Studies on Cynipidae Alloxystinae
6. Phaenoglyphis villosa (Hartig) and Alloxysta arcuata (Kieffer)

by

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ABSTRACT. — The authors consider *Phaenoglyphis villosa* (Hartig) to be a very widely specialized aphid hyperparasite. It has been reared from quite a number of combinations of aphids and primary parasites (Aphidiidae and Aphelinidae) and described under several names, for which lectotypes have been designated. *Alloxysta arcuata* (Kieffer) is probably a hyperparasite of several aphid species through *Ephedrus persicae* Froggatt and perhaps other *Ephedrus* species as primary parasites.

This publication deals with two species of Alloxystinae, common in France and in the Netherlands, and no doubt in a large part of Europe. As both species were suspected of being described more than once, it was necessary to consult as many original types in question as possible, especially of the older authors.

The first author has the Hartig collection of Alloxystinae at his disposal and some of the Thomson species. In the first week of November 1976 he visited the British Museum (Natural History) in London in order to study Cameron's types. Though most of the Cameron species of Alloxystinae will be dealt with in a future paper, the material relating to the two present species will be treated here. The second author has the Léon Carpentier collection on loan. In this collection most Alloxystinae species described by Kieffer are represented. The types and the history of this collection have been discussed by Dessart (1969).

Both authors have been in correspondence with each other for a long time and exchanged specimens for comparison with the types. In the present paper, the first author is responsible for statements concerning the types of Hartig, Thomson and Cameron, the second in regard to the Kieffer types. As the data on the labels of the Carpentier material have been fully documented by Dessart (1969), further indications concerning the lectotypes and paralectotypes in question will be given here only if necessary.

Phaenoglyphis villosa (Hartig, 1841) comb.nov.

Xystus villosus Hartig, 1841: 353, ♀
Allotria piciceps Thomson, 1862: 409, ♀, syn.n.
Allotria (Auloxysta) piciceps Thomson: Thomson, 1877: 813, ♀
Allotria dolichocera Cameron, 1889: 56—57, ♀, syn.n.
Allotria collina Cameron, 1889: 57, ♀, syn.n.
Allotria (Bothrioxysta) Carpentieri Kieffer, 1902a: 11, ♀, syn.n.
Allotria (Bothrioxysta) foveigera Kieffer, 1902a: 11—12, ♂, ♀, syn.n.
Allotria (Bothrioxysta) curvata Kieffer, 1902a: 12, ♂, ♀, syn.n.
Allotria recticornis Kieffer, 1902a, 12—13, ♂, ♀, syn.n.
Alloxysta subaperta Kieffer, 1904: 595, ♀, syn.n.
Alloxysta campyla Kieffer, 1904: 597, ♂, syn.n.

Most species of Alloxystinae seem to be highly specialized hyperparasites of aphids through Aphidiidae and Aphelinidae. However, at least one species seems very widely specialized, both in respect to its direct and to its indirect hosts. This *Phaenoglyphis* species may easily be distinguished by the absence of parapsidal furrows, by the partly open radial cell in the fore wing and by the characteristic shape of the pits at the base of the scutellum. We have considered whether one variable species is involved or a complex of closely related species that are very difficult to separate. In our opinion, only carefully performed, and therefore time-consuming breeding experiments with the progeny of single pairs in several combinations of aphids and primary parasi-

tes, or even crossing experiments, could give the solution of the problem. Though some characters such as size, relative lengths of the antennal segments and the colour of the legs may vary to some extent, for the time being it seems most logical to accept only one single species.

We have reared specimens from a large number of combinations of aphids and primary parasites as in the following list of combinations of aphids, primary parasites and food plants. These it must be understood are examples of the wide host-specialization of *Phaenoglyphis villosa* and is not nearly complete. In the Netherlands the following combinations were established by Evenhuis: *Tuberculoides annulatus* (Hartig) — *Praon flavinode* (Haliday) — *Quercus robur* L.; *Periphyllus* sp. — *Trioxys falcatus* Mackauer — *Acer campestre* L.; *Eucallipterus tiliae* (Linnaeus) — an unidentified species of Aphelinidae — *Tilia* sp.; *Rhopalosiphum insertum* (Walker) — *Monoctonus cerasi* (Marshall) — cultivated *Malus sylvestris* (L.) Mill.; *Hyalopterus pruni* (Geoffroy) — *Praon volucre* Haliday — *Prunus* sp. and *Phragmites australis* (Cav.) Trin. ex Steud; *Aphis* sp. — *Lysphlebus* sp. — *Cirsium arvense* (L.) Scop.; *Dysaphis plantaginea* (Passerini) — *Ephedrus persicae* Froggatt - cultivated *Malus sylvestris* (L.) Mill.; *Brevicoryne brassicae* (L.) — *Diaeretiella rapae* (M'Intosh) — *Sinapis arvensis* L.; *Liosomaphis berberidis* (Kaltenbach) — *Trioxys hortorum* Starý — *Berberis vulgaris* L.; *Hyperomyzus lactucae* (L.) — *Aphidius sonchi* Marshall — *Sonchus asper* (L.) Hill.; *Cryptomyzus galeopsidis* (Kaltenbach) — *Aphidius ribis* Haliday — *Galeopsis tetrahit* L.; *Macrosiphum rosae* (L.) — *Aphidius rosae* Haliday — cultivated *Rosa* spp.; *Uroleucon campanulae* (Kaltenbach) — *Trioxys centaureae* (Haliday) — *Campanula* sp.; *Microlophium evansi* (Theobald) — *Aphidius ervi* Haliday — *Urtica dioica* L.; *Metopolophium dirhodum* (Walker) — *Aphidius uzbekistanicus* Lutzhetski — various species of Gramineae.

In France the combinations established by Barbotin and identified by Dr. G. Remaudière are: *Rhopalosiphum padi* (Linnaeus) — *Ephedrus plagiator* (Nees) and *Trioxys auctus* (Haliday) and *Aphidius* sp. — *Poa annua* L.; *Liosomaphis berberidis* (Kaltenbach) — *Aphelinus* sp. — *Mahonia aquifolium* (Pursh) Nutt.; *Nasonovia ribisnigri* (Mosley) — *Aphidius hieraciorum* Starý — *Leontodon* sp.; *Sitobion avenae* (Fabricius) — *Aphidius* sp. — *Hordeum murinum* L.; *Staticobium* sp. — *Praon* sp. — *Statice* sp., and with unknown primary parasites: *Rhopalosiphum insertum* (Walker) — a species of Cyperaceae; *Myzus ornatus* Laing — *Lapsana communis* L.; and the combination *Aphis nerii* (Boyer de Fonscolombe) — *Gomphocarpus fruticosus* (L.) Ait.f. from Réunion, Africa.

If *Phaenoglyphis villosa* was reared from samples of mummified aphids, it emerged almost always simultaneously with one or more other species of Alloxystinae in the same combination of aphid and primary parasite. However, these other Alloxystinae are apparently much more strictly specific.

Though the species is widely specialized, there seems to exist some preference for certain combinations of aphids and primary parasites. In the Netherlands it was commonly reared from *Liosomaphis berberidis* through *Trioxys hortorum*. During investigations on apple aphids, it was sometimes reared from *Rhopalosiphum insertum* through *Monoctonus cerasi*, seldom from *Dysaphis plantaginea* through *Ephedrus persicae* and up to now, in spite of numerous samples, not from *Aphis pomi* De Geer through *Trioxys angelicae* (Haliday).

We also saw specimens from North America and New Zealand. This aphid hyperparasite might be cosmopolitan; probably it has been introduced into other continents together with the aphids on their food plants and with the primary parasites.

Phaenoglyphis villosa (Hartig) has been described under several names, of which *Xystus villosus* Hartig is the oldest. In the Hartig collection there is only one female specimen under this name. Evenhuis labelled this as the holotype *Xystus villosus* Hartig. It has been glued on the tip of a small triangular cardboard point. The pin also bears a small, almost square, white cardboard which is blank, and a handwritten label "villosus m." The specimen has become discoloured, so that the main colour is now red instead of black as in our fresher specimens. Hartig described the species as having a red prothorax, metathorax (propodeum) and base of abdomen. It may be that the specimen was already rather old and somewhat discoloured at the time Hartig described it. There is no essential morphological difference between Hartig's holotype and our reared specimens.

This species has also been described by Thomson as *Allotria piciceps*. In 1862 Thomson placed

it with those species having an open radial cell ("Costa nulla, cellula radiali aperti"). In 1877, however, he erected *Auloxysta* as a subgenus of *Allotria* Westwood, 1833, and placed it in this subgenus of which he stated the radial cell to be closed ("Alae cellula radiali occlusa"). Kieffer (1902a) commented upon this discrepancy, but still he placed the species in *Allotria* Westwood. This genus, in Kieffer's work, in agreement with Förster's conception (Förster, 1869), is stated to have completely developed wings with a closed radial cell, in contrast to *Alloxysta* Förster, 1869, which has completely developed wings but an open radial cell.

Evenhuis examined the three syntypes of *Allotria piciceps* Thomson, one male and two females, and found them to be conspecific. They have an open radial cell and belong to the same species as *Phaenoglyphis villosa.* One of the females is here designated as the lectotype. It has been glued on the point of a small triangular cardboard. On the pin below the cardboard is a small square label with "1973 43". The other two specimens were labelled as paralectotypes. They are mounted in the same way as the lectotype. The pin with the male specimen is accompanied from above downwards by a small, square, white label with two undecipherable signs, by a small label "♂" and by two square, light blue labels "1969 92" and "1972 42", respectively. The female specimen is accompanied by a small, rectangular, white label with an illegible word and by a square, light blue label "1972 44".

Evenhuis also studied the lectotype of *Allotria dolichocera* Cameron, 1889, a female, designated by Quinlan (1974). It was found to be conspecific with *Phaenoglyphis villosa.* The species was wrongly ranged by Cameron under those with a closed radial cell.

Quinlan (1974) did not designate a lectotype for *Allotria perplexa* Cameron, 1889, of which species he stated "type(s) lost" [1]. The type series contains, among others, a number of specimens of *Phaenoglyphis villosa,* with which Cameron's description is in exact agreement for the specimens with somewhat darkened femora. However, until a lectotype has been designated, an opinion about the identity of *Allotria perplexa* has to be suspended.

Allotria collina is represented in the British Museum by one female specimen, which must be considered the holotype. Quinlan (1974) stated about the species "type(s) lost" [1]. Cameron (1889) ranged it wrongly under the species with a closed radial cell. It was found to be a small specimen of *Phaenoglyphis villosa.*

The most reliable character to separate *Phaenoglyphis* Förster, 1869, sensu Hellén, 1959, from *Alloxysta* Förster, 1869, sensu Hellén, 1931, is the presence of a longitudinal suture on each of the mesopleurae. The presence of two pits at the base of the scutellum, the large radial cell in the fore wing with a straight or almost straight distal part of the radial vein, and the long or rather long, more or less distinctly curved third antennal segment in the male, are also conspicuous characters. These characters were already mentioned by Thomson (1877) for his subgenus *Auloxysta,* which is a subjective synonym of *Phaenoglyphis* Förster, 1869, sensu Hellén, 1959.

The great importance of the characters mentioned was apparently not, or at least not fully, understood by many later workers. Kieffer (1902a) published *Allotria* subgenus *Bothrioxysta* for the species without parapsidal furrows, with a closed radial cell, and with one or two pits at the base of the scutellum. In this subgenus he included, besides *Allotria* (*Auloxysta*) *nigripes* Thomson and *Allotria* (*Auloxysta*) *piciceps* Thomson, three new species, namely *Allotria* (*Bothrioxysta*) *Carpentieri, Allotria* (*Bothrioxysta*) *foveigera* and *Allotria* (*Bothrioxysta*) *curvata.* Barbotin studied the types of these species. The radial cell turned out to be open in the types of all three species! The distinction between them, as given by Kieffer, is due to minor differences. Kieffer mentions the third antennal segment of the male to be straight in *A. foveigera* and weakly curved in *A. curvata.* In fact, in the male types of *A. foveigera* the third antennal segment is also weakly curved, which has been overlooked by Kieffer. Moreover, it seems rather curious that two so similar species should have been reared from one and the same host aphid species, as stated by Kieffer (1902a): "Aphis vivant sur Sinapis alba". Barbotin's conclusion is that all three species described

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[1]) At the time Mr. Quinlan prepared his publication it was not realised that the unrecognized types were on loan and these were not returned until much later.

by Kieffer in *Bothrioxysta* belong to one species, conspecific with *Phaenoglyphis villosa* (Hartig).

Allotria Carpentieri Kieffer is represented by one female, which Barbotin labelled as the holotype. *Allotria foveigera* Kieffer is represented by three conspecific specimens, one of which, a female, Barbotin labelled as the lectotype, and each of the two others as paralectotypes. There are five conspecific specimens of *Allotria curvata* Kieffer. One of these, with "26-6-03" on the label, has apparently been added after Kieffer's description (1902) and cannot be considered as belonging to the syntype series. Of the other specimens, three, all males, have been mounted on a single pin; they were labelled by Barbotin as paralectotypes, and the remaining one, a female, designated as the lectotype of *Allotria curvata* Kieffer.

Barbotin also studied the three syntypes of *Allotria recticornis* Kieffer, 1902a, all females, belonging to ones species, conspecific with *Phaenoglyphis villosa* (Hartig). Kieffer described the male and also what he considered to be the female ("femelle présumée"). As the male specimens could not be found in the collection Carpentier, they must be considered as lost. In absence of proof of the opposite view, there is no reason to consider these females as belonging to a different species. Thus Barbotin designated number 3209 as the lectotype and the two other specimens — mounted on one pin, one of them with the number 2169 — as paralectotypes of *Allotria recticornis* Kieffer.

Barbotin, furthermore, studied the types of *Alloxysta subaperta* Kieffer, 1904, and of *Alloxysta campyla* Kieffer, 1904. Each of the two species is represented by one specimen, labelled by Barbotin as holotypes. He found them both conspecific with *Phaenoglyphis villosa.* This proved that Kieffer did not always look well at the species he described. Otherwise he would not have failed to observe the longitudinal sutures on the mesopleurae and the pits at the base of the scutellum, conspicious characters mentioned for some other species of Alloxystinae.

That Kieffer described so many species under different names may also be explained by the fact that he did not keep a collection for comparison. It is generally accepted that he sent the type specimens back to their owner after he had described them.

Phaenoglyphis species seem to show less differentiating characters than do most *Alloxysta* species. The third antennal segment in the male is always curved, the others straight. The pattern of pubescence of the pronotum, so characteristic for many *Alloxysta* species, is almost evenly pubescent except for a narrow bare mediolongitudinal strip; the faint pronotum keels reach obliquely from the middle to the hind border (fig. 1). The propodeum always shows two similar longitudinal keels. Outside these keels the propodeum is almost uniformly pubescent; the part between is proximally pubescent and distally bare (fig. 2), contrary to the *Alloxysta* species showing keels, which only have a medioproximal hairstrip (fig. 8). The shape of the two pits at the base of the scutellum may be considered a most useful differentiating character in *Phaenoglyphis.*

Morphological characters

Antennae in male somewhat longer, in female about as long as body; third antennal segment in male somewhat narrower and about as long as fourth, faintly but distinctly curved (fig. 3), in female third and fourth antennal segments subequal and narrower than the fifth (fig. 4). Parapsidal furrows absent or sometimes indicated as very short grooves. Pits at the base of the scutellum oval (fig. 5). Radial cell in fore wing large, wide, for the most part open along the front border (fig. 6).

Colour pattern

Black. Mandibulae, three basal antennal segments in male and four in female, legs and wing veins yellowish to brownish, with the remainder of the antennae dark brown and sometimes the centre of the femora somewhat darkened.

Length male: 0.7—1.3 mm (average 1.0 mm), female: 0.9—1.5 mm (average 1.2 mm).

Remark: Thomson in his 1877 publication gave the measurements in "mill", which is apparently smaller than "mm" of the metric system. This is the reason that Kieffer (1902b) and Von Dalla Torre & Kieffer (1910) gave the measures for the species described by Thomson in 1877 too large.

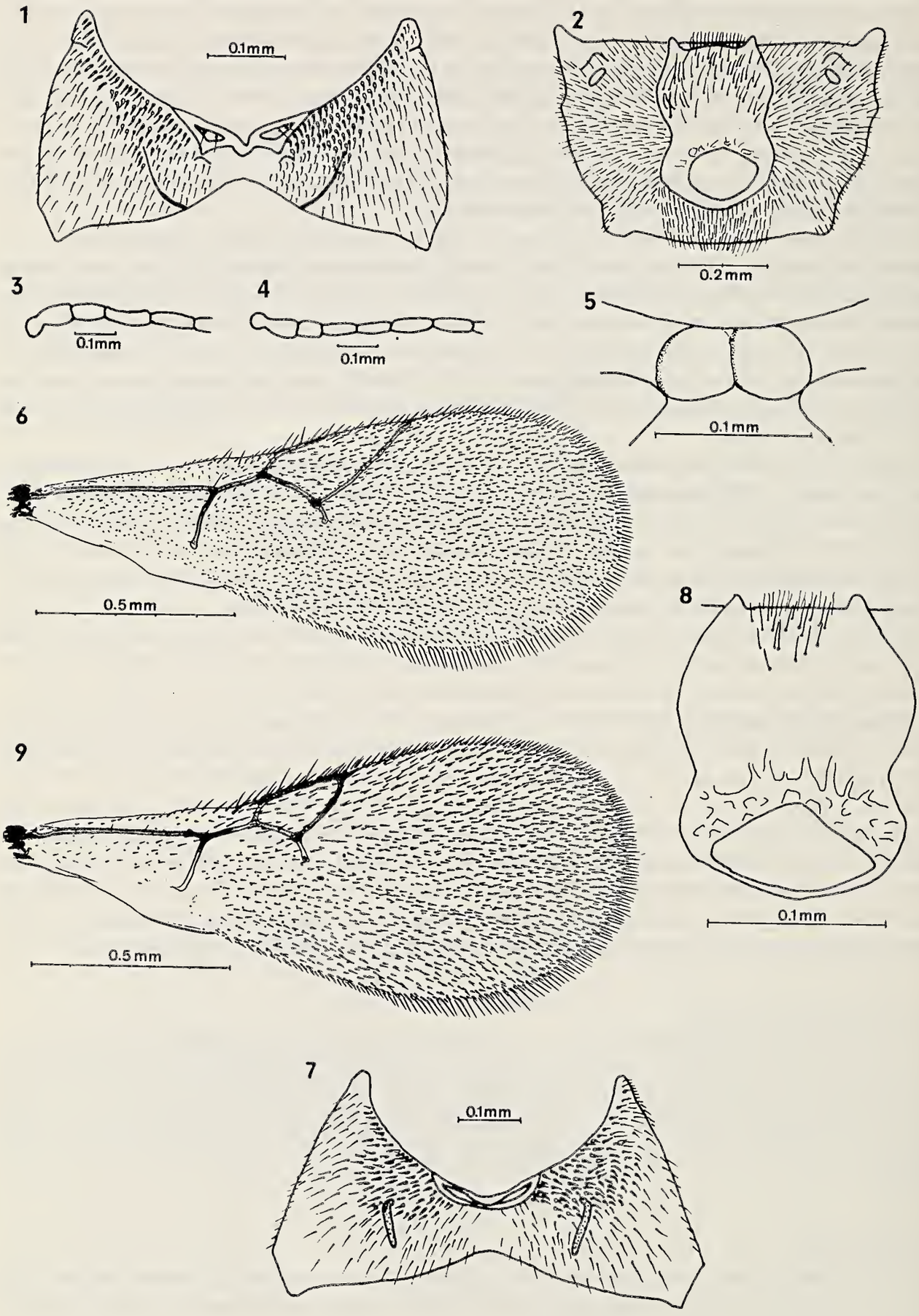

Fig. 1—6. *Phaenoglyphis villosa* (Hartig). 1, Pronotum; 2, Propodeum; 3, Basal part of male antenna; 4, Basal part of female antenna; 5, Pits at base of scutellum; 6, Fore wing. Fig 7—9. *Alloxysta arcuata* (Kieffer). 7, Pronotum; 8, Middle part of propodeum (between the keels); 9, Fore wing.

Alloxysta arcuata (Kieffer, 1902) comb.n.

Allotria minuta (Hartig, 1840) (det. Cameron, 1890: 244♂, ♀) (misidentification).
Allotria arcuata Kieffer, 1902a: 12
Allotria castaneiceps Kieffer, 1904: 601-602, ♀ syn.n.

The characters that Hartig (1840, 1841) gave for *Xystus minutus* are very few. He only stated the female was black with the base of the antennae and the legs uniformly reddish ("testaceis"), and the radial cell very small and closed. It is not surprising that the species has been differently interpreted by various authors.

Evenhuis examined the four specimens that Cameron ranged under the name *Allotria minuta* (Hartig), which are in the British Museum (Natural History). These specimens are syntypes of *Allotria arcuata* Kieffer, 1902. Kieffer introduced this name because he did not agree with Cameron's conception of *Allotria minuta* (Hartig).

The four syntypes belong to two species. One of these, represented by only one male, has an open radial cell and thus cannot be considered as a lectotype of *Allotria arcuata*. The three other specimens, all females, are conspecific and belong to a species that, both in France and in the Netherlands, was often reared from *Myzus cerasi* (Linnaeus) through *Ephedrus* sp. on cultivated cherry. In the Netherlands it was also often reared from *Dysaphis plantaginea* (Passerini) through *Ephedrus persicae* Froggatt on cultivated apple. In the Hartig collection there are nine types of *Xystus minutus* Hartig, 1840, belonging to various species. All are different from *Alloxysta arcuata* Kieffer, 1902.

Barbotin compared specimens reared from *Myzus persicae* with the three conspecific syntypes of *Allotria castaneiceps* (Kieffer, 1904), all females, and found that they belong to the same species. One of them, with the number 5751, he designates lectotype, the two others paralectotypes of *Allotria castaneiceps* Kieffer.

Morphological characters

Antennae in male distinctly longer, in female somewhat shorter than body. Pronotum pubescent to a large extent, also inside the short keels except for a mediolongitudinal strip (fig. 7). Propodeum with two keels, which are strongly curved outward, pubescent outside the keels and with few medioproximal hairs between the keels (fig. 8). Radial cell rather small, closed (fig. 9).

Colour pattern

Male: Head yellowish, darker between the ocelli; antennae unicolourous yellow. Thorax and abdomen black. Legs and wing veins yellowish.

Female: As male, but head darker, especially above insertion of antennae brownish; antennae from the fifth segment on brown.

Length male and female: 1.1—1.4 mm (average 1.2 mm).

This species is very similar to *Alloxysta ligustri* Evenhuis, but may be distinguished by its larger size, by being somewhat darker and especially by the more outwardly curved keels on the propodeum. It might be a hyperparasite of various aphids through *Ephedrus persicae* and possibly also other *Ephedrus* species. More information is needed.

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