

Four families of Phoroidea (Insecta: Muscomorpha).

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Potential competing interests: No potential competing interests to declare.

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The Cyclorrhapha suborder is made up of classically shaped flies, the ones that look like flies. They have three-segment antennae. The larvae are pruned and acephalous, meaning that the head is not differentiated from the rest of the body. Phoroidea is a superfamily of Muscomorpha. The Cyclorrhapha suborder is made up of classically shaped flies, the ones that look like flies. They have three-segment antennae. The larvae are pruned and acephalous, meaning that the head is not differentiated from the rest of the body [1-3].

Family Lonchopteridae

Lonchopteridae is a small family of flies with only 60 known species, generally classified in only one genus *Lonchoptera* Meigen, 1803. In Brazil, there is only one record of the cosmopolitan and parthenogenic species *Lonchoptera bifurcata* (Fallén, 1810), possibly spread across the globe through trade in vegetables. They are small, elongated, yellowish-brown flies with pointed wings, which is why they are called "spear-winged flies" in English [3-5].

3.1. Family Lonchopteridae are small insects that, like all Diptera, only have the first pair of wings developed; They measure between 2 and 5 millimeters and are found in shady and humid places, often on the banks of watercourses. A characteristic feature is that they have pointed wings, similar to a spear, which led to this name being given to the family, and why they are commonly known as flies with lanceolate or pointed wings. *Lonchopteris*, Brongniart 1828 (genus of fossil ferns that had lanceolate leaflets); *Lonchocarpus* Kunth (Fabaceae) and *Deguelia* Aubl. (Fabaceae) (genus of leguminous trees and shrubs with lance-shaped pod-like fruits). The mesonotum scutellum and legs have well-developed bristles. The radial vein R has three branches (R1, R2+3, R4+5). The median vein M is furcating (M1, M2). The anal vein A merges with the cubital vein Cu (female) or terminates freely (male) (Figures 1) [3-6].

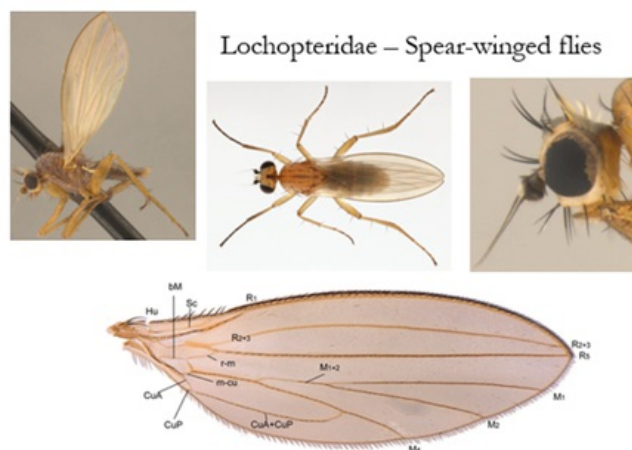


Figure 1 Adults of Lochopteridae lateral and dorsal view and wing. The radial vein R has three branches (R1, R2+3, R4+5). The median vein M is furcating (M1, M2). The anal vein A merges with the cubital vein Cu.

Sources: <https://quizlet.com/502878789/wip-enwc406-cyclorrhapha-calyptrates-flash-cards/and>, Photo 18141460, (c) Mardon Erbland, some rights reserved (CC BY-NC-SA)

Larvae develop in humid places, in decomposing organic matter, leaf litter, and plant debris. There are several records of larvae being found in semi-aquatic places, including *L. bifurcata* (such as in New Zealand). They are saprophages, macrophages, and mycetophagous. The larvae are quite characteristic, flat, and segmented, somewhat reminiscent of an isopod or Psephenidae, but with anterior and posterior filamentary projections (Figures 2) [3-6].



Figure 2 A slide-mounted larva of *Lonchoptera bifurcata* (Fallén, 1810), collected at the Ashburton Forks showing the general body form, anterior and posterior filaments, lateral spines posterior spiracles, and gut contents dominated by detritus.

Source: <https://www.semanticscholar.org/paper/Unexpected-records-of-spear-winged-fly-larvae-from-Winterbourn/0072694d3c044ca263d1998a9fc671f83bb760c9/figure/1>



Figure 3 *Lonchoptera lutea* Panzer, 1809 pupa Ribbesford Wood

Source: John Bingham and https://www.wbrc.org.uk/WORCRECD/38/Bingham_John--1Lonchoptera_lutea_pupae_at_Ribbesford_Wood.html

The five families of Diptera included in this work do not form a natural taxonomic group, since they do not belong to the same suborder or section. On the one hand, and continuing with the study of the Brachycera-Orthorrhapha suborder, the families Scenopinidae and Xylomyidae are included; On the other hand, the Lonchopteridae, Hippoboscidae, and Nycteribiidae are included in the suborder Brachycera-Cyclorrhapha [3-7].

However, the family Lonchopteridae belongs to the section Aschiza, while the families Hippoboscidae and Nycteribiidae belong to the section Schizophora. Therefore, it is a taxonomic mixture of five families. However, it has been considered appropriate to group them into a single work due to the small area that each one of them occupies and because it is a work of a faunal type and not a taxonomic one [3-8].

Family of Diptera with about 20 species known in the Palearctic region. Only three species have been recorded in the Iberian Peninsula. These are very common dipterans on grass in humid and shady areas. *Lonchoptera bifurcata* (Fallen, 1810) Material studied: Barcelona: *Lonchoptera lútea* Panzer, 1809 Material studied: Barcelona: Barcelona [3-8].

Suborder: Brachycera; Infraorder: Muscomorpha; Section: Cyclorrhapha; Superfamily: Phoroidea. Genus: *Lonchoptera* Meigen, 1803, *Neolonchoptera* Vaillant, 1989 and *Spilolonchoptera* Yang, 1998.

Family Lonchopteridae Curtis, 1839. *Lonchoptera tristis* Meigen, 1824. A European species only recorded in Jaén in this cave, it usually appears in the areas closest to the entrance [3-10].

Family Opetiidae

They Muscomorpha, thus having a particular type of pupal case resembling a rounded barrel and called puparium. The Platypezoidea are a superfamily of true flies in the section Aschiza. Their closest living relatives are the Syrphoidea, which, for example, contain hoverflies. Like these, the adults do not burst open their pupal cases with a ptilinum when

hatching, thus the Aschiza do not have the Inverted-U-shaped suture above the antennae [12-14].

Five families are placed in the Platypezoidea, listed below in taxonomic sequence: Phoridae, Opetiidae, Ironomyiidae, Lonchopteridae, and Platypezidae. The Ironomyiidae, Lonchopteridae, and Phoridae are sometimes separated as Phoroidea. The reduced Platypezoidea thus united the two families of flat-footed flies [15-17].

The infraorder Cyclorrhapha is divided into two subgroups: Aschiza and Schizophora. Aschiza, which comprises the families Platypezidae, Lonchopteridae, Ironomyiidae, Sciadoceridae, Phoridae, Syrphidae, Pipunculidae, and Opetiidae, is considered a monophyletic group. However, some authors consider this subgroup to be paraphyletic about Schizophora [18-19].

Domain: Eukaryota, Kingdom: Animalia, Phylum: Arthropoda, Subphylum: Hexapoda, Class: Insecta, Subclass: Pterygota, Infraclass: Neoptera, Superorder: Endopterygota, Order: Diptera, Suborder: Brachycera, Infraorder: Muscomorpha, Superfamily: Platypezoidea and Family: Opetiidae (Figure 4) [19-23].

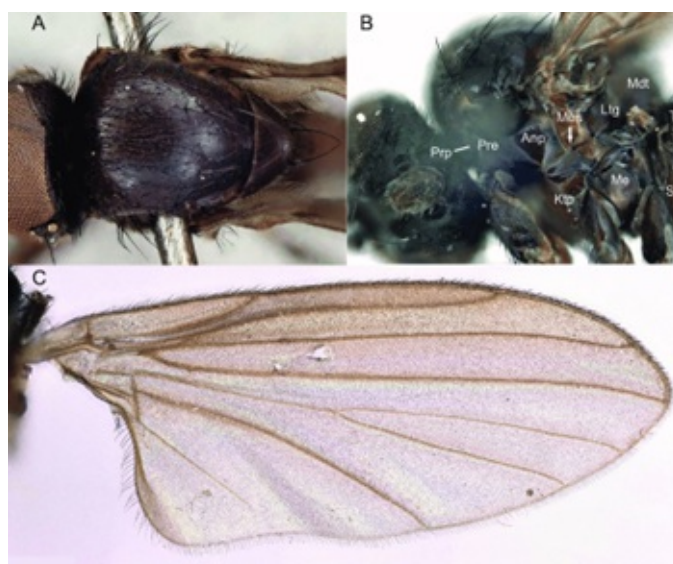


Figure 4 *Opetia nigra* Meigen, 1830 male: A, thorax, dorsal view; B, thorax, lateral view; C, wing. The black arrow points to the short displacement of the katepisternum under the mesepimeron, white arrow points to the partial suture between mesopleurotrochantim and meron

Source: https://www.researchgate.net/figure/Opetia-nigra-Meigen-male-A-thorax-dorsal-view-B-thorax-lateral-view-C-wing_fig3_323319863

Distribution. Palearctic species. Recorded in Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Great Britain, Hungary, Ireland, Italy, Luxembourg, Netherlands, Poland, Portugal, Romania, Slovakia, Spain, Sweden, Switzerland and Russia (ER).

Biology. Adults run on broad leaves in wooded biotopes, where they sometimes form swarms. Adults were found in

decaying wood. The species is bivoltine, the adult flight period in Central Europe (Figure 5) [24].



Figure 5 *Opetia nigra* Meigen, 1830

Source: Photo 12737741, (c) Rui Andrade, all rights reserved

Opetiidae was formerly Platypezidae.

Genus: *Opetia* Meigen, 1830 Palearctic, *Opetia aberrans* Shatalkin, 1985, *Opetia alticola* Saigusa, 1963, *Opetia anomalipennis* Saigusa, 1963, *Opetia nigra* Meigen, 1830, *Puyehuemyia* Amorim et al, 2018, Chile Recent and *Puyehuemyia chandleri* Amorim et al, 2018.

Opetia nigra Meigen, 1830.

Ourense: Entrimo, Olelas, 12.04.2009, 1 male (sweeping net, Quercus robur forest, 400 m) (ABIGA 18928); Oimbra, feces de Cima, 07/30/2008, 1 male (manguero, fields along the river bank, 400 m) (R. Pine leg., ABIGA 16413). Previous Spanish appointments: Barcelona. A new family for Galicia [25-26].

Family Platypezidae

The flies are slender to stout, 2 to 10 mm long, black, gray, yellow, orange, or brown, or a combination of these colors. Chest and rounded in front. Antennae with a three-segmented bare edge located terminally on the flagellomere. Mouthparts are short and fleshy. Chests with transverse sutures are usually visible only on the sides. Wings light or brownish, the veins on the posterior half of the wing not setous. The abdomen is elongated, and cylindrical or somewhat flattened [27-31].

The larvae appear to feed in moist fungal forests. The adults feed on honeydew leaves and other deposits on the leaves. Adults can also be seen hovering or running in the damp sand of creek beds. Males can form aerial swarms; which females enter to select mates. These flies are not able to walk like humans who have problems with flat feet. This fly can run fast and sometimes its movement is similar to a scuttle fly. It may be so called because the distal tarsal segment of

the foreleg is flattened laterally. What is visible here is the anal lobe on the very large wing (Figures 6-8) [32-36].



Figure 6 *Agathomyia wankowiczii* (Schnabl, 1884) galls. *Ganoderma applanatum* (Pers.) Pat., 1887 (Polyporales: Ganodermataceae)

Sources: Pictures <https://www.commanster.eu/Commanster/Insects/Flies/AFlies/Agathomyia.wankowiczii.html>





Figure 7 *Agathomyia wankowiczii* (Schnabl, 1884). While trying to rear a lep larva found eating a fungus, *Psathyrella* sp., I found this larva

Sources: Photo 115288192, (c) Josef Wirth, some rights reserved (CC BY-NC), Published from Finland <https://laji.fi/en/taxon/MX.277396> and ID by R. Healy and <https://bugguide.net/node/view/1038789>



Figure 8 Larvae and adults of Platypezidae: 1–4 –*Kesselimyia chandleri* Vaňhara, 1981: 1 – female, 2 – two females ovipositing on *Macrolepiota procera* (Scopoli) (Agaricales: Agaricaceae), 3 – larva on the fungus gills, 4 – larva in detail. 5 – *Platypeza aterrima* Walker, 1836, male. 6 – *Paraplatypeza bicincta* (Szilády, 1941), female. Giant. 1–6. Larvae and adults: 1–4 – *Kesselimyia chandleri* Vaňhara, 1981: 1 – female, 2 – two females during laying in the tall sedge *M. procera*, 3 – larva on sedge leaves, 4 – larva detail. 5 – *Platypeza aterrima* Walker, 1836, male. 6 – *P. bicincta*, female

Source: All photos by M. Tkoč and https://www.researchgate.net/figure/6-Larvae-and-adults-of-Platypezidae-1-4-Kesselimyia-chandleri-Vanhara-1981-1_fig1_273645495

These flies are not officially registered for Chile, even though there is a scientific work Collin the year 1931, that describes or mentions the *Platypeza brunnescens* (Collin, 1931) that is currently identified as *Lindneromyia brunnescens* (Collin, 1931), without clarifying its exact location so it cannot be associated with Chile. According to the taxonomic structure

offered by Naturalists, this family is composed of four subfamilies (Callomyiinae, Microsaniinae, and Platypezinae).

Subfamily Callomyiinae Rondani, 1841: Genus *Agathomyia* Verrall, 1901. Some species: *Agathomyia boreella* (Zetterstedt, 1838), *Agathomyia cinerea* (Zetterstedt, 1852), *Agathomyia elegantula* (Fallén, 1815), = *dahlbomi* (Zetterstedt, 1838), *Agathomyia falleni* (Zetterstedt, 1819), *Agathomyia lundbecki* Chandler in Shatalkin, 1985, *Agathomyia sexmaculata* (von Roser, 1840) and *Agathomyia scutellaris* (Zetterstedt, 1838). Genus *Callomyia* Meigen, 1804: Some species: *Callomyia amoena* Meigen, 1824, *Callomyia elegans* Meigen, 1804, = *leptiformis* (Fallén, 1810) and *Callomyia krivosheinae* Shatalkin, 1982.

Subfamily Microsaniinae Enderlein, 1936: Genus *Microsania* Zetterstedt, 1837: Some species: *Microsania capnophila* Shatalkin, 1985, *Microsania collarti* Chandler, 2001, *Microsania pallipes* (Meigen, 1830) and *Microsania strapline* Collart, 1954.

Subfamily Platypezinae Fallén, 1815: Genus *Bolopus* Enderlein, 1932: Some species: *Bolopus furcatus* (Fallén, 1826). Genus *Paraplatypeza* Kessel & Maggioncalda, 1968. Species: *Paraplatypeza atra* (Meigen, 1804) and *Paraplatypeza bicincta* (Szilády, 1941). Genus *Platypeza* Meigen, 1803: Some species: *Platypeza aterrima* Walker, 1836, *Platypeza consobrina* Zetterstedt, 1844, and *Platypeza fasciata* Meigen, 1804.

Subfamily Platypezina Wahlgren, 1910: Genus *Polyporivora* Kessel & Maggioncalda, 1968; Species: *Polyporivora boletina* (Fallén, 1815) and *Polyporivora picta* (Meigen, 1830). Genus *Protoclythia* Kessel, 1950: Some species: *Protoclythia modesta* (Zetterstedt, 1844). Genus *Seri* Kessel & Maggioncalda, 1966 Species: *Seri obscuripennis* (Oldenberg, 1916) [37-40].

Family Pseudopomyzidae

Most Nerioidae are associated with dead and decaying organic matter such as dead wood, rotting fruit, and bat dung. On the other hand, Fergusoninidae form galls in plants of the family Myrtaceae, and some Micropezidae have larvae that are predatory or agricultural pests. The antenna is usually porrect or slightly deflexed, wing veins R2+3 and R4+5 are usually convergent, and the wing anal cell is usually much smaller than the subcostal cell [42-44].

They are small (1.0-5.0mm), with 28 species described throughout the world in six genera. Characteristics of the family are: head with three to four pairs of recumbent orbital setae, distinct vibrissa, extended antenna with rounded first flagellomere, four pairs of dorsocentral setae, one or two cathepisternal setae, moderately infuscated wings, reduction of the Sc and CuA2 vein, A1+CuA2 sclerotized and bm-cu absent (Figure 9) [44-48].



Figure 9 fig. 1-7. *Pseudopomyza atrimana* (Meigen, 1830) female: 1. habitus, 2. head and thorax right lateral view, 3. head left lateral view, 4. head and thorax dorsal view. 5. head and thorax left dorso-lateral view, 6. right wing, 7. abdomen with the ovipositor in the foreground posterior dorsal view

Source: <https://www.semanticscholar.org/paper/Pseudopomyzidae%3A-una-nueva-familia-de-d%C3%ADpteros-para-P%C3%A9rez/ebd55c7f9b43f5a2b8866ce5b5aa11bbf2636d49/figure/0>

The biology and immature stages are unknown for Neotropical members, but larvae likely develop in decaying organic plant matter such as trunks and branches. Adults of some *Latheticomyia* Wheeler, 1956, species are attracted to banana baits manure, and sardines. At least one undescribed species of *Latheticomyia* grows in sugarcane bagasse. Most species are from the New World and Asia. There is only one European species, *Pseudopomyza atrimana* (Meigen, 1830), which occurs in woodland, and adults have been found to gather over rotting logs or attracted to the freshly cut and sappy stumps or logs of deciduous trees (Figure 10) [49-51].



Figure 10 Ecology and behaviour: A, sap feeding; B–C, territoriality; D, courtship; E mating pair

Sources: figure.png md5:483b1078c47ae5bfe5e442897f52622, published in Zenodo

Zootaxa, 5124(1), 95-100, 2022

A family Pseudopomyzidae represented by three current genera with species distributed in the Australian area associated with guano. Very little is known about the biology of members of the Pseudopomyzidae, but they are found associated with decaying logs or under the bark of trees. Six current genera are recognized that are distributed in the New World, in the Palearctic, eastern, and Australian areas [52-53].

They are dipterans found in all zoogeographic regions except for the Afrotropical region. In the Neotropical Region, the genus *Heloclusia* Malloch, 1933, *Latheticomyia* Wheeler, 1956, *Pseudopomyzella* Hennig, 1969 and *Rhinopomyzella* Hennig, 1969 are found. Members of this group were previously classified in the family Cypselosomatidae [52-54].

Genus: *Latheticomyia* Wheeler, 1956, *Heloclusia* Malloch, 1933, *Macalpinella* Papp, 2005, *Polypathomyia* Krivosheina, 1979, *Pseudopomyza* Strobl, 1893, *Pseudopomyzella* Hennig, 1969, *Rhinopomyzella* Hennig, 1969 and *Tenuia* Malloch, 1926 [54-56].

Pseudopomyza atrimana (Meigen, 1830) (Pseudopomyzidae) Portugal: Braga, Esposende, Fonte Boa, and Rio Tinto (Marchão) Among the most common plant species are the following: *Salix atrocinerea* Brot. (Salicaceae), *Quercus robur* L. (Fagaceae), *Lythrum salicaria* L. (Myrtaceae), *Sambucus black* L. (Adoxaceae), *Eucalyptus* sp. (Myrtaceae) and *Pinus pinaster* Aiton (Pinaceae) [54-56].

Pseudopomyza atrimana where the breeding substrate of larvae as well as the preferred habitat of the species remain unknown. Record of adults swarming over tree logs it was presupposed that *P. trimana* could develop under the bark of dead trees, being the only species of the family where the habitat of the larva is known [57-60].

Two very distant clades of small to minute flies from the New World have offered contrasting taxonomic challenges and rewards. One is a group of brightly and distinctively marked shiny yellow and brown species and the other group presents a uniform and dull appearance. Looks can be deceiving, however: The seemingly dull flies in the genus *Bromeloecia* Spuler, 1924 (Sphaeroceridae: Limosininae) have character-rich wings and wing interference patterns and informatively elaborate terminalia.

The attractive species of *Pseudopomyza* and *Rhinopomyzella* (Pseudopomyzidae), alternatively, offer a limited and highly homoplastic character set. Current revisions of these two contrasting groups are compared and contrasted, concluding that the only thing they have in common is a remarkably high proportion of new species awaiting description and naming [60].

References

- [1] Vaillant F. Contribution to the study of the Diptera Lonchopteridae of Europe and North Africa. Bulletin of the Vaudoise Society of Natural Sciences. 1989; 79: 209–229.
- [2] Baena MJ, Figueroa MT, Manuel J, López-Rodríguez ML, Pérez T. Inventory of the cave fauna of the birth cave of the San Blas Stream (Siles, Jaén, Spain). Conservation and management proposal. Biospeleological Monographs. 2010; 5: 1-8.
- [3] Drake CM. The Distribution and habitat preferences of British Lonchopteridae (Diptera)". Entomologist's Monthly Magazine. Yang C.K. Lonchopteridae. In: Xue WQ, Chao CM, eds. Flies of China. 1st ed. Shenyang: Liaoning Science and Technology Press; 1998. p. 49–59.
- [4] Pérez T. Provisional catalog of cave-dwelling invertebrates from the province of Jaén (Andalusia, Spain). [Internet]. Andalusian: Minutes II Andalusian Congress of Speleology; @2008 [cited 2024 Apr]. Available from <https://ecologia.ugr.es/sites/dpto/ecologia/public/inline-images/inventario-de-fauna-cavernicola-de-la-cueva.pdf>.
- [5] Borror DJ, Triplehorn CA, Johnson NF. An introduction to the study of insects. 6th ed. New York: Saunders Cool Publ. 1992.
- [6] Iberfauna. Subordinate Brachycera. [Internet]. Madri: The Iberian fauna data bank. National Museum of Natural Sciences (CSIC); @ 2005 [cited 2024 Apr 07]. Available from: <http://iberfauna.mncn.csic.es/showficha.aspx?rank=J&idtax=3642>.
- [7] Anderson H. Family Lonchopteridae. In: Soós A, eds. Catalog of Palaearctic Diptera. Dolichopodidae-Platypezidae. 7th ed. Budapest: Elsevier Scientific Publishing; 1991. p. 139-142.
- [8] Carles-Tolrá M. New data on the dipterans of Spain (Diptera: Scenopinidae, Xylomyidae, Lonchopteridae, Hippoboscidae, Nycteribiidae). Bulletin of the Spanish Association of Entomology. 1998; 22(1-2): 75-79.
- [9] Pérez T. Some notes on invertebrates captured in caves in Jaén. Espeleo. 2007; 19: 27-28.
- [10] Pérez T, Tinaut A. Biospeleology in the Province of Jaén. 1st ed. Speleum: Bio Speleum. 2005.
- [11] McAlpine DK. New extant species of ironic flies (Diptera: Ironomyiidae) with notes on Ironomyiidae morphology and relationships". Proceedings of the Linnean Society of New South Wales. New South Wales: The Linnean Society of New South Wales. 2008; 129: 17–38.
- [12] Coram R, Jarzembowski EA, Mostovski MB. Two rare *Eremoneura* flies (Diptera: Empididae and Opetiidae) from the Purbeck Limestone group. Paleontology Journal. 2000; 34(3): 370–373.
- [13] Chandler PJ. Flat-Footed flies: (Diptera Opetiidae and Platypezidae) of Europe (Fauna Entomologica Scandinavica). 36th ed. ed. Leiden: Brill Academic Publishers. 2001.
- [14] Amorim DS, Silva VC, Brown BV. *Puyehuemyia chandleri*, gen. nov., sp. nov. (Diptera, Opetiidae): remnant of a

Cretaceous biota in Chile. *American Museum Novitates*. 2018; (3892): 1–27.

[15] Griffiths GCD. Review of Manual of Nearctic Diptera. *Quaestiones Entomologicae*. 1990; 26: 117-130.

[16] Griffiths GCD. Relationships among the major subgroups of Brachycera (Diptera): a critical review. *Canadian Entomologist*. 1990; 126: 861-880.

[17] McAlpine JF. Phylogeny and classification of the Muscomorpha. In: McAlpine JF, Wood DM, eds. *Manual of Nearctic Diptera*. 3rd ed. Ottawa: Canadian Research Branches of Agriculture. 1989.

[18] Yaetes DK, Wiegmann BM. Congruence and controversy: Toward a higher-level phylogeny of Diptera. *Annual Review of Entomology*. 1999; 44: 397-428.

[19] Griffiths GCD. Review of papers on the male genitalia of Diptera by Wood DM and associates. *Studia Dipterologica*. 1993; 3: 107-123.

[20] McAlpine JF, Wood DV. *Manual of Nearctic Diptera*. 3rd ed. Ottawa: Canadian Research Branches of Agriculture. 1989.

[21] Kaminski AC. Phylogenetic analyzes of Diptera (Insecta) with data molecular: genes, alignments, sampling, and algorithms [P.h.D. dissertation]. São Paulo: Universidade de São Paulo; 2006.

[24] koč M, Roháček J. Diversity, distribution and biology of Romanian flat-footed flies (Diptera, Opetiidae, and Platypezidae) with taxonomic notes on *Callomyia saibhira* Chandler. *ZooKeys*. 2014; 459: 95–118.

[25] Carles-Tolrá M. Two new species for Spain and faunal novelties for Galicia (Spain) (Diptera: Blephariceridae, Thaumaleidae, Atelestidae, Athericidae, Mythicomyiidae, Opetiidae, Platypezidae, Canacidae, Chloropidae and Coelopidae). *Entomologic Archives*. 2020; 22: 105-108.

[26] Amorim DS, Silva VC, Brown BV. The first Opetiidae (Platypezoidea) is known from the Southern Hemisphere from Valdivian Forest, Chile [Internet]. Windhoek: 9th International Congress of Dipterology; @ 2018 [cited 2024 Apr 07]. Available from https://nucleus.iaea.org/sites/naipc/twd/Documents/Abstract_booklet_circular_ICD9_2018.PDF.

[27] Merriam-Webster. Platypezidae. In: Merriam-Webster.com dictionary. 2024. Available from <https://www.merriam-webster.com/dictionary/Platypezidae>.

[28] Iberfauna. Family Platypezidae. The Iberian fauna data bank [Internet]. Madrid: National Museum of Natural Sciences (CSIC); @ 2005 [cited 2024 Apr 07]. Available from <http://iberfauna.mncn.csic.es/showficha.aspx?rank=J&idtax=3708>.

[29] Chandler PJ. The Flat-footed flies (Opetiidae and Platypezidae) of Europe. *Fauna Entomologica Scandinavica*. 36th ed. Leiden: Brill; 2001. p. 1–278.

[30] Smith KGV. An introduction to the immature stages of British Flies. *Diptera larvae, with notes on eggs, puparia, and pupae*. 10th ed. St Albans: Handbooks for the Identification of British Insects. 1989.

- [31] Chandler PJ. Platypezidae. In: Soós A, Papp L, eds. Catalogue of Palearctic Diptera. 7th ed. Budapest: Hungarian Natural History Museum; 1991. p. 205–217.
- [32] Ståhls G, Rätzel E. The genus *Microsania* (Platypezidae, Microsaninae) in Finland. *Sahlbergia*. 2013; 19: 50–52.
- [33] Kessel EL. Platypezidae. In: McAlpine JF, eds. Manual of Nearctic Diptera. 1st ed. Ottawa: Agriculture Canada; 1981. p. 681-688.
- [34] Shatalkin AI. New and little-known Palaearctic Diptera of the families Platypezidae, Psilidae, and Lauxaniidae. *Russian Entomology Journal*. 1993; 1: 59–74.
- [35] Grimaldi DA, Cumming JM. Brachyceran Diptera in Cretaceous ambers and Mesozoic diversification of the Eremoneura. *Bulletin of the American Museum of Natural History*. 1999; 239: 1–124.
- [36] Mostovski MB. New representatives of Platypezidae (Diptera) from the Mesozoic and main directions in the evolution of the family. *Paleontological Museum Zurich*. 1995; 2: 106–118.
- [37] Zhang JF. Four new genera of Platypezidae. *Acta Palaeontologica Sinica*. 1987; 26: 595–603.
- [38] Chandler PJ. The Oriental and Australasian species of Platypezidae (Diptera). *Invertebrate Taxonomy*. 1994; 8(2): 351 - 434.
- [39] Kessel EL, Clopton JR. The Platypezidae of the Ethiopian zoogeographic region, with descriptions of new species and a new genus (Diptera). *Wasmann Journal of Biology*. 1970; 28(1): 47-167.
- [40] Tkoč M, Tóthová A, Ståhls G, Peter J, Chandler JV. Molecular phylogeny of flat-footed flies (Diptera: Platypezidae): main clades supported by new morphological evidence. *Zoologica Scripta*. 2017; 46(4): 429-444.
- [41] Silva Neto CQ. Diversity of Diptera (Insecta) - in a single point - in the Inhamum Ecological Reserve, Municipality of Caxias, State of Maranhão, Brazil. [Internet]. São Luís: Universidade Estadual do Maranhão; @ 2017 [cited 2024 Apr 07]. Available from https://sis.sig.uema.br/sigaa/public/programa/noticias_desc.jsf?lc=pt_BR&id=939¬icia=8807621.
- [42] Resh VH, Carde RT. *Encyclopedia of Insects*. 1st ed. New York: Academic Press. 2009.
- [43] Lonsdale O. Family groups of Diopsoidea and Nerioidea (Diptera: Schizophora)-Definition, history, and relationships. *Zootaxa*. 2020; 4735 (1): 1–177.
- [44] Papp L. Some acalyptrate flies (Diptera) from Taiwan. *Acta Zoologica Academiae Scientiarum Hungaricae*. 2005; 5: 187–213.
- [45] Braga IS. Diversity and taxonomy of Nerioidea (Diptera, Schizophora) in Atlantic Forest and Caatinga Areas of the state of Paraíba [Internet]. João Pessoa: Universidade Federal da Paraíba; @ 2017 [cited 2024 Apr 07]. Available from <https://repositorio.ufpb.br/jspui/bitstream/123456789/12777/1/Arquivototal.pdf>.

- [46] Buck M, McAlpine DK. Pseudopomyzidae (Pseudopomyza flies). Manual of Central American Diptera. 2010; 2: 821–825.
- [47] Carvalho-Filho FS, Esposito MC. Redescription of *Pseudopomyzella flava* Hennig (Diptera: Cypselosomatidae) and the first record from Brazil. Biota Neotropica. 2011; 11(1): 195-197.
- [48] Carvalho-Filho FS, Esposito MC. Redescription of *Pseudopomyzella* Hennig (Diptera: Cypselosomatidae) and first record from Brazil. Biota Neotropica. 2011; 11: 1–3.
- [49] Marques DWA, Rafael JA. *Latheticomyia* Wheeler (Diptera: Pseudopomyzidae) from Peru: new species, description of the male of *L. longiterebra* Hennig and a key to species. Zootaxa. 2016; 4093(3): 424–434.
- [50] Chandler PJ. *Pseudopomyza atrimana* (Meigen) (Diptera: Pseudopomyzidae) is a fly of an acalypterate family new to Britain. Proceedings and Transactions of the British Entomological and Natural History Society. 1983; 16: 87–91.
- [51] Brown B, et al. Manual of Central American Diptera. 1st ed. Ottawa: NRC Research Press. 2010.
- [52] Contreras-Ramos, A. Book review: Manual of Central American Diptera. In: Brown BV, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado M, eds. Ottawa: National Research Council of Canada; 2010. p. 65–67.
- [53] Rafael JA, Melo GAR, Carvalho CJB, Casari AS, Constantino R. Insects from Brazil: diversity and taxonomy. 1st ed. Ribeirão Preto: Editora Holos. 2012.
- [54] Zumbado MA. Diptera of Costa Rica and the New World tropics =Diptera of Costa Rica and the New World tropics. 1st ed. Santo Domingo de Heredia: National Institute of Biodiversity. 2006.
- [55] Wolff M. Insects of Colombia. 1st ed. Medellín: Author's publication. 2006.
- [56] Oosterbroek P. The European Families of the Diptera: Identification, diagnosis, biology. 1st ed. Utrecht. KNNV Publishing. 2006.
- [57] Andrade R, Gonçalves AR. Acartophthalmidae, Pseudopomyzidae, and Xylomyidae –Three families of Diptera new to the Portuguese Fauna. Bulletin of the Aragonese Entomological Society. 2014; 54: 167–170.
- [58] Belgers D. A new location of *Pseudopomyza atrimana* (Meigen, 1830) in the Netherlands. New locality of *Pseudopomyza atrimana* (Meigen, 1830) in the Netherlands. The Fly Swatter. 2010; 2: 26-27.
- [59] Roháček J. A new record of the mass occurrence of *Pseudopomyza atrimana* (Meigen), with notes on the probable breeding habitat of the species (Diptera: Pseudopomyzidae). Journal of the Museum of Silesia Natural Sciences. 2012; 61(1): 3-10.
- [60] Buck M, McAlpine DK. Pseudopomyzidae. In: Brown BV, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA, eds. Manual of Central American Diptera. 2nd ed Ottawa: NRC-CNRC; 2010. p. 821-825.

[61] Yau T, Marshall SA. Pseudomyza (Pseudomyzidae) versus the Limosininae (Sphaeroceridae) parallel systematics studies and insights into acalyptrate diversity [Internet]. Windhoek: Advances in Neotropical Dipterology, Abstract volume, International Congress of Dipterology; @ 2018 [cited 2024 Apr 07]. Available from https://www.uoguelph.ca/nadsfly/ICD/ICD9/ICD9_Abstract_volume.pdf.