Review of the Charipinae (Hymenoptera: Cynipoidea: Figitidae) present in the Natural History Museum of Denmark with new records and a key

Revision af Charipinae (Hymenoptera: Cynipoidea: Figitidae) fra Statens Naturhistoriske Museum med nye fund og en bestemmelsesnøgle

Mar Ferrer-Suay[1*], Simon Haarder[2], Jesús Selfa[1] & Juli Pujade-Villar[3]

[1]*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; mar.ferrer.suay@gmail.com*

[2]*Femhusevej 2, 4773 Stensved, Denmark. E-mail: simon.haarder@gmail.com*

[3]*Universitat de Barcelona, Facultat de Biologia, Departament de Biologia Animal. Avda. Diagonal 645, 08028-Barcelona, Spain. E-mail: jpujade@ub.edu*

**Corresponding author: mar.ferrer.suay@gmail.com*

Sammenfatning

Eksemplarer af Charipinae fra Statens Naturhistoriske Museum, indsamlet fra en række forskellige lokaliteter i Danmark, revideres. Ni forskellige arter forekommer i materialet, som omfatter et samlet antal på 142 eksemplarer: *Alloxysta brachyptera* (Hartig, 1840), *A. castanea* (Hartig, 1841), *A. citripes* (Thomson, 1862), *A. halterata* (Thomson, 1862), *A. mullensis* (Cameron, 1883), *A. nigrita* (Thomson, 1862), *A. pallidicornis* (Curtis, 1838), *A. victrix* (Westwood, 1833) og *Phaenoglyphis villosa* (Hartig, 1841). Seks af arterne er ikke tidligere nævnt fra Danmark i litteraturen. En bestemmelsesnøgle præsenteres til identifikation af de forskellige arter af Charipinae som forekommer i Danmark, suppleret med de vigtigste morfologiske træk for hver enkelt art. Som følge af revisionen kendes 12 Charipinae-arter nu fra Danmark.

Abstract

Charipinae collected from different localities in Denmark and deposited in the Natural History Museum of Denmark have been revised. In total, 142 specimens have been identified grouped in nine species: *Alloxysta brachyptera* (Hartig, 1840), *A. castanea* (Hartig, 1841), *A. citripes* (Thomson, 1862), *A. halterata* (Thomson, 1862), *A. mullensis* (Cameron, 1883), *A. nigrita* (Thomson, 1862), *A. pallidicornis* (Curtis, 1838), *A. victrix* (Westwood, 1833) and *Phaenoglyphis villosa* (Hartig, 1841). Of these species, six are cited for the first time from Denmark. Diagnosis and morphological features for those new records are given and also a key for the Charipinae present in Denmark is presented. A total of 12 Charipinae species is now known to occur in Denmark.

Introduction

The Charipinae (Hymenoptera: Cynipoidea: Figitidae) are very small wasps (0.8-2.0 mm). They are mainly characterized by their smooth and shiny body, and are hyperparasitoids of hemipterans - aphids and psyllids - via the hymenopteran families Aphelinidae, Braconidae and Encyrtidae (Ferrer-Suay et al., 2012). This subfamily is composed by eight valid genera: *Alloxysta* Förster, 1869 (cosmopolitan), *Phaenoglyphis* Förster, 1869 (cosmopolitan), *Lytoxysta* Kieffer, 1909 (North America), *Lobopterocharips* Paretas-Martínez & Pujade-Villar, 2007 (Nepal), *Dilyta* Förster, 1869 (cosmopolitan except Australia), *Apocharips* Fergusson, 1986 (Eastern Palaearctic and Neotropics), *Dilapothor* Paretas-Martínez & Pujade-Villar, 2006 (Australia) and *Thoreauana* Girault, 1933 (Australia).

The taxonomy of this subfamily has been always very chaotic due to the large number of species described and their few diagnostic features. The type material of Charipinae species has already been revised which is very useful to establish the limits between species (Ferrer-

Suay et al., 2012). Charipinae are widely distributed around all biogeographic regions, although they are well-known from the Holarctic.

We have studied the Charipinae material deposited in the Natural History Museum of Denmark (NHMD), University of Copenhagen. This material was collected from the 1870's to the 1890's and is, in general, well preserved. The specimens were originally collected and probably also determined by the Danish entomologists R.W.T. Schlick (1839-1916) and W.H.K. Wüstnei (1839-1907), but some labels are incomplete. Most of the species were identified correctly, however some species names need to be updated after the taxonomic revisions made in this group. After this revision 8 species of Charipinae were recorded from the NHMD collection: *Alloxysta brachyptera* (Hartig, 1840), *A. castanea* (Hartig, 1841), *A. halterata* (Thomson, 1862), *A. mullensis* (Cameron, 1883), *A. nigrita* (Thomson, 1862), *A. pallidicornis* (Curtis, 1838), *A. victrix* (Westwood, 1833) and *Phaenoglyphis villosa* (Hartig, 1841). The label information from the Charipinae present in the NHMD has not been published before.

Older studies cited several species from Denmark: *A. castanea* (by Hellén, 1963 and Andrews, 1978) (also here recorded), *A. pedestris* (Curtis, 1838) by Hellén (1963) and *Phaenoglyphis stricta* (Thomson, 1862) by Hellén (1963). These records can be considered as reliable because the authors who cited them knew the important morphological features of these species, but it is important to notice that we have not checked the material identified. Further, Ferrer-Suay et. al. (2018) listed specimens of *A. mullensis*, *A. ramulifera* (Thomson, 1862) and *A. victrix* collected from Denmark (South- and Central Zealand) in the 1990s, deposited in the Canadian National Collection of Insects (Ottowa, Canada); of these, only *A. ramulifera* was not found in the NHMD collection. Recently, one of the co-authors of this study (Simon Haarder), has reared Charipinae material from different localities on the islands Zealand and Møn, and another contributor, Mathias Holm, has collected specimens from the eastern part of the Jutland peninsula. The species collected have resulted to be *A. citripes* (Thomson, 1862) and *A. brachyptera,* respectively. This material is very important because we have also information about the host which the charipines are related, which is very useful for future aphid biological control programs.

Thus, at present there are 12 Charipinae species recorded in Denmark. In this review we present the diagnoses and label information for the material of each species and images of their diagnostic features used for their identification. Also, a key to the Danish species of Charipinae is given.

Material and Methods

The Charipinae collection (142 specimens) at The Natural History Museum of Denmark was scrutinized and revised by the first, third and final author; No Charipinae specimens is deposited in the collection at Naturhistorisk Museum in Aarhus (pers. comm. Thomas J. Simonsen). The second author photographed males and females (if possible) from each *Alloxysta*-species. The specimens were photographed with the Visionary Digital™ system. The two field records of *Alloxysta brachyptera* were documented with a NikonD7000 camera.

Morphological terms 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.

For better comparison, antennae of all the *Alloxysta* species cited here are grouped in figure 2 (a-g), all radial cells in figure 3 (a-e). These specimens, mounted on cardboards, have been studied with a stereomicroscope (Leica MZ6). The field-emission gun environmental scanning electron microscope (FEI Quanta 200 ESEM) was used for high-resolution imaging without gold-coating of the specimens.

The type material of Charipinae is deposited in the following institutions, with name of curators or responsible of each of them:

- MVMA (National Museum of Victoria, Melbourne, Australia; K. Walker)
- MZLU (Lund Museum of Zoology, Lund, Sweden; C. Hansson)
- OUMNH (Hope Department of Entomology, Oxford, England; J. E. Hogan)
- ZSM (Zoologische Staatssammlung, München, Germany; S. Schmidt)

Finally, a map of the hitherto known Charipinae localities in Denmark (Ferrer-Suay et al. 2018 and this study) was produced using Simplemappr (Fig. 1).

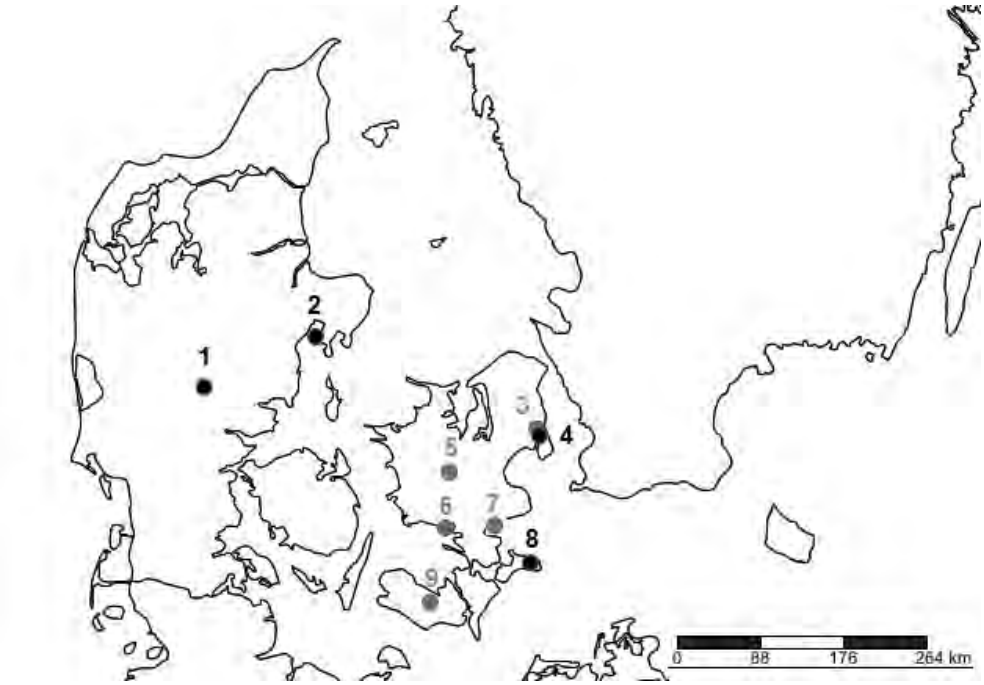

Fig. 1. Known Charipinae localities in Denmark. Gray denote localities published in Ferrer-Suay et al. (2018) and historical records from this study. For these localities, GPS-coordinates have been approximated. Black denote recent field records, which are based on precise GPS-coordinates. 1: Nedergård Skov (*Alloxysta brachyptera*). 2: Dejret Øhoved (*A. brachyptera*). 3: Utterslev Mose (*A. mullensis*). 4: Landbohøjskolen (*A. citripes*). 5: Gyrstinge (*A. mullensis, A. ramulifera, A. victrix*). 6: Karrebæksminde (*A. ramulifera*). 7: Feddet v. Præstø (*A. mullensis*). 8: Ny Borre (*A. citripes*). 9: Maribo (*A. castanea, A. pallidicornis*). See text for more details.

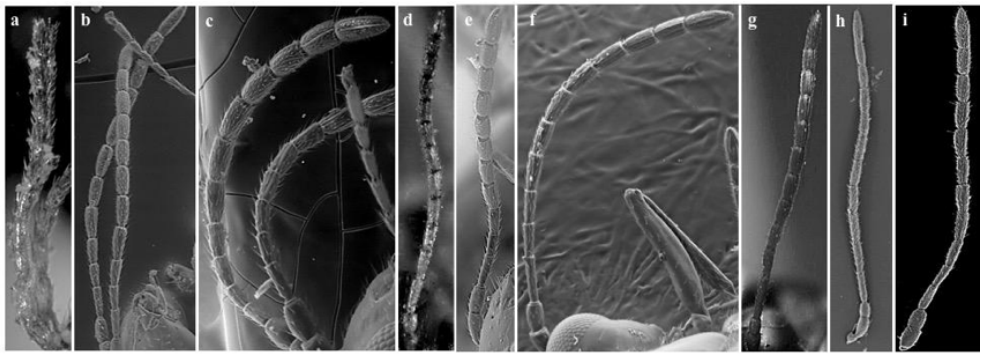

Fig. 2. Antennae in *Alloxysta*: a) *A. brachyptera*; b) *A. castanea*; c) *A. citripes*; d) *A. halterata*; e) *A. mullensis*; f) *A. nigrita*; g) *A. pallidicornis*; h) *A. victrix*; i) *P. villosa*.

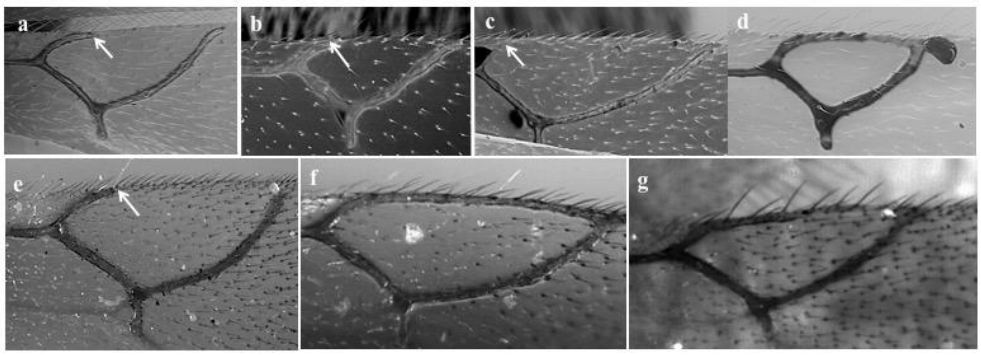

Fig. 3. Types of radial cell in *Alloxysta*: a) *A. castanea*; b) *A. citripes*; c) *A. nigrita*; d) *A. mullensis*; e) *A. pallidicornis*; f) *A. victrix*; g) *P. villosa*.

Results

Alloxysta brachyptera (Hartig, 1840) (Figs. 2a, 4 and 5)
Xystus brachypterus Hartig, 1840: 200. Type: deposited in ZSM (examined).

Material studied. (5♀ & 5♂): "*Allotria brachyptera*": 3♂; "♀", "Coll. R.W. Schlick": 4♀; "♀", "Coll. R.W. Schlick": 1♀; "Brachypterous Htg" "3/80": 1♂; Dejret Øhoved (beach zone, Eastern Jutland), collected 31 october 2017: 1♀; Nedergård Skov (mixed forest, Central Jutland), coll. 25 august 2017: 1♂

Diagnosis. *Alloxysta brachyptera* is a brachypterous species, with pronotal carinae absent, propodeal carinae present and F1 shorter than pedicel (Fig. 2a). It is similar to *A. pedestris* but they can be easily differentiated by the propodeal carinae: present in *A. brachyptera*, absent in *A. pedestris*.

Remarks. New record from Denmark.

Fig. 4. Field records of male (left) and female (right) of *Alloxysta brachyptera*. Photos: Mathias Holm.

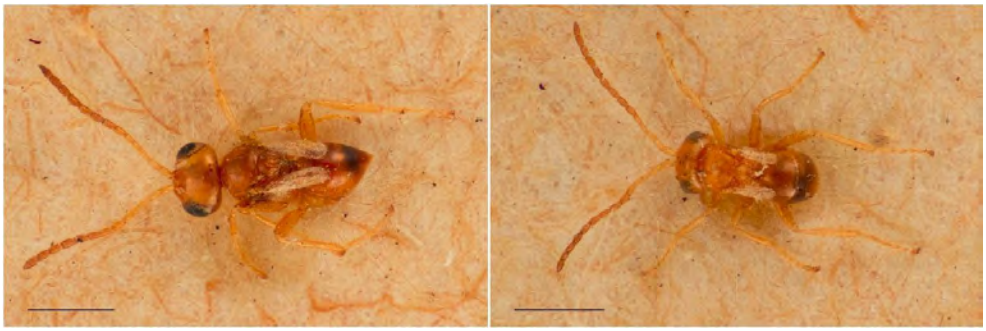

Fig. 5. Museum specimens of *Alloxysta brachyptera*. Left: female. Right: Male. Scale bar: 0,5 mm.

Alloxysta castanea (Hartig, 1841) (Figs. 2b, 3a and 6)
Xystus castaneus Hartig, 1841: 352. Type: deposited in ZSM (examined).

Material studied. (70♀♂): "*Erythrothorax* Htg": ♂ & ♀; "Coll. R.W. Schlick": ♂ & ♀; "*Allotria erythrothorax* Htg", "Coll. R.W. Schlick": ♂ & ♀; "Coll. R.W. Schlick": ♂ & ♀; "Coll. R.W. Schlick": ♂ & ♀. [Decipherable data labels mentions "Maribo", as well as one of two different dates: "7/77" and "7/78"].

Diagnosis. *Alloxysta castanea* has a partially open radial cell being 2.4 times as long as wide (Fig. 3a), pronotal and propodeal carinae present, male and female with rhinaria present from F3 to F12, F2-F4 subequal in length (Fig. 2b), F1 and F2 slightly curved in male. It is similar to *A. aurata* Belizin, 1968 but they can be differentiated by the relation between F2 and F3: F2 subequal to F3 in *A. castanea* (Fig. 2b), F2 shorter than F3 in *A. aurata* and size of radial cell: 2.3 times as long as wide in *A. castanea* (Fig. 3a), 3.0 times as long as wide in *A. aurata*.

Remarks. Previously recorded from Denmark by Andrews (1978).

Fig. 6. Museum specimen (female) of *Alloxysta castanea*. Scale bar: 0,5 mm

Alloxysta citripes (Thomson, 1862) (Figs. 2c, 3b and 7)
Allotria citripes Thomson, 1862: 410. Type: deposited in MZLU (examined).

Material studied. (3♀): Landbohøjskolen (urban park, Frederiksberg, Copenhagen), reared from mummified *Drepanosiphum platanoidis* (Hemiptera: Drepanosiphidae) nymphs collected on *Acer pseudoplatanus* 30 October 2015: 2♀ and several adult *Aphelinus thomsoni* (Hymenoptera: Aphelinidae); Ny Borre (village, Eastern Møn), ex. mummified *D. platanoidis* nymphs on *A. pseudoplatanus*, coll. 10 June 2017: 1♀ and several adult *A. thomsoni*. [Mummified *D. platanoidis* collected in June 2017 at Mallings Kløft (11 kilometers east of Vordingborg, South Zealand) produced only *A. thomsoni* specimens].

Diagnosis. *Alloxysta citripes* has a partially open small radial cell being 2.1 times as long as wide (Fig. 3b), pronotal carinae present, propodeal carinae present forming a plate but not protruding (it is a propodeal plate without relief), female antennae with rhinaria present from F4, F1 subequal to pedicel and longer than F2, F2-F4 subequal in length (Fig. 2c), male antennae with rhinaria present from F1, pedicel-F3 subequal, F3 slightly shorter than F4. It is similar to *A. postica* (Hartig, 1841) but they can be differentiated by the shape of propodeal carinae: not protruding in *A. citripes*, clearly visible and forming a protruding plate in *A. postica*; size of radial cell: 2.1 times as long as wide in *A. citripes* (Fig. 3b), 2.5 times as long as wide in *A. postica*.

Remarks. New record from Denmark.

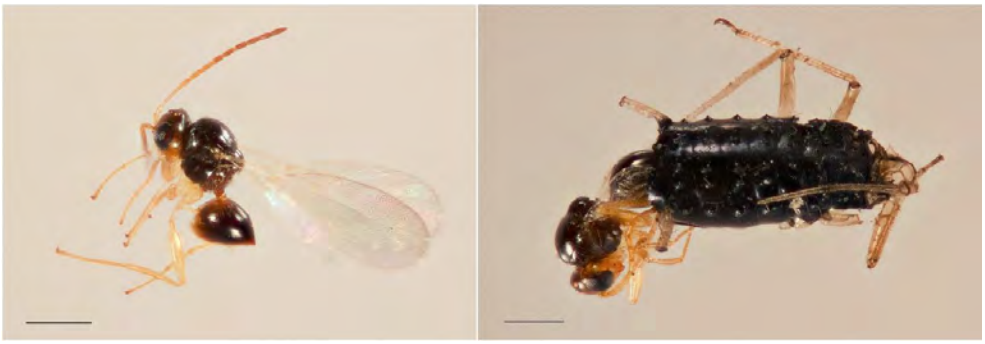

Fig. 7. Reared female specimens of *Alloxysta citripes*. The specimen on the right died on its way out of the mummified aphid host (*Drepanosiphum platanoidis*). Scale bar: 0,5 mm.

Alloxysta halterata (Thomson, 1862) (Figs. 2d, 3f and 8)
Allotria halterata Thomson, 1862: 410. Type: deposited in MZLU (examined).

Material studied. (3♀ & 13♂): "Coll. R.W. Schlick": 6♂; "*Allotria cursor* Htg": 3♂; "♀", "Coll. R.W. Schlick": 1♀; "♂", "Coll. R.W. Schlick": 3♂; "Ms", "♂": 1♂; "Mdmc 8.9.81" [handwritten], "Coll. Wüstnei", "*Allotria cursor* Htg": 1♀; "Ms", "♀", "handwritten Htg": 1♀. [dates on labels range from "5-77" to "19/7-96", the majority are from end-1870's and early- to mid-1880's]

Diagnosis. *Alloxysta halterata* is easily differentiated from the other brachypterous *Alloxysta* species (*A. brachyptera*, *A. pedestris* and *A. apteroidea* Hellén, 1963) by having the pronotal carinae present. Females with normal size wings are similar to *A. victrix* because both species have radial cell closed and propodeal carinae absent, but they can be differentiated by the size of the radial cell: 2.4 times as long as wide in some *A. halterata* females, 3.0 times as long as wide in *A. victrix* (Fig. 3f); and relation between F1 and F2 in females: F1 subequal to F2 in *A. halterata*, F1 longer than F2 in *A. victrix* (Fig. 2h).

Remarks. New record from Denmark.

Fig. 8. Museum specimens of *Alloxysta halterata*. Top: female (with empty aphid host). Bottom: Male. Scale bar: 0,5 mm.

Alloxysta mullensis (Cameron, 1883) (Figs. 2e, 3d and 9)
Allotria mullensis Cameron, 1883: 366. Type: deposited in BMNH (examined).

Material studied. (7♂): "*Circumscripta* Hg" "5/77 Utterslev Mose": 7♂.

Diagnosis. *Alloxysta mullensis* has a closed radial cell being 2.2 times as long as wide (Fig. 3d), pronotal carinae absent, propodeal carinae present forming a plate, male and female with rhinaria present from F4, F1 longer than F2, F2 subequal to F3, F3 shorter than F4 (Fig. 2e). It is similar to *A. fracticornis* (Thomson, 1862) but they can be differentiated by the relation

between F1 and pedicel: F1 subequal to pedicel in *A. mullensis* (Fig. 2e), F1 longer than pedicel in *A. fracticornis*; proportion between flagellomeres: F1 longer than F2 and F2 subequal to F3 in *A. mullensis* female (Fig. 2e), F1-F3 subequal in length in *A. fracticornis* female; F3 straight in *A. mullensis* male, F3 curved in *A. fracticornis* male.

Remarks. Previously recorded from Denmark by Ferrer-Suay et al. (2018)

Fig. 9. Museum specimen (male) of *Alloxysta mullensis*. Scale bar: 0,5 mm.

Alloxysta nigrita (Thomson, 1862) (Figs. 2f, 3c and 10)
Allotria nigrita Thomson, 1862: 409. Type: deposited in MZLU (examined).

Material studied (1 ♀): "*Nigrita* Thoms": 1 ♀.

Diagnosis. *Alloxysta nigrita* has a completely open radial cell being 2.9 times as long as wide in both male and female (Fig. 3c), pronotal carinae present, propodeal carinae absent, female antennae with rhinaria present from F4 in both male and female, female antennae with F1 longer than pedicel and F2, F2 shorter than F3, F3 longer than F4 (Fig. 2f), male antennae with F1 longer than pedicel and subequal to F2, F2 longer or subequal to F3, F3 shorter than F4. It is similar to *A. brachycera* Hellén, 1963 but they can be differentiated by the relation between F2 and F3: F2 shorter than F3 in *A. nigrita* (Fig. 2f), F2 longer than F3 in *A. brachycera*; size of radial cell: 2.9 times as long as wide in *A. nigrita* (Fig. 3c), 2.7 times as long as wide in *A. brachycera*.

Remarks. New record from Denmark.

Fig. 10. Museum specimen (female) of *Alloxysta nigrita*. Scale bar: 0,5 mm.

Alloxysta pallidicornis (Curtis, 1838) (Figs. 2g, 3e and 11)
Cynips pallidicornis Curtis, 1838: 688 (April 1). Type: deposited in MVMA (examined).

Material studied. (1♀ & 1♂): "*Allotria forticornis*" "1/10-76" "Maribo": 1♀; "Coll. R.W. Schlick" "29/9-77" "Maribo": 1♂.

Diagnosis. *Alloxysta pallidicornis* is easily differentiated from the other *Alloxysta* species by the following of features: radial cell completely open (Fig. 3e), pronotal carinae present, propodeal carinae present, well defined and separated by setae in the anterior half and forming a plate in the posterior half, rhinaria present from F2 (Fig. 2g).

Remarks. New record from Denmark.

Fig. 11. Museum specimens of *Alloxysta pallidicornis*. Left: male. Right: female.Scale bar: 0,5 mm.

Alloxysta pedestris (Curtis, 1838)
Cynips pedestris Curtis, 1838: 688. Type: deposited in MVMA (examined).

Diagnosis. *Alloxysta pedestris* is mainly characterized being a brachypterous species without visible radial cell, pronotal and propodeal carinae also absent, F1 longer than pedicel and F2,

F2 subequal to F3. It is similar to *A. apteroidea* but they can be differentiated by the length of the fore wing: they reach the beginning of the metasoma in *A. pedestris* while they are very short, practically absent in *A. apteroidea*; relation between F1/pedicel: F1 longer than pedicel in *A. pedestris* but F1 shorter than pedicel in *A. apteroidea*.

Remarks. Previously recorded from Denmark by Hellén (1963).

Alloxysta ramulifera (Thomson, 1862)
Xystus minutus Hartig, 1840: 200. Type: deposited in ZSM (examined).

Diagnosis. *Alloxysta ramulifera* is mainly characterized having small closed radial cell, being 2.0 times as long as wide, pronotal carinae present also very small sometimes difficult to see under the pubescence, propodeal carinae forming a plate, rhinaria and club shaped begin in F4, F1 subequal to pedicel, F1 longer than F2, F2 subequal to F3, F3 shorter than F4. *Alloxysta ramulifera* is very similar to *A. arcuata* both species having pronotal carinae, propodeal plate, and radial cell small and closed. They can be distinguished by: shape of pronotal carinae, small and sometimes very difficult to see under the pubescence in *A. ramulifera* (thick and clearly visible in *A. arcuata*); shape of propodeal plate, in *A. ramulifera* the carinae are straight separated by setae in the first 1/3 and forming a plate in the last 2/3 (forming a complete plate in *A. arcuata*); and in size of radial cell: 2.0 times as long as wide in *A. ramulifera* (2.3 times as long as wide in *A. arcuata*).

Alloxysta victrix (Westwood, 1833) (Figs. 2h, 3f and 12)
Allotria victrix Westwood, 1833: 495. Type: deposited in OUMNH (Andrews, 1978: 92).

Material studied (23♀ & 8♂): "♀", "*Allotria victrix* Wstw": 4♀; "♀", "Coll. R.W. Schlick": 5♀; "♂", "Coll. R.W. Schlick": 6♂; "Coll. R.W. Schlick": 1♂ & 7♀; "Ms", "♀", "Victrix Wstw": 1♀; "Ms", "♀": 1♀; "Wst", "♀": 1♀; "*Allotria erythrocephala* Htg", "Coll. Wüstnei": 1♀; "Sondby 13.9.97", "Coll. Wüstnei": 1♀; "*Allotria circumscripta* Htg": 2♀ & 1♂. [dates on labels, when present, range from "15/9-78" to "7/8-84"]

Diagnosis. *Alloxysta victrix* has a large closed radial cell being 3.0 times as long as wide (Fig. 3f), pronotal carinae present, propodeal carinae absent, absence of setae on area where propodeal carinae are present in other Charipinae species, male and female with rhinaria present from in F3, F1 longer than pedicel and F2, F2-F4 subequal (Fig. 2h), F1-F3 curved in male. It is similar to *A. consobrina* (Zetterstedt, 1838) but they can be differentiated by the proportions of the flagellomeres: F2-F4 subequal in length in *A. victrix* (Fig. 2h), F2 subequal to F3 and F3 shorter than F4 in *A. consobrina*; size of radial cell: 3.0 times as long as wide in *A. victrix* (Fig. 3f), 2.7 times as long as wide in *A. consobrina* and degree of propodeal pubescence: in *A. victrix* the propodeum lacks setae on the area where the longitudinal carinae are present in other Charipinae, *A. consobrina* has the propodeum completely covered with dense setae.

Remarks. Previously recorded from Denmark by Ferrer-Suay et al. (2018)

Fig. 12. Museum specimens of *Alloxysta victrix*. Left: male. Right: female. Scale bar: 0,5 mm.

Phaenoglyphis stricta (Thomson, 1877)
Allotria (Auloxysta) stricta Thomson, 1877: 812. Type: deposited in MZLU (examined).

Cited in Denmark by Hellén (1963).

Diagnosis. *Phaenoglyphis stricta* is mainly characterized having notauli, scutellar fovea with straight sides and open on the top and on the bottom, female antennae with the rhinaria and club shape begin in the last two thirds of F1, F1 longer than pedicel and F2, F2-F4 subequal in length. It is similar to *P. insperatus* but they can be differentiated by the shape of scutellar foveae: they are with straight sides and open both on the top and on the bottom in *P. stricta* while rounded and slightly open at the bottom in *P. insperatus*; size of radial cell: 2.4 times in *P. stricta* as long as wide in *P. insperatus* but 2.9 times.

Phaenoglyphis villosa (Hartig, 1841) (Figs. 2i and 3g)
Xystus villosus Hartig, 1841: 353. Type: deposited in ZSM (examined).

Material studied. (2♂): "*Circumscripta* Hg": 2♂.

Diagnosis. *Phaenoglyphis villosa* has a partially open radial cell being 2.1-2.7 times as long as wide (Fig. 3g), pronotal and propodeal carinae present, notauli absent, scutellum with two deep oval foveae more or less separated by a carina or completely fused, female antennae with rhinaria present from F3, F1 as long as pedicel or slightly longer, F1 subequal to F2, F2 shorter than F3, F3 shorter than F4 (Fig. 2i), male antennae with rhinaria present from F3, F1 subequal to F2, F2 shorter than F3. *P. villosa* is easily differentiated from other *Phaenoglyphis* spp. because it is the only species with a partially open radial cell.

Remarks. New record from Denmark.

Discussion

The Charipinae are well known from the Palaearctic (Ferrer-Suay et al., 2012). Most of the species were described from this region by Hartig (Germany), Thomson (Sweden) and Hellén (Finland) and later most of them have been cited in different countries and regions around the world (Ferrer-Suay et al., 2018).

Nevertheless, the continuation of the studies based on material collected in the 19th century, for example in Denmark, reveal new records from this country. It is possible that other Charipinae genera are also present in Denmark but they have not been collected yet. This underlines the importance of studying all the material collected by specialists, and also to continue with the collections in the field in order to show the real distribution patterns of the

species. In this case museum collections is essential for the improvement of the knowledge of this fauna.

Identification key to Charipinae species present in Denmark:

1. Lower part of mesopleuron with horizontal sulcus .....*2 (*Phaenoglyphis-species)
- Mesopleuron lacks horizontal sulcus. Radial cell open, partially open or closed..... ..... 3 (Alloxysta-species)

2. Radial cell partially open (Fig. 2g)..... *P. villosa*
- Radial cell closed. ..... *P. stricta*

3. Brachypterous species.....4
- Fully winged species, usually longer than mesosoma and metasoma.....6

4. Pronotal carinae present ..... *A. halterata*
- Pronotal carinae absent.....5

5. Propodeal carinae well defined joining at the base. Male: F1 shorter than pedicel. Female unknown .....*A. brachyptera*
- Propodeal carinae absent. Male: F1 subequal or slightly longer than pedicel, F1-F4 subequal in length. Female: F1 longer than pedicel and F2, F2 subequal to F3. ....*A. pedestris*

6. Radial cell closed.....7
- Radial cell open or partially open 9

7. Pronotal carinae absent ..... *A. mullensis*
- Pronotal carinae present..... 8

8. Propodeal carinae absent. Radial cell 3.0 times as long as wide .....*A. victrix*
- Propodeal carinae present. Radial cell 2.0 times as long as wide ..... *A. ramulifera*

9. Radial cell open.....10
- Radial cell partially open.....11

10. Propodeal carinae absent ..... *A. nigrita*
- Propodeal carinae present.....*A. pallidicornis*

11. Propodeal carinae not protruding; F1 subequal to pedicel in both sexes ....*A. citripes*
- Propodeal carinae protruding forming a plate; F1 longer than pedicel..... .....*A. castanea*

Conclusion

With this information we can establish that Charipinae has a continuous distribution, mainly in the European continent, and the spaces between records are due to a lack of identified material. It is necessary to continue collecting new material, as well as check identification of specimens already in collections, in order to improve the knowledge of this important subfamily. In Denmark, the prospect of finding new species for the country is rather good as Charipinae has not been subjected to a comprehensive faunistic effort in well over 100 years and all museum records with decipherable labels are from the Copenhagen area or from Maribo on Lolland. The recent field records comprise findings from Zealand and Møn, but also from the hitherto uninvestigated Jutland peninsula. Specimens reared from a named aphid

host, ideally along with the primary wasp host, will additionally generate important information about the host choice of these interesting small hyperparasitoids.

Acknowledgements

We would like to thank to Lars Vilhelmsen and Anders Illum (Natural History Museum of Denmark) who provided access to the material here studied and helped with the Visionary Digital photography system for the second author. Mathias Holm is thanked for sharing his specimens of *Alloxysta brachyptera* from Jutland. This research was supported by the project CGL2014-56151of the "Ministerio de Educación y Ciencia" of Spain and the contract "Ayudas Juan de la Cierva-Formación" (FJCJ-2014-21120) of the "Ministerio de Educación" of Spain.

Litterature

Andrews, F. G., 1978. Taxonomy and host specificity of Nearctic Alloxystinae with a catalogue of the World species (Hymenoptera: Cynipidae). Occasional Papers in Entomology 25: 1—128.

Cameron, P., 1883. Descriptions of sixteen new species of parasitic Cynipidae, chiefly from Scotland. Transactions of the Entomological Society of London 16(4): 365—374.

Curtis, J., 1838. British entomology; being illustrations and descriptions of the genera of insects found in Great Britain and Ireland: containing coloured figures of Nature of the rarest, and beautiful species and in many instances of the plants upon wich there are found. Privately published, London, 15: 674—721.

Ferrer-Suay, M., Paretas-Martínez, J., Selfa, J. & Pujade-Villar, J., 2012. Taxonomic and synonymic world catalogue of the Charipinae and notes about this subfamily (Hymenoptera: Cynipoidea: Figitidae). Zootaxa 3376: 1—92.

Ferrer-Suay, M., Selfa, J. & Pujade-Villar, J., 2018. Palaearctic species of Charipinae (Hymneoptera: Figitidae): two new species, synthesis and identification key. European Journal of Taxonomy 427: 1-110.

Hartig, T., 1840. Ueber die Familie der Gallwespen. Zeitschrift für Entomologie (Germar) 2: 176—210.

Hartig, T., 1841. Erster Nachtrag zur Naturgeschichte der Gallwespen. Zeitschrift für Entomologie (Germar) 3: 322—358.

Hellén, W., 1963. Die Alloxystininen Finnlands (Hymenoptera: Cynipidae) Fauna Fennica 15: 1—23.

Paretas-Martínez, J., Arnedo, M.A., Melika, G., Selfa, J., Seco-Fernández, M.V., Fülöp, D. & Pujade-Villar, J., 2007a. Phylogeny of the parasitic wasp subfamily Charipinae (Hymenoptera, Cynipoidea, Figitidae). Zoologica Scripta 36: 153—172.

Thomson, C.G., 1862. Forsök till upställning och beskrifning af Sveriges Figiter. Öfversigt af Kongl. Svenska Vetenskaps-Akad: s förhandl 18: 395—420.

Westwood, J.O., 1833. Notice of the habits of a Cynipidous insect parasitic upon the *Aphis rosae* with descriptions of several other parasitic Hymenoptera. Magazine of Natural History 6: 491—497.