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MAR FERRER-SUAY (*) - JESUS SELFA (**) - CLAIRE VILLEMANT (***)
MARIE-CECILE ANDREÏ-RUIZ (****) - JULI PUJADE-VILLAR (*)

FIRST RECORDS OF CHARIPINAE (HYMENOPTERA CYNIPOIDEA FIGITIDAE) FROM THE CORSICA ISLAND

(*) *Universitat de Barcelona, Facultat de Biologia, Departament de Biologia Animal. Avda. Diagonal 645, 08028-Barcelona, Spain;*e-mail: jpujade@ub.edu; mar.ferrer.suay@gmail.com *(Corresponding Author).*
(**) *Universitat de València, Facultat de Ciències Biològiques, Departament de Zoologia. Campus de Burjassot-Paterna, Dr. Moliner 50, E-46100 Burjassot (València), Spain;* e-mail: jesus.selfa@uv.es
(***) *Muséum National d Histoire Naturelle, UMR7205 MNHN-CNRS. 45, Rue Buffon. 75005-Paris, France;* e-mail: ville man@mnhn.fr
(****) *Office de l'Environnement de la Corse, Avenue Jean Nicoli, 20250 Corte, France;* e-mail: marie-cecile.ruiz@oec.fr

Ferrer-Suay M., Selfa J., Villemant C., Andreï-Ruiz M.-C., Pujade-Villar J. – First records of Charipinae (Hymenoptera Cynipoidea Figitidae) from the Corsica island.

Charipinae fauna from the Corsica Island has been studied. Five *Alloxysta* and one *Apocharips* species are cited for the first time in this island: *Alloxysta arcuata* (Kieffer, 1902), *A. brevis* (Thomson, 1862), *A. castanea* (Hartig, 1841), *A. citripes* (Thomson, 1862), *A. victrix* (Westwood, 1833) and *Apocharips trapezoidea* (Hartig, 1841). These identifications are the first record of these two genera and the Charipinae subfamily from the Corsica Island. Short descriptions and diagnoses are given for all Charipinae species present in this island. A key to distinguish them is also given.

KEY WORDS: Hymenoptera, Figitidae, Charipinae, *Alloxysta*, *Apocharips,* Corsica Island.

INTRODUCTION

The Charipinae belong to Figitidae family (Hymenoptera: Cynipoidea). They are mainly parasitoids of other insects. Concretely, Charipinae are secondary parasitoids of aphids via the hymenopterans Aphidiinae (Braconidae) and Aphelininae (Aphelinidae) and secondary parasitoids of psyllids *via* Encyrtidae (Hymenoptera: Chalcidoidea) (MENKE and EVENHUIS, 1991). They are economically and biologically very important but identifying specimens at species level is very difficult. For this reason, a comprehensive revision of this subfamily is necessary; this is the task undertaken nowadays by the Cynipoidea group at the University of Barcelona.

The taxonomy of subfamily Charipinae has been always very chaotic and an obstacle to correctly identify the species. Eight genera are considered valid within the subfamily: *Alloxysta* Förster (cosmopolitan), *Phaenoglyphis* Förster (cosmopolitan), *Lytoxysta* Kieffer (North America), *Lobopterocharips* Paretas-Martínez & Pujade-Villar (Nepal), *Dilyta* Förster (cosmopolitan, except Australia), *Apocharips* Fergusson (Eastern Palaearctic and Neotropics), *Dilapothor* Paretas-Martinez & Pujade-Villar (Australia), and *Thoreauana* Girault (Australia). A total of 281 species have been described throughout the years of which 168 are considered valid (FERRER-SUAY *et al.*, 2012). Members of subfamily Charipinae are very small wasps (0.8-2.0mm), characterized by a smooth and shiny body, antennae filiform and an important reduction of wing venation. *Alloxysta* is the most species-rich and widespread genus within the Charipinae. Nowadays, it includes 111 valid species (FERRER-SUAY *et al.*, 2012). On another hand, the genus *Apocharips* includes only six valid species (FERRER-SUAY *et al.*, 2013).

Charipinae fauna from the Corsica Island has been revised. No Charipinae species has so far been recorded from this island. Five *Alloxysta* species have been identified: *A. arcuata* (Kieffer, 1902), *A. brevis* (Thomson, 1862), *A. castanea* (Hartig, 1841), *A. citripes* (Thomson, 1862) and *A. victrix* (Westwood, 1833). Only one and well distributed *Apocharips* species has been recorded: *A. trapezoidea* (Hartig, 1841). These new recorded species are shortly described and compared with their most similar species. These short descriptions present the main diagnostic features which are essential to identify each species and differentiate it from the others. These features are illustrated in corresponding figures. A key is given to identify the Charipinae from the Corsica Island.

MATERIAL AND METHODS

The material studied here was caught in Corsica in spring, between 1993 and 1997, with yellow pan traps or Malaise traps. The location of the study sites and capture methods performed are mentioned and illustrated in PUJADE-VILLAR *et al.*, (2003: Fig. I). The material is deposited in the Universitat de Barcelona (UB) and Muséum National d'Histoire Naturelle of Paris (MNHN). A previous record of Cynipidae collected during the same project was previously published (PUJADE-VILLAR *et al.*, 2003).

In 1993, collections were made every week from the 1st May to the 2nd July (R1 to R9 samplings) in four study sites, two of them being located in crowded oak stands (DN and DA) and two others in clear senescent oak stands (SW and SE). In each site 3 yellow pan traps were positioned on the ground (S) and 3 others in the tree crown (C) using an original system of pulleys developed by ANDREÏ-RUIZ (1996). In 1994, yellow pan traps were

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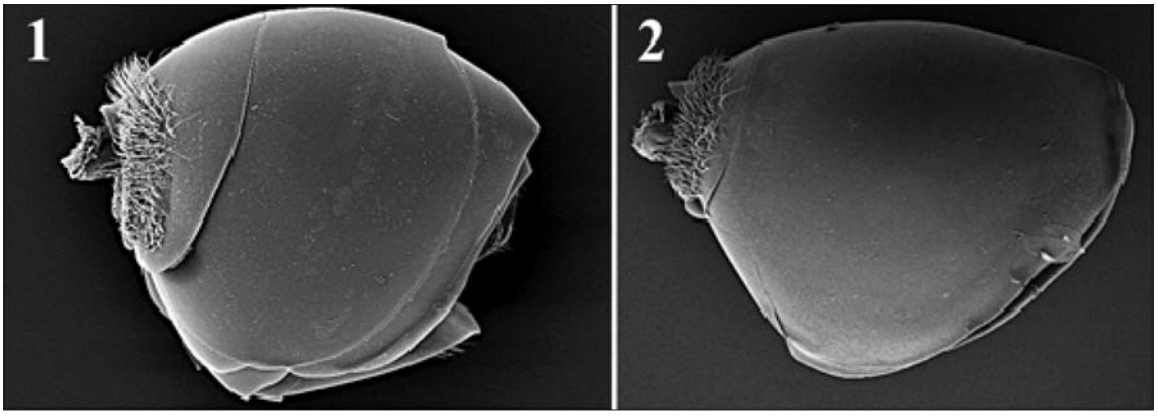

Figure I – Metasoma in lateral view of: 1) *Alloxysta* sp.; 2) *Apocharips* sp.

placed in a crowded green oak stand near the forest station of Pirio. Traps were set up in various strata from the ground (CS1 to CS17 traps) to 3 m (CI to CVI) and 14 m (CH1 to CH6) above the ground. Collections were made from 4th to 12th June (R1) and 12th to 19th June (R2) (VILLEMANT and ANDREÏ-RUIZ, 1999). In 1997 a Malaise trap was placed in the same oak stand and insects were collected weekly from the 27th May to the 5th August.

In 1996, cynipoids were caught with two Malaise traps, one positioned on the ground (MS) and the other in the crown of a tree at 3m above the ground (MH). Both were located in cork oak forest of Bastiliccacia at about 10 km eastward from Ajaccio. Emergence traps were also placed on the ground in the cork oak stand. Collections were performed weekly from the 31st May to the 21st June (R1 to R4 samplings).

All specimens, mounted on cardboards, have been studied with a stereomicroscope (NIKON SMZ-1). The field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM) was used for high-resolution imaging without gold-coating of the specimens.

Morphological terms used are taken from 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 base of Rs vein. Females and males are morphologically identical except where indicated.

Figure 1 shows the shape of *Alloxysta* and *Apocharips* metasoma. For better comparison, antennae of all the *Alloxysta* and *Apocharips* species cited here are grouped in Fig. II, 1-6, all radial cells in Fig. III, 1-6; different shapes of pronotum and propodeum are showed in Fig. IV, 1-4.

RESULTS

Alloxysta arcuata (Kieffer, 1902)

DIAGNOSIS – *Alloxysta arcuata* is mainly characterized by a small closed radial cell, presence of pronotal carinae, propodeal carinae forming a plate, F1 subequal to pedicel and longer to F2, F2 subequal to F3. *Alloxysta arcuata* is similar to *Alloxysta ramulifera* (Thomson, 1862) but the two species can be differentiated by several features: rhinaria begin in F3 in *A. arcuata* female (Fig. II, 1) instead of F4 in *A. ramulifera*; pronotal carinae are well defined and visible in *A. arcuata* (Fig. IV, 3) but

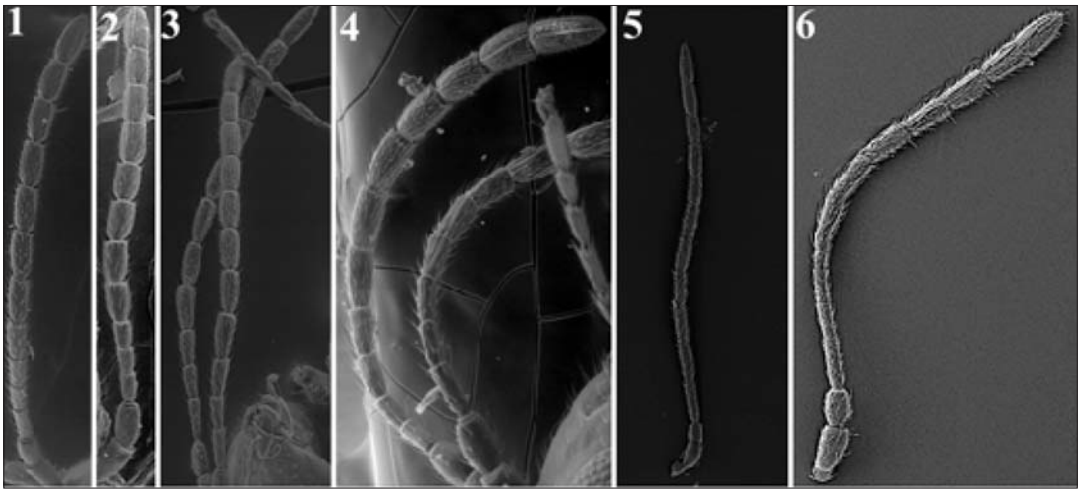

Figure II – Antennae of: 1) *Alloxysta arcuata*; 2) *A. brevis*; 3) *A. castanea*; 4) *A. citripes*; 5) *A. victrix*; 6) *Apocharips trapezoidea*.

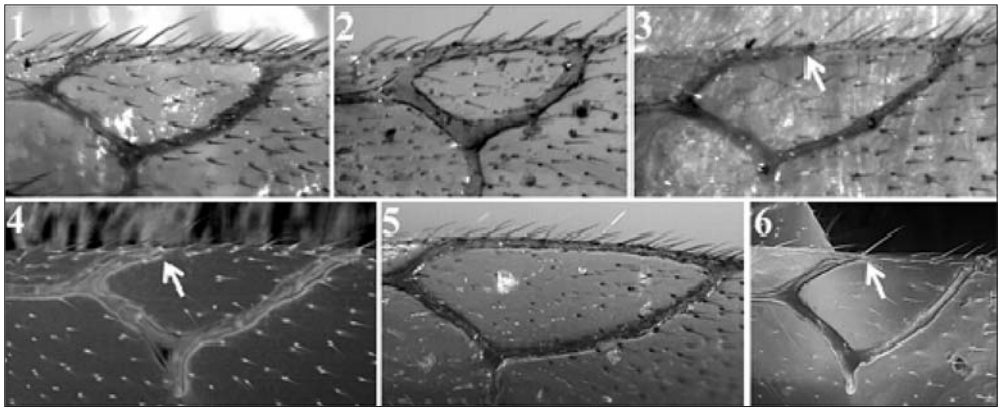

Figure III – Radial cell of: 1) *Alloxysta arcuata*; 2) *A. brevis*; 3) *A. castanea*; 4) *A. citripes*; 5) *A. victrix*; 6) *Apocharips trapezoidea*.

small and sometimes difficult to see under the pubescence in *A. ramulifera*; radial cell is 2.3x as long as wide in *A. arcuata* (Fig. III, 1) instead of 2.0x in *A. ramulifera*; propodeal carinae are curved in *A. arcuata* (Fig. IV, 1) and straight in *A. ramulifera*.

MATERIAL EXAMINED – (1♂ & 5♀♀) "CH1 R1 94 Pirio": 3♀; "Corse subéraie Bastilicaccia, R2MH Malaise, 31 V-7 VI 1996": 1♀; "Pirio CH5 R2 94": 1♀; "Corse subéraie Bastilicaccia, R3MS Malaise, 7-14 VI 1996": 1♂; "PIRIO C517 R2 94": 1♀. 1♂ & 3♀ (MNHN) and 2♀ (UB).

SHORT DESCRIPTION – Head yellowish brown in female (more yellowish in male), mesosoma and metasoma dark brown; scape, pedicel, F1 and F2 dark yellow, F3-F12 brown; legs yellow and veins yellowish brown. Female antenna 13-segmented; F1-F2 smooth, thinner than remaining ones; club begins in F3 but it is more evident from F4, F3-F11 with rhinaria; F1 subequal to pedicel, F1 longer than F2, F2-F4 subequal (Fig. II, 1). Male antenna 14-segmented; F1 smooth, thinner than remaining flagellomeres, F2-F12 with rhinaria and club shaped; F2 sometimes slightly curved, F1 longer than pedicel, F1 subequal to F2, F2 shorter than F3 and F3 shorter than F4. Pronotum densely pubescent with two carinae clearly visible under the pubescence (Fig. IV, 3). Propodeum densely pubescent, with a central plate formed by two carinae bearing several apical setae; plate margins slightly curved outward (Fig. IV, 1). Forewing longer than body, radial cell closed, 2.3 times as long as wide in both sexes (Fig. III, 1).

DISTRIBUTION - Previously known from the Palaearctic region. New record from the Corsica Island.

Alloxysta brevis (Thomson, 1862)

DIAGNOSIS - *Alloxysta brevis* is mainly characterized by a small closed radial cell, absence of pronotal carinae, propodeal carinae forming a plate, F1 shorter than pedicel and F1-F3 subequal in length. This species is similar to *Alloxysta darci* (Girault, 1933), but could be differentiated by the antenna's length: shorter than body in *A. brevis* while longer in *A. darci*; marginal setae of forewing shorter in *A. brevis* than in *A. darci*.

MATERIAL EXAMINED - (2♀) "Fango 10 VII 1991, VC2": 1♀ (MNHN); "Pirio CS13 R1 94": 1♀ (UB).

SHORT DESCRIPTION - Head yellowish brown, mesosoma and metasoma dark brown; scape, pedicel and F1-F3 yellow, F4-F12 brown; legs yellowish testaceous and veins yellowish brown. Female antenna 13-segmented; F1-F3 smooth and thinner than remaining ones, F4-F11 with rhinaria and club shaped; F1 shorter than pedicel, F1-F3 subequal in length, F3 shorter than F4 (Fig. II, 2). Male antenna 14-segmented; as female without any flagellomere curved. Pronotum covered with sparse setae, without carinae (Fig. IIII, 4). Propodeum covered with abundant pubescence; two carinae present, separated by a few setae and forming a plate in their basal two-thirds, their sides slightly curved. Forewing longer than body; radial cell closed, 2.1x as long as wide (Fig. III, 2).

DISTRIBUTION - Previously known from the Palaearctic region. New record from the Corsica Island.

Alloxysta castanea (Hartig, 1841)

DIAGNOSIS – *Alloxysta castanea* is mainly characterized by its partially open radial cell, presence of pronotal and propodeal carinae, rhinaria beginning in F4. It is similar to *Alloxysta aurata* Belizin, 1968 but can be differentiated by the ratio between F2 and F3 and the size of radial cell: F2 is subequal to F3 in *A. castanea* (Fig. II, 3) while F2 shorter than F3 in *A. aurata*; radial cell is 2.3x as long as wide in *A. castanea* (Fig. III, 3) while 3.0x in *A. aurata*.

MATERIAL EXAMINED – (2♀) "Corse subéraie Bastilicaccia, R2MH Malaise, 31 V-7 VI 1996": 1♀ (MNHN); "Pirio Malaise 30 VII-5 VIII 1997": 1♀ (UB).

SHORT DESCRIPTION – Head yellowish brown, mesosoma brown and metasoma dark brown; scape, pedicel and F1-F2 yellow, F3-F12 yellowish brown; legs yellow and veins yellowish brown. Female antenna 13-segmented; F1-F2 smooth, thinner than remaining flagellomeres, F3-F11 with rhinaria and club shaped; F1 longer than pedicel and F2, F2-F4 subequal in length (Fig. II, 3). Male antenna 14-segmented, segments with same proportions as in female except F1 and F2 slightly curved. Pronotum densely pubescent with two strong

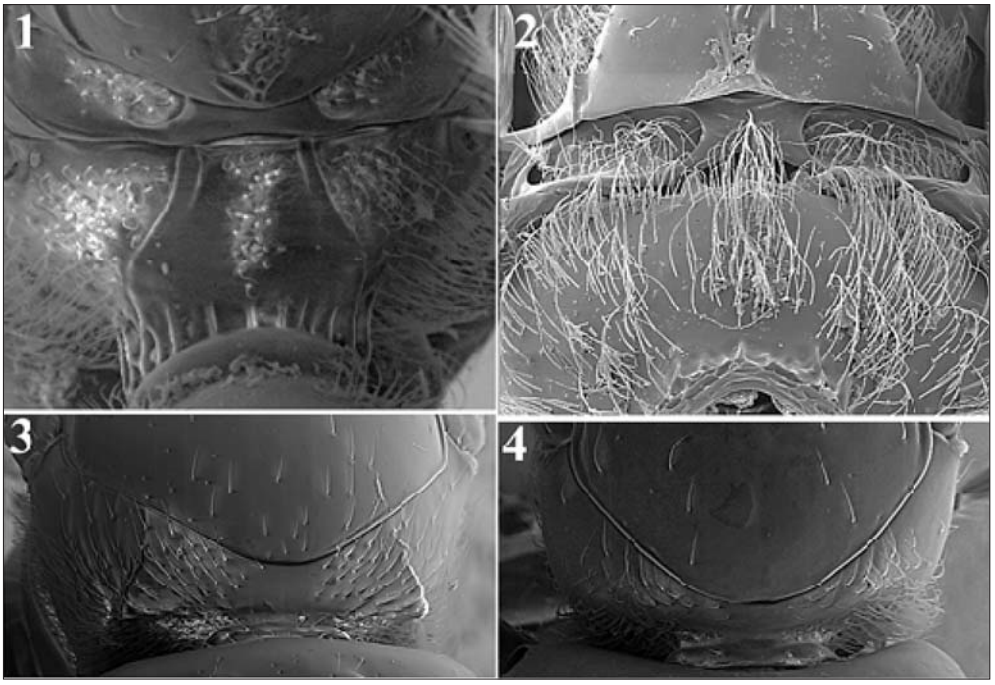

Figure IV – Pronotum and propodeum of: 1) *Alloxysta arcuata*, propodeal carinae present and forming a plate; 2) *A. victrix*, propodeal carinae absent; 3) *A. arcuata*, pronotal carinae present; 4) *A. brevis*, pronotal carinae absent.

carinae. Propodeum densely covered with long setae; two propodeal carinae forming a plate with slightly curved lateral margins, its top sparsely pubescent. Forewing longer than body; radial cell partially open, 2.4x as long as wide (Fig. III, 3).

DISTRIBUTION - Species known from the Holarctic region. New record from the Corsica Island.

Alloxysta citripes (Thomson, 1862)

DIAGNOSIS - *Alloxysta citripes* is mainly characterized by a small partially open radial cell, presence of pronotal carinae, propodeal carinae forming a plate but not protruding, rhinaria beginning in F4 and F1 subequal to pedicel. The combinations of these features make this species easily distinguishable from all known *Alloxysta* species.

MATERIAL EXAMINED – (19♂ & 34♀) "Corse subéraie Bastilicaccia, R3MH Malaise, 7-14 VI 1996": 3♂ & 5♀; "PIRIO CS2 R1 94": 1♀; "Pirio CH1 R2 94": 1♀; "Pirio CH4 R1 94": 1♂; "Pirio CI R2 94": 2♀; "Corse subéraie Bastilicaccia, R4MH Malaise, 14-21 VI 1996": 6♂ & 6♀; "Corse subéraie Bastilicaccia, R1MH Malaise, 24-31 V 1996": 3♂; "Pirio CII R1 94": 1♀; "Corse subéraie Bastilicaccia, R2MH Malaise, 31 V-7 VI 1996": 4♂ & 2♀; "Pirio CS12 R2 94": 1♀; "Corse subéraie Bastilicaccia, R3MS Malaise, 7-14 VI 1996": 1♂ & 7♀; "Pirio CH3 R2 94": 1♀; "Pirio Malaise 16-24 VI 1997": 3♀; "Pirio CH2 R2 94": 1♀; "Bastilicaccia R1MS, 24-31 V 1996": 1♀; "Pirio CH6 R2 94": 1♀; "Pirio Malaise 8-15 VII 1997": 1♀; "Pirio CH4 R2 94": 1♂; "Pirio Malaise 10-17 VI 97": 1♂; "27 V- 3VI 97": 1♀; "Pirio CH2 R2 94": 1♀. 9♂ & 15♀ (UB) and 10♂ & 19♀ (MNHN).

SHORT DESCRIPTION - Head and mesosoma brown, metasoma yellowish brown; antennae, legs and veins yellowish. Female antenna 13-segmented; F1-F3 smooth, thinner than remaining flagellomeres, F4-F11 with rhinaria and club shaped; F1 subequal to pedicel and longer than F2, F2-F4 subequal in length (Fig. II, 4). Male antenna 14-segmented; F1-F12 with rhinaria and club shaped; pedicel-F3 subequal, F3 slightly shorter than F4. Pronotum with few setae and two thick carinae clearly visible. Propodeum with many setae and two carinae not protruding, well defined at the first half and forming a plate in the last half. Forewing longer than body; radial cell partially open, 2.1x as long as wide (Fig. III, 4).

DISTRIBUTION – Species known from the Palaearctic region. New record from the Corsica Island.

Alloxysta victrix (Westwood, 1833)

DIAGNOSIS – *Alloxysta victrix* is mainly characterized by its large closed radial cell, pronotal carinae present, propodeal carinae absent, rhinaria beginning in F3. It is similar to *Alloxysta fuscicornis* (Hartig, 1841) but can be differentiated by the proportion between flagellomeres F2-F4 subequal in length in *A. victrix* while F2 subequal to F3 and F3 shorter than F4 in *A. fuscicornis*; size of radial cell: 3.0x as long as wide in *A. victrix* instead of 2.7x in *A. fuscicornis*; density of propodeal pubescence: in *A. victrix,* propodeal carinae are absent but the corresponding longitudinal areas lack setae while the entire propodeum is densely setose in *A. fuscicornis*.

MATERIAL EXAMINED - (2♂ & 3♀) "Fango AS6 R1 94": 1♀; "RSSWS3": 1♀; "FANGO AS9 R194": 1♂; "CS12 R1 94 Pirio": 1♀; "FANGO AS15B R1 94": 1♂. 1♂ & 1♀ (UB) and 1♂ & 4♀ (MNHN).

SHORT DESCRIPTION – Head dark yellow, mesosoma and metasoma dark brown; scape, pedicel and F1-F2 yellow, F3-F11 yellowish brown; legs yellow; veins brown. Female antenna 13-segmented; F1-F2 smooth, thinner than remaining flagellomeres, F3-F11 with rhinaria and club shaped; F1 longer than pedicel and F2, F2-F4 subequal (Fig. II, 5). Male antenna 14-segmented, similar to female but with F1-F3 curved (F1 slightly curved while F2 and F3 strongly curved). Pronotum sparsely setose, with two carinae clearly visible. Propodeum with abundant pubescence, without carinae, lacking setae on longitudinal areas where carinae are present in other Charipinae species (Fig. IV, 2). Forewing longer than body; radial cell closed, 3.0 times as long as wide (Fig. III, 5).

DISTRIBUTION – Cosmopolitan. New record from the Corsica Island.

Apocharips trapezoidea (Hartig, 1841)

DIAGNOSIS – Until now *Apocharips trapezoidea* is the only *Apocharips* species present in the Corsica Island. This species is easily differentiated from the other *Apocharips* by its radial cell completely open with R1 and Rs veins parallel (Fig. III, 6). The morphologically nearest *Apocharips* species is *Apocharips hansoni* Menke, 1993 which can be easily differentiated by the presence of radial carinae around the clypeus; these radial carinae are lacking in *A. trapezoidea*.

MATERIAL EXAMINED - (1♂) "Fango AE R2 94": 1♂ (MNHN).

SHORT DESCRIPTION – Head, mesosoma and metasoma dark brown; scape, pedicel and F1-F3 yellow, F4-F12 yellowish brown; legs and veins yellowish brown. Female antenna 13-segmented; F1-F4 smooth, thinner than remaining flagellomeres, F5-F11 with rhinaria and club shaped; F1 longer than pedicel and F2, F2 subequal to F3, F3 shorter than F4 (Fig. II, 6). Male antenna 14-segmented; F1-F12 with rhinaria and club shaped; F1 longer than pedicel and F2, F2-F4 subequal in length. Pronotum covered with setae, two thick carinae clearly visible. Apex of scutellum with M-shaped carinae. Propodeum densely setose, two thick carinae well defined, wider at base. Forewing longer than body; radial cell open, 1.0x as long as wide, R1 and Rs veins straight and parallel (Fig. III, 6).

DISTRIBUTION – Previously known from the Palaearctic region. New record from the Corsica Island.

DISCUSSION

The Charipinae are a very poorly studied group. However, during last years the Cynipoidea group from the University of Barcelona has greatly increased the knowledge about it. In this revision of the Charipinae fauna from the Corsica Island, five *Alloxysta* and one *Apocharips* species are cited for the first time, which are the first records of the subfamily and the two genera in this Mediterranean island.

Alloxysta which is the most species-rich Charipinae genus has also the most complicated taxonomy. Morphological variability as well as small sizes of the species resulted into ambiguous diagnostic characters. Four features only are important to species identification: i) length ratios 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 (FERRER-SUAY *et al.,* 2011). Only six valid species are clearly distinguishable (FERRER-SUAY *et al*., 2013) as for the genus *Apocharips*. Concretely, *A. trapezoidea* is easily differentiated from the other *Apocharips* species by the shape of the radial cell, which is completely open with R1 and Rs parallel.

In case of islander fauna a certain grade of endemism could be expected. However, the species cited in this study are well known from the Palearctic region. They are present in Spain and in France, in the Mercantour National Park within the Mediterranean Alps. A comprehensive revision of the Italian Charipinae fauna has not yet been done. The record of well-distributed and known species from Corsica could be explained by the geographical position of the island, very close to the mainland.

The following key allows to identify the Charipinae species recorded in the Corsica Island.

1. Metasoma with two tergal plate, basal tergite much shorter than second along middorsal line (Fig. I, 2). ..... ***Apocharips***
Radial cell open, with R1 and Rs parallel (Fig. III, 6)
..... *Apocharips trapezoidea* (Hartig, 1841)
– Metasoma with two large visible terga, subequal in length along middorsal line, basal tergite 1/4-1/3 smaller than second in lateral view (Fig. I, 1) ..... ***Alloxysta*** 2

2. Radial cell closed. 3
– Radial cell partially open 5

3. Propodeal carinae absent; F1 longer than pedicel and F2, F2-F4 subequal (Fig. IV, 2). . ..... *A. victrix*
– Propodeal carinae present, forming a plate. 4

4. Pronotal carinae absent (Fig. IV, 4); antenna shorther than body; F1 shorter than pedicel; F1-F3 subequal in length (Fig. II, 2). ..... *A. brevis*
– Pronotal carinae present (Fig. IV, 3); antenna longer than body; F1 subequal to pedicel; F1 longer than F2, F2 subequal to F3 (Fig II, 1). ..... *A. arcuata*

5. Propodeal carinae forming a plate but not protruding; F1 subequal to pedicel (Fig. II, 4); radial cell 2.1x as long as wide (Fig. III, 4). ..... *A. citripes*
– Propodeal carinae forming a plate well differentiated and distinct; F1 longer than pedicel (Fig. II, 3); radial cell 2.4x as long as wide (Fig. III, 3). ..... *A. castanea*

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