



## Survey of the families Anthomyzidae, Aulacigastridae, Odoniidae, Periscelididae, and Trichoceridae (Insecta: Diptera)

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### Abstract

The families of Anthomyzidae, Aulacigastridae, Odoniidae, and Periscelididae of the Opomyzoidea are rare in nature and, therefore, little represented in collections. However, perhaps this rarity is because its natural history is little known and the appropriate collection methods have not yet been defined. Still, there are records of a considerable number of individuals from this group being captured. Trichoceridae, is a small family of insects in the order Diptera, the only one in the superfamily Trichoceroidea (Nematocera: Tipulomorpha). Apart from Trichoceridae, very few insects appear in adult form during the winter months. They are usually seen in the fall or early spring and can be seen on mild winter days. The objective of this manuscript is to carry out an inventory of the families Anthomyzidae, Aulacigastridae, Odoniidae, Periscelididae, and Trichoceridae. In summary, the following analysis steps were taken:

- Exhaustive reading of each article aiming for a global understanding and discovery of the approach used by its authors;
- Identification of the central ideas of each article;
- Classification of ideas around meaning cores;
- Comparison between the different meaning cores present in the articles studied;
- Classification of the meaning cores into broader axes (themes) around which the authors' discussions revolved and
- Writing interpretative summaries of each theme.

After analyzing the contents of the articles, we sought to establish a dialogue between the themes found and the literature that served as the basis for introducing the present study.

**Keywords:** Characteristic; Larvae; Morphology; Opomyzoidea; Puparium

### 1. Introduction

Opomyzoidea show a range of lifestyles including mining plant leaves many Agromyzidae, feeding in grass stems Anthomyzidae and Opomyzidae, forming plant galls Fergusoninidae, feeding on fungi some Anthomyzidae and Asteiidae), feeding on sap flows of trees some Aulacigastridae, Odoniidae and Periscelididae, living in galleries of wood-boring insects (Odoniidae) or water-filled cavities of plants phytotelmata; Aulacigastridae, Neurochaetidae and Periscelididae. In the superfamily Agromyzoinea, there are two sister groups: Odoniidae and Agromyzidae + Fergusoninidae. Odoniidae was originally included in Agromyzidae and for a long time was treated as a subfamily of this family. It has been established that the Odoniidae as a separate family [1-2].

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### Objective

The objective of this manuscript is to carry out an inventory of the families Anthomyzidae, Aulacigastridae, Odoniidae, Perisclididae, and Trichoceridae (Insecta: Diptera).

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## 2. Methods

In summary, basically, the following analysis steps were taken:

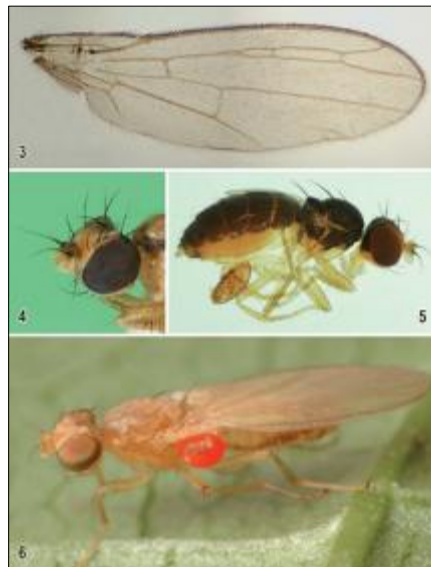
- Exhaustive reading of each article aiming for a global understanding and discovery of the approach used by its authors;
- Identification of the central ideas of each article;
- Classification of ideas around meaning cores;
- Comparison between the different meaning cores present in the articles studied;
- Classification of the meaning cores into broader axes (themes) around which the authors' discussions revolved and (6) writing of interpretative summaries of each theme.

After analyzing the contents of the articles, we sought to establish a dialogue between the themes found and the literature that served as the basis for introducing the present study.

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## 3. Family Anthomyzidae

These small flies are elongated, thin, and somewhat flattened. Detailed morphological characteristics include an antenna awn with long or short hairs and sometimes feathery. The eyes are in contact with the vertex. There are 1 to 3 pairs of setae on the top of the head, pointing towards the center and/or back. The wings are long and thin, transparent or with diffuse light brown spots, particularly at the apex of the wing and/or with whitish spots, and with a reduced anal lobe. The coloration pattern varies tremendously, from almost completely yellow to completely black, usually with patterns of both colors on the body. The most common thing is that they have the dorsal part of the body black and the rest yellow (Figure 1) [1-3].



Source: Photo by J. Roháček (3), M. Deml (4, 5) and D. Gavryushin (6)

**Figure 1** Monstrosities in Anthomyzidae. 3-*Anthomyza gracilis* Fallén, 1823, female (Slovakia), wing with modified venation; 4-*Stiphrosoma laetum* (Meigen, 1830), female (Czech Republic), head with 3 ors on left orbit. Figs 5-6: Commensals and parasites of Anthomyzidae. 5-*Stiphrosoma sabulosum* (Haliday, 1837), female (Czech Republic) with phoretic deutonymph of a mite of *Uropodina* sp.; 6-Collin 1944, female (Russia: CET) with parasitic mite larva of *Parasitengona* sp.

### 3.1. Biology

Species in this family are associated with forests and are occasionally collected by sweeping a hand net along tree trunks. Species of the *Numetopia* sp. are collected in flowers. Adults of the genus *Stenomicro* Coquillett, 1900, (sometimes placed in the family Aulacigastridae) are common in the leaf rolls of plants in the family Heliconiaceae, particularly those inhabited by Chrysomelidae of the subfamily Hispinae [1-4].



Source: Photo: M. Deml (Figs 68–70), K.N. Barber (Figs 71–73).

**Figure 2** figs 68–73. *Quametopia terminalis* (Loew, 1863), puparium and habitat of adults and immatures (Canada: Ontario): 68 – empty puparium (length 3.1 mm), dorsally; 69 – ditto, laterally; 70 – ditto, ventrally; 71 – artificially reared larvae and puparium inside stem of *Impatiens capensis* Meerb. (Balsaminaceae); 72 – microhabitat of overwintering larvae, hollow root of *I. capensis*; 73 – typical habitat of *Q. terminalis*, growth of *I. capensis* in birch-maple forest (Ontario: Sault Ste Marie)

The flies probably breed in the droppings that fall to the bottom of the curled leaves. The *Stenomicro* of rolled leaves are not easy to capture with a vacuum cleaner, as they have a peculiar way of running along the tube formed by the leaf. They move very quickly and with equal skill forward, backward, and sideways. They rarely fly, giving them the appearance of floating on the surface of the leaves [1-5].

Larvae have been reported from decaying dicotyledonous plants, from fungi, and in Europe from leaf sheaths of various grasses and of *Typha* L. (Typhaceae), *Scirpus* L. (Cyperaceae), and *Juncus* L. (Juncaceae), from *Lipara* Meigen, 1830 (Diptera, Chloropidae), galls on Phragmites. They may be either phytophagous or saprophagous, but damage to cereals or other plants has not been reported [1-6].

### 3.2. Systematic

**Subfamily Anthomyzinae** Czerny, 1903: *Amnonthomyza* Roháček, 1993, *Amygdalops* Lamb, 1914, *Anagnota* Becker, 1902, *Anthomyza* Fallén, 1810, *Apterosepsis* Richards, 1962, *Barbarista* Roháček, 1993, *Carexomyza* Roháček, 2009, *Cercagnota* Roháček & Freidberg, 1993, *Epischnomyia* Roháček, 2006, *Fungomyza* Roháček, 1999, *Ischnomyia* Loew, 1863, *Margdalops* Roháček & Barraclough, 2003, *Mumetopia* Melander, 1913, *Paranthomyza* Czerny, 1902, *Receptrix* Roháček, 2006, *Reliquantha* Roháček, 2014 (Lutetian, Baltic amber), *Santhomyza* Roháček, 1984, *Stiphrosoma* Czerny, 1928, *Typhamyza* Roháček, 1992 and *Zealantha* Roháček, 2007 [5-8].

**Subfamily †Protanthomyzinae** Roháček, 1998: †*Protanthomyza* Hennig, 1965 (Lutetian, Baltic Amber, Bitterfeld amber).

*Anthomyza albimana* (Meigen, 1830). *Anthomyza collini* Andersson, 1976. **Distribution:** Barcelona and Girona (Spain) [7-8].

## 4. Study Selected

### 4.1. Study 1

Wikipedia: Anthomyzidae Slovakia

**Genus:** *Amygdalops* Lamb, 1914, *Anagnota* Becker, 1902, *Anthomyza* Fallén, 1810, *Apterosepsis* Richards, 1962, *Barbarista* Roháček, 1993, *Cercagnota* Roháček & Freidberg, 1993, *Epischomyia* Roháček, 2006, *Fungomyza* Roháček, 1999, *Ischnomyia* Loew, 1863, *Paranthomyza* Czerny, 1902, *Receptriz* Roháček, 2006, *Santhomyza* Roháček, 1984, *Stifrosoma* Czerny, 1928, *Typhamyza* Roháček, 1992, *Zealantha* Roháček, 2007 [10].

## 5. Family Aulacigastridae

The family Aulacigastridae is a small family of insects of the order Diptera (Brachycera: Cyclorrhapha: Acalyptratae). Composed of saprophagous forms, it is not of obvious economic importance [11-12].

The Acalyptratae is a subsection of the Schizophora, which is a section of the order Diptera, the "true flies". In various contexts, the Acalyptratae also are referred to informally as the acalyptrate muscoids, the they don't have the calyptra (which covers the dumbbells) known acalyptrates are obligate blood-feeders (hematophagous), though blood feeding at various stages of the life history is common throughout other Dipteran section [13-15].

### 5.1. Description

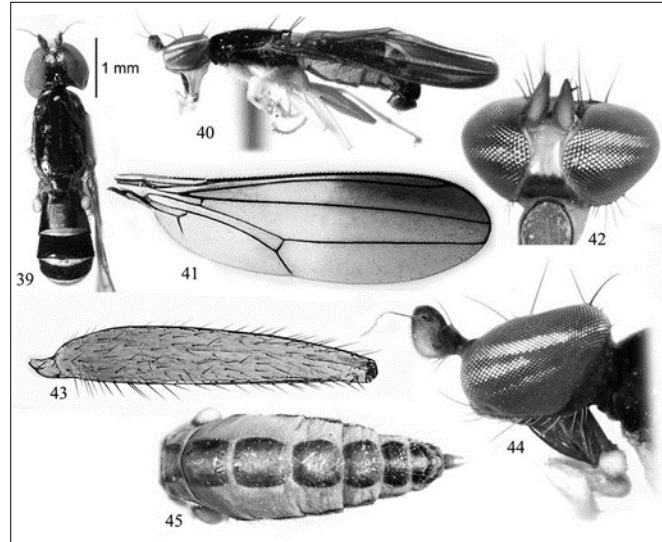
Adults have a small body, 2 to 5 mm long and dark, with an integument covered by a thin gray tomentum. The head has large eyes, red in living specimens with greenish bands on the front. The thorax is equipped with 1-2 pairs of dorsal setae. The pleurae have a pair of robust setae on the ventral episternum and more setae along the posterior margin of the dorsal episternum. The rib extends to the end of the media and presents two fractures (Figure 3) [15-18].



Sources: Zoologia (Curitiba) 35 • 2018 • <https://doi.org/10.3897/zoologia.35.e130> and <https://www.scielo.br/j/zool/a/hFv83NmX4zvV8Fgf4r3tkPg/?lang=en#>

**Figure 3** figs 2-5 Digital photographs of *Aulacigaster zurqui* sp. nov., paratype female: (2) habitus, lateral view; (3) habitus, dorsal view; (4) head, frontal view; (5) head, side view. Specimen is 2.6 mm long

The subcosta is thin but complete and reaches the wing margin. The radio is divided into three branches, R1 being short. Posterior veins present, with complete CuA1, short and curved CuA2, confluent in the anal; A1+CuA2 vein incomplete, not reaching the wing margin. Among the transverse veins, the radiomedial (r-m) and medial-cubital (dm-cu) veins are always present. The abdomen is composed of five apparent urites in the male and six in the female, with the first and second tergites partially fused. Adults frequent the habitat adjacent to sites where postembryonic development took place (Figure 4) [17-20].

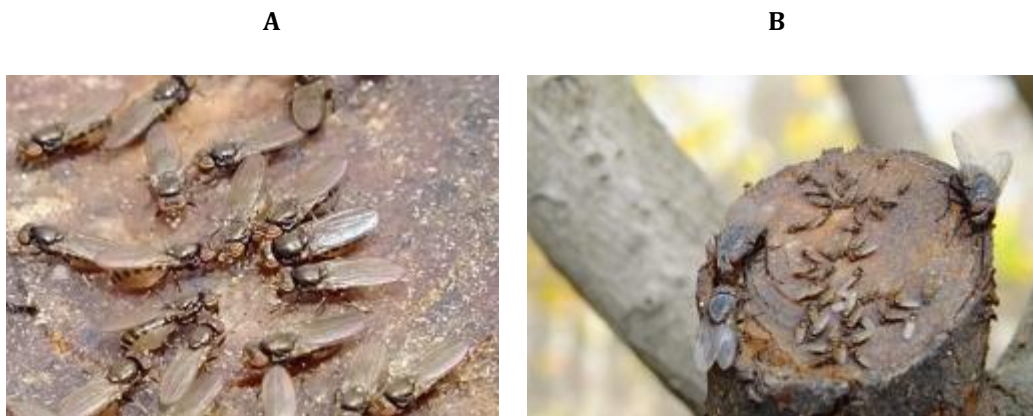


Source: [https://www.researchgate.net/figure/FIGURES-39-45-Digital-photographs-of-Aulacigaster-fastidiosa-new-species-the\\_fig8\\_274666708](https://www.researchgate.net/figure/FIGURES-39-45-Digital-photographs-of-Aulacigaster-fastidiosa-new-species-the_fig8_274666708)

**Figure 4** Digital photographs of *Aulacigaster fastidiosa* Rung & Mathis, 2011, new species (the *ecuadoriensis* group, Neotropical Region). (39) body of male, dorsal aspect; (40) body of male, lateral aspect; (41) right wing of male, dorsal aspect; (42) head of male, frontal-ventral aspect; (43) hind femur of male, dorsal aspect; (44) head of male, lateral aspect; (45) female abdomen, ventral aspect

## 5.2. Biology

The larva is thin and elongated subcylindrical and in some species reaches 6–7 mm in length at maturity with less than a millimeter in diameter. The cephalic capsule tapered, elongated, and curved downwards. The metamerism is not very evident, there are eight pairs of ventral pseudopodia and the posterior part extends into a long caudal respiratory siphon. The larvae develop in plant exudates, even very viscous, emitted from the wounds of various arboreal plants, or in phytotelmae collected from the leaves of Bromeliaceae (Figures 5A-5B) [18-20].



Sources: Photo#1311808. Photo#1311809. Copyright © 2016 Loren & Babs Padelford and <https://bugguide.net/node/view/1311808/bgimage>

**Figure 5A** Small flies on weeping serviceberry tree - *Aulacigaster* Macquart, 1835, Fontenelle Forest, Bellevue, Sarpy County, Nebraska, USA October 28, 2016. Size: approx. 3-4 mm. **Figure 5B** These small flies were taking sap from a weeping serviceberry tree

The puparium has an elliptical profile, is flattened dorsal-ventrally, and has a light yellowish-brown color. The anterior part shows two long respiratory horns, carrying the thoracic stigmata, and the caudal part presents a short tubular extension carrying the abdominal stigmata. The biological cycle has an indefinite number of generations per year and wintering, in temperate regions, occurs at the adult or, less frequently, pupal stage [19-21].

### 5.3. Distribution

Despite the limited number of species, the family is represented in all zoogeographic regions with the exception of Australasia, with a prevalent presence in the Holarctic [21-22].

### 5.4. Systematic

**Genus** *Aulacigaster* Macquart, 1835: **Species:** *Aulacigaster afghanorum* Papp, 1997, *Aulacigaster africana*, Barraclough, 1993, *Aulacigaster borbonica* Hilger & Kassebee, 2000, *Aulacigaster falcata* Papp, 1997, *Aulacigaster leucopeza* (Meigen, 1830), *Aulacigaster mcalpinei* Mathis & Freidberg, 1994, *Aulacigaster neoleucopeza* Mathis & Freidberg, 1994, *Aulacigaster pappi* Kassebeer, 2001, *Aulacigaster perata* Barraclough, 1993, *Aulacigaster sabroskyi* Mathis & Freidberg, 1994.

**Genus** *Curiosimusca* Rung, Mathis & Papp, 2005. **Species:** *Curiosimusca khooi* Rung, Mathis & Papp, 2005, *Curiosimusca maefangensis* Rung, Mathis & Papp, 2005, *Curiosimusca orientalis* Rung, Mathis & Papp, 2005.

**Genus** *Echidnocephalodes* Sabrosky, 1980: **Species** *Echidnocephalodes barbatus* (Lamb, 1914), *Echidnocephalodes ecuadoriensis* Hennig, 1956, *Echidnocephalodes melanoleuca* Hennig, 1956, *Echidnocephalodes minuta* Hennig, 1956, and *Echidnocephalodes plesiomorphic* Hennig, 1969.

**Genus** *Schizochroa* Hennig, 1956: **Species:** *Schizochroa ecuadoriensis* Hennig, 1956, *Schizochroa melanoleuca* Hennig, 1956, *Schizochroa minuta* Hennig, 1956 and *Schizochroa plesiomorphica* Hennig, 1969 [22-24].

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## 6. Study selection

### 6.1. Study 1

The genus *Stenomicroa* comprises a group of Diptera that has been little studied. Adults were observed flying over the spiral pre-foitation of *Heliconia* sp., which, according to the luvimetric index, may constitute a very efficient microhabitat for the life cycle of many individuals. The objective of the work is to describe the larval stages of a new species of Aulacigastridae found in this environment, as well as to survey the immature forms of other dipterans. The work is concentrated in the Mocambo area, which is a dryland forest reserve located on the outskirts of Belém. The leaves, still spiralizers, are packed in numbered plastic bags, and their contents are placed in containers with the same number. In the laboratory, individual observations of the leaves and their contents are made using a stereoscopic microscope. All larvae of *Stenomicroa* sp. found they be from the last stage [25].

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## 7. Family Odoniidae

Odoniidae is a small family of flies small, robust, ranging from 2.5 to 6 mm in length. There are only 58 described species, but there are representatives in all major biogeographical domains. Life histories are known for only a few species of *Odinia* Robineau-Desvoidy, 1830, and no biological information is available for most species in the family [26-27].

### 7.1. Description

Representatives of Odoniidae are small and robust. They are gray, mottled with brown. Head wider than long; forehead as broad as long in both sexes. Predominantly yellow antenna; pedicel with dorsal bristle, globular flagellum with pubescent to bipectinate awn. Thorax is robust, often heavily bristled, including four or five pairs of dorsocentral bristles. Scutellum robust and convex, with two pairs of setae [28-30].

Wing short and wide, always dark around the subcostal break. The costal vein contours the wing to R4 + 5 or M1. Subcostal vein incomplete; complete BM and DM cells; convex cup cell apex. The A1+ Cu2 vein does not reach the wing margin. Strong legs, often yellow, moderately bristle; dilated posterior femur in males. The abdomen is short and wide, normally yellow to brown mottled with gray (Figure 6) [30-32].



Source: <https://treatment.plazi.org/id/A93A87B9783D9869FF7AFD066DD3F8AF>

**Figure 6** *Pauximyia oliveirai* sp. November, Holotype ♂. 1, habitus, lateral view (dissected abdomen); 2, head, side view; 3, head, front view; 4, head, front view, tilted; 5, thorax, dorsal view; 6, abdomen; 7, wing. Abbreviations: bm-m-basal medial crossed vein; CuA-anterior branch of the cubital vein; CuA+CuP-anterior branch of the cubital vein + posterior branch of the cubital vein; dm-m-discal medial crossed vein; M 1 -first media branch; M 4 - fourth branch of the media; R 2+3 -second branch of the ray; R 4+5 -third branch of the ray; r-m-radial-medial crossed vein

## 7.2. Biology

Adults are closely associated with trees, especially those infested with other insects, rot, fungus, or oozing sap. Some species are known to feed on polypore fungi on trees. Palearctic species were created associated with beetles xylophages or from trees attacked by these Coleoptera, and less commonly from larvae coleopteran other moths. They are generally associated with galleries of wood-boring beetles, with various possibilities of saprophytic to predator life history (Figures 7A-7B) [30-32].



Sources: Photo#2001892 and [https://www.researchgate.net/figure/Ferdinanda-cuprea-ovipositing-on-sound-bark-about-10-cm-from-the-nearest-sap-exudation\\_fig1\\_324112070](https://www.researchgate.net/figure/Ferdinanda-cuprea-ovipositing-on-sound-bark-about-10-cm-from-the-nearest-sap-exudation_fig1_324112070)

**Figure 7A** *Traginops irroratus* Coquillett, 1900 (Odoniidae): On a sap drip from a wound in a large oak with *Drosophilinae*. Forest Hills Gardens, Queens County, New York, USA. **Figure 7B** *Ferdinanda cuprea* (Scopoli, 1763)

ovipositing on sound bark about 10 cm from the nearest sap exudation and *F. cuprea* ovipositing on sound bark about 10 cm from the nearest sap exudation and larvae were found feeding on sap from trunk damage in oak and ash

### 7.3. Systematic

**Subfamily Odiniinae:** Genus *Afrodinia* Cogan, 1975, *Neoalticomerus* Hendel, 1903, *Odinia* Robineau-Desvoidy, 1830, *Turanodinia* Stackelberg, 1944.

**Subfamily Traginopinae:** Genus *Coganodinia* Gaimari & Mathis, 2008, *Helgreelia* Gaimari, 2007, *Lopesiodinia* Prado, 1973, *Neoschildomyia* Gaimari, 2007, *Neotraginops* Prado, 1973, *Paratraginops* Hendel, 1917, *Pradomyia* Gaimari, 2007, *Schildomyia* Malloch, 1926, *Shewellia* Hennig, 1969 and *Traginops* Coquillett, 1900 [33-35].

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## 8. Studies selections

### 8.1. Study 1

Odiniidae Hendel, 1920

Subfamily Odiniinae Hendel, 1920

Genus *Odinia* Robineau-Desvoidy, 1830

*Odinia surumuana* Prado, 1973. Type locality: Brazil (Roraima). Distribution: Brazil (Roraima). *Odinia* sp. 1, Locality: Brazil (Roraima, Ilha de Maracá).

Although it counts a few species, the group is present in all biogeographic regions and there are estimates of a large number of undescribed species. The family is considered monophyletic and is divided into two subfamilies Odiniinae and Traginopinae. There are records of 39 species in 11 genera for the Neotropical region. Of these, 24 species of nine genera are known to Brazil; Only one species was previously known from Roraima [36-39].

### 8.2. Study 2

In this work, groups of visiting insects of the species *Terminia argentea* Mart & Zucc (Combretaceae) are reported to use their exudates in a cerrado area of Mato Grosso do Sul.

Data collection took place in a fragment of cerrado covering around 600 hectares at Brazilian Agricultural Research Company beef cattle (EMBRAPA), in Campo Grande, MS. Study area: The observation period began at 7:46 am and ended at 6:00 pm during a single day. The insects were collected with the help of an entomological net. The observation period consisted of 45 minutes of observation each hour.

Individuals from 11 insect families were found visiting *T. argentea* exudates. Diptera, Lepidoptera, Hymenoptera, Coleoptera, and Blattaria were the groups of visitors to the exudates. Among the visitors, dipterans contributed the largest number of families (Ropalomeridae, Neriidae, Drosophilidae, Odiniidae, Muscidae), followed by Coleoptera and Hymenoptera with Nitidulidae, Cucujidae and Vespidae, Apidae, respectively. Butterflies (Nymphalidae) and cockroaches (Blattellidae) also used the exudate as a resource.

Among all visits with more than one species visiting, 70% occurred when Mesembrinelliinae was seeking the resource. The nymphalids showed a waiting tactic, staying around 1.5m above the exudate exit point, always visiting the resource when it was without visitors; In a total of 54 visits, Nymphalidae contributed 9.25%. Coleoptera from the family Nitidulidae and Diptera from the families Drosophilidae, Muscidae, Neriidae, Odiniidae, Ropalomeridae, Sarcophagidae and Tachinidae [40].

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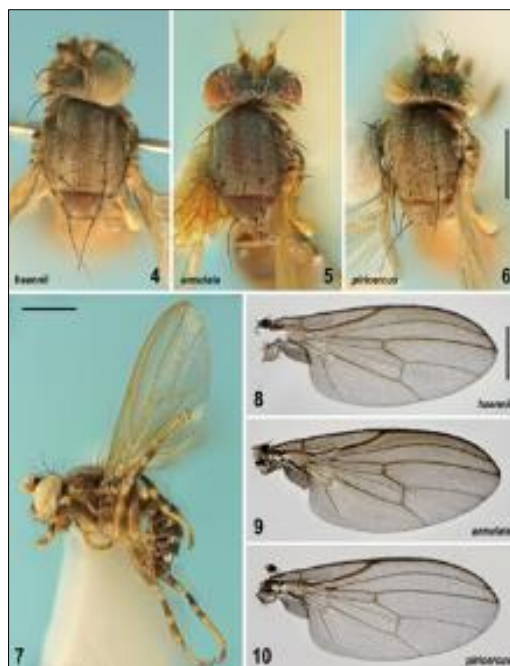
## 9. Family Periscolididae

### 9.1. Description

Periscolididae is a small family of Diptera composed of small insects, measuring between 2.5 and 5 mm in length, slender or robust. They are apparently rare in nature and, therefore, they are poorly represented in collections, probably because their natural history is little known and the appropriate collection methods have not yet been defined. The



family is characterized by a convex and bristle face, a forehead with 1-2 fronto-orbital setae, an antenna with a hood-shaped pedicel and a dorsal slit, and a bipectinate edge (Figure 8) [41-42].



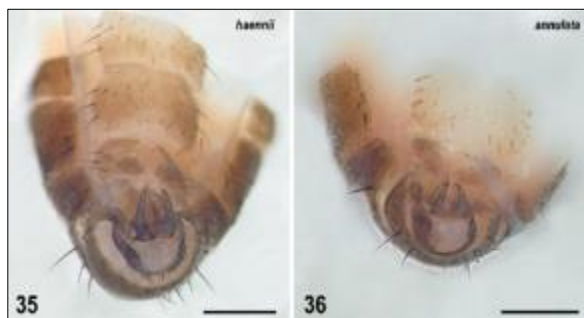
Sources: <https://doi.org/10.3897/alpeno.6853991> and Photos by J. Roháček and <https://alpineentomology.pensoft.net/article/85391/>

**Figure 8** *Periscelis* species (*Myodris*), adults. 4. *Periscelis (Myodris) haennii* sp. nov., male paratype (dried in ethanol), thorax dorsally; 5. *Periscelis (Myodris) annulata* (Fallén, 1813), male (dry mounted), thorax dorsally; 6. *Periscelis (Myodris) piricercus* Carles-Tolrá & Verdugo Páez, 2009, male (dried in ethanol), thorax dorsally; 7. *Periscelis (M.) haennii* sp. nov., male paratype (dried in ethanol), laterally; 8. *Periscelis haennii* sp. nov., male paratype, right wing; 9. *P. annulata*, male, right wing; 10. *P. piricercus*, male, right tip. Only is based on specimens from Slovakia, others are from specimens from Losone (Switzerland)

Hyaline or infusate wing, absent costal break and incomplete subcostas, costal vein reaching the vein or not M1, dm cell with a shallow longitudinal fold (*Periscelidinae*), cup cell generally present and well-developed or reduced CuA2 vein; middle tibia with an apicoventral bristle; male pre-abdomen composed of six segments, symmetrical or asymmetrical post-abdomen, developed or inconspicuous surstyle, articulated or fused with epandrium, cerci weakly sclerotized; Female abdomen with 2 tergite and sternites, seven separate or fused, forming a complete ring. The main characteristic of the family is a pedicel similar to a hood with a dorsal slit, however, this characteristic also occurs in *Neurochaetidae* and other genera of *Acalypratae* [41-43].

## 9.2. Biology

Larvae and adults of *Periscelis* (Smith, 1875), were associated with sap poured from deciduous trees such as oak, white poplar, elm and cotton. Larvae distinguishes between the larval stages of the subgenera *Periscelis* and *Myodris* Lioy, 1864. The habits and habitats of three European species of *Periscelis* were written. Larvae are found in waters between leaves of monocotyledons, including *Bromeliaceae*, *Lineaceae* and *Poaceae*, in Hawaii. *Stenomicro* sp. larvae and pupae were collected. in bromeliad phytotelmata (Figure 9) [44-45].



Sources: Photos by L. Pollini Patrineri and <https://alpineentomology.pensoft.net/article/85391/element/2/16/>

**Figure 9** Distal part of male abdomen of two *Periscelis (Myodris)* species (photographed in situ in ethanol). 35. *Periscelis (Myodris) haennii* sp. nov., paratype; 36. *P. (M.) annulata* (Fallén), Switzerland

### 9.3. Systematic

**Subfamily Periscelidinae:** Genus: *Oldenberg*, 1914. Genus *Dioposoma* Malloch, 1932, *Marbenia* Malloch, 1931, *Neoscutops* Malloch, 1926, *Parascutops* Mathis & Papp, 1992 and *Periscelis* Loew, 1858.

**Subfamily Stenomicroinae.** *Cyamops* Melander, 1913, *Myodris* Lioy, 1864, *Planinasus* Cresson, 1948, *Procyamops* Hoffeins & Rung, 2005, *Stenomicroinae* Papp, 1984, *Stenocyamops* Papp, 2006 and *Stenomicroa* Coquillett, 1900 [46-47].

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## 10. Study selection

### 10.1. Study 1

Characterize the dipterofauna in the dry land fragment of the 1st Infantry Battalion in the Jungle – Manaus, Amazonas, in the dry and rainy periods.

Collections were carried out with four traps (two Malaise and two suspended) in the months of September and October 2017, and February and March 2018 (one week of each month). After collection, all material was identified down to family and an analysis of the abundance, and number of individuals, of these families was carried out.

During the dry and rainy period, 1379 dipterans from the suborder Brachycera were captured, divided into 28 families, which are: Agromyzidae (1), Calliphoridae (2), Chloropidae (14), Clusiidae (5), Drosophilidae (138), Dolichopodidae (203), Ephydriidae (25), Hybotidae (10), Lauxaniidae (32), Lonchaeidae (5), Micropezidae (27), Milichiidae (39), Muscidae (20), Neriidae (3), Periscelididae (10), Phoridae (463), Richardiidae (9), Ropalomeridae (4), Sarcophagidae (45), Sepsidae (8), Syrphidae (11), Sphaeroceridae (175), Stratiomyidae (64), Tabanidae (12), Tachinidae (25), Ulidiidae (26), Xylomyiidae (3). Collections in the dry period were less abundant compared to the rainy period. Larvae and adults of Periscelididae have been associated with sap shed from deciduous trees such as oak, white poplar, elm, and cotton [48].

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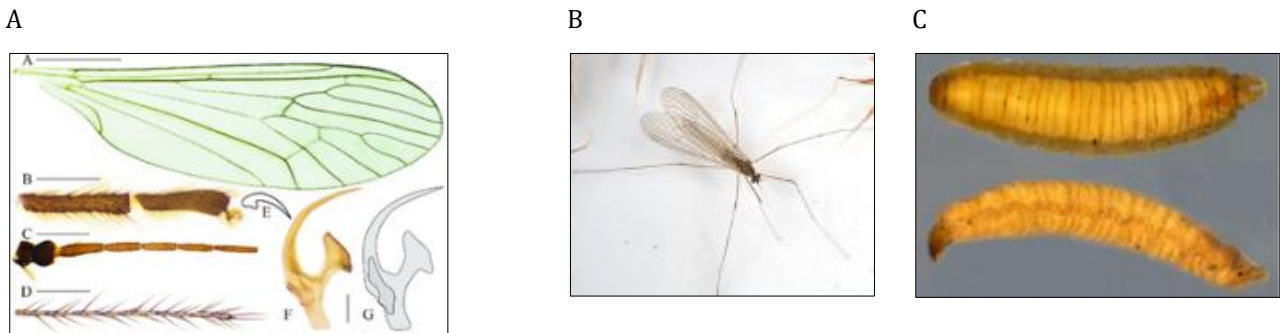
## 11. Family Trichoceridae

Trichoceridae, is a small family of insects in the order Diptera, the only one in the superfamily Trichoceroidea (Nematocera: Tipulomorpha). Apart from Trichoceridae, very few insects appear in adult form during the winter months. They are usually seen in the fall or early spring and can be seen on mild winter days [49].

### 11.1. Description

The head is relatively small and transverse, with large lateral eyes, equipped with two or three ocelli and antennae made up of 16 poorly differentiated segments, except the basal ones. The thorax has a complete U-shaped transverse suture. The legs are long and slender, developing along the length of the femurs and tibiae. Membranous wings, long and narrow, with a large anal lobe. The abdomen is thin and cylindrical, in the male it has two processes equal to the caudal end, in the female it is fusiform and has an ovipositor generally curved downwards (Figures 10A-10C) [50-53].

The coast stretches along the entire shore. The subnerve, close to the radius, is long and divides into two terminal branches: Sc1 is longitudinal and aligned with the base and flows into the rib, Sc2 is quite short, differs in a more proximal position, and takes on a transverse course, merging into R1 (Figures 10A-10C) [53-55].

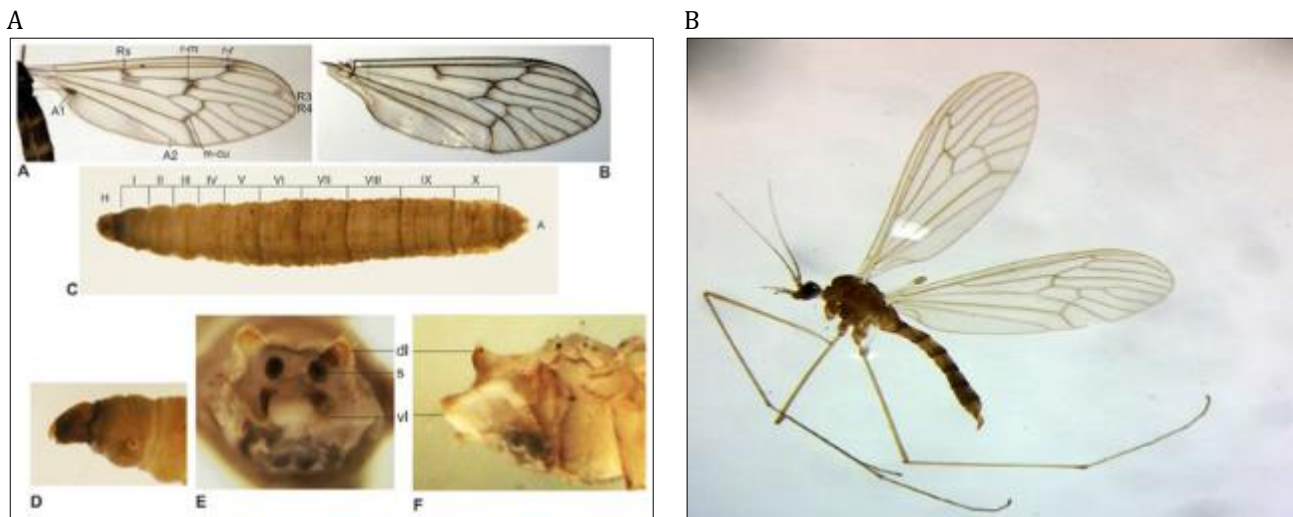


Sources: file:///C:/Users/Lenovo/Downloads/Kolcsar\_etal2018.pdf, [https://pbase.com/tmurray74/crane\\_flies\\_family\\_trichoceridae](https://pbase.com/tmurray74/crane_flies_family_trichoceridae) and Author: Caroline Harding, Ministry for Primary Industries, New Zealand.

**Figure 10A** *Trichocera (Metatrachocera) unica* Kolcsár, sp. nov. male: A-right wing; B-fore fourth and fifth tarsus; C-scape, pedicel, and first five flagellomeres; D-last (f14) flagellomere; E-schematic illustration of the tarsal claw, lateral view of the aedeagal complex. **Figure 10B** Family Trichoceridae. **Figure 10C** Larva of *Trichocera annulata* Meigen, 1818 (Nematocera: Trichoceridae) from dorsal and ventral views

### 11.2. Biology

Adults have habits similar to those of Tipulomorpha in general: they are found mainly in humid and cool environments. There are frequent reports of Trichoceridae adults in dark environments, such as caves, basements, and tree hollows. In the warmer months, in less cold regions, these insects enter aestivation, in the adult or larval phase (Figures 11A-11B) [54-55].



Sources: Photo: E Krzemińska, <https://doi.org/10.7717/peerj.5408>, <https://peerj.com/articles/5408/> and © Petrašiūnas A, Kvište G

**Figure 11A** Identification of *Trichocera bimaculata* Walker, 1848. (A) wing of the specimen from the Polish Antarctic Arctowski Station, Admiralty Bay; (B) for comparison, a wing of the specimen from terra typica (Austria, cave; the middle part seems somewhat misshaped because the wing is dry). Larva: arrangement of segments (C); a characteristic, elongated, and strongly sclerotized head capsule; anterior spiracle (D); scheme of anal end with four anal lobes surrounding two large spiracles, in posterior (E) and lateral (F) view. Abbreviations: dl, dorsal lobe; s, spiracle; vl, ventral lobe. **Figure 11B** *Trichocera annulata* Meigen, 1818 female from Mallorca

The larvae are also found in the colder months throughout the year. They live on decaying plant matter and can be distinguished by their well-developed head capsule, amphinestic spiracular arrangement, and oblique/vertical. Trichoceridae larvae are terrestrial and colonize in moist and decomposing organic substrates: Trichoceridae larvae are found in plant residues, animal excrement, fungal mycelia, poorly preserved food, bird nests, and rodent burrows.

Occasionally they can also behave like phytophagous insects, but basically, they are scavengers with a tendency to develop in substrates of plant origin [55-57].

Adults can also be found resting inside caves and hollow logs. Larvae occur in moist habitats where they feed on decaying organic matter. They are of no economic importance. The family has a wide distribution in the temperate regions of both hemispheres but with a predominant concentration in the Holarctic region. The greatest biodiversity in the Palearctic. Is in Australia and New Zealand and has a large their presence in the southern hemisphere, Europe, and the region Neotropical [56-58].

### 11.3. Systematic

**Genus:** *Diazosma* Bergroth, 1913, *Nothotrichocera* Alexander, 1926, *Paracladura* Brunetti, 1911.

**Genus** *Trichocera* Meigen, 1803: *Trichocera annulata* Meigen, 1818, *Trichocera bimacula* Walker, 1848, *Trichocera maculipennis* Meigen, 1818, *Trichocera major* Edwards, 1921 *Trichocera parva* Meigen 1804, *Trichocera* and *regelationis* Linnaeus, 1758 [59-].

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## 12. Study selection

### 12.1. Study 1

Genus *Trichocera* in Morocco: first records from Africa and a new species (Diptera: Trichoceridae)

*Trichocera (Saltrichocera) annulata* Meigen, 1818

*Trichocera (Metatrichocera) annulata* Meigen in: Krzemińska 1999: 253.

Mediated through: Biodiversity Data Journal. The first record for Mallorca and the second from the Balearic Islands

*Trichocera annulata* is widespread in the Mediterranean region, with records from Algeria, Asia Minor and Ethiopia (Dahl and Alexander 1976), Malta, Morocco and Sardinia. Along with our data from Mallorca, these records suggest that this species has an unusually high tolerance to warm temperatures within the genus *Trichocera* [60].

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## 13. Conclusion

The families Anthomyzidae, Aulacigastridae, Odoniidae and Periscolididae of the Opomyzoidea are apparently rare in nature and, therefore, little represented in collections, in particular. However, perhaps this rarity is due to the fact that its natural history is little known and the appropriate collection methods have not yet been defined, but there are records of a considerable number of individuals from this group being captured. Trichoceridae, is a small family of insects in the order Diptera, the only one in the superfamily Trichoceroidea (Nematocera: Tipulomorpha). Apart from Trichoceridae, very few insects appear in adult form during the winter months. They are usually seen in the fall or early spring and can be seen on mild winter days.

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