

# On the identity of *Leucopis* (Diptera Chamaemyiidae) described by Camillo Rondani: a revision of eight silver fly species

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## Abstract

The dipterologist Camillo Rondani described a wide number of new Diptera species, including 12 species of silver flies (Diptera Chamaemyiidae). The first Rondani description of Chamaemyiidae was carried out in 1847 in his research “*Osservazioni sopra parecchie specie di esapodi afidicidi e sui loro nemici*”. Among them, *Ochtiphila obscuripes* Rondani 1875 was considered by Czerny (1936) synonymous of *Chamaemyia geniculata* (Zetterstedt 1838). Later on, Raspi shed light on the identity of *Leucopis palumbii* Rondani 1872 (Raspi, 1983b; 1988); *Leucopis bursaria* Rondani 1848 (Raspi, 2003) and *Ochtiphila frontella* Rondani 1875 (Raspi, 2006). In this research, the identity of the other *Leucopis* species described by Rondani is established. The valid species are *Leucopis (Leucopis) aphidivora* Rondani 1847, of which *Leucopis fiorii* Raspi 1986 is a new synonym; *Leucopis (Leucopis) aphidiperda* Rondani 1848; *Leucopis (Leucopis) misaphida* Rondani 1848; *Leucopis (Leucopis) minuscula* Rondani 1875; *Leucopis (Leucopis) talaria* Rondani 1875; *Leucopomyia palliditarsis* (Rondani 1875), of which *Leucopis alticeps* Czerny 1936 is a new synonym. *Leucopis (Leucopis) armillata* Rondani 1875 is a new synonym of *Leucopis palumbii* Rondani 1872, and *Leucopis ballestrerii* Rondani 1875 is a new synonym of *Leucopomyia silesiaca* (Egger 1862). Overall, concerning the twelve species of Chamaemyiidae described by Camillo Rondani, nine of them are still considered valid species. This study adds basic knowledge to silver fly systematics and has helpful implications concerning Chamaemyiidae-based biological control programs.

**Key words:** aphids, natural enemies, systematics, biological control.

## Introduction

The dipterologist Camillo Rondani, with his “*Dipterologiae Italicae Prodromus*” (1856-1880) (see O’Hara *et al.*, 2011 for details) provided an organic study on systematic and basic biological knowledge about this important order of insects. In his career, Rondani described many new species of Diptera, including 12 of Chamaemyiidae. Among them, *Ochtiphila obscuripes* Rondani 1875 was considered synonymous of *Chamaemyia geniculata* (Zetterstedt 1838) (Czerny, 1936); Raspi clarified the identity of *Leucopis palumbii* Rondani 1872 (Raspi, 1983b; 1988), *Leucopis bursaria* Rondani 1848 (Raspi, 2003) and *Ochtiphila frontella* Rondani 1875 (Raspi, 2006). The first Rondani descriptions of the Chamaemyiidae was in 1847, in the work “*Osservazioni sopra parecchie specie di esapodi afidicidi e sui loro nemici*”. In this work, Rondani (1847; 1848a; 1848b) focused on the importance of silver flies in a broad ecological perspective, uncommon at that time: “*Fra i principali ostacoli che la provvida natura oppone all’esorbitante moltiplicarsi degli afidi, si devono annoverare parecchie specie d’insetti le quali distruggono un numero immenso di questi parassiti fitofaggi, nutrendosi nello stato di larva esclusivamente di essi in diverse foggie uccidendoli*” ... “*Siccome però la provvida natura impedisce il moltiplicarsi eccessivo della specie degli entomati fitofagi perchè non divengano in modo straordinario dannose, servendosi principalmente del mezzo di altri insetti entomofagi che ne diradano gli individui, così si oppone eziando alla loro totale distruzione servendosi nel modo medesimo di specie voraci che scemano il numero dei loro nemici ... perchè alcuni Imenotteri tenessero limitata la moltiplicazione di parecchi insetti afidivori col mettere un uovo presso i medesimi o*

*sopra o dentro il loro corpo, onde la larva che ne sbuccia si possa nutrire delle larve afidicide succhiandole o ro-dendole dall’esterno o dentro di quelle alloggiando*”. In the first part of his masterpiece, Rondani (1847) studied some aphidiphagous hoverflies (Diptera Syrphidae). Rondani collected some larvae of these species and reared them, waiting for adult emergence. During this survey, Rondani also collected other, unknown, aphidiphagous larvae, and discovered that they were of genus *Leucopis* of Meigen: “*Le larve dei Ditteri che furono da me conosciute afidivore e che parmi non fossero note prima d’ora sono le seguenti. Una specie del genere Pipiza, tre del genere Paragus, queste e quella dalla famiglia delle Syrphinae; quattro o cinque specie di Leucopis della famiglia delle Muscinae; ed una specie di Cecidomyia della stirpe delle Tipulidae e della famiglia delle Cecidomyinae, e di queste farò conoscere tutto ciò che fu da me osservato sulle loro abitudini*”.

The *Leucopis* species described by Rondani (1847; 1848a) were *L. aphidivora*, *L. aphidiperda*, *L. bursaria* and *L. misaphida*. Concerning the first three species, Rondani described larvae, puparia, adults and basic biology. Rondani also asserted, with correct systematic vision, that *L. aphidivora*, *L. aphidiperda* and *Leucopis lusoria* Meigen (a species with larvae preying on *Coccus* sp. on *Juniperus virginiana*) may be considered varieties of just a single species, since adults were very similar. However, larvae and puparia showed deep differences, not allowing the validation of this hypothesis. Finally, Rondani (1875) described a further number of *Leucopis*: *L. talaria*, *L. minuscula*, *L. palliditarsis*, *L. armillata* and *L. ballestrerii*. In this research, the identity of the species described by Rondani (1847; 1848a; 1875) in the genus *Leucopis* is revised and Lectotypes are designated.

## Materials and methods

The Types of all *Leucopis* species described by Rondani (1847; 1848a; 1872; 1875) were stored in box n. 35 of the Dipterological Collection of Camillo Rondani at the “La Specola” Zoological Museum, Florence University. The species studied here were analyzed following their order in box n. 35. To prepare terminalia, the final segments of *Leucopis* specimens were removed and soaked in a hot KOH (10% w:v) solution for several minutes, rinsed in distilled water, acidified in a 75% ethanol rinse with a few drops of glacial acetic acid, studied and stored in a drop of water-soluble Faure liquid on the label under the specimen. Morphological terms in the descriptions follow McAlpine (1981; 1987).

### 1. *Leucopis (Leucopis) aphidivora* Rondani

*Leucopis aphidivora* Rondani 1847: 349. Box n. 35 of the Dipterological Collection of Camillo Rondani.

*Leucopis fiorii* Raspi 1986: 478 (new synonym).

The card labelled “*aphidivora* Rnd”, handwritten, accompanied the types. The type ♀ is prepared with a wide pin through the right half of the anterior part of the mesonotum (figure 1a). Beneath the specimen there are a white oval card bearing the progressive red number 1812, and a red label below: Syntypus - *Leucopis (Leucopis) aphidivora* Rond. - det.G. Morge, Ex 5 (*in litteris*). The puparium, stored with the female Syntype, is prepared with a pin through the central part (figure 1b); beneath the puparium there is a white oval card bearing the progressive red number 1812, and a red label below: Syntypus - *Leucopis (Leucopis) aphidivora* Rond. - det.G. Morge, Ex 6 (*in litteris*). The specimen and the puparium correspond to the concise but accurate description by Camillo Rondani (Rondani, 1847 pp. 349-351; Rondani, 1875 pp. 261 and 263-264).

### Type material

Paralectotypus ♀ and 1 puparium (figure 1) in the Zoological Museum of “La Specola”, Florence.

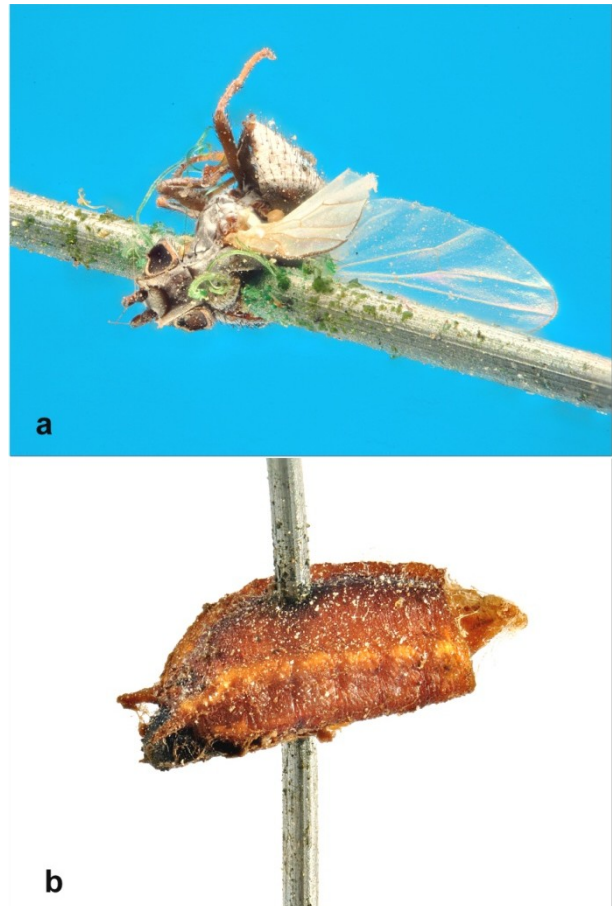
The Lectotypus ♀ and its puparium, prepared with a same pin, was designated by G. Morge as Ex n.1 (Morge, 1962) (box 337 of Museum of Department of Scienze Biologiche, Geologiche e Ambientali, Bologna University (Italy). The abdomen of Lectotypus was prepared in Canada balsam and the slide is conserved in Box 337.

### Diagnosis

“*Fronte in medio fascia lata, subquadrata, antice excavata, nigra, lateribus et antice albida. Thorace lineis quatuor fuscis, lateralibus magis perspicuis et fuscioribus, pedes nigri geniculis anguste luteis*”.

Body silvery grey, length 2.0 mm, wing 2.0 mm length.

**Head** - Head about 1.8 times higher than long; frons at anterior ocellus level 2.1 times narrower than width of head. Frons dark grey, squarish, with darker black-brown vittae on lateral border; fronto-orbital plate silvery white. Ocellar plate slightly raised, grey, covered



**Figure 1.** *Leucopis aphidivora* Rondani 1847, Paralectotypus ♀: (a) habitus; (b) puparium.

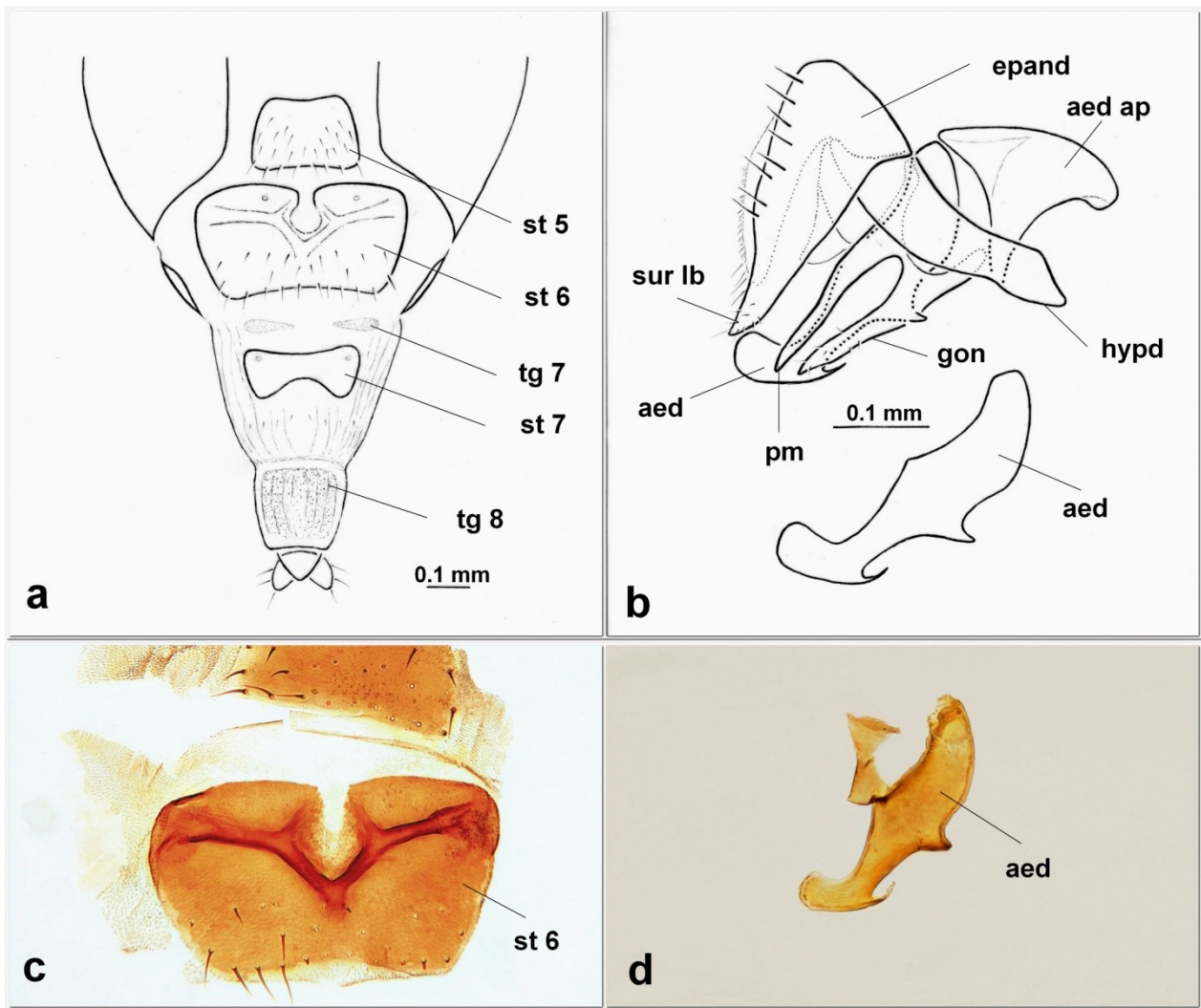
(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

with thick whitish-yellow hairs. Height of gena and height of eye in ratio 1:3. Genal setulae and one strong genal bristle present. Antenna black, arising slightly beneath middle of head; flagellum suboval, slightly higher than long; arista black, apical segment at least 4 times longer than stout second one. Palpus blackish. Labellum yellowish-brown.

**Thorax** - Mesonotum with two rust-brown dorsocentral vittae noticeable, reaching posterior pair of dorsocentral setae and two noticeable dark grey median stripes in anterior half of mesonotum. Anteriorly, spaces between the lateral and median stripes without setulae. Two pairs of posteriorly located strong dorsocentral setae present, the posterior setae about two times longer than the anterior. Prescutellum well developed. Scutellum brown pruinose in central part. Strong sternopleural bristle present.

**Wing** - Hyaline. Anterior crossvein (r-m) well beyond middle of discal cell. Veins R4+5 and M1 about parallel in distal part. Apical section of CuA1 1.75 times longer than posterior crossvein (dm-cu), posterior crossvein 1.75 times shorter than the distance between anterior and posterior crossvein. Haltere stout, whitish-yellow.

**Legs** - Legs dark blackish; apical part of femora, bases of all tibiae, bases of prothoracic first tarsomere, mesothoracic first two tarsomeres and metathoracic first tarsomere yellowish-brown.



**Figure 2.** *Leucopis aphidivora* Rondani 1847: (a) Paralectotypus, ♀ terminalia, schematic drawing in ventral view; (b) additional specimen: ♂ terminalia, schematic drawing in lateral view; (c) Paralectotypus: ♀ terminalia, detail of sternite 6; (d) additional specimen: aedeagus in lateral view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, gon = gonopod, hypd = hypandrium, pm = paramere, st = sternite, sur lb = surstylar lobe, tg = tergite. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

*Abdomen* - Syntergite 1+2 dark brownish, appearing grey on posterior margin and posterolateral angles. Anterior part of tergite 3 with two dark brown oval submedian spots; tergites 4 and 5 with weakly noticeable dark brown longitudinal median stripes. Tergites 3-5 covered with long, sparse setulae, longer and stronger at posterolateral angles and along posterior edges.

*Female terminalia* (figure 2a, 2c) (Raspi, 1986) - Ovipositor short. The sixth sternite is very characteristic with a deeply rounded cavity along the proximal edge, subrectangular in shape, with blunted angles, 2 times as high as and 1.5 times larger than sternite 7. Sternite 6 is heavily sclerotized centrally, with sclerotized ridges of support, setae arranged mainly in three transversal ridges, in the posterior half of the sternite. Sternite 7 is a wide, transversal sclerite with a pronounced concavity on distal edge. Tergite 7 is represented by two symmetric, narrow transverse areas very weakly sclerotized. Tergite 8 is uniformly, but weakly

sclerotized. Two pairs of strongly sclerotized spherical spermathecae present.

*Male terminalia* (figure 2b, 2d) (Raspi, 1986) - The male terminalia of *L. aphidivora* are very characteristic: epandrium narrow, subtriangular in lateral view, with about 8 setae on the posterolateral edge; surstylar lobes stout and bent posteriorly; parameres and gonopods resembling an H in which the H "arms" aimed to distal part of aedeagus are convergent and about two times longer than their opposites, which are divergent; aedeagus unmistakable, in lateral view (figure 2d), with greatest width at half of length, the distal part stout and bent towards epandrium. The distal margin of aedeagus base is connected with hypandrium by a structure in shape of chalice.

*Puparium* (figure 1b) - Body weakly rough, ferruginous, carinate, lateral keels more light rusty-yellowish, length about 2.5 mm. Posterior spiracular protuberances cone-shaped, length (about 0.3 mm) at least 3 times the wide of base.



## Remarks

The preparation of female terminalia of the *L. aphidivora* paralectotype (figure 2a, 2c) and the study of the lectotype designed by Morge (1962), and in particular the study of the slide with the female terminalia of the lectotype show that *L. aphidivora* is a species well characterized by the peculiar shape of the female terminalia, in particular for sternites 6 and 7. Unfortunately in the literature, with exception of Raspi (Raspi, 1983b; 1986; 1988; 1996; 2003; Raspi and Bertolini, 1993) few researches reported the female terminalia of *Leucopis* species (McAlpine, 1971; Gaimari and Raspi, 2002), but in this case the female terminalia of *Leucopis fiorii* Raspi 1986 correspond with those illustrated here for the paralectotype of *L. aphidivora* (figure 2a, 2c). In addition, the adults of *L. fiorii*, correspond to Rondani description and to the types of *L. aphidivora*. Consequently, the male terminalia of *L. aphidivora* had been illustrated by Raspi (1986) as *L. fiorii*, and are here reported (figure 2b, 2d).

## Additional specimens

*L. aphidivora* types were compared with specimens present in the Dipterological Collection of our Department (DiSAAA-a): *Leucopis fiorii*, Raspi, 4♂♂ (holotype and 3 paratypes) and 3♀♀ (paratypes), Perugia, 20-22.VIII.1975, ex *Aphis fabae* Scopoli, on *Arctium lappa* L., Carlo Ricci legit.

## Synonymy

New synonym of the *Leucopis aphidivora* Rondani 1847 is *Leucopis fiorii* Raspi 1986.

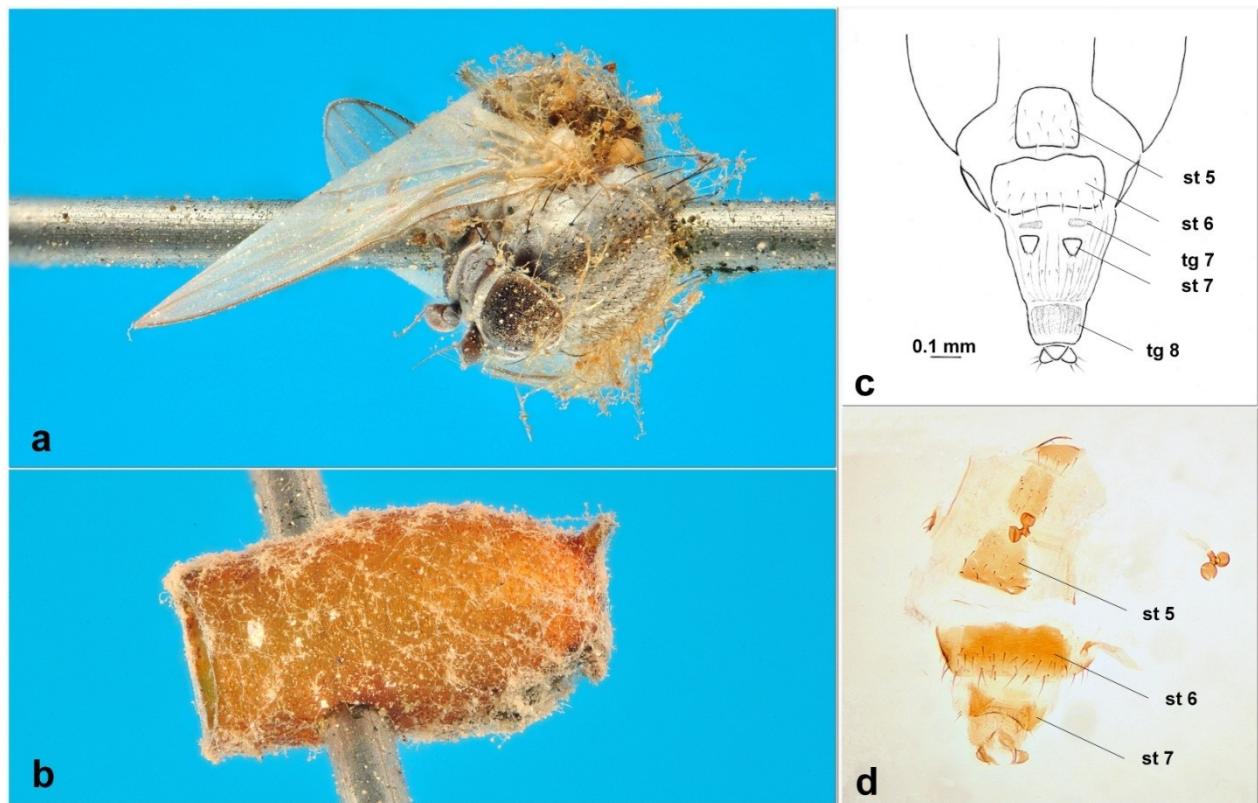
## Biology

Rondani (1847 pp. 349-350) find the larvae of this species prey on "*Aphis terricola*" on roots of *Pichris hieracioides* in August. Other biological data include their preying on *Aphis fabae* on basal leaves of *Arctium lappa* in August (Raspi, 1986).

## 2. *Leucopis (Leucopis) aphidiperda* Rondani

*Leucopis aphidiperda* Rondani 1848: 434. Box n. 35 of the Dipterological Collection of Camillo Rondani.

The card labelled "*aphidiperda* Rnd", handwritten, follows the types. The types, 1♀ (figure 3a) and its puparium, and 1♂ and its puparium (figure 3b), are each prepared with a pin through the posterior part of the mesonotum. Beneath each specimen there is a white oval card bearing the progressive red number 1812 and a red label beneath: Syntypus - *Leucopis (Leucopis) aphidiperda* Rond. - det.G. Morge, Ex 3 and Syntypus - *Leucopis (Leucopis) aphidiperda* Rond. - det.G. Morge, Ex 4, respectively (*in litteris*). The specimens (figure 3) and the puparia correspond to the concise but accurate description by Camillo Rondani (Rondani, 1848 pp. 434-437; Rondani, 1875 pp. 261-262 and 264).



**Figure 3.** *Leucopis aphidiperda* Rondani 1848, Paralectotypus: (a) ♀ habitus; (b) ♂ puparium; (c) ♀ terminalia, schematic drawing in ventral view; (d) ♀ terminalia: detail of sternites 5, 6 and 7, and spermathecae. Abbreviations: st = sternite, tg = tergite.

(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

### Type material

Paralectotypus ♀ and its puparium and Paralectotypus ♂ and its puparium in the Zoological Museum of “La Specola”, Florence. The Lectotypus ♂, a pinned specimen, was designated by G. Morge as Ex n. 2 (Morge, 1962) (box 337 of Museum of Department of Scienze Biologiche, Geologiche e Ambientali, Bologna University, Italy). The male genitalia of the lectotypus was prepared in Canada balsam and the slide is conserved in Box 337.

### Diagnosis

“*Tarsi antici ima basi tantum lutescente. Thorax lineis fuscis quatuor, duabus exterioribus magis distinctis et fuscioribus*”.

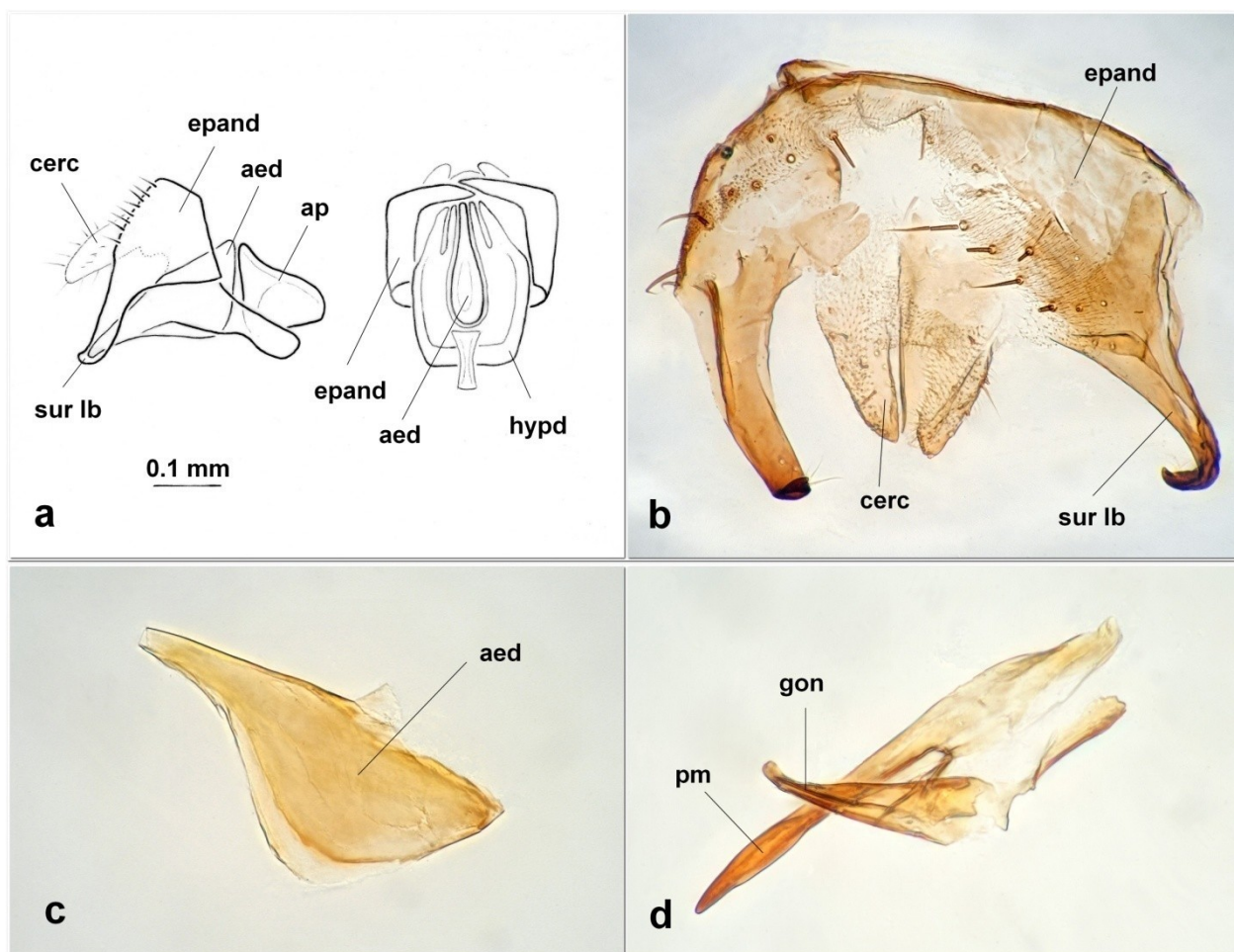
Body silvery grey, length 2.0 mm, wing 2.0 mm length.

**Head** - Head about 2.0 times higher than long; frons at anterior ocellus level 2.7 times narrower than width of head. Frons dark grey, squarish, with darker black-brown vittae on lateral border; fronto-orbital plate silvery white. Ocellar plate prominent, more prominent in male than in female, dark grey-brownish. Anterior ocel-

lus sunken and smaller than posterior ocelli. Height of gena and height of eye in ratio 1: 3.4. Genal setulae and one strong genal bristle present. Antenna black, arising slightly beneath middle of head; flagellum roundish; arista black, conical, apical segment at least 3 times longer than stout second segment. Palpus blackish. Labellum yellowish-brown.

**Thorax** - Mesonotum with two wide rust-brown dorsocentral vittae noticeable, reaching posterior pair of dorsocentral setae, and two noticeable dark grey median stripes on anterior half, each delimited and covered with 2-3 rows of setulae. Anteriorly, spaces between the lateral and median stripes without setulae. Two pairs of posteriorly located strong dorsocentral setae present, the posterior setae about two times longer than the anterior. Prescutellum well developed. Strong sternopleural bristle present.

**Wing** - Hyaline. Anterior crossvein (r-m) well beyond middle of discal cell. Veins R4+5 and M1 slightly convergent in distal part. Distance between anterior and posterior crossvein, apical section of CuA1 and posterior crossvein (dm-cu) about equal in length. Haltere stout, whitish-yellow.



**Figure 4.** *Leucopis aphidiperda* Rondani 1848, Paralectotypus ♂: (a) terminalia, schematic drawing in lateral and ventral view; (b) terminalia, in dorsal view; (c) aedeagus, in lateral view; (d) gonopod and paramere, in lateral view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, gon = gonopod, hypd = hypandrium, pm = paramere, sur lb = surstylar lobe.

(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

*Legs* - Legs dark blackish; apical part of femora, bases of all tibiae, bases of prothoracic first tarsomere, mesothoracic first three tarsomeres and metathoracic first two tarsomeres yellowish-brown.

*Abdomen* - Syntergite 1+2 dark brownish, appearing grey along posterior margin and posterolateral angles. Tergite with two dark-brown submedian spots weakly noticeable anteriorly. Tergites 3-5 covered with long, sparse setulae, in about four rows, longer and stronger at posterolateral angles and along posterior edges.

*Female terminalia* (figure 3c, 3d) - Ovipositor relatively short. Sternite 6 subrectangular in shape, with blunted angles; at least 2.3 times as wide as high with numerous setae in posterior half of sternite and 1.7 times larger than sternite 5. Sternite 7 is presented as two small almost equilaterally triangular sclerites with blunted apices, turned distally and adorned with two setulae. Tergite 7 with two symmetric transversal narrow sclerites, weakly sclerotized, with pointed apex oriented laterally. Tergite 8 is uniformly, but weakly sclerotized. Two pairs of strongly sclerotized spherical spermathecae present.

*Male terminalia* (figure 4) - The male terminalia of *L. aphidiperda* are characterized by a stout epandrium, subtriangular in lateral view; surstylar lobes elongated and narrowing distally, bent posteriorly and crossed ventrally (figure 4a, 4b); parameres and gonopods in shape of an "H", where the posterior arms are a narrow, elongated fork (figure 4d). Aedeagus short, with stout semi-elliptical base in lateral view (figure 4 a, 4c).

*Puparium* (figure 3b) - Body rough, light ferruginous, size about  $2.3 \times 1.1$  mm, barrel shaped, wider posteriorly. Tergites each with evenly spaced transverse rows of small papulae. Posterior spiracular protuberances short (about 0.2 mm length), cone-shaped and divaricating, length at least 2 times the width of base, with 7-8 rings of trunk-conical papulae.

#### Remarks

The study of the *L. aphidiperda* paralectotypes and their puparia (figures 3 and 4) and the study of lectotypus designated by Morge (1962) show that *L. aphidiperda* is a well-characterized species. The head has a prominent ocellar plate, more prominent in male than in female, is dark grey-brownish, and has the anterior ocellus sunken and small. Wing with distance between anterior and posterior crossvein, apical section of CuA1 and posterior crossvein (dm-cu) about equal in length. The male and female terminalia, as well as the external morphology of the adults, vaguely resemble *Leucopis annulipes* Zetterstedt, but the aedeagus and surstylar lobes of *L. annulipes* are more elongated (Raspi, 1996) and, most importantly, the puparia of these two species look very different; in particular the puparium of *L. aphidiperda* presents small and spaced papulae, while the puparium of *L. annulipes* presents strong, elongated and pointed spines (Raspi, 1996).

#### Additional specimens

The specimens present in the Dipterological Collection of our Department (DiSAAA-a) ascribable at *Leu-*

*copis aphidiperda* Rondani are: 4 ♀♀ and their puparia, Italy, Arma di Taggia (IM), on thamerix, IX.1991, A. Raspi legit; 13 ♂♂ and ♀♀, M. Kozanek leg., Slovakia: Kamenec-Konopisko, 25.VIII.1994; Slovakia occ., Bojnice, 28.VII.85 and 20.VIII.1991; Slovakia mer., Devinska Kobila, IX.1994.

#### Biology

Rondani (1848 p. 434) found that the larvae of this species prey on "*Aphis mali* of Authors" on apple-tree.

#### 3. *Leucopis (Leucopis) minuscula* Rondani

*Leucopis minuscula* Rondani 1875: 265. Box n. 35 of the Dipterological Collection of Camillo Rondani.

*Leucopis auraria* Tanasijtshuk *sensu* Raspi (misidentification; Raspi, 1995; 2013; Raspi and Ebejer, 2008).

The card labelled "*minuscula* Rnd", handwritten, follows the specimen. The type is prepared with a micropin fixed through the thorax laterally (figure 5a), allowing a view of the mesonotum. Beneath the specimen there are a white oval card bearing the progressive red number 1815 and a red label below: Holotypus- *Leucopis (Leucopis) minuscula* Rond. - det.G. Morge, Ex 12 (*in literis*), beneath a red card "La Specola" Museum, Rondani collection, Holotypus. The specimen correspond to the concise but accurate description by Camillo Rondani (Rondani, 1875 pp. 262 and 265).

#### Type material

Holotypus ♀ (figure 5a) in the Zoological Museum of "La Specola", Florence.

#### Diagnosis

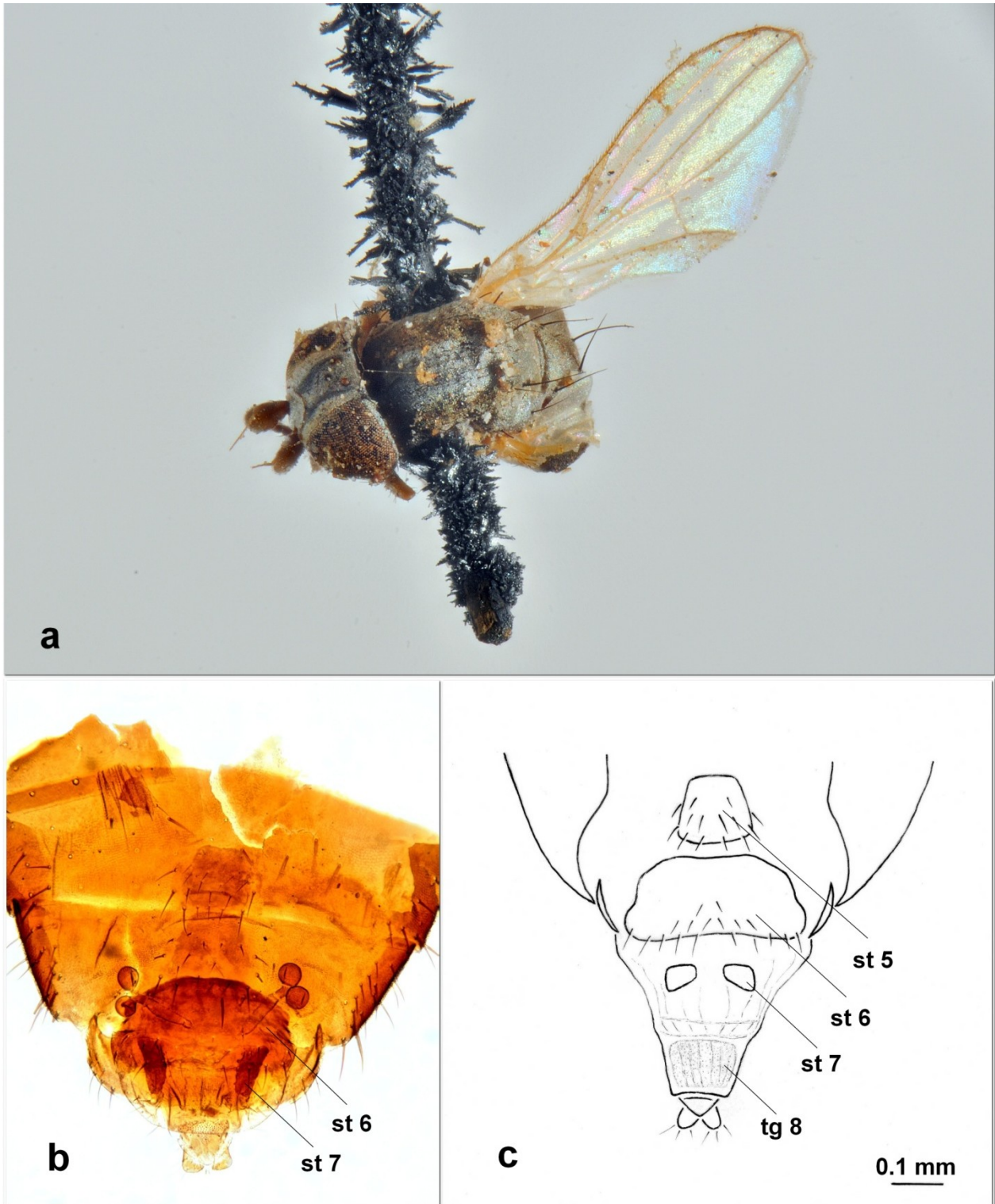
"*Sat parva, antennae fusco rufescentes, non nigrae; thorax vittis obscuris lateralibus latis et lineis fuscis intermediis distinctis*".

Body silvery grey, length 1.7 mm, wing 1.7 mm length.

*Head* - About 1.6 times higher than long; frons at anterior ocellus level 2.8 times narrower than width of head. Fronto-orbital plate light grey; frontal vitta darker grey with dark-black vittae in lateral border. Ocellar plate grey slightly raised; anterior ocellus sunken. Inner and outer vertical bristles subequal. Height of gena and height of eye in ratio 1:4. Genal setulae and one stout genal bristle present. Antenna dark reddish not black, rising slightly beneath middle of head; flagellum suboval, weakly higher than long; arista with the apical segment about 4 times longer than second one. Palpus dark at the top. Labellum yellowish-brown.

*Thorax* - Mesonotum light grey in central part. Two pairs of posteriorly located dorsocentral setae present; dark-yellow dorsocentral vittae, reaching the anterior pair of dorsocentral setae, dark-grey median stripes, both covered and delimited by two rows of setulae, stripes extending posteriorly until the middle of mesonotum. Lateral and median stripes spaced, without setulae. Prescutellum well developed. Scutellum yellowish, pruinose. Sternopleural bristle isolated, stout.





**Figure 5.** *Leucopis minuscula* Rondani 1875, Holotypus ♀: (a) habitus, in dorsal view; (b) terminalia in ventral view; (c) terminalia, schematic drawing in ventral view. Abbreviations: st = sternite, tg = tergite. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

*Wing* - Hyaline. Anterior crossvein (r-m) is located beyond the middle of the discal cell. Veins R4+5 and M1 slightly converging in distal part. Apical section of CuA1 1.5 times longer than posterior crossvein (dm-cu), posterior crossvein 1.5 times shorter of the distance between anterior and posterior crossvein. Haltere pale yellow.

*Legs* - Legs dark grey, with the exception of the apical

part of femora, base of all tibiae, distal part of median tibiae and the first two and four tarsomeres of the second and third pair of legs, which are yellowish-brown.

*Abdomen* - Syntergite 1 and 2 dark-brownish, appearing grey at posterior margin and posterolateral angles. Tergite 3 with two brown submedian spots. Tergites 3-5 covered with long, sparse setulae.

*Female terminalia* (figure 5b, 5c) - Ovipositor short. Sternite 6 large, sub-trapezoidal, about 1.9 times as wide as high; with setulae on the posterior half. Tergite 6 regular in shape, rather low. Sternite 5 sub-trapezoidal, at base about two times narrower of sternite 6, with setulae distributed along the lateral and basal areas. The sternite 7 presents two symmetric, almost sub-rectangular transversal sclerites. Tergite 7 membranous. The segment 8 is uniformly and weakly sclerotized. Two pairs of strongly sclerotized spherical spermathecae present.

*Male terminalia* (figure 6a, 6b, 6c) - The ♀♀ and ♂♂ emerged by puparia collected on the same host consent to identify with certainty the male of *L. minuscula* Rondani: epandrium subtriangular in lateral view, with about 9 setae on the latero-posterior margin; surstylar lobe short, stout, bent slightly antero-ventrally; parameres and gonopods of common shape in *Leucopis*, aedeagus with white base, subtriangular in lateral view, the second half abruptly narrow, tubular and strongly bent downwards.

*Puparium* (figure 6d) - Body rough, light chestnut-coloured ferruginous, size about 2.4 × 1.0, oval shape, wider in central part, posterior spiracular protuberances cone-shaped, about 0.25 length (length at least 2 times the wide of base), generally with 5 rings of trunk-conic

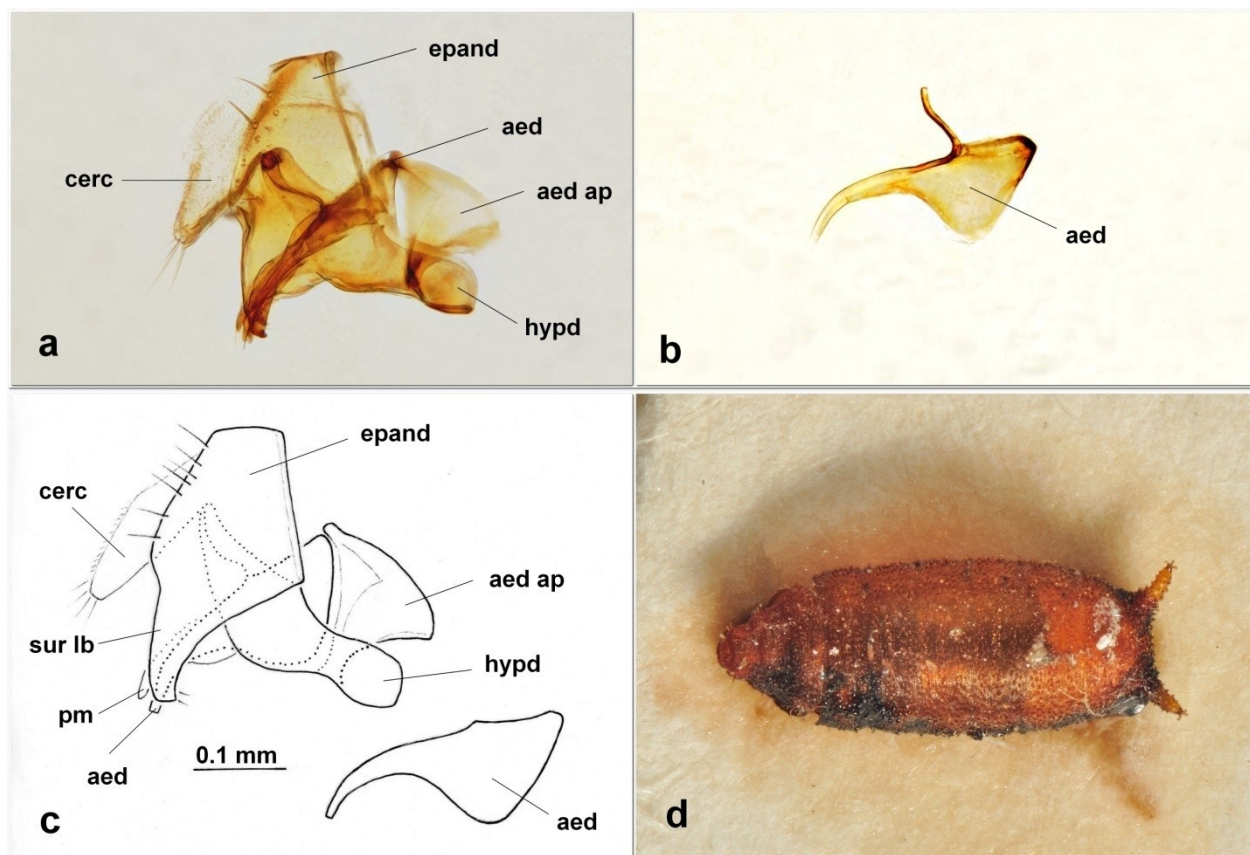
papulae; at the top of each posterior spiracle protuberances 3 lobes each bearing a lipform longitudinal opening. In each segment of tergum, 3 cluster of rows, spaced out, each composed by few (2-3 irregular rows) of sparse secreting papulae with at the top a solid wax secretion.

#### Remarks

The study of the Holotypus of *L. minuscula* Rondani and its female terminalia (figure 5) show that *L. minuscula* is a well characterized species, in particular by its small size, the antenna rusty brown, not black or not completely black, by the palpi that are usually yellow (though in the Holotypus and in some specimens are dark-blackish distally), by the wide, rusty-yellow dorso-central vittae. The peculiar shape of sternites 6-7 of female. Adults obtained by collecting puparia on the same host has aided with certainty the identification of the male of *L. minuscula* Rondani (figure 6).

#### Additional specimens

*L. minuscula* holotype was compared with specimens present in the Dipterological Collection of our Department (DiSAAA-a): 10 ♀♀ and ♂♂, ex puparia, Pisa VII.2008, ex *Chaitophorus populialbae* and *C. populeti*, on *Populus alba*, A. Raspi legit; 19 ♂♂ and 6 ♀♀, ex



**Figure 6.** *Leucopis minuscula* Rondani 1875, additional specimens: (a) ♂ terminalia in lateral view; (b) aedeagus in lateral view; (c) ♂ terminalia: schematic drawing in lateral view; (d) puparium in dorsal view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, hypd = hypandrium, pm = paramere, sur ls = surstylar lobes.

(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))



puparia, Pisa 10.VI.-30.VII.1995, ex *Chaitophorus populialbae* and *C. populeti*, on *Populus alba*, Sabrina Ambroselli legit. Note, the latter samples had been erroneously identified by Raspi as *Leucopis auraria* Tanasijtshuk (Raspi and Ebejer, 2008).

**B i o l o g y**

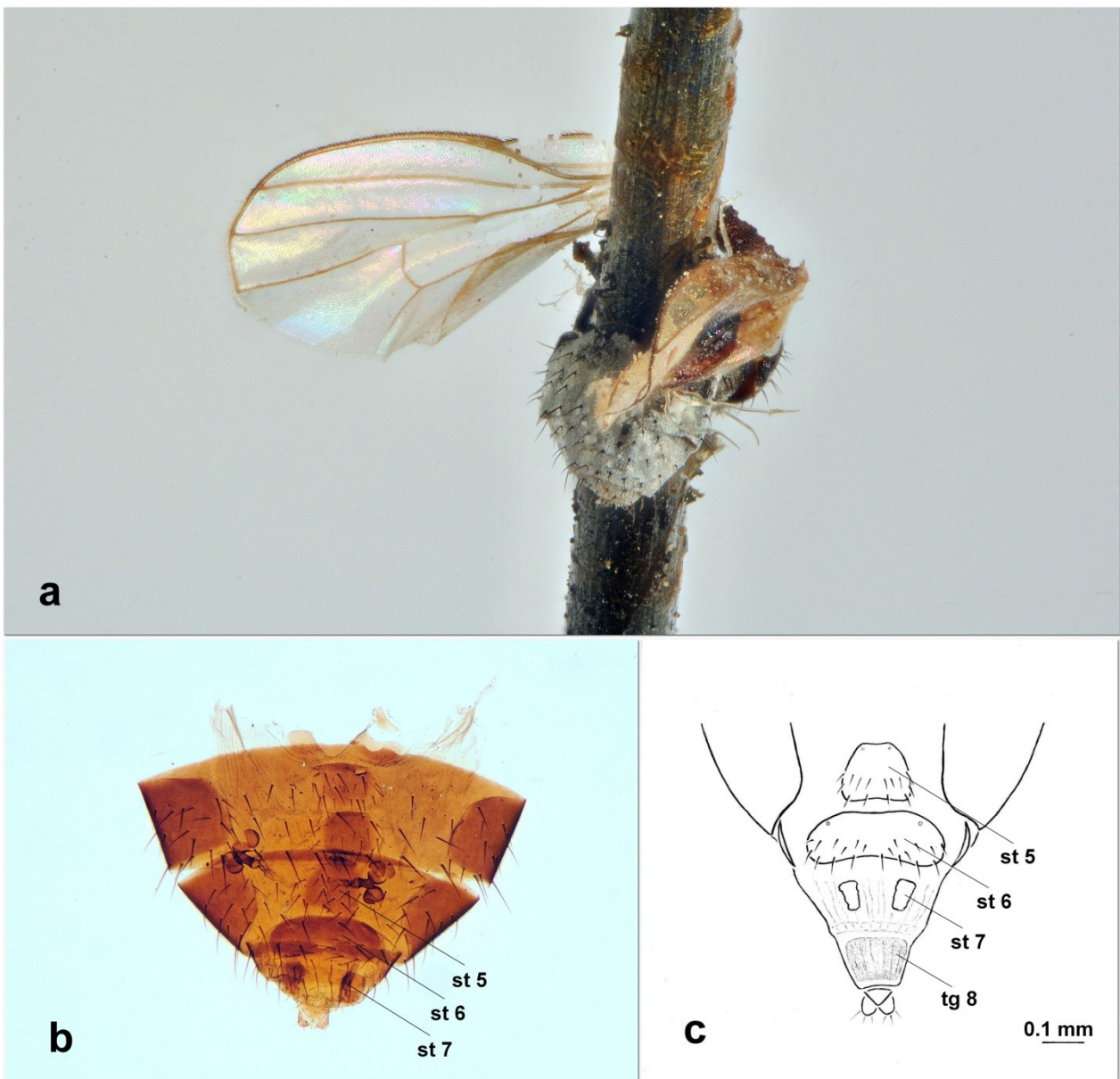
Rondani did not record any biological observations for this species. To the best of our knowledge, the only information available were reported in Rondani, 1875 p. 265: “*Specimen unicum observavi in Italia australi lectum et mihi transmissum a Cl. Haliday*”. We found larvae of *L. minuscula* prey on *Chaitophorus populialbae* and *C. populeti*, on *Populus alba*. In the summer pupation occurs on the lower sides of leaves of *Populus alba*.

**4. *Leucopis (Leucopis) talaria* Rondani**

*Leucopis talaria* Rondani 1875: 264. Box n. 35 of the Dipterological Collection of Camillo Rondani.

*Leucopis glyphinivora* Tanasijtshuk *sensu* Raspi (misidentification, Raspi, 1986; 1995; 2013; Canale *et al.*, 2002; Raspi and Ebejer, 2008; Satar *et al.*, 2015).

The card labelled “*talaria* Rnd”, handwritten, accompanied the specimen. The type is prepared with a pin fixed into the posterior extremity of mesonotum. Beneath the specimen there are a white oval card bearing the progressive red number 1816, and a red label below: Holotypus- *Leucopis (Leucopis) talaria* Rond. - det.G. Morge, Ex 13 (*in litteris*) and beneath a red card “La Specola” Museum, Rondani collection, Holotypus.



**Figure 7.** *Leucopis talaria* Rondani 1875, Holotypus ♀: (a) habitus, in dorsal view; (b) terminalia in ventral view; (c) terminalia: schematic drawing in ventral view. Abbreviations: st = sternite, tg = tergite. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

**Type material**

Holotypus ♀ in the Zoological Museum of “La Specola”, Florence. Unfortunately, the Holotypus is lacking a head, part of the thorax and legs (figure 7a), so the original description of Rondani is presented, along with the description of wing, abdomen and female terminalia of Holotypus.

**Diagnosis**

“Tarsi postici basi tantum articuli primi lutescentes. Vittae frontales nigricantes distinctissimae, latiusculae”.

Rondani description (1875, pp. 262 and 264):

“Frons cano-albicans, vittis duabus nigricantibus latiusculis, sic latis ut distantibus.

Thoracis vittae obscurae laterales et lineae fuscae intermediae distinctae.

*Abdominis puncta duo dorsualia perspicua.*

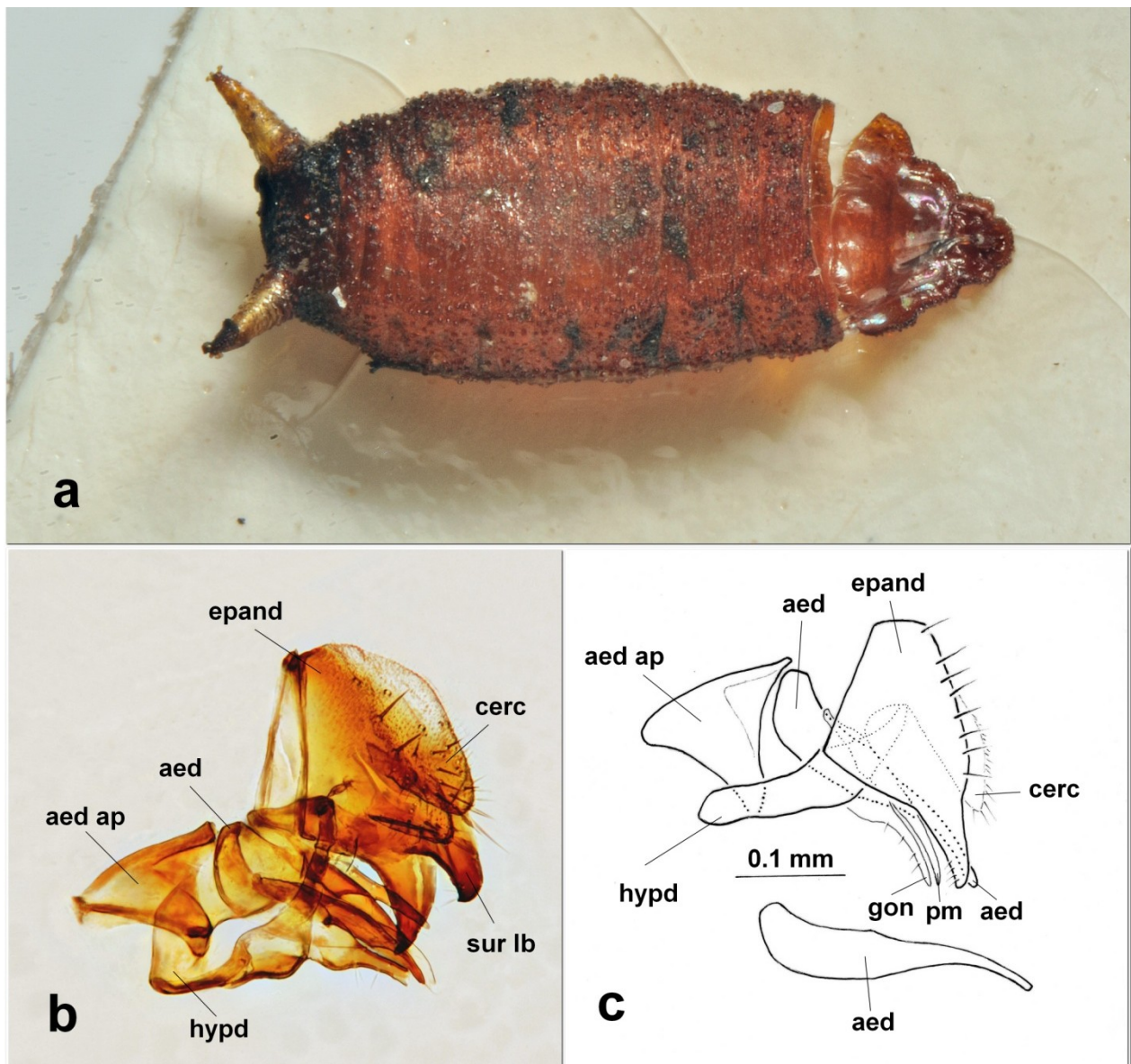
*Pedes nigricantes, geniculis omnibus, tarsorum intermediorum articulis duobus, posticorum basi articuli primi lutescentibus.*

*Alarum vena transversa exterior minus longa distantiae ab intermedia; longitudinales quarta et quinta paulo extrinsecus divergentes.*

*Notae istae in unico exemplare observatae.*

*Inter Hyalopteros pruni Kch. invento”.*

*Wing* (figure 7a) - Hyaline, 1.7 mm length. Anterior crossvein (r-m) is located beyond the middle of the discal cell. Veins R4+5 and M1 divergent in distal part. Apical section of CuA1 equal in length if compared to the posterior crossvein (*dm-cu*), posterior crossvein 1.4 times shorter of the distance between anterior and posterior crossvein. Haltere pale yellowish.



**Figure 8.** *Leucopis talaria* Rondani 1875, additional specimens: (a) puparium in dorsal view; (b) ♂ terminalia, in dorso-lateral view (c) ♂ terminalia, schematic drawing in lateral view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, gon = gonopod, hypd = hypandrium, pm = paramere, sur lb = surstylar lobes.

(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

*Abdomen* - Syntergite 1+2 dark grey, grey at posterior margin and posterolateral angles. Tergite 3 with two submedian spots, tergites 3-5 with long, sparse setulae, longer and stronger at postero-lateral angles and along posterior edges.

*Female terminalia* (figure 7b, 7c) - Ovipositor short. Sternite 6 large, reniform elongated, appearing uniformly sclerotized; about 2.6 times as wide as high, with 3 irregular rows of setulae on the posterior half. Tergite 6 regular in shape, rather low. Sternite 5 subtrapezoidal, at base about 2 times narrower of the sternite 6; with setulae distributed along lateral and second basal area, uniformly sclerotized. The sternite 7 presents two symmetric, longitudinal sub-rectangular sclerites (figure 7b, 7c). Tergite 7 membranous. The segment 8 is uniformly and weakly sclerotized in lateral parts. Two pairs of sclerotized spherical spermathecae present.

*Male terminalia* (figure 8b, 8c) (Raspi, 1986) - The ♀♀ and ♂♂ emerged by puparia collected on the same host consent to identify with certainty the male of *L. talaria* Rondani: epandrium subtriangular, in lateral view, with about 8 setae on the latero-posterior margin; surstilar lobe short, stout, bent slightly antero-ventrally; parameres and gonopods of common shape in *Leucopis*, aedeagus, in lateral view, of unmistakable shape: narrow and elongated, with narrow, compressed base, long about half of the whole aedeagus, second half tubular that become thin gradually and bent lightly downwards to the top (figure 8b, 8c).

*Puparium* (figure 8a) - Body rough, chestnut-coloured ferruginous, size about 2.7 × 1.2 mm. Body, sub-oval elongated, wider in posterior half. Two lateral, longitudinal ridges, in mamelonar shape in each segment. In each segment of tergum the body is sculptured by few groups of transversal irregular rows, spaced out, each composed by few (2 irregular rows) of sparse secreting stout papulae with at the top a solid wax secretion. Posterior spiracle protuberances very characteristic: strongly conic, more light - yellowish, with wide base, about 0.4 mm long (height: at least 1.5 times the base) and with 5 rings of rounded papulae. At the top of each posterior spiracle protuberances, three lobes each bearing a lipform longitudinal opening.

## Remarks

Rondani (1875) in the description of *L. talaria* identified the distinctive character of this species: wing with divergent veins R4+5 and M1 in distal part (figure 7a), that is not a common character in the genus *Leucopis*, and though with certain variability, the dark legs are uncommon as well. This characteristic of the wing, the concise but accurate description by Camillo Rondani, and the study of female terminalia of the holotype, and in particular the peculiar shape of sternites 6-7 of the female has allowed with certainty the identification of the male of *L. talaria* Rondani, comparing ♀♀ and ♂♂ emerged by puparia collected on the same host.

## Additional specimens

The specimens present in the Dipterological Collection of our Department (DiSAAA-a), utilized to compare with the Holotypus ♀ of *L. talaria* Rondani, are

many specimens collected in the field from puparia and reared in laboratory for several generations (Canale *et al.*, 2002), all erroneously identified by Raspi as *Leucopis glyphinivora* Tanasijtshuk, for example: 15♂♂ and ♀♀, ex puparia, Perugia, VIII.1982, ex *Aphis fabae*, on *Arctium lappa*, C.Ricci legit; A. Raspi legit: 8♂♂ and ♀♀, ex puparia, S. Maria a Monte (PI), ex *Aphis fabae* on *Vicia faba* and *Heliantus annuus*, IX.1984, VI.1985, VIII.1985; 20♂♂ and ♀♀, ex puparia on *Cynara scolymus*, Capezzano Pianore (LU), 30.VII. and 20.VIII.2001.

## Biology

Rondani, 1875 p. 264: "...*Notae istae in unico exemplare observatae. Inter Hyalopteros pruni Kch. invento*". Evidently, an adult (the holotype) was observed feeding among *Hyalopterus pruni*. The larva of *Leucopis talaria* prey on also *H. pruni*, but only on *Prunus*. Besides this species, only the larvae of *Leucopis argentata* Heeger may be found to prey on *H. pruni*, but only on *Pragmites australis* (Raspi, 1983a; Raspi, 2008).

## 5. *Leucopomyia palliditarsis* (Rondani)

*Leucopis palliditarsis* Rondani 1875: 266. Box n. 35 of the Dipterological Collection of Camillo Rondani.

*Leucopis alticeps* Czerny 1936: 8. (new synonym).

*Leucopis bona* Rohdendorf 1940: 6 (synonym).

The card labelled "*palliditarsis* Rnd", handwritten, accompanied the specimen. The type is prepared with a pin fixed into the posterior extremity of the mesonotum. Beneath the specimen there are a white oval card bearing the progressive red number 1817 and a red label below: Holotypus- *Leucopis* (*Leucopis*) *palliditarsis* Rondani - det.G. Morge, Ex 14 (*in litteris*). The specimen (figure 9a) correspond to the concise but accurate description by Camillo Rondani (Rondani, 1875 pagg 262 and 266). The type allows viewing one strong prescutellar seta on the right-side and two strong dorsocentral setae. Therefore, this species is a member of genus *Leucopomyia* Malloch 1921.

## Type material

Lectotypus ♀ (designated herein) in the Zoological Museum of "La Specola", Florence. Designation of a Lectotypus is necessary to fix the identity of the species for stability and to avoid confusion.

## Diagnosis

"*Thorax vittis tantum lateralibus distinctis. Frons cano-albicans unicolor*".

Body silvery grey, length 2.5 mm, wing 2.5 mm length.

*Head* - Head high, about 2.1 times higher than long; frons at anterior ocellus level 2.9 times narrower than head width. Frons "*non manifeste obscure vittata*", grey ocellar plate slightly raised. Height of gena and height of eye ratio 1:5. Genal setulae and one stout genal bristle present. Antenna black, rising slightly beneath middle of head; flagellum suboval, weakly higher than long; arista black, apical segment at least 3 times longer than second one. Palpus blackish. Labellum yellow-brownish.





**Figure 9.** *Leucopomyia palliditarsis* (Rondani 1875), Lectotypus ♀: (a) habitus, in lateral view; (b) terminalia in ventral view. Abbreviations: st = sternite, tg = tergite. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

*Thorax* - Mesonotum uniformly setulose. Only two rust-brown dorsocentral vittae noticeable, reaching the posterior pair of dorsocentral setae. Between dorsocentral vittae there are about 8 rows of more or less regular setulae reaching to posterior pair of dorsocentral setae. Two pairs of posteriorly located strong dorsocentral setae present, one strong prescutellar seta visible on the right side. Strong sternopleural bristle present.

*Wing* - Hyaline. Anterior crossvein (r-m) is located beyond the middle of the discal cell. Veins R4+5 and M1, slightly converging in the second half, parallel only in the extreme distal part. Apical section of CuA1 1.2 times longer than posterior crossvein (dm-cu), posterior crossvein 1.6 times shorter of the distance between anterior and posterior crossvein. Haltere yellowish.

*Legs* - Femora dark grey, the apical part of femora and the base of all tibiae yellows, while tibiae are dark grey-brown, and tarsi yellow-brownish.

*Abdomen* - Syntergite 1+2 dark-brownish, appearing grey at posterior margin and posterolateral angles. Tergite 3 with two dark-brown oval submedian spots. Tergites 3-5 covered with long, sparse setulae.

*Female terminalia* (figure 9b) - Ovipositor elongated. The sternite 6 shows round shape, heavily sclerotized in the central area and with setae arranged mainly along the edge. Sternite 6 is 1.3 times as wide as high and 1.3 times as large as the sternite 5. The sternite 7 presents two small, elongated, thin and symmetrical, subtriangular sclerites with sinuous contour. The tergite 7 is represented by a narrow transverse area weakly sclerotized.

The segment 8 presents in the sternum two small, symmetrical, elongated sclerites with vertex pointing towards the anterior part. In the tergum, two lateral sclerites are present, weakly sclerotized and fused in the distal part. Two pairs of sclerotized spherical spermathecae present.

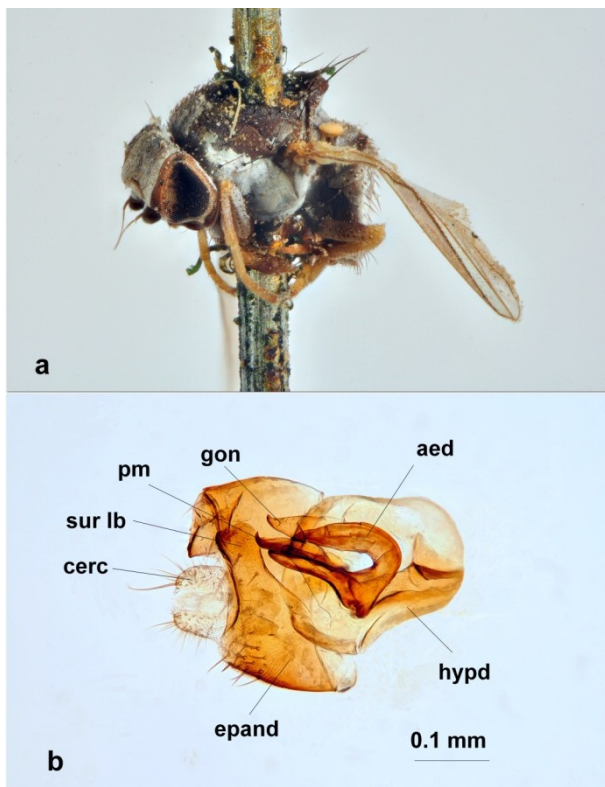
#### Remarks

Study of the lectotype of *L. palliditarsis* has shown that this species belongs to genus *Leucopomyia* Malloch, since a strong prescutellar seta is clearly visible on the right part on mesonotum, close to the dorsocentral setae. The study of the abdomen on the female allows us to state that this species is the same as *Leucopomyia alticeps* (Czerny). Raspi and Bertolini (1993) studied the biology of *Leucopomyia silesiaca* (Egger) and *Leucopomyia alticeps*, both common in Italy, describing for both species, reared from field larvae collected on the host, the larva, the puparium, male genitalia and for first time the female terminalia (Raspi and Bertolini, 1993). Later on, the data for mass-reared *L. alticeps* were reported (Loni and Raspi, 2002). Moreover, the type of *L. palliditarsis* Rondani perfectly fit the description given by Czerny for *Leucopomyia alticeps* (Czerny, 1936), with special reference to black antennae and palpi, the head being about 2.1 times higher than long, the height of gena and height of eye in ratio 1:5 and for the small setulae uniformly distributed on the mesonotum. Unfortunately, as reported by Smith (1963), who erroneously considered *Leucopomyia alticeps* as syno-

nym of *Leucopis annulipes* Zetterstedt (McAlpine, 1967), Czerny's type was destroyed in the last war (Smith, 1963). The type was stored at the Zoological Museum of Hamburg (Czerny, 1936).

#### Additional specimens

The Lectotypus ♀ of *L. palliditarsis* Rondani is compared with many specimens present in the Dipterological Collection of our Department (DiSAAA-a) classified by Raspi as *Leucopis (Leucopomyia) alticeps* Czerny, for example: 9♂♂ and ♀♀, Livorno 11.VI.1977 ex *Chloropulvinaria floccifera*; 9♂♂ and ♀♀, Pisa (San Rossore), 2.VI.1988, ex *Planococcus vovae*; 23♂♂ and ♀♀, Lecce, 1.IX.1978. The adults may be slightly different from the concise Rondani description of *L. palliditarsis*, for example, there are specimens with slightly noticeable dark-grey frontal vittae, with slightly noticeable dark grey median stripes, abdomen with syntergite 1+2 dark black, tergite 3 with two black spots and blackish longitudinal, median stripes on the tergites 4-5. There are also specimens with the last tarsomeres darker, others with lighter legs, with tibiae dark-grey shaded only in central part. Nevertheless, the dimensional ratio of head and of wing veins, but in particular the dimensional ratio and peculiar shape of female sternites fit perfectly with those of the *L. palliditarsis* lectotype.



**Figure 10.** *Leucopis armillata* Rondani 1875, Lectotypus ♂ [= synonym of *Leucopis (Leucopis) palumbii* Rondani 1872]: (a) habitus, in lateral view; (b) terminalia in ventral view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, gon = gonopod, hypd = hypandrium, pm = paramere, sur lb = surstylar lobes. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

#### Synonymy

New synonym of *Leucopomyia palliditarsis* (Rondani 1875) is *Leucopis alticeps* Czerny 1936 of Authors. In particular the specimens reported by Raspi as *Leucopis (Leucopomyia) alticeps* Czerny should be considered the same as *Leucopomyia palliditarsis* (Quaglia and Raspi, 1979a; 1979b; Raspi and Bertolini, 1993; Raspi 1995; Loni and Raspi, 2002; Raspi, 2013).

#### Biology

The species of the genus *Leucopomyia* Malloch are characterized by a pair of prescutellar acrostichal setae, which are not present in species of the genus *Leucopis* Meigen (Hennig, 1938), but the main difference is in their biology. The larvae of *Leucopomyia* species live by preying on the eggs of Coccidae, Pseudococcidae, and Eriococcidae (Rhynchota Sternorrhyncha Coccoidea), in the egg sac (Raspi and Bertolini, 1993). Rondani (1875) found *L. palliditarsis* with *Chaitophorus populi* on *Populus nigra*, “*Raro lecta in collibus parmensibus inter aphides populi nigrae, seu Chaithophoros populi Kch*”. This sentence seems to lead to an aphidiphagous species. However, it seems likely that Rondani collected the adult feeding on aphid honeydew. Indeed, the larva and puparium were not described.

#### 6. *Leucopis (Leucopis) armillata* Rondani

*Leucopis armillata* Rondani 1875: 266. Box n. 35 of the Dipterological Collection of Camillo Rondani (new junior synonym of *Leucopis (Leucopis) palumbii* Rondani 1872: 213).

The card labelled “*armillata* Rndn”, handwritten, follows the specimens. The two syntypes (figures 10a and 11a) are each prepared with a pin fixed into the posterior extremity of the mesonotum. Beneath each syntype, there is a white oval card bearing the progressive red number 1819, beneath the syntype ♂ a red label: Lectotypus- *Leucopis (Leucopis) armillata* Rondani - det.G. Morge, Ex 47 (*in litteris*) and beneath the syntype ♀ (without head) a red label “La Specola” Museum, Rondani collection, Paralectotypus. The types correspond to the concise but accurate description by Camillo Rondani (Rondani, 1875 pp. 262 and 266).

#### Type material

Lectotypus ♂ (designation herein) (figure 10a) and Paralectotypus ♀ (figure 11a) in the Zoological Museum of “La Specola”, Florence. Designation of a Lectotypus is necessary to fix the identity of the species for stability and to avoid confusion.

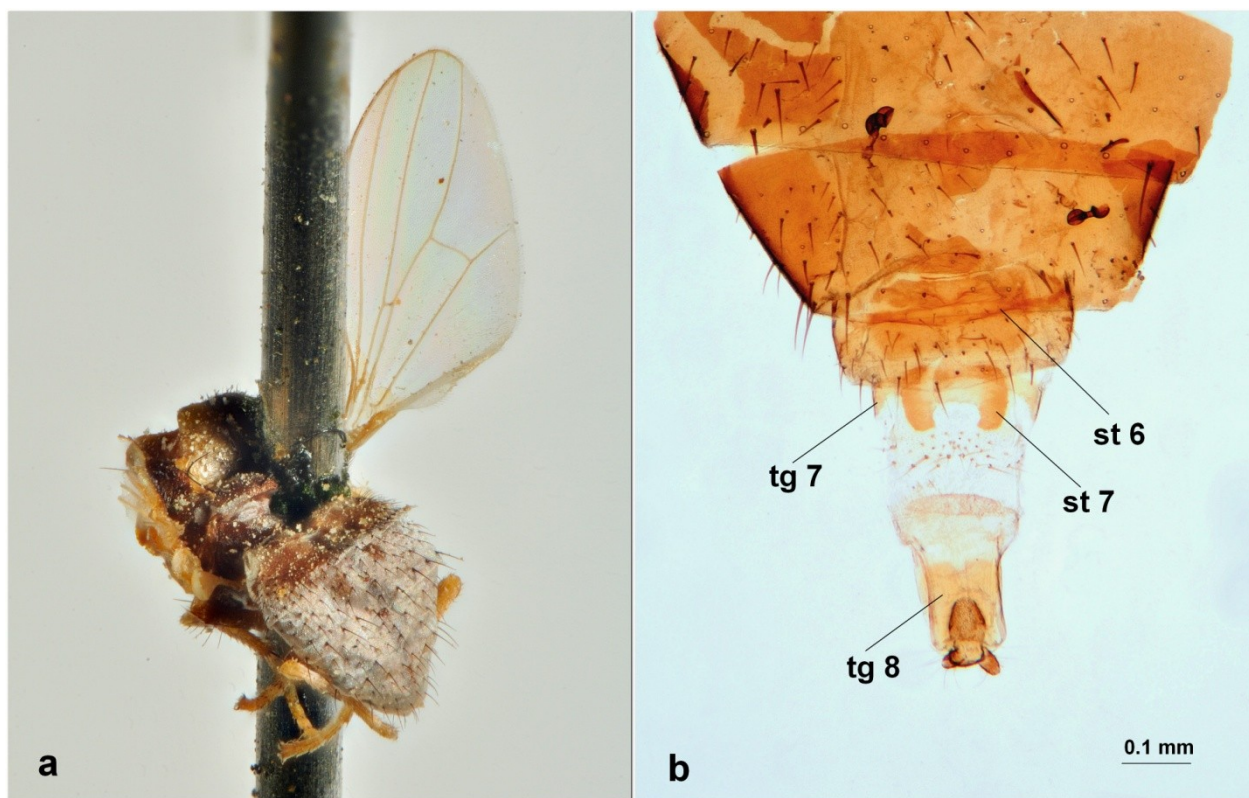
#### Diagnosis

“*Frons albicans, in medio grisescens, sed vittis obscuris non perspicuis. Alae venis longitudinalibus quarta et quinta ad apicem paulo convergentibus*”.

Body silvery grey, length 2.4 mm, wing 2.4 mm length.

**Head** - Head about 1.6 times higher than long; frons at anterior ocellus level 2.7 times narrower than the head width. Frons “*frons albicans in medio grisescens, sed vittis obscuris non perspicuis*”, grey ocellar plate slightly





**Figure 11.** *Leucopis armillata* Rondani 1875, Paralectotypus ♀ [= synonym of *Leucopis (Leucopis) palumbii* Rondani 1872]: (a) habitus, in dorsal view; (b) terminalia in ventral view. Abbreviations: st = sternite, tg = tergite. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

raised. Height of gena and height of eye in ratio 1:4. Genal setulae and one strong genal bristle present. Antenna black, rising slightly beneath middle of head; flagellum suboval, weakly higher than long; arista black, apical segment at list 4 times longer than second one. Palpus blackish. Labellum yellow-brownish.

**Thorax** - Mesonotum setulose, setulae reaching the posterior pair of dorsocentral setae. Two rust brown dorsocentral vittae, reaching the posterior pair of dorsocentral setae, between the dorsocentral vittae there are, in the anterior part of notum, two dark median vittae, setulae lacking only in the initial part between the vittae. Two pairs of posteriorly located stout dorsocentral setae present. Stout sternopleural bristle present.

**Wing** - Hyaline. Anterior crossvein (r-m) is located beyond the middle of the discal cell. Veins R4+5 and M, converging in the distal part (figure 10c). Apical section of CuA1 1.1 times shorter than posterior crossvein (dm-cu), posterior crossvein 1.6 times shorter of the distance between anterior and posterior crossvein. Haltere yellowish.

**Legs** - Femora dark grey, with the exception of their apical part, which are yellowish, as well as the base of tibiae, tibiae and tarsi yellow-brownish; tibiae light grey shaded in central part, in particular in the anterior tibia.

**Abdomen** - Syntergite 1+2 dark brown, appearing grey at posterior margin and posterolateral angles (figure 10c). Tergite 3 with two dark-brown submedian spots. Tergites 3-5 covered with long, sparse setulae, longer and stronger at postero-lateral angles and along posterior edges.

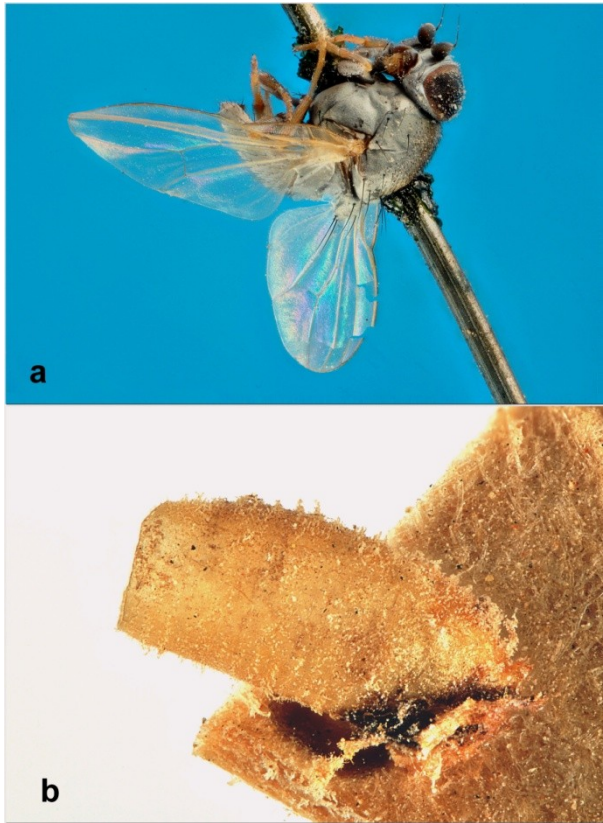
**Male terminalia** (figure 10b) - Epandrium, surstylar lobes and aedeagal apodeme stout, epandrium wedge-shape, stocky thickset in lateral view, with 18 setae on the latero-posterior margin; surstylar lobe short, stout, bent postero-ventrally. Parameres bending at the top, gonopods in spatula shape, aedeagus with narrow base and strongly bent.

**Female terminalia** (figure 11b) - Ovipositor elongated, the sternite 6 is sub-rectangular in shape with blunted angles, about 1.6 times as wide as high and 1.6 times as large as the sternite 5. The sternite 6 is sclerotized in the superior half, setae arranged on three rows in the posterior part of the sternite. Sternite 7 1.6 times narrower of sternite 6, in shape of upside-down U with the two lateral arms sub-rectangular and more sclerotized and turn distally, united at base with a rectangular, transversal bridge, slightly sclerotized. The tergite 7 is represented by a narrow transverse area. The segment 8 with tergite weakly, but uniformly, sclerotized. Two pairs of small, sclerotized, spherical spermathecae present.

#### Remarks

The study of the lectotype and paralectotype of *L. armillata* allowed us to understand that this species is synonym of *Leucopis (Leucopis) palumbii* Rondani, 1872. The preparation of male terminalia of the Lectotypus (figure 10b) and the female terminalia of the Paralectotypus (figure 11b) supported our hypothesis. Raspi (1983b) previously studied the types of *L. palumbii* (figure 12a), and described the male terminalia of a





**Figure 12.** *Leucopis palumbii* Rondani 1872: (a) Lectotypus ♀, in lateral view; (b) Paralectotypus: puparium with light coloration. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

paralectotype (Raspi, 1983b). In the same study, the author also provided biological data for this species and described the structure of female terminalia (Raspi, 1983b). The external morphology of *L. armillata* adults (figure 10a, 10b) agrees with that of the types of *L. palumbii* (figure 12a), with special reference to the large and lightly colored frons, the mesonotum bearing small setulae, the wing with veins R4+5 and M1 convergent. Following Rondani (1872), *L. palumbii* is a species characterized by yellow tibiae and tarsi “*A speciebus omnibus auctorum distincta colore tibiarum et tarsorum toto pallido-lutescente...*”. However, Raspi (1983b; 1988) highlighted that the yellow coloration of tibiae and tarsi is not constant in wild populations of this species, even if the observation made by Rondani for types of *L. palumbii* are true. It should be noted that the types of *L. palumbii* developed on *Geoica utricularia* (Passerini), showed yellow tibiae and tarsi, with a cream-coloured puparium (figure 12b) “*pupa pallidetestacea, hirtula, corniculos breves sub-tuberculiformes uno apici praeberet*” (Rondani, 1875). In any case, these traits are not constant in *L. palumbii* (Raspi, 1983b; 1988). Indeed, in July, within the gall of *Eriosoma lanuginosum* Hartig (Eriosomatinae) we found two kinds of puparia of *L. palumbii*, some being white-cream coloured, the others dark-brown. The dark-brown puparia, after summer and autumn, overwinter inside the dried galls on elm, and the adults emerge during the spring of

the following year. These adults have darker legs with all tibiae yellowish-brown with a large band dark-grey in central part. From the white-cream puparia, the adults emerge from the middle and the end of July; all specimens having yellowish tibiae and tarsi. These adults complete, in Tuscany and Liguria, at least another generation before the autumn feeding on species of Fordinae: *Forda formicaria* Heiden, *G. utricularia*, *Baizongia pistaciae* (L.), on terebinth and *Aploneura lentisci* (Passerini) on lentisk (Raspi, 1983b; 1988). Then they overwinter as puparia, dark-brown in colour, inside the galls of these hosts. The adults emerge in the late spring; the colours of the tibiae are, usually, yellow or sometimes light grey shaded in central part (Raspi, 1983b; 1988).

In the Lectotypus of *L. armillata*, we detected that all tibiae were darker in their central part, even if Rondani noted this only for front legs. Thus, we believe that this one is the darker form of *L. palumbii*, as demonstrated by male and female genitalia. The typical form is generally found in the adults belonging to summer and autumn generations. Rondani reported that *L. armillata* has been found “*in agro parmensi non frequens inter afides varios*”, allowing us to suppose that he collected adults feeding on aphid honeydew. Indeed, the puparia have not been described by Rondani.

#### Additional specimens

The types of *L. armillata* Rondani were compared with many specimens present in the Dipterological Collection of our Department (DiSAAA-a) identified by Raspi as *Leucopis palumbii* Rondani, for example, A. Raspi legit: ex *Eriosoma lanuginosum*, 24♂♂ and ♀♀, Volterra (PI), 15.IV.1978; 20♂♂ and ♀♀, Pisa, 12-20.IV.1978; 113♂♂ and ♀♀, Pisa 1-10.IV.1979; 21♂♂ and ♀♀, Livorno (Parrana), 4-20.IV.1979; 22♂♂ and ♀♀, Pisa, 28.III.1980; 32♂♂ and ♀♀, Livorno (Parrana), 18-30.VI.1978; 21♂♂ and ♀♀, Livorno, 18-20.VII.1985; 39♂♂ and ♀♀, Pisa, 10-25.VII.1989; ex *Eriosoma pyricola*, 24♂♂ and ♀♀, Pisa, 10.VII.1979; ex *Tetraneura akinire*, 18♂♂ and ♀♀, Livorno, 18-20.VI.1985; ex *Tetraneura ulmi*, 37♂♂ and ♀♀, Livorno, 18.VI.1985; ex *Tetraneura caerulea*, 7♂♂ and ♀♀, Livorno, 12.VI.1989; ex *Aploneura lentisci*, 7♂♂ and ♀♀, Livorno, IV.1980, 1984, 1985.

#### Synonymy

*Leucopis (Leucopis) armillata* Rondani 1875 is new synonym of *Leucopis (Leucopis) palumbii* Rondani 1872.

#### Biology

*L. palumbii* lives either on Eriosomatinae (Rhynchota Sternorrhyncha Aphidoidea) on elm and on Fordinae (Rhynchota Sternorrhyncha Aphidoidea) on terebinth and lentisk (Raspi, 1983b; 1988) and its biological cycle can be summed up in this way: it lives from May to July inside the galls produced by host on the elm, first preying on *Tetraneura ulmi* (L.), *Tetraneura akinire* Sasaki, *Tetraneura caerulea* (Passerini), then prey on *Eriosoma pyricola* Baker et Davidson and in July *Eriosoma lanuginosum* (Hartig). In the same gall of this last host

two types of puparia are found, some are white-cream coloured, others dark-brown. The dark-brown puparia feed during the summer and autumn and then overwinter, the adults will emerge during the spring of the following year. From the white-cream puparia the adults emerge from the middle and the end of July. These adults complete at least another generation before the autumn feeding on: *F. formicaria*, *G. utricularia*, *B. pistaciae*, on terebinth and *A. lentisci* on lentisk. Overwintering is as puparia, inside the galls of these hosts. The adults emerge in the late spring (Raspi, 1983b; 1988).

### 7. *Leucopomyia ballestrerii* (Rondani)

*Leucopis ballestrerii* Rondani 1875: 267. Box n. 35 of the Dipterological Collection of Camillo Rondani. New junior synonym of *Leucopomyia silesiaca* (Egger 1862: 782).

The card labelled “*ballestrerii* Rnd”, handwritten, follows the specimens. Each of the two syntypes is prepared with a pin through the posterior extremity of the mesonotum. Beneath each syntype there is a white oval card bearing the progressive red number 1821 and a red label below: Lectotypus ♀ - *Leucopis* (*Leucopomyia*?) *ballestrerii* Rondani - det.G. Morge, Ex 20 and *Leucopis* (*Leucopomyia*?) *ballestrerii* Rondani - det.G. Morge, Ex 21 (*in litteris*). The specimens (figure 13a)

correspond to the concise but accurate description by Camillo Rondani (Rondani, 1875 pp. 263 and 267). With the types being prepared with a pin through the central posterior extremity of the mesonotum, unfortunately this hinders the view of prescutellar setae.

### Type material

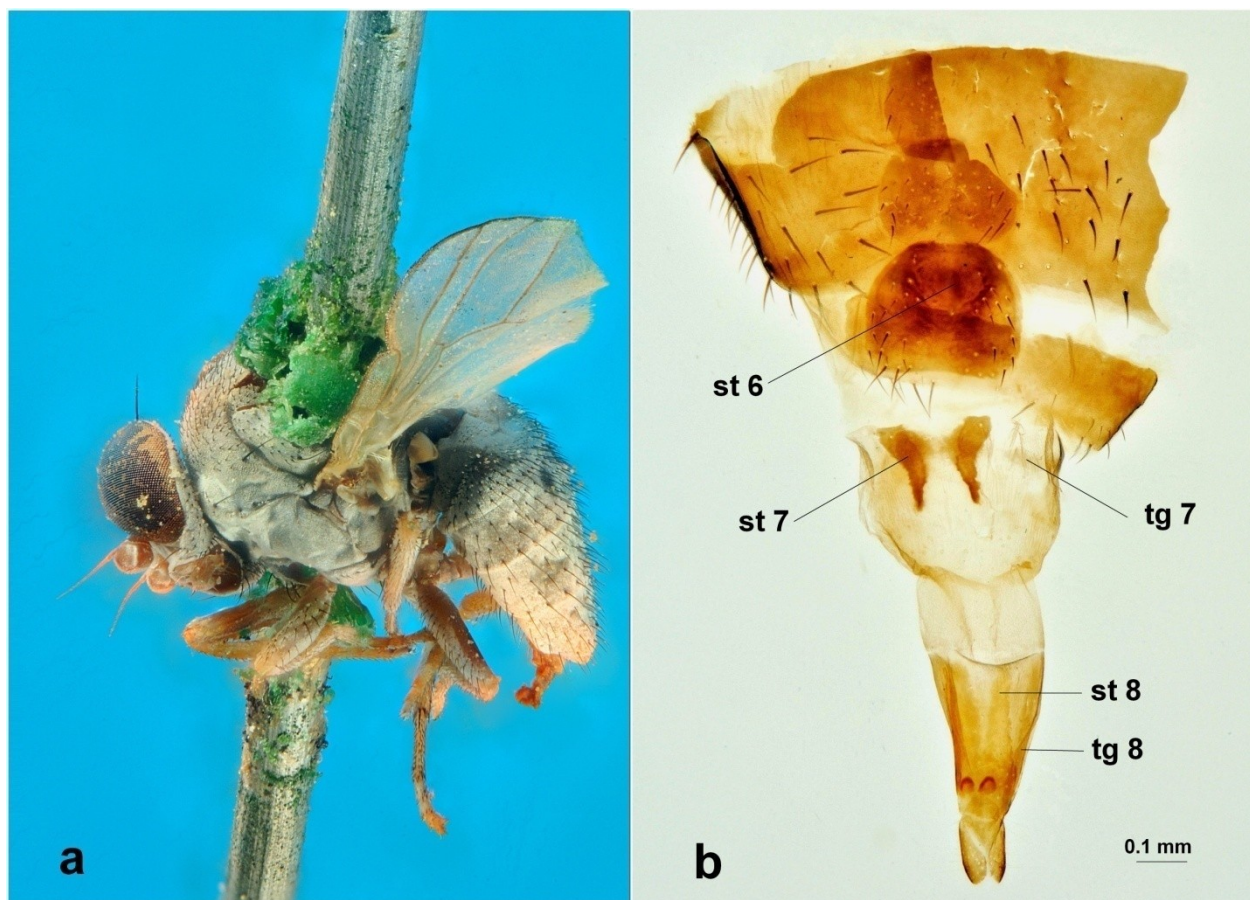
Lectotypus ♀ (designated herein) and Paralectotypus ♀ in the Zoological Museum of “La Specola”, Florence. Designation of a Lectotypus is necessary to fix the identity of the species for stability and to avoid confusion.

### Diagnosis

“*Antennae luteae vel fusco-lutescentes. Abdominis puncta nigra dorsualia distincta, latiuscula, rotundata*”.

Body silvery grey, length 3 mm, wing 3 mm length.

*Head* - Head about 2 times higher than long; frons at anterior ocellus level at least 3 times narrower than head width. Fronto-orbital plate silvery white; frontal vitta and ocellar plate light grey, with darker lateral border, ocellar plate slightly raised. Height of gena and height of eye in ratio 1:7. Genal setulae and one strong genal bristle present. “*Antennis rufescentibus, non nigris*” rising slightly beneath middle of head; flagellum suboval, weakly higher than long; arista with apical segment at least 4 times longer than second one. Palpus yellowish. Labellum yellow-brownish.



**Figure 13.** *Leucopis ballestrerii* Rondani 1875, Lectotypus ♀ [= *Leucopomyia silesiaca* (Egger 1862)]: (a) habitus, in lateral view; (b) terminalia in ventral view. Abbreviations: st = sternite, tg = tergite. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

*Thorax* - Mesonotum uniformly setulose. Only two shaded rust brown dorsocentral vittae noticeable, reaching the first pair of dorsocentral setae. Between dorsocentral vittae there are rows, more or less regular, of setulae, reaching to the dorsocentral setae. Only two pairs of posteriorly located strong dorsocentral setae are visible. Strong sternopleural bristle present.

*Wing* - Hyaline. Anterior crossvein (r-m) is located beyond the middle of the discal cell. Veins R4+5 and M1, converging in the distal part. Apical section of CuA1 about 2 times longer than posterior crossvein (dm-cu), posterior crossvein about 3 times shorter of the distance between anterior and posterior crossvein. Haltere yellowish.

*Legs* - Femora dark grey; apical part of femora, tibiae and tarsi yellow-brownish.

*Abdomen* - Syntergite 1+2 dark-brownish, appearing grey at posterior margin and posterolateral angles. Tergite 3 with two brown submedian spots, dark grey longitudinal median stripe weakly noticeable on tergites 4 and 5. Tergites 3-5 covered with long, sparse setulae, longer and stronger at postero-lateral angles and along posterior edges.

*Female terminalia* (figure 13b) - Ovipositor elongated. Sternite 6 is approximately of trapezoidal shape with base 1.3 times as wide as high and with numerous setulae along the lateral and posterior margin. The base of sternite 6 is about 1.3 times as wide as the base of the sternite 5. The sclerite 5 has numerous setulae uniformly distributed. The sternite 7 presents two small, sub-triangular sclerites with regular contours. The tergite 7 is reduced, represented by a narrow, transverse and weakly sclerotized area. The segment 8 is weakly sclerotized. The weakly sclerotized area is represented by two lateral, almost rectangular, sclerites along the whole of the sternite 8. In the tergum, two lateral sclerites are present, weakly sclerotized and fused in the distal part. Two pairs of strongly sclerotized spherical spermathecae.

## Remarks

The study of types of *L. ballestrerii* allowed to understand that this species belongs to the genus *Leucopomyia* Malloch in particular by the mesonotum being uniformly setulose and by the two shaded rust brown dorsocentral vittae being noticeable. The study of female abdomen (figure 13b) allow us to state that this species is the same as *Leucopomyia silesiaca* (Egger). Indeed, Raspi and Bertolini (1993) studied the biology of *Leucopomyia silesiaca* and *Leucopomyia alticeps*, both common in Italy, describing for both species, reared from field larvae collected on the host, the larva, the puparium, male terminalia and for first time the female terminalia (Raspi and Bertolini, 1993). The ovipositor of *Leucopomyia ballestrerii* is identical to that of *Leucopomyia silesiaca* (Raspi and Bertolini, 1993). Moreover, the types of *L. ballestrerii* Rondani perfectly fit the description by Egger (1862) for *L. silesiaca*. Furthermore, no species of *Leucopis* possess yellow or rusty-brown antennae, the mesonotum uniformly setulose with dorsocentral vittae noticeable and yellow tibiae and tarsi. Unfortunately, as reported by Tanasijtshuk

(1986), it is currently unknown where the types of *L. silesiaca* are located. Overall, we suggest considering *L. ballestrerii* Rondani as synonym of *Leucopis (Leucopomyia) silesiaca* Egger 1862.

## Additional specimens

The type ♀♀ of *L. ballestrerii* Rondani have been compared with many specimens present in the Dipterological Collection of our Department (DiSAAA-a) and identified by Raspi as *Leucopis (Leucopomyia) silesiaca* Egger, for example: Grosseto, 34♂♂ and ♀♀, 19-30.VI.1968, ex *Euphilippia olivina*; 2♂♂ Pisa, (Asciano), 27.VI.1977, ex *Lichthensia viburni*; 4♂♂ and ♀♀, Pisa (Asciano), 20.VI.1988, ex *Lichthensia viburni*; 2♀♀, Volterra (PI), 6.VII.1977, ex *Euphilippia olivina*. The adults may be slightly different from the concise Rondani description of *L. ballestrerii*, for example, there are specimens with slightly noticeable dark grey median stripes, with dorsocentral vittae goldish-yellow, abdomen with syntergite 1+2 dark brown, tergite 3 with two dark spots, and tergites 4-5 with blackish longitudinal, median stripes. Nevertheless the dimensional ratio of the head and of wing veins, wing veins R4+5 and M1 converging in distal part, and in particular the dimensional ratio and shapes of female sternites fit perfectly with those of the Lectotypus of *L. ballestrerii*.

## Synonymy

*Leucopis ballestrerii* Rondani 1875 is new synonym of *Leucopomyia silesiaca* (Egger 1862).

## Biology

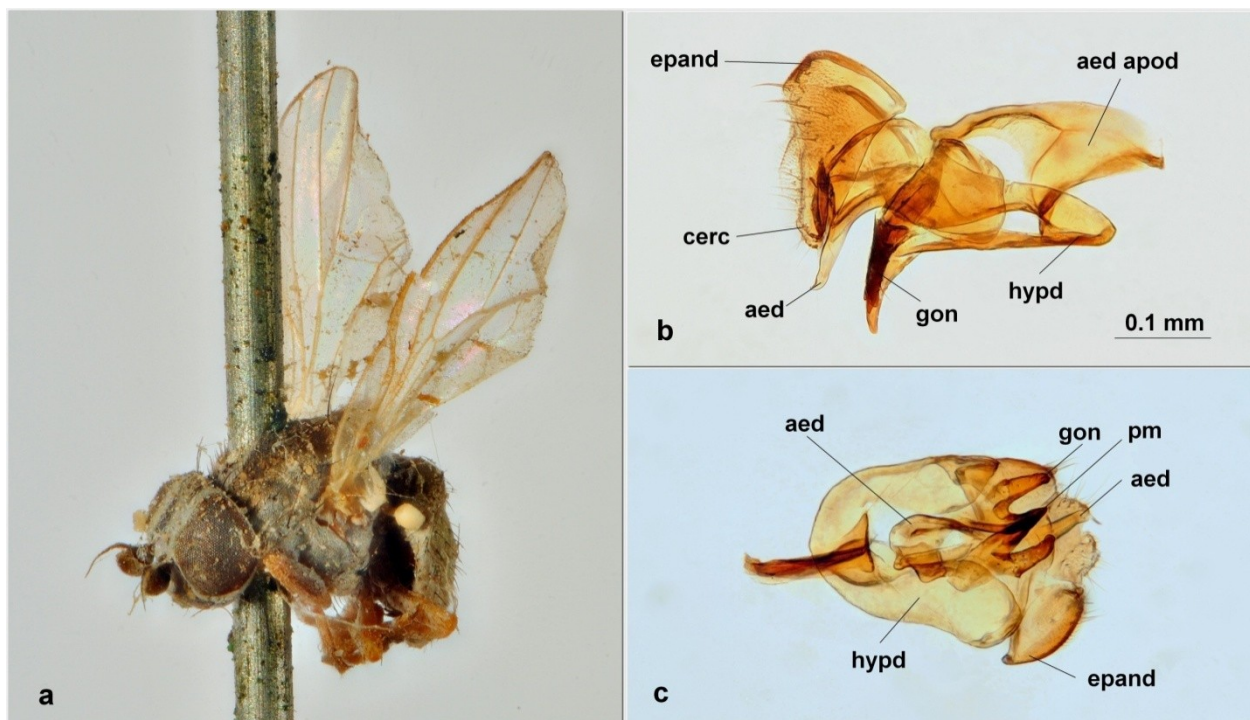
The species of the genus *Leucopomyia* Malloch are characterized by a pair of prescutellar acrostical setae, which are not present in species of the genus *Leucopis* (Hennig, 1938). However, the main difference is in their biology. The larvae of *Leucopomyia* develop by preying on the eggs of Coccidae, Pseudococcidae, and Eriococcidae (Rhynchota Sternorrhyncha Coccoidea), in the egg sac (Raspi and Bertolini, 1993). Rondani (1875), collected *L. ballestrerii* on galls of *B. pistaciae*: "*Exemplaria aliqua inveni inter Pemphigos cornicularios Pass., gallas siliquiformes Pistaciae terebinti efformantibus, a March. Ballestrero panormitano mihi transmissas*". The sentence is a little bit ambiguous, and would seem to refer to an aphidiphagous species, but we hypothesize that Rondani probably collected adult individuals, that were in or near galls to feed on honeydew, or emerged from Coccoidea present on *P. terebintus*. Indeed, larvae and puparia had not been reported by Rondani.

## 8. *Leucopis (Leucopis) misaphida* Rondani

*Leucopis misaphida* Rondani 1848: 440. Box nr. 35 of the Dipterological Collection of Camillo Rondani.

The card labelled "*misaphida* Rnd", handwritten, follows the specimen. The type is prepared with a pin through the anterior half of the mesonotum. Beneath the specimen there is a white oval card bearing the progressive red number 1822, and a red label below: Holotypus-*Leucopis (Leucopis) misaphida* Rond. - det.G. Morge,





**Figure 14.** *Leucopis misaphida* Rondani 1848, Lectotypus ♂: (a) habitus, in lateral view; (b) terminalia in lateral view; (c) terminalia in ventral view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, gon = gonopod, hypd = hypandrium, pm = paramere, sur lb = surstylylar lobes. (In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

Ex 22 (*in litteris*). The specimen (figure 14a) correspond to the concise but accurate description by Camillo Rondani (Rondani, 1848 pp. 440-441; Rondani, 1875 pp. 263 and 267). With the type prepared with a pin through the anterior half of the mesonotum, this allows viewing two pairs of dorsocentral setae, the anterior pair appear very reduced, small.

#### Type material

Lectotypus ♂ (designated herein) in the Zoological Museum of “La Specola”, Florence. Designation of a Lectotypus is necessary to fix the identity of the species for stability and to avoid confusion.

#### Diagnosis

“*Frons obscura bivittata. Thoracis lineae fuscae intermediae observandae, et vittae obscurae laterales amplissimae. Pedes toti lutescentes, exceptis femoribus anticis in medio, et tarsi pariter anticis ad apicem, obscure fuscis*”.

Body light grey, length about 2 mm, wing 1.9 mm length.

**Head** - Head, about 1.7 times higher than long; frons at anterior ocellus level 2.6 times narrower than head width. Fronto-orbital plate silvery white; frontal vitta and ocellar plate grey, with two vittae darker lateral border; ocellar plate slightly raised. Height of gena and height of eye in ratio 1:4. Genal setulae and one strong genal bristle present. Antenna black, rising slightly beneath middle of head; flagellum suboval, weakly higher than long; arista black, apical segment at list 2.5 times longer than second one. Palpus blackish. Labellum yel-

low-brownish.

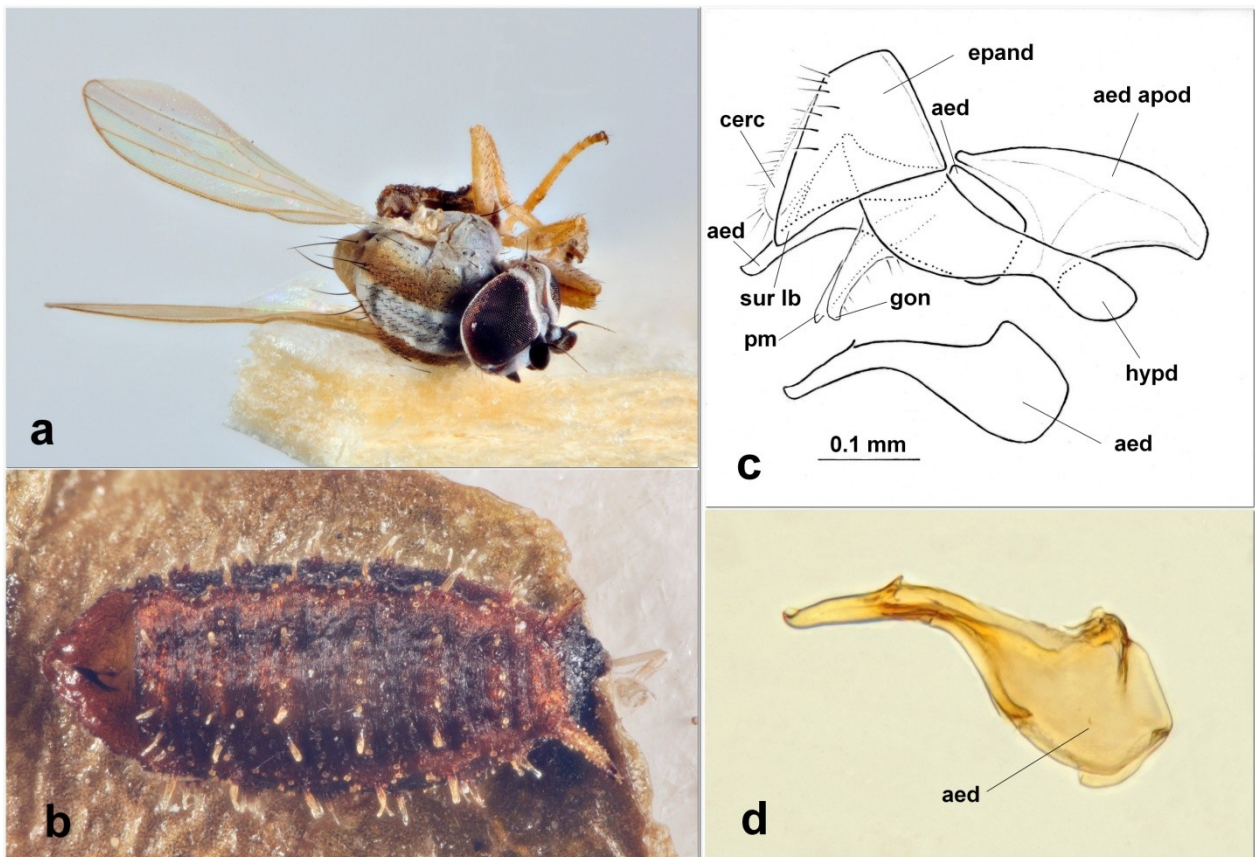
**Thorax** - Mesonotum light grey in central part. Two pairs of posteriorly located dorsocentral setae present; anterior pair small, shorter than posterior ones. Rust yellow dorsocentral vittae wide, reaching the posterior pair of dorsocentral setae, dark grey median stripes slightly noticeable, both covered and delimited by two- three rows of setulae, stripes extending posteriorly to beyond the middle of mesonotum, and reaching the anterior pair of dorsocentral. Lateral and median stripes spaced, without setulae. Yellowish and pruinose scutellum. Strong sternopleural bristle.

**Wing** - Hyaline. Anterior crossvein (r-m) well beyond middle of discal cell. Veins R4+5 and M1 slightly converging in distal part. Apical section of CuA1 1.1 times shorter than posterior crossvein (dm-cu), posterior crossvein 1.3 times shorter of the distance between anterior and posterior crossvein. Haltere pale yellowish.

**Legs** - All yellowish, except the anterior legs, with femora grey in the central part and dark distal tarsomeres.

**Abdomen** - Syntergite 1+2 dark grey, grey at posterior margin and posterolateral angles. Tergites 3 without spots, tergites 3-5 grey with yellowish pollinosity, with long, sparse setulae, longer and stronger at posterolateral angles and along posterior edges.

**Male terminalia** (figures 14b, 14c, 15c) - Epandrium small, subtriangular in lateral view, about 18 setae in posterior margin. Surstylylar lobes, wide, compact, subtriangular. Aedeagus, in lateral view, with stout base, in the posterior half abruptly narrow, tubular and strongly bent downwards and pointed tip (figure 15c, 15d). Aedeagal



**Figure 15.** *Leucopis misaphida* Rondani 1848, additional specimens: (a) male, in dorsal view; (b) puparium in dorsal view; (c) ♂ genitalia: schematic drawing in lateral view; (d) aedeagus in lateral view. Abbreviations: aed = aedeagus, aed ap = aedeagal apodeme, cerc = cercus, epand = epandrium, gon = gonopod, hypd = hypandrium, pm = paramere, sur lb = surstylar lobes.

(In colour at [www.bulletinofinsectology.org](http://www.bulletinofinsectology.org))

apodeme large and stout. In ventral view, hypandrium large, a long aedeagus and characteristic parameres and gonopods in chela shape. The aedeagus is characterized by a stout base opened ventrally and dorsally, aedeagus long, in the proximal part opened dorsally, connected with hypandrium in distal part (figure 15d).

**Puparium** (figure 15b) - Very distinctive puparium, “thorny”, chestnut-coloured ferruginous, size about 2.5 × 1.1 mm. Body weakly flattened, sub-oval elongated, with two lateral, longitudinal prominent ridges, each segment with rounded dorsolateral and lateroventral prominencies. Body sculptured by few (three) transversal rows of sparse papulae with at the top an evident solid wax secretion. At the top of lateroventral and dorsolateral prominencies a long conic waxy secretion and along a transversal, central line, in each segment of tergum, 4 long conic waxy secretions. Posterior spiracle protuberances conic and long (0.1 × 0.5 mm) with 8 rings of papulae (6-8 papulae for ring). At the top of each posterior spiracle protuberances, three lobes each bearing a lipform longitudinal opening.

#### Remarks

Among *Leucopis*, this species is easy to identify, due to its small size (maximum length: 2 mm), wide rust-

yellow dorsocentral vittae, tergite 3 of the abdomen without spots, tergites 3-5 grey with yellowish pollinosity, legs yellowish with the exception of prothoracic leg with grey femur in the central part and dark distal tarsomeres. The peculiar structure of the male genitalia also make it easy to recognize (figures 14b, 14c, 15c, 15d). However, this species had not previously been encountered again after more than 150 years since its description.

#### Additional specimens

The study of the Lectotypus of *L. misaphida* permitted us to identify with certainty some specimens (figure 15a) collected by us and present in the Dipterological Collection of our Department (DiSAAA-a): 3♂♂ ex puparia, Pisa 10.VII.2009, ex *Aphis gossypii* on *Hybiscus*, G. Benelli legit; 1♂ 15.VII.2014, adult on leaves of lentisk, D. Romano legit.

#### Biology

Rondani (1848 pp. 440-441; 1874 p. 267): “*Inventa in colle ditionis parmensis inter aphides loniceræ Fnscl. seu Siphocorinas Pass. xylostei Schr.*” Larvae of this species have been collected by Raspi and coworkers while predated on *Aphis gossypii* Glover on *Hybiscus*.

## Conclusions

Our results showed that of the eight *Leucopis* species described by Rondani and here studied, the valid species are *Leucopis (Leucopis) aphidivora* Rondani 1847; *Leucopis (Leucopis) aphidiperda* Rondani 1848; *Leucopis (Leucopis) misaphida* Rondani 1848; *Leucopis (Leucopis) minuscula* Rondani 1875; *Leucopis (Leucopis) talaria* Rondani 1875; *Leucopomyia palliditarsis* (Rondani 1875) (of which *Leucopis alticeps* Czerny 1936 is synonym). *Leucopis armillata* Rondani 1875 is a synonym of *Leucopis (Leucopis) palumbii* Rondani 1872; and *Leucopis ballestrerii* Rondani 1875 is a synonym of *Leucopomyia silesiaca* (Egger 1862). Overall, concerning the twelve species of Chamaemyiidae described by Camillo Rondani, nine of them are still considered valid species. This study adds basic knowledge to silver fly systematics and has helpful implications concerning Chamaemyiidae-based biological control programs.

## Acknowledgements

Stephen Gaimari and an anonymous reviewer kindly improved an earlier version of the manuscript. We are grateful to Luca Bartolozzi of the Museo di Storia Naturale "La Specola", University of Florence, Italy and Mario Marini (Department of Biological, Geological, and Environmental Sciences, University of Bologna, Italy), for their kind assistance. We would like to thank Paolo Giannotti e Riccardo Antonelli (Department of Agriculture, Food and Environment, University of Pisa, Italy) for their valuable assistance with macrograph processing.

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Received October 22, 2015. Accepted May 18, 2016.