

## SYSTEMATICS, MORPHOLOGY AND PHYSIOLOGY

### First Record of *Alloxysta* Förster (Hymenoptera: Figitidae) from Costa Rica, with Description of Four New Species

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#### Keywords

Cynipoidea, Charipinae, Neotropical, Central America, faunistic

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Edited by Takumasa Kondo – CORPOICA

Received 04 April 2011 and accepted 13 June 2011

#### Abstract

Four new species of *Alloxysta* Förster are described (*A. andrewsi* Ferrer-Suay & Pujade-Villar n. sp., *A. costaricensis* Ferrer-Suay & Pujade-Villar n. sp., *A. hansonii* Pujade-Villar n. sp. and *A. luismii* Ferrer-Suay n. sp.) from Costa Rica being the first records of this genus in this area. Their morphological features and diagnostic characters are illustrated. We provide a diagnosis of *Apocharips hansonii* Menke with a detailed description of the radial cell, which expands the characteristics of the genus *Apocharips*.

#### Introduction

The Charipinae (Hymenoptera: Figitidae) are very small wasps hyperparasitoids of Aphidiinae (Hymenoptera: Ichneumonoidea: Braconidae), Aphelininae (Hymenoptera: Chalcidoidea: Aphelinidae) and Encyrtidae (Hymenoptera: Chalcidoidea) parasitoids of aphids and psyllids. They are a widely distributed group of insects that have expanded along with their hosts (primary parasitoids). This subfamily has an important economic impact on the efficacy of biological control because they may affect the efficiency of primary parasitoids in controlling the pest species.

The taxonomy of this group has suffered a lot of changes throughout the years. Currently, eight valid genera are recognized (Carver 1993, Ronquist 1999, Paretas-Martínez & Pujade-Villar 2006, Pujade-Villar & Paretas-Martínez 2006, Paretas-Martínez *et al* 2007b): *Alloxysta* Förster (cosmopolitan), *Phaenoglyphis* Förster (cosmopolitan), *Lytoxysta* Kieffer (North America), *Loboptercharips* Paretas-Martínez & Pujade-Villar (Nepal), *Dilyta* Förster (cosmopolitan), *Apocharips* Ferguson (cosmopolitan,

not cited from Australia), *Dilapothor* Paretas-Martínez & Pujade-Villar, and *Thoreauana* Girault (Australia).

The genus *Alloxysta* has been previously revised, i.e., Andrews (1978) revised the Nearctic *Alloxysta* and *Phaenoglyphis*, and more recently Pujade-Villar *et al* (2002) revised the South American Charipinae. No exhaustive studies are known from the northern part of the Neotropical region. Only one species of Charipinae, *Apocharips hansonii* Menke, was recorded from Costa Rica. The genus *Alloxysta* is herein recorded for the first time from Costa Rica, and four new species are described. *Alloxysta halli* Andrews is also recorded in Costa Rica for the first time.

#### Material and Methods

The specimens studied in this work were collected by Paul Hanson in different places of Costa Rica during a period of time from 1988 to 1997 with Malaise traps. These specimens are deposited in the following institutions: UCR (Universidad de Costa Rica) and UB (col. J.P-V,

Universitat de Barcelona, Spain).

The most important diagnostic characters assigned to *Alloxysta* are the shape of flagellomeres in female and male antenna, the presence or absence of carinae at the pronotum and propodeum, the size and shape of the radial cell and sometimes the presence of carinae at the apex of the scutellum. We have focused mainly on these characters to compare the specimens of Costa Rica with other species of *Alloxysta* present in the Americas.

The morphological terms used are drawn from Paretas-Martínez *et al* (2007a). The following abbreviations are used: F1-F12, first and following flagellomeres, T2-T3, second and third tergum of the metasoma.

Specimens were studied using stereomicroscopy and environmental scanning electron microscopy. The field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM) was used for high-resolution imaging without gold-coating of the specimens (12-15 kV).

***Alloxysta andrewsi* Ferrer-Suay & Pujade-Villar n. sp. (Fig 1)**

*Type material* (15♀)

**HOLOTYPE** ♀: "COSTA RICA, San José, Zurquí de

Moravia, 1600 m, III.1995, P. Hanson". **PARATYPES**: 1♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, XII.1995, P. Hanson"; 1♀: "COSTA RICA, San José, Cerro de la Muerte, Est. Biol. Cuericí, 2600 m, II.1997, P. Hanson"; 1♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, III.1992, col. P. Hanson"; 1♀: "COSTA RICA, Cartago, La Cangreja, 1950 m, IX-XII.1992, P. Hanson"; 1♀: "COSTA RICA, San José, 2 km W Empalme, 2300 m, II-III.1995, P. Hanson"; 8♀: "COSTA RICA, Cartago, Cerro de la Muerte, Villa Mills, 3000 m, III-VI.1990, Hanson"; 1♀: "COSTA RICA, Cartago, Cerro de la Muerte, Villa Mills, 3000 m, VII-VIII.1989, Hanson". Holotype and nine paratypes deposited in UCR, five paratypes deposited in UB.

**Diagnosis**

Females of *Alloxysta andrewsi* n. sp. (males unknown) are closely related to *Alloxysta affinis* (Baker) and *Alloxysta quebeci* Andrews because all of them have the radial cell partially open and the same proportions of flagellomeres (F1 > F2, F2 subequal to F3). *Alloxysta andrewsi* n. sp. differs from these two species in the location where the rhinaria begins. In *A. andrewsi* n. sp., the rhinaria begins in F3, in *A. affinis* in F2 and in *A. quebeci* in F4. Also, *A. andrewsi* n. sp. differs from *A. affinis* in the smaller size of the radial cell.

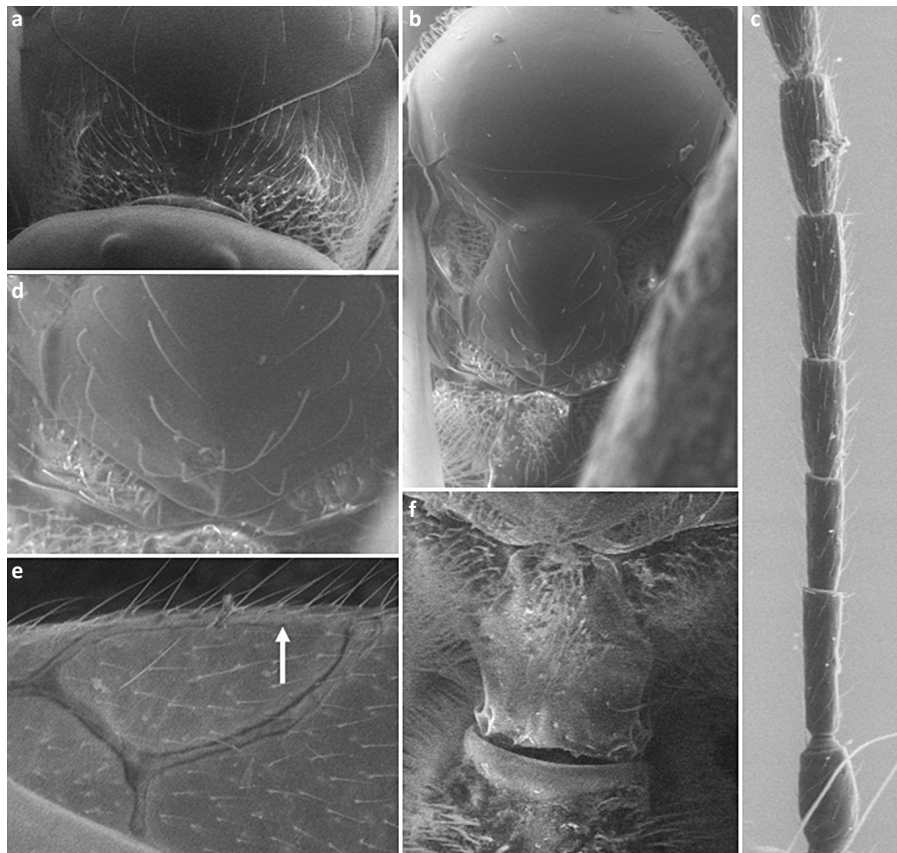


Fig 1 *Alloxysta andrewsi* n. sp. a) pronotal carinae; b) mesoscutum; c) detail antenna; d) carina at the apex of scutellum; e) radial cell, the arrows indicates where the venation ends; f) propodeum plate.

**Description**

*Length.* Female: 0.9-1.2 mm; male: unknown

*Coloration.* Head yellowish brown, mesosoma and metasoma dark brown. Antennomeres 1-4 yellowish brown, antennomeres 5-12 brown. Legs dark yellow. Veins brown.

*Head.* Transversely ovate, slightly wider than high in front view, with smooth and shiny surface; with dense setae around and below toruli and very few setae on vertex and posterodorsal sides of head, long setae on frons. Transfacial line 1.24 times the height of compound eye. Malar space 0.58 times the height of compound eye.

*Antenna* (Fig 1c) 13-segmented, filiform, clava in F3-F11; flagellomeres covered with sparse setae; flagellomeres F1-F2 smooth, F3-F11 with rhinaria; F1 and F2 straight, thinner than remaining ones; pedicel 2.0 times as long as wide, F1 4.7 times as long as wide, F2 3.4 times as long as wide, F3 3.1 times as long as wide; F1 1.3 times as long as pedicel, F1 1.3 times as long as F2, F2 subequal to F3, F1 1.2 times as long as F3, F4 1.2 times as long as F3, F4 longer than F5, F5-F11 subequal in length, width and shape.

*Mesosoma.* Pronotum densely covered with long setae at proximal, center and lower corners; distolateral corners and middle of pronotal plate almost bare. Pronotal carinae clearly distinguishable covered by many setae (Fig 1a). Mesoscutum smooth and shiny, round in dorsal view with scattered setae (Fig 1b). Height of mesopleural triangle along anterior margin 1.5 times the height of mesopleuron. Scutellum smooth and densely pubescent, especially at the apex, with one thick carina at middle of the apex of scutellum (Fig 1d). Carinae of propodeum defined in the anterior 2/3 separated by a densely pubescent space, forming a plaque on the lower 1/3, strongly curved side, having several carinae at the base of the plaque (Fig 1f).

*Forewing.* Large, longer than body, 1.53 times as long as body length, covered with dense pubescence; marginal setae present. Radial cell partially open at the costal margin, 2.4 times as long as wide; R1 slightly curved, Rs long and curved and not reaching costal margin (Fig 1e).

*Metasoma.* Proximal part with an incomplete ring of setae which is narrower dorsally (glabrous in the center) and wider laterally. Remainder of metasoma smooth with terga clearly visible. T1 0.74 times as long as T2, T1 0.30 times as long as metasoma.

*Etymology.* The new species is dedicated to the author who did the last revision of Nearctic Charipinae (genera *Alloxysta* and *Phaenoglyphis*), Fred G. Andrews.

*Distribution.* Only known from Costa Rica.

***Alloxysta costaricensis* Ferrer-Suay & Pujade-Villar n. sp.** (Fig 2)**Type material**

(1♂). **HOLOTYPE** ♂: "COSTA RICA, San José, Cerro de la Muerte, 19 km S, 3W Empalme, 2600 m, IV-V.1993, Hanson & Godoy". Holotype ♂ deposited in UCR.

**Diagnosis**

The male of *Alloxysta costaricensis* n. sp. (females unknown) is closely related to *Alloxysta bicolor* (Baker), because the two species have the radial cell totally open, the same size of radial cell and the same proportions of flagellomeres (F1-F3 subequal in length). Nevertheless, *A. costaricensis* n. sp. differs from *A. bicolor* in the shape of F1-F3 (F1-F3 few modified in *A. costaricensis* n. sp., but F2-F3 straight in *A. bicolor*) and also differs at the beginning of rhinaria (F4 in *Alloxysta costaricensis* n. sp., but F5 in *A. bicolor*).

**Description**

*Length.* Female: unknown; male: 1.16 mm

*Coloration.* Head, mesosoma and metasoma dark brown. Scape brown, antennomeres 2-5 yellowish brown, antennomeres, 6-13 brown. Legs yellowish testaceous. Veins brown.

*Head.* Transversely ovate male slightly wider than high in front view, with smooth and shiny surface; with dense setae around and below toruli and very few setae on vertex and posterodorsal sides of head, setae on frons. Transfacial line 0.85 times the height of compound eye. Malar space 0.38 times the height of compound eye.

*Antenna* (Fig 2a) 14-segmented, filiform, clava in F4-F12; flagellomeres covered with sparse setae; flagellomeres F1-F3 smooth and slightly bowed, F2 and F3 more bowed than F1; F4-F12 with rhinaria; F1, F2 and F3 thinner than remaining ones; pedicel 1.5 times as long as wide, F1 4.2 times as long as wide, F2 4.2 times as long as wide, F3 4.3 times as long as wide; F1 1.7 times as long as pedicel, F1-F4 subequal in length, F4 longer than F5, F5-F12 subequal in length, width and shape.

*Mesosoma.* Pronotum densely covered with long setae at proximal, center and lower corners; distolateral corners almost bare; middle of pronotal plate bare. Pronotal carinae clearly distinguishable, covered by many setae (Fig 2c). Mesoscutum smooth and shiny, round in dorsal view with scattered setae. Height of mesopleural triangle along anterior margin 1.4 times the height of mesopleuron. Scutellum smooth and densely pubescent, not carinated (Fig 2d). Propodeum with two vertical and parallel carinae joining at the base among many pubescence (Fig 2b), with some carinae at the plate base.

*Forewing.* Large, longer than body, 1.7 times as long as



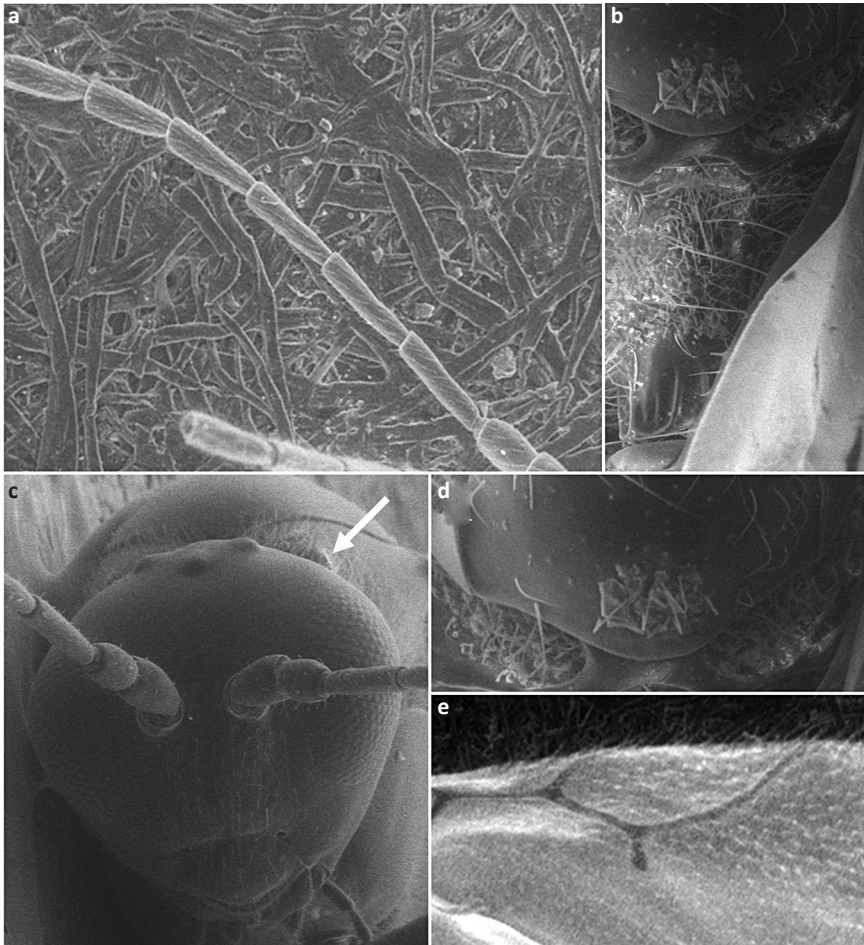


Fig 2 *Alloxysta costaricensis* n. sp. a) detail antenna; b) propodeal carinae; c) pronotal carinae indicated by arrows; d) apex of scutellum; e) radial cell.

body length, covered with dense pubescence; marginal setae present. Radial cell open at the costal margin, 3.2 times as long as wide (Fig 2e); R1 straight and short, Rs long, curved and not reaching costal margin.

**Metasoma.** Proximal part with a complete ring of bristled hairs which is narrower dorsally and wider laterally. Remainder of metasoma smooth with terga clearly visible. T1 0.82 as long as T2, T1 0.32 as long as metasoma in male.

**Etymology.** The name of this species refers to the biogeographical region where it was collected, i.e., Costa Rica.

**Distribution.** Only known from Costa Rica.

### *Alloxysta hansonii* Pujade-Villar n. sp. (Fig 3)

**Type material** (3 ♂ & 12 ♀)

**HOLOTYPE** ♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, XII. 1995, P. Hanson". **PARATYPES:** 1 ♂ with the same label of Holotype; 1 ♂: "COSTA RICA, San José, Cerro

de la Muerte, 19 km S, 3W Empalme, 2600 m, XII.1992, Hanson & Godoy"; 1 ♀: "COSTA RICA, San José, Cerro Muerte, 16 km S, Empalme, 2600 m, III-IV.1989, Hanson"; 1 ♀: "COSTA RICA, San José, Cerro de la Muerte, Est. Biol. Cuericí, 2600 m 1997, P. Hanson"; 1 ♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, I. 1996, col. P. Hanson"; 1 ♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, III. 1996, col. P. Hanson"; 1 ♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, V. 1992, col. P. Hanson"; 1 ♀: "COSTA RICA, San José, Zurquí de Moravia, 1600 m, V.1995, col. P. Hanson"; 2 ♀: "COSTA RICA, San José, 2 km W Empalme, 2300 m, II-III.1995, P. Hanson"; 1 ♀: "COSTA RICA, Cartago, La Cangreja, 1950 m, XII. 1991, Hanson & Godoy"; 1 ♂: "COSTA RICA, San José, Las Nubes, VIII-IV.1988, P. Hanson"; 1 ♀: "COSTA RICA, Cartago, Cerro de la Muerte, Villa Mills, 3000 m, III-VI.1990, Hanson"; 1 ♀: "COSTA RICA, Cartago, Cerro de la Muerte, Villa Mills, 3000 m, VII-IX.1990, Hanson". Holotype ♀ and paratypes (2 ♂ & 8 ♀) deposited in UCR, 1 ♂ and 3 ♀ (paratypes) deposited in UB.

### **Diagnosis**

Females of *Alloxysta hansonii* n. sp. are closely related

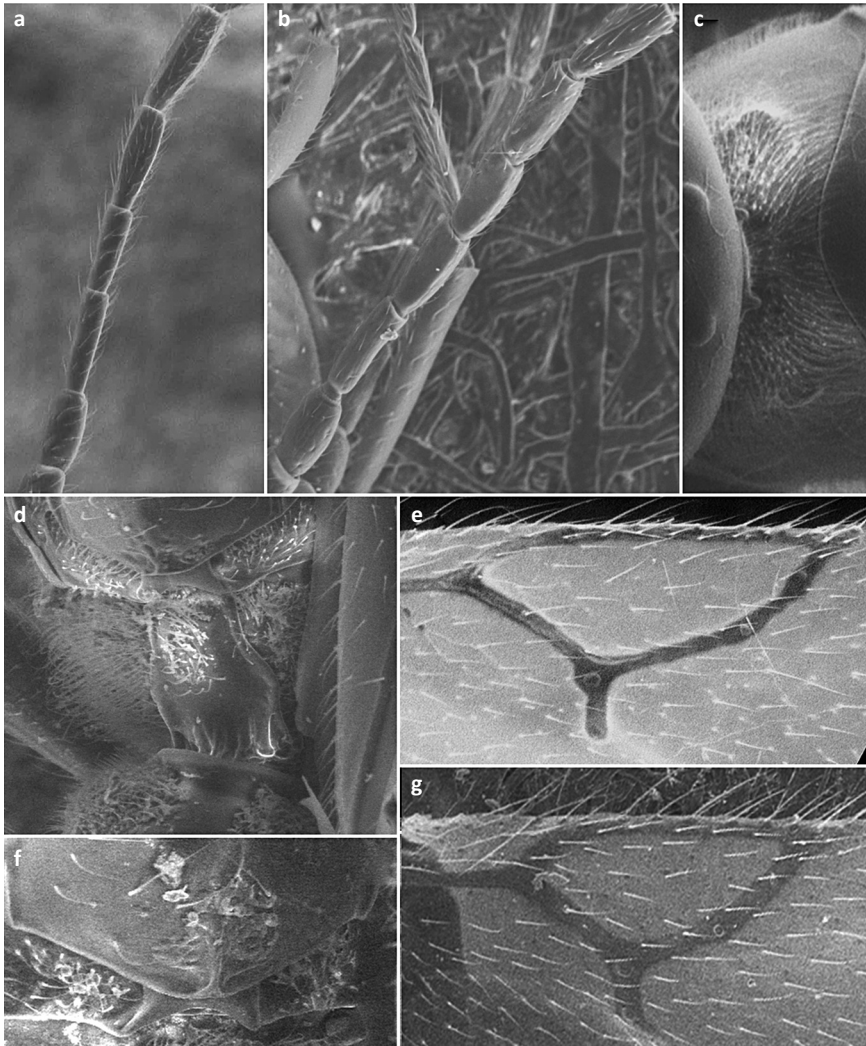


Fig 3 *Alloxysta hansonii* n. sp. a) detail antenna, female; b) detail antenna, male; c) pronotal carinae; d) propodeum plate; e) radial cell, female; f) carina at the apex of scutellum; g) radial cell, male.

to *Alloxysta dicksoni* Andrews and *Alloxysta xanthopsis* (Ashmead) because all of them have the radial cell closed and the same proportions of flagellomeres ( $F1 > F2$ ,  $F2 < F3$ ). Nevertheless, *A. hansonii* n. sp. differs from these two species mentioned in the size of the radial cell; which is bigger in *A. hansonii* n. sp. than in *A. dicksoni* and *A. xanthopsis*. Also, *A. hansonii* n. sp. differs from *A. dicksoni* in the location where the rhinaria begins ( $F4$  in *A. hansonii* n. sp., and  $F3$  in *A. dicksoni*) and differs from *A. xanthopsis* because the mesoscutum is glabrous in *A. hansonii* n. sp. (does not have two lines of setae trisecting it as in *A. xanthopsis*). Males of *A. hansonii* n. sp. are closely related to *A. dicksoni* and *Alloxysta leguminosa* (Weld 1920) because all of them have a closed radial cell and the same proportions on flagellomeres ( $F1 > F2$ ,  $F2$  subequal to  $F3$ ). Nevertheless, *A. hansonii* n. sp. differs from *A. dicksoni* on the shape of  $F2$  ( $F2$  of *A. dicksoni* greatly narrowed in basal one-fifth,  $F2$  does not have this shape in *A. hansonii* n. sp.) and differs from *A. leguminosa* in the location where the rhinaria begins ( $F5$  in *A. hansonii* n. sp.,  $F4$  in

*A. leguminosa*). Also differs from these two species in the size of the radial cell (bigger in *A. hansonii* n. sp. than in *A. dicksoni* and smaller than *A. leguminosa*). *Alloxysta hansonii* n. sp. is also closely related to two cosmopolitan species that had been introduced in the Neotropical region [*Alloxysta fuscicornis* (Hartig) and *Alloxysta victrix* (Westwood)] because all of them have the radial cell closed and pronotal carinae present, but differ mainly in the presence of propodeal carinae (present in *A. hansonii*, but absent in *A. fuscicornis* and *A. victrix*). Moreover, males of *A. hansonii* n. sp. also differ from males of *A. fuscicornis* and *A. victrix* in the shape of  $F1$ - $F3$ ;  $F1$  slightly modified in *A. hansonii* n. sp.,  $F1$ - $F3$  strongly modified in *A. fuscicornis* and *A. victrix*. *Alloxysta hansonii* n. sp. is also closely related to *Alloxysta desantisi* Pujade-Villar & Diaz because the two species have the radial cell closed, pronotal and propodeal carinae present but differs in size of the radial cell (bigger in *A. hansonii* n. sp.) and in shape of carinae at the propodeum (slightly curved in *A. hansonii* n. sp., straight in *A. desantisi*); moreover, the male of *A. hansonii*



n. sp. also differs from the male of *A. desantisi* in the shape of F1-F3 (only F1 few modified in *A. hansonii* n. sp., F1-F3 clearly bowed in *A. desantisi*).

### Description

*Length.* Female: 0.9-1.4 mm; male: 1.0-1.1 mm

*Coloration.* Head brown or yellowish brown; mesosoma and metasoma dark brown. Antennomeres 1-3 dark yellow or yellowish brown, antennomeres 4-13 brown. Legs dark yellow. Veins brown.

*Head.* Transversely ovate, smooth and shiny, slightly wider than high in front view, with dense setae around and below toruli and very few setae on vertex and posterodorsal sides of head; setae on frons. Transfacial line 0.97 times the height of a compound eye. Malar space 0.47 times the height of a compound eye.

*Antenna.* Female (Fig 3a): 13-segmented, filiform; clava in F3-F11; flagellomeres covered with sparse setae; F1-F3 smooth, F4-F11 with rhinaria; F1 and F2 straight, thinner than remaining ones; pedicel 2.3 times as long as wide, F1 4 times as long as wide, F2 3.3 times as long as wide, F3 3.2 times as long as wide; F1 1.2 times as long as pedicel, F1 1.2 times as long as F2, F3 1.2 times as long as F2, F1 subequal to F3, F4 1.2 times as long as F3, F4-F11 subequal in length, width and shape. Male (Fig 3b): 14-segmented, filiform, clava F2-F12; flagellomeres covered with sparse setae; F1 thinner, smooth and slightly bowed, F5-F12 with rhinaria; pedicel 2 times as long as wide, F1 3.3 times as long as wide, F2 2.3 times as long as wide, F3 2 times as long as wide; F1 1.1 times as long as pedicel, F1 1.1 times as long as F2, F2 subequal to F3, F4 1.1 times as long as F3, F4-F12 subequal in length, width and shape.

*Mesosoma.* Pronotum densely covered with long setae, glabrous or with very few setae at distolateral corners; pronotal carinae long and thick, covered by abundant setae (Fig 3c). Mesoscutum smooth and shiny, round in dorsal view with scattered setae. Height of mesopleural triangle along anterior margin 1.4 times the height of mesopleuron. Scutellum smooth and densely pubescent, with one thick carina at middle of the apex of scutellum (Fig 3f). Carinae of propodeum defined in the anterior 2/3 separated by a densely pubescent space, forming a plaque on the lower 1/3, slightly curved side, having several carinae at the base of the plaque (Fig 3d).

*Forewing.* Large, longer than body, 1.37 times as long as body length in female and 1.40 as long as body length in male, covered with dense pubescence; marginal setae present. Radial cell closed, 2.6 times as long as wide in female (Fig 3e), 2.4 times as long as wide in male (Fig 3g); R1 short, slightly curved in female and straight in male; Rs long, curved.

*Metasoma.* Proximal part with an incomplete ring of setae; narrower dorsally (glabrous in the center) and wider

laterally. Remainder of metasoma smooth with terga clearly visible. T1 0.70 as long as T2, T1 0.30 as long as metasoma in female; T1 0.76 as long as T2, T1 0.28 as long as metasoma in male.

*Etymology.* The new species is dedicated to Paul E. Hanson (University of Costa Rica) who collected the Type material.

*Distribution.* Only known from Costa Rica.

### *Alloxysta luismii* Ferrer-Suay n. sp. (Fig 4)

#### Type material (1♂)

**HOLOTYPE** ♂: "COSTA RICA, Heredia Santo Domingo, 1200 m, Café, YPT VII.1994, M. Cerda & P. Hanson". Holotype ♂ deposited in UCR.

#### Diagnosis

The male of *Alloxysta luismii* n. sp. (females unknown) is closely related to *A. affinis* (Baker) and *Alloxysta commensuratus* Andrews because all of them have the radial cell partially open at the costal margin and F1-F3 not bowed. Nevertheless, *A. luismii* n. sp. differs from both mentioned species in the proportion of the flagellomeres; F1-F3 subequal in length in *A. luismii* n. sp. and F1>F2, F2=F3 in *A. affinis* and *A. commensuratus*. Also *A. luismii* n. sp. differs from both in the size of the radial cell; in *A. luismii* n. sp. it is smaller than *A. affinis* and *A. commensuratus*.

#### Description

*Length.* Female: unknown, male: 1.03 mm

*Coloration.* Head, mesosoma and metasoma light brown, the bottom of the head and metasoma yellowish. Antennomeres 1-3 yellow, the rest of antennomeres brown gradually darkening to the end. Legs dark yellow. Veins brown.

*Head.* Transversely ovate, smooth and shiny, wider than high in front view, with dense setae on frons and very few setae around and below toruli, on vertex and posterodorsal sides of head. Transfacial line 1.38 times the height of compound eye. Malar space 0.52 times the height compound eye.

*Antenna.* (Fig 4b) 14-segmented, filiform; clava F2-F12; flagellomeres covered with sparse setae; F1-F2 smooth, F3-F12 with rhinaria; F1 thinner than remaining ones, F1-F3 not bowed; pedicel 1.7 as long as wide, F1 as long as pedicel; F1 2.8 as long as wide, F2 2.5 as long as wide, F3 2.3 as long as wide; F1-F3 subequal in length, F4 1.2 times as long as F3, F4-F12 subequal in length, width and shape.

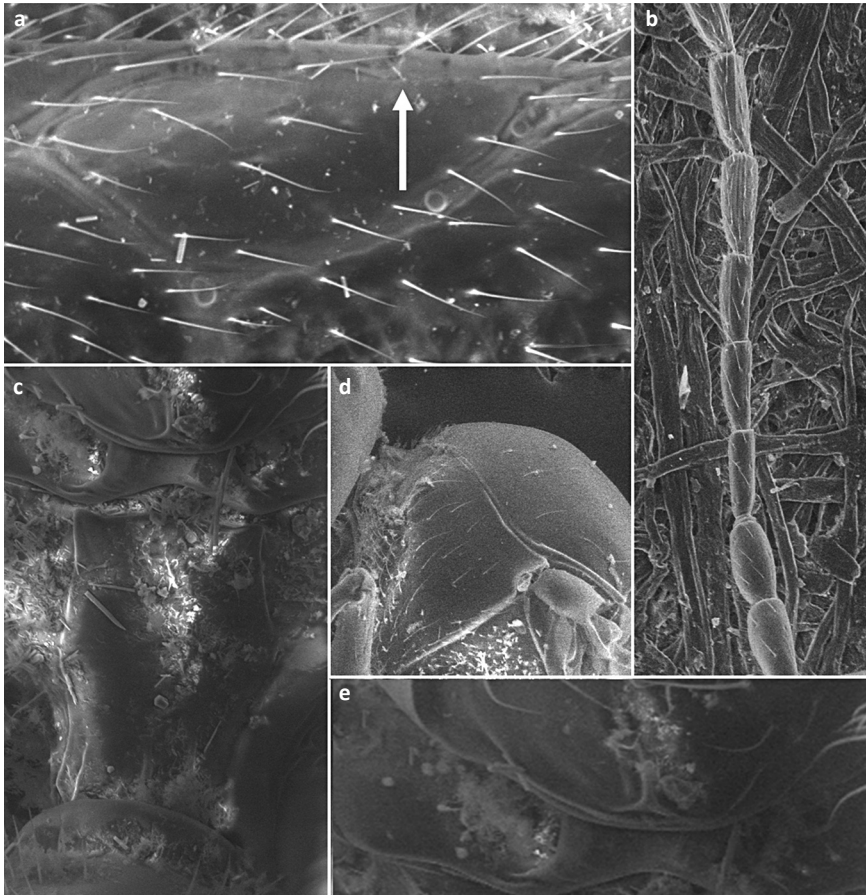


Fig 4 *Alloxysta luismii* n. sp. a) radial cell, the arrows indicates where the venation ends; b) detail antenna; c) propodeum plate; d) pronotal carinae; e) carina at the apex of scutellum.

**Mesosoma.** Pronotum densely covered with long setae, glabrous or with very few setae at distolateral corners; pronotal carinae thick, clearly visible (Fig 4d). Mesoscutum smooth and shiny, round in dorsal view with scattered setae. Height of mesopleural triangle along anterior margin two times the height of mesopleuron. Scutellum smooth and densely pubescent, with one thick carina at middle of the apex of scutellum (Fig 4e). Carinae of propodeum defined in the anterior 2/3 separated by a space densely pubescent, forming a plaque on the lower 1/3, curved side, having several carinae at the base of the plaque (Fig 4c).

**Forewing.** Large, longer than body, 1.19 times as long as body, covered with dense pubescence; marginal setae present. Radial cell closed, 2.3 times as long as wide (Fig 4a); R1 short, Rs long and curved.

**Metasoma.** Proximal part with an incomplete ring of setae; narrower dorsally (glabrous in the center) and wider laterally. Remainder of metasoma smooth with terga clearly visible. T1 0.70 as long as T2, T1 0.23 as long as metasoma.

**Etymology.** The new species is dedicated to Luis-Miguel Garrido-Salas; the author of this species wants to thank him for always being there.

**Distribution.** Only known from Costa Rica.

### *Alloxysta halli* Andrews

**Studied material.** (1♀) "COSTA RICA, San José, Cerro Muerte, 20 km S. Empalme, 2800 m, III-IV 1989, Hanson"

### **Diagnosis**

According to Andrews (1978: 63), the female of *Alloxysta halli* is distinguished from other Nearctic species by the lack of an expanded fifth antennal segment. In the other hand, *A. halli* is closely related to *A. bicolor* (Baker) and *Alloxysta schlingeri* Andrews because all of them have the radial cell open and the same proportions of flagellomeres ( $F1 > F2$ ,  $F2 = F3$ ). Nevertheless, *A. halli* differs from both mentioned species in the size of the radial cell (in *A. halli* it is smaller than *A. bicolor* and bigger than *A. schlingeri*). Also differs from *A. bicolor* in the setal arrangement of the mesoscutum (with scattered setae in *A. halli*, and scattered setae on anterior and lateral one-third in *A. bicolor*) and differs from *A. schlingeri* in Rs (in *A. halli* it is not distinctly angulated just before costal margin).

**Distribution.** Canada (Alberta, British Columbia and Ontario), USA (Washington) (Andrews 1978: 63) and Costa Rica (present study).

### ***Apocharips hansonii* Menke**

**Type material** (1♀, 1♂)

**HOLOTYPE** ♀: “Costa Rica, Cartago, La Cangreja, 1950 m, III-V-1992, Malaise trap, Paul Hanson collector”; “HOLOTYPE *Apocharips hansonii* Menke, Arnold S. Menke (pink label)”. **PARATYPE** ♂: “COSTA RICA, Alajuela P. N., Volcan Poas 2500 m, 26.V.1991, col. Paul Hanson”; “*Trioza* sp. leaf gall on *Phoebe* or *Nectandra*”; “PARATYPE *Apocharips hansonii* Menke, Arnold S. Menke (partially pink label)”.

**Additional material** (4♀, 2♂). 1♂ & 1♀: “Cerro de la Muerte, IV. 1995, leaf gall on *Cinnamomum*” 1♀: “COSTA RICA, Alajuela P.N., Volcan Poas, 2500 m, 25.X.1990, col. Paul Hanson”, “Psyllid leaf gall-Lauraceae”; 1♀: “Volcan Poas, I. 95, Cinamf. psyllid galls”; 1♂: “Volcan Poas, I. 94, Cinamf. psyllid gall”; 1♀: “COSTA RICA, Punter. Pen. Osa, 5 km N. Pto. Jiménez, 10 m, VII-VIII.1993, Hanson & Godoy”.

### **Diagnosis**

This species is characterized and differentiated from all other species of this genus by having irradiant carinae in the head around the clypeus (see Fig 10 in Menke 1993: 100).

### **Comments**

In the original description, Menke (1993) only mentioned the length of the radial cell, but not its shape. Nevertheless, after studying the type material and the additional material of this species we concluded that the shape of the radial cell is peculiar in *A. hansonii*. The radial cell is open with R1 short, reaching costal margin, Rs long, slightly curved, also reaching costal margin and these two veins are not parallel (Fig 5b). Traditionally, one of the diagnostic features of *Apocharips* genus was the shape of the radial cell: open with inner and outer veins (R1-Rs) parallel (Fig 5a). Thus in *Apocharips* genus we can find these two types of radial cell; the model of *A. hansonii* is exclusive of this species.

**Distribution.** Costa Rica.

### **Discussion**

Relatively few studies have been done that address the Charipinae in the Nearctic and Neotropical region.

Andrews (1978) revised the Nearctic *Alloxysta* and

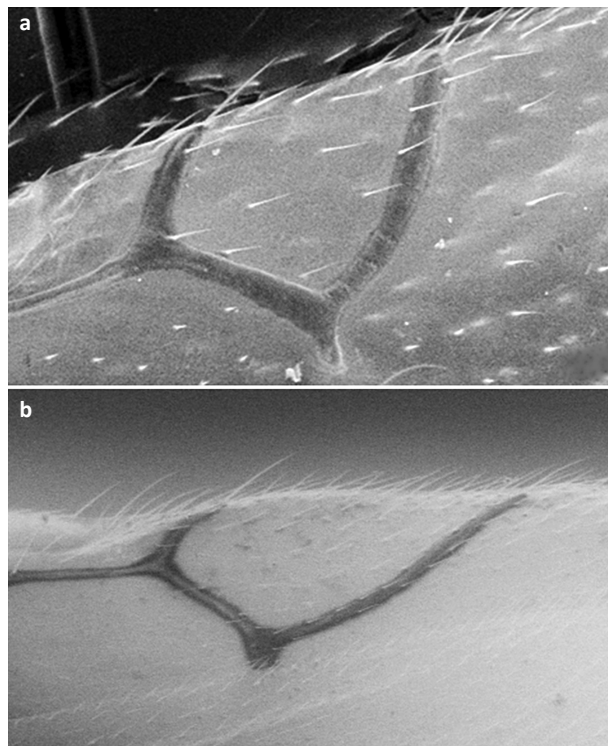


Fig 5 Two types of radial cell in *Apocharips* genus. a) radial cell of *Apocharips trapezoidea*; b) radial cell of *Apocharips hansonii*.

*Phaenoglyphis* genera and described some new species, including *A. halli* that has been now been recorded in Costa Rica.

In the Neotropical region, Andrews (1976) described a species from Argentina and Chile, Pujade-Villar *et al* (2002) reviewed the Charipinae species present in South America and Paretas-Martínez & Pujade-Villar (2007) reviewed the Neotropical Charipinae. These studies show that hitherto there were only six species described for this region: *A. desantisi*, *A. fuscicornis*, *Alloxysta nothofagi* Andrews, *Apocharips angelicae* Pujade-Villar & Evenhuis, *Apocharips hansonii* and *Phaenoglyphis villosa* (Hartig). Paretas-Martínez & Pujade-Villar (2007) determined nine distinct morphotypes of *Alloxysta* from the Neotropical region that were possibly new species, although they have not been described yet.

Concerning to Costa Rica, only *Apocharips hansonii* Menke was described. After this study, the *Alloxysta* genus is also recorded in Costa Rica. We also highlight the expansion of the distribution range of *A. halli*, which was only known from Canada and the USA. This species and the four herein described follow the same morphological pattern: all have a brown-yellowish coloration, and carinae present at the pronotum and propodeum. The pronotal carinae are in all cases very thick and clearly visible; the propodeal carinae are also evident, well defined at anterior two-thirds separated by pubescence and forming a plate in the bottom third, in this bottom



plate there are a number of carinae. All new species have a thick carina at the apex of scutellum, except for *A. costaricensis*.

The species of *Alloxysta* cited in this study are distinguished by the morphology of the radial cell and the different proportions of flagellomeres:

- *A. halli* and *A. costaricensis* (females unknown) have the radial cell completely open; the males of these two species differ in the morphology and proportions of the first three flagellomeres, in the location where the rhinaria begins and the size of radial cell.
- *A. andrewsi* (males unknown) and *A. luismii* (females unknown) have a radial cell partially open. These two species described in this study from different sexes cannot be considered as the male and female of the same species because of: i) the relatively greater curvature of the vein Rs in *A. andrewsi*; ii) the greatest thickness and curvature of the pronotal carinae in *A. luismii*; and iii) the distinct morphology of the propodeal plate.
- *A. hansonii* is the only species of Costa Rica with a closed radial cell.

## Acknowledgments

We want to thank Dr. Paul Hanson for the loan of the species described in this study, and to the anonymous reviewers whose comments helped improved the manuscript. This research was supported by the projects CGL2008-00180 and the grant AP2009-4833 of the Science and Innovation Ministry of Spain.

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