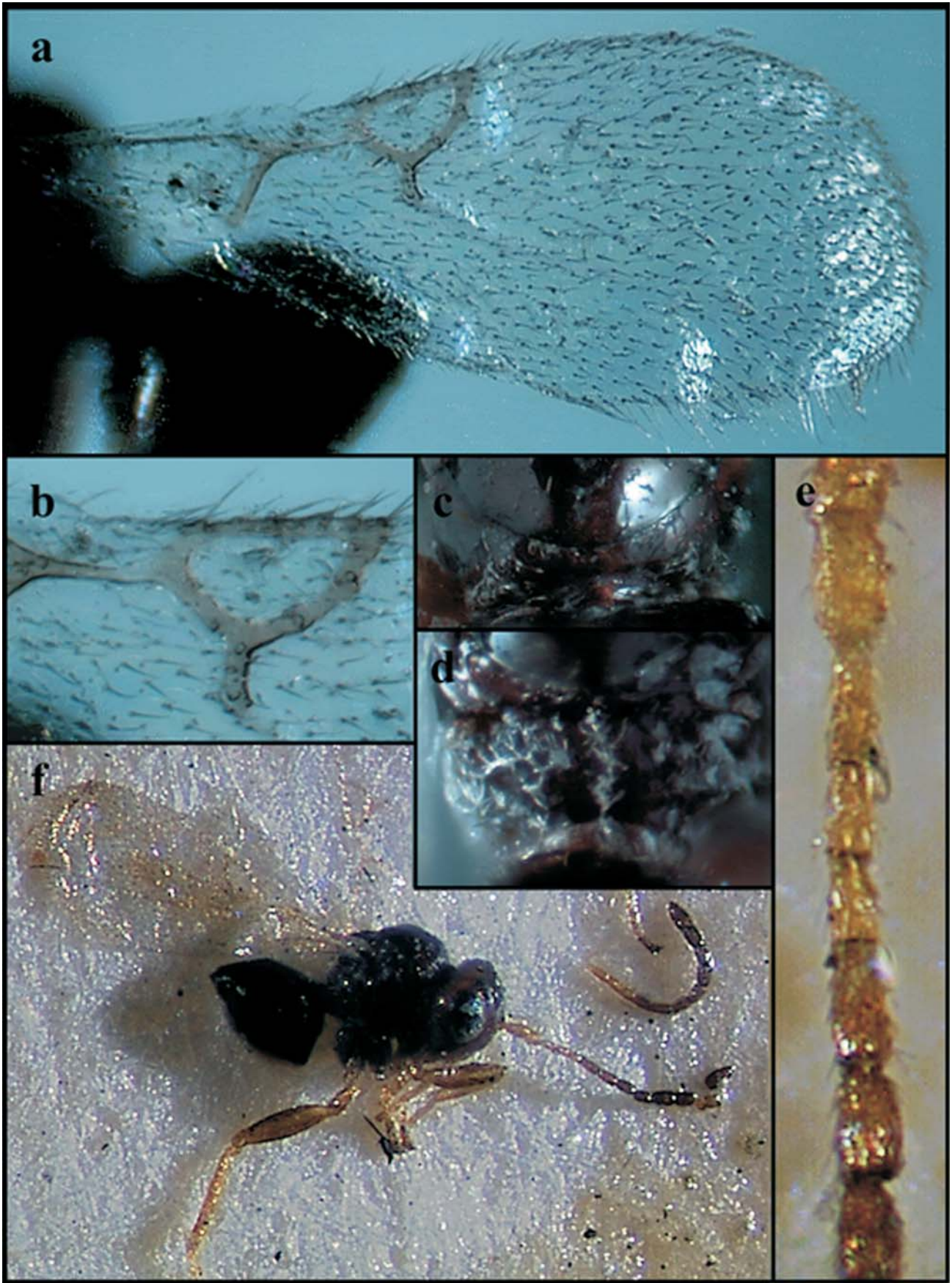


Fig. 4. *Alloxysta mullensis* (Cameron, 1883), female: a) forewing; b) radial cell; c) pronotum; d) propodeum; e) antenna; f) body.
 Fig. 4. *Alloxysta mullensis* (Cameron, 1883), hembra: a) ala anterior; b) celda radial; c) pronoto; d) propodeo; e) antena; f) cuerpo.

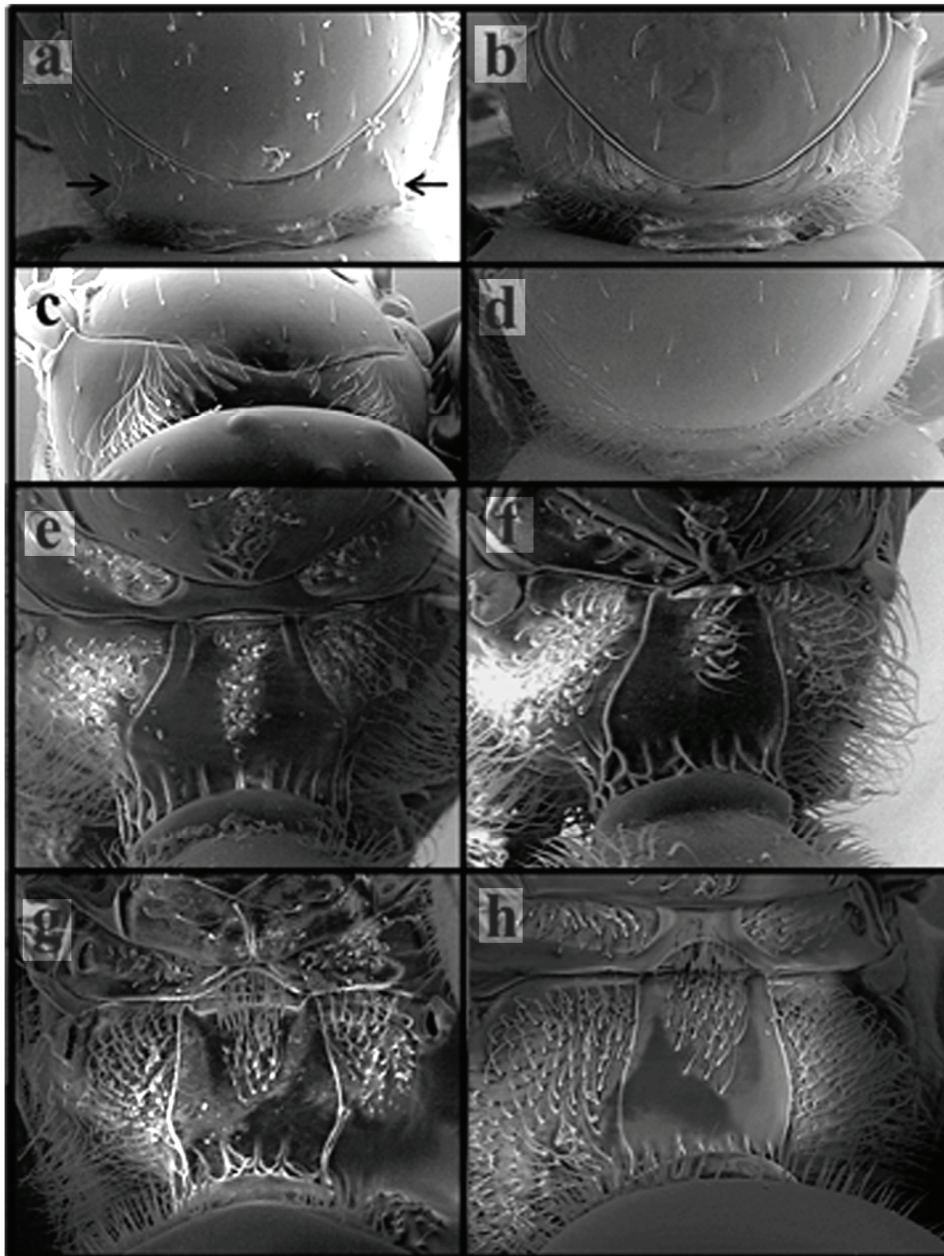


Fig. 5. Details of pronotum and propodeum: **a)** pronotum of *A. arcuata*; **b)** pronotum of *A. brevis*; **c)** pronotum of *A. darci*; **d)** pronotum of *A. mullensis*; **e)** propodeum of *A. arcuata*; **f)** propodeum of *A. brevis*; **g)** propodeum of *A. darci*; **h)** propodeum of *A. mullensis*.

Fig. 5. Detalles del pronoto y el propodeo: **a)** pronoto de *A. arcuata*; **b)** pronoto de *A. brevis*; **c)** pronoto de *A. darci*; **d)** pronoto de *A. mullensis*; **e)** propodeo de *A. arcuata*; **f)** propodeo de *A. brevis*; **g)** propodeo de *A. darci*; **h)** propodeo de *A. mullensis*.

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