

Occurrence of the Scenopinidae Family in animal droppings (Insecta: Diptera)

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Abstract

In general, Scenopinidae larvae colonize the sandy soils of arid environments or bedding and feed by preying on other terrestrial arthropods. However, they can often be found, always as predators, in other habitats, such as wood and other decaying organic substrates, burrows and nests of mammals and birds, and sometimes in domestic environments. The objective of this manuscript is to carry out a survey of the ethology and bioecology of the Scenopinidae Family (Insecta: Diptera). The research was carried out in studies related to quantitative aspects taxonomic and conceptual aspects. A literature search was carried out containing articles published from 1923 to 2022. The mini review was prepared in Goiânia, Goiás, from September to October 2021, through the Biological Abstract, Periodicals Capes and Scielo.

Keywords: Larvae; Predator; Organic substrates; Nests of mammals; Domestic environments

1. Introduction

Scenopinidae Westwood, 1840, is a cosmopolitan family of insects of the order Diptera (Brachycera: Asiloidea), including over 400 species. These are known, in English, as common window flies. This name refers to the particular behavior of adults *Scenopinus fenestralis* Linnaeus, 1758, whose larvae often develop in domestic environments, and flickering adults generally tend to bake on the windows inside houses (Figures 1, 2, 3 and 4) [1,2].



Source: <https://elp.tamu.edu/ipm/bugs/order-diptera-flies/family-scenopinidae-window-flies/diptera-scenopinidae-prorates-window-flies-b/>

Figure 1 Specimen of Scenopinidae Family

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Source: <https://elp.tamu.edu/ipm/bugs/order-diptera-flies/family-scenopinidae-window-flies/diptera-scenopinidae-prorates-window-flies-b/>

Figure 2 Specimen of Scenopinidae Family



Source: <https://elp.tamu.edu/ipm/bugs/order-diptera-flies/family-scenopinidae-window-flies/diptera-scenopinidae-prorates-window-flies-b/>

Figure 3 Specimen of Scenopinidae Family

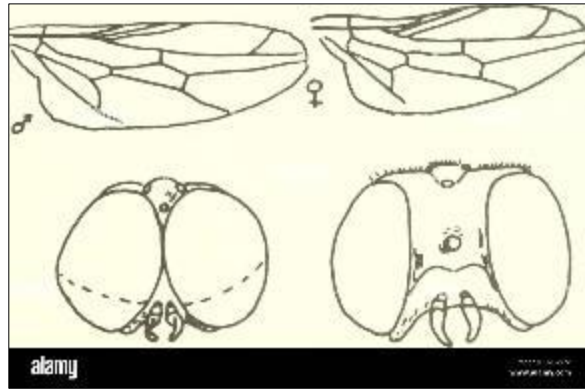


Source: <https://elp.tamu.edu/ipm/bugs/order-diptera-flies/family-scenopinidae-window-flies/diptera-scenopinidae-prorates-window-flies-b/>

Figure 4 Specimen of Scenopinidae Family

1.1. Description

Adults are small insects, usually with a body no more than 5 mm long, without hair or moderately hairy and with a blackish pound. The head is holoptic in most males, dicoptic in females, with three eyes. The antennae are composed of three articles, with a long flagellum and provided with small scraps. The buccal apparatus is of the sucking type, with a very short lower lip, fleshy at the tip and 1-2 segmented maxillary palps (Figure 5) [3,4].



Source: https://www.researchgate.net/publication/322406106_Scenopinidae_Window_Flies

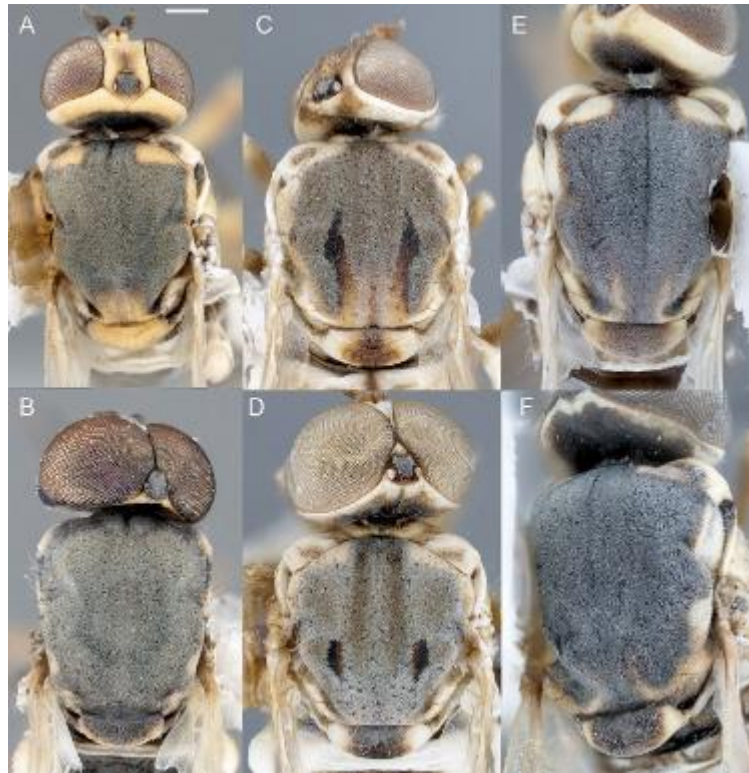
Figure 5 Male. Unknown. Length: Female body 3.4 mm. wing 2

The thorax is moderately convex, with the mesoscut provided with hairs in the Proratinae. The legs are short and have tarsi without arolium and empodium. The wings are folded over the abdomen, at rest and overlap each other. The abdomen is broad, cylindrical or flattened, consisting of seven apparent urites in males and eight in females (Figures 6, 7, 8A, 8B and 9) [5,6].



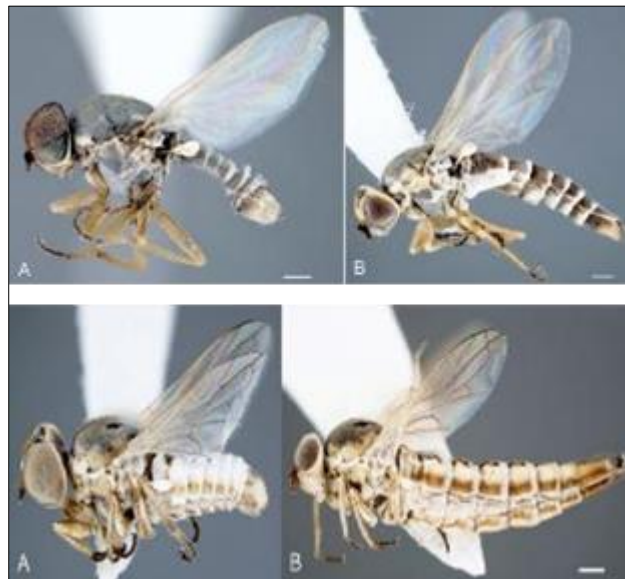
Source Shaun L, Winterton S, Gaimari D. Revision of the South American window fly genus *Heteromphrale* Kröber, 1937 (Diptera, Scenopinidae). ZooKeys. 2001; 39-57

Figure 6 A female head, anterior view B male head, anterior view; *Heteromphrale chilensis* Kroeber, 1928: C female head, anterior view D male head, anterior view; *Heteromphrale cyanops* (Edwards, 1932): E female head, anterior view, F male head, anterior view



Source: Shaun L, Winterton†, S, Gaimari D. Revision of the South American window fly genus *Heteromphrale* Kröber, 1937 (Diptera, Scenopinidae). *ZooKeys*. 2001; 39-57

Figure 7 A female thorax, dorsal view B male thorax, dorsal view; *Heteromphrale chilensis* Krober, 1928: C female thorax, dorsal view, D male thorax, dorsal view; *Heteromphrale cyanops* (Edwards, 1932): E female thorax, dorsal view, F male thorax, dorsal view



Source: Shaun L, Winterton†, S, Gaimari D. Revision of the South American window fly genus *Heteromphrale* Kröber, 1937 (Diptera, Scenopinidae). *ZooKeys*. 2001; 39-57

Figure 8A A male, lateral view; B female, lateral view. **Figure 8B:** A male, lateral view, B female, lateral view



Source: Shaun L, Winterton†, S, Gaimari D. Revision of the South American window fly genus *Heteromphrale* Kröber, 1937 (Diptera, Scenopinidae). *ZooKeys*. 2001; 39-57

Figure 9 *Heteromphrale* spp., female terminalia: *Heteromphrale blanca* sp. n.: A dorsal view B lateral view, C ventral view; *Heteromphrale chilensis* Kroeber, 1928: D dorsal view E lateral view, F ventral view; *Heteromphrale chilensis* Kroeber, 1928 (Edwards): G dorsal view H lateral view and ventral view

The wing coast differs substantially from that of Therevidae for the number of branches of the average, reduced to 2 or 3 and from that of Bombyliidae for the simpler morphology of the radial system. In most families, the rib stops at the tip of the wing, at the end of R 5 or M 1. An exception is the genus *Caenotus*, in which it extends along the entire margin (Figure 10) [7,8].

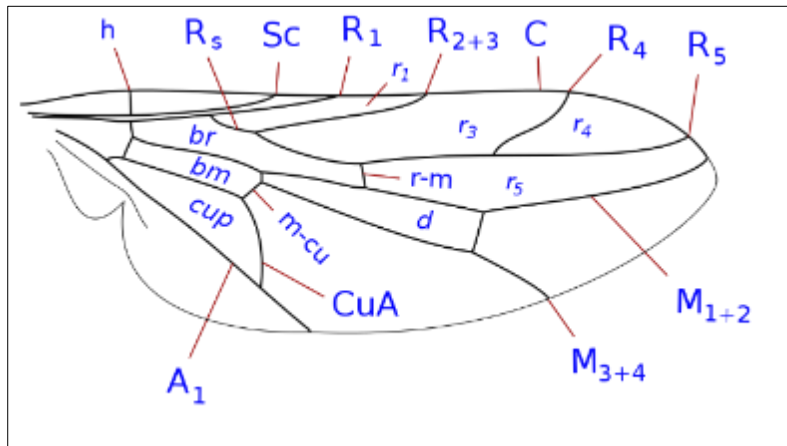


Source: <https://elp.tamu.edu/ipm/bugs/order-diptera-flies/family-scenopinidae-window-flies/diptera-scenopinidae-scenopinus-window-flies-female-e/>

Figure 10 Your fly is *Scenopinus* sp., in the *Scenopinus velutinus* (Kroeber, 1913) species group. Some female *Scenopinus* have a somewhat elongate abdomen, as in your specimen

The radio is divided into four branches, with R 2 + 3 undivided. The entire radial system is positioned in correspondence with the front half of the wing, without exceeding the axis connecting the base of the tip. R 1 and R 2 + 3 are relatively short and converge on the costal margin at a short distance from each other. R 4 terminates at the costal margin, R 5

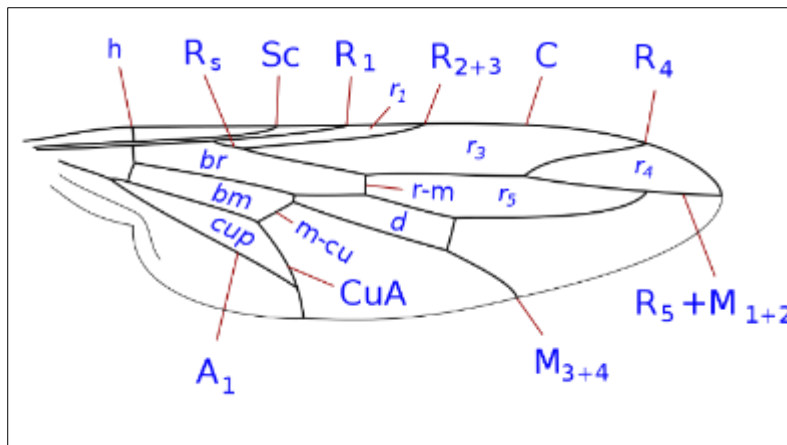
terminates before the tip of the wing or, in some genera, at the apex (e.g., but R 5 may also converge at the apex (*Cyrtosarthe* and *Pseudatrichia*) (Figure 11) [9,10].



Source: <https://en.wikipedia.org/wiki/Scenopinidae>

Figure 11 Diagram of wing veins in subfamily Scenopininae, p.a. *Scenopinus*

The average is divided into two or three branches. M 1 is always present and usually goes forward, merging on the edge forward or in correspondence with the tip of the wing (e.g. *Scenopinus*, *Prepseudatrichia*, *Caenotinae* and *Proratinae*); in most genera Scenopininae, it flows into R 5, closing the first posterior cell, while in *Cyrtosarthe* it flows into the posterior margin; Finally, in some Australian species, belonging to the genera *Scenopinus* and *Rekiella*, M 1 is incomplete and does not reach the edge. M 2 is generally missing Scenopininae, while it is present in *Proratinae*, *Cyrtosarthe* and *Caenotus* and flows into the posterior margin. In these genera, the M 1 + 2 bifurcation coincides with the anterior distal apex of the disc cell or is located distal to the cell. M 3 is absent in the whole family, M 4 is always present, but in *Seguyia* it is incomplete and does not reach the edge (Figure 12) [10,11,12].



Source: <https://en.wikipedia.org/wiki/Scenopinidae>

Figure 12 Diagram of wing veins in some windows flies of subfamily Scenopininae, p.a. *Pseudatrichia* or *Metatricha*

1.2. Biology

In general, Scenopinidae larvae colonize the sandy soils of arid environments or bedding and feed by preying on other terrestrial arthropods. However, they can often be found, always as predators, in other habitats, such as wood and other decaying organic substrates, burrows and nests of mammals and birds, and sometimes in domestic environments (Figure 13).



Source: <https://www-test.cdpa.ca.gov/plant/ppd/entomology/scenopinidae.html>

Figure 13 Copula: Scenopinidae Family

The latter habit, derived from a secondary adaptation to anthropization, is common in some species of the genus *Scenopinus*. In this case, the larvae prey on insects that infest clothing (moths), food (moth larvae and beetles), wood (woodworms) or even animal parasites associated with humans or domestic animals, such as mites and fleas.

Adults have a glyciphagous diet and feed on nectar and honey. The occurrence of Scenopinidae (*Scenopiridus* sp.) in excrements is due to the presence of fungi and larvae and other insects. Scenopinidae larvae are predators and feed on a variety of insects (Figures 14 and 15) [12,13,14,15].

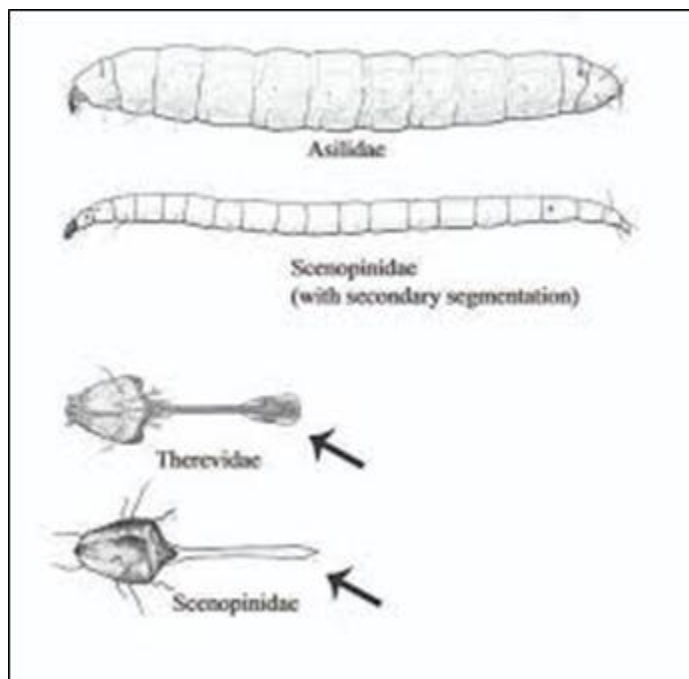


Source: <https://bugguide.net/node/view/469708>

Figure 14 Larvae of Scenopinidae Family

Figure 15 Larvae of Scenopinidae Family. Here just some pics how to distinguish Therevidae and Scenopinidae larvae. The larvae of both families have a secondary segmentation, they have more "visible" segments than the close related Asilidae for example and are therefore very easy to identify. Therevidae are different from Scenopinidae by the shape of the so-called metacephalic rod

Source: <https://bugtracks.wordpress.com/2013/01/10/life-in-an-old-phoebe-nest/>



Source: <https://bugguide.net/node/view/469708>

Figure 15 Larvae of Scenopinidae Family

1.3. Distribution

The family, although it has a limited number of species, is cosmopolitan and is present in all zoogeographic regions of the planet, with a higher degree of biodiversity in the arid or semi-arid regions of the warm and tropical temperate belt (Figure 16) [13,14,15,16].



Source: <https://inaturalist.ca/taxa/248099-Scenopinus>

Figure 16 *Scenopinus fenestralis* Linnaeus, 1758 and *Scenopinus glabrifrons* Meigen, 1824

For most families, individual species have fairly limited areas, but four species associated with anthropogenic environments have become cosmopolitan through the exchange of goods. These are *Scenopinus fenestralis* Linnaeus, 1758 and *Scenopinus glabrifrons* Meigen, 1824, of European origin, *Scenopinus lucidus* Becker, 1902, of African origin and *Scenopinus papuanus* (Kröber, 1912), of Indo-Malaysian-Australasian origin. [13,14,15,16].

In Europe there are only two genera, with a single species reported in Spain, and *Scenopinus*, represented in different regions, from the Mediterranean Sea to Scandinavia, to Russia (Figure 17) [13,14,15,16].



Source: <https://www.biodiversidadvirtual.org/insectarium/Scenopinus-glabrifrons-img1223666.html>

Figure 17 *Scenopinus papuanus* (Kröber, 1912)

Four species are reported in Italy, all belonging to the genus *Scenopinus*: in addition to the cosmopolitan *S. fenestralis* (absent in Sardinia) and *Scenopinus glabrifrons* (absent in northern Italy), *Scenopinus albicinctus* (Rossi, 1794) and *Scenopinus niger* (De Geer, 1776) are also reported (Figure 18) [13,14,15,16]

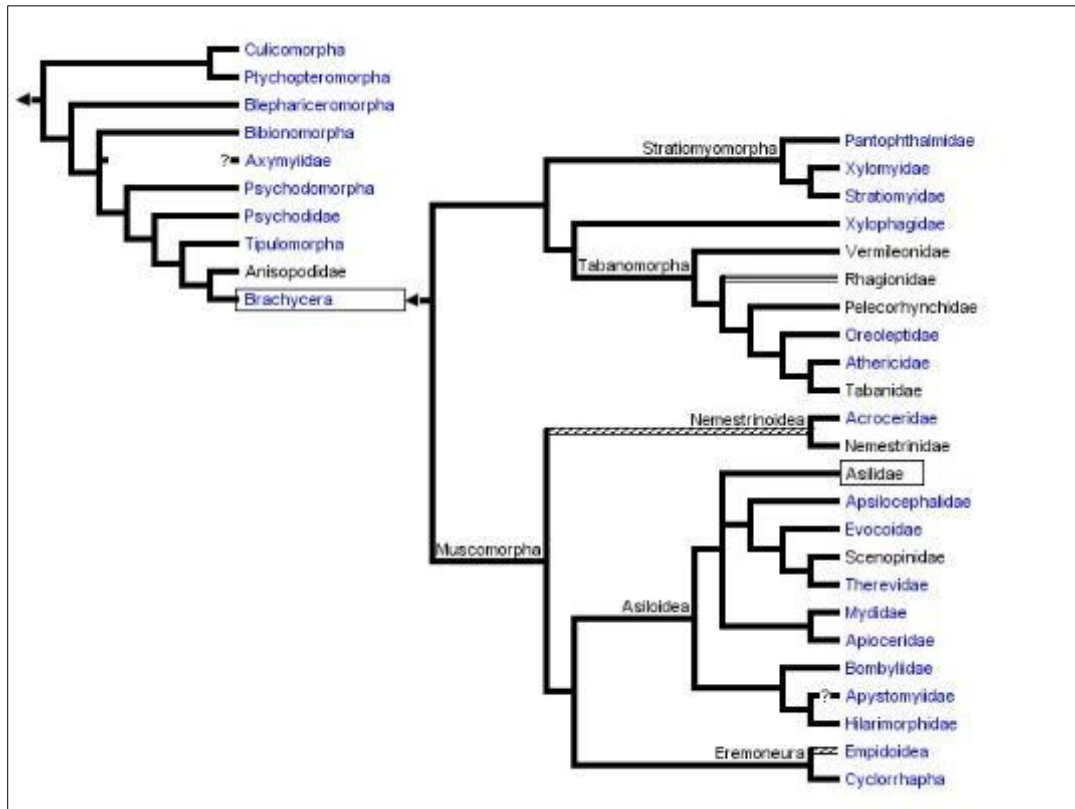


Source: <https://zookeys.pensoft.net/article/70085/>

Figure 18 *Scenopinus albicinctus* (Rossi, 1794) and *Scenopinus niger* (De Geer, 1776) and *Scenopinus glabrifrons* Meigen, 1824

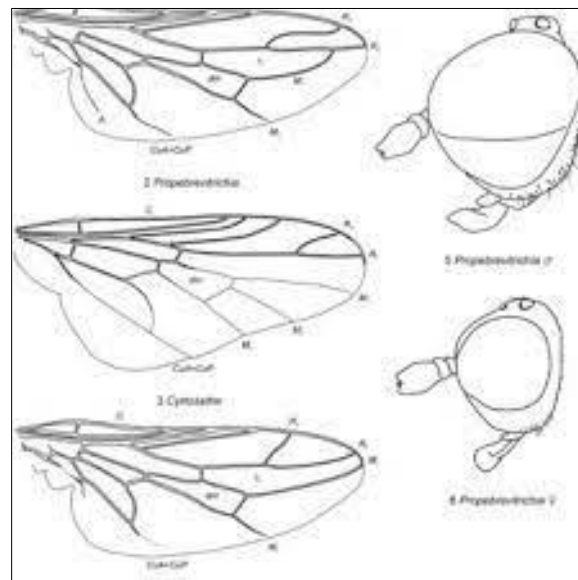
1.4. Taxonomy, Systematics and phylogeny

Phylogenetically, Scenopinidae are related to the Therevidae family and are therefore placed in the Terevoid clade. Although knowledge is still developing, the family is said to be identified in a monophyletic clade positioned as a separate line from Therevidae sensu stricto after the disjunction of Apsilocephalidae and *Evocoa chilensis* (Yeates, Irwin & Wiegmann, 2003) (Asiloidea) (Figures 19 and 20) [17].



Source: <https://www.nhm.ac.uk/natureplus/blogs/diptera-blog/2015/04/30.1.html>

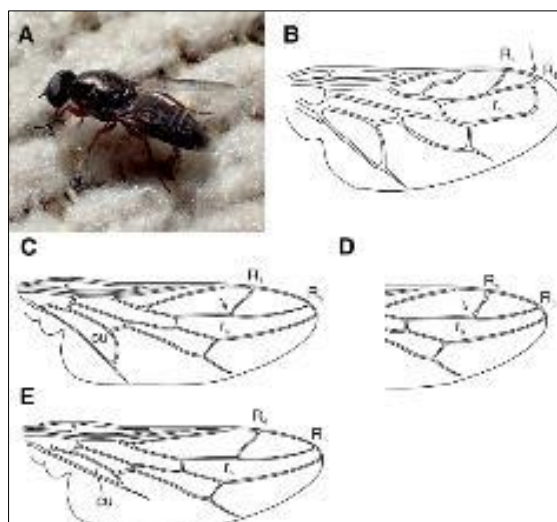
Figure 19 Phylogenetic arrangement of Diptera showing the more advanced Brachycerans and the position of the Asilidae (robberflies) within it



Source: file:///C:/Users/User/Downloads/Winterton2017SCENSuricata5-50-SCENOPINIDAE-1209to1219.pdf

Figure 20 Wings and heads of Scenopinidae: (2) wing of *Propebrevitrichia* sp.; (3) same, *Cyrtosathe kirkspriggsi* Winterton & Metz, 2005 (4) same, *Prepseudatrichia* sp.; (5) male head of *Propebrevitrichia serowensis* Winterton, 2005, lateral view; (6) same, female

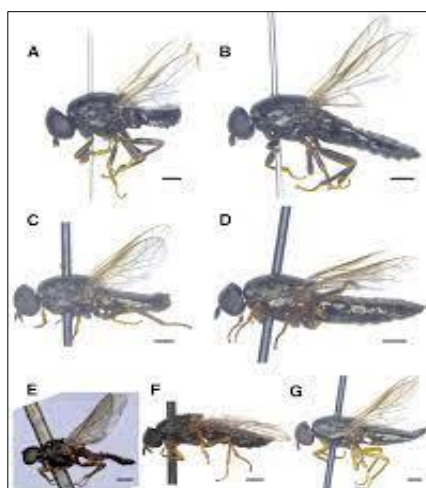
In the past, the family Scenopinidae identified with the current subfamily of Scenopininae, while the other genera known then were classified in different systematic positions, suffering, throughout history, some displacements. *Prorates* was described and classified among Empididae and *Caenotus* was described and classified among Therevidae (Figure 21) [18].



Source: Photograph by J. Pohjoismäki B, Narchuk (1988). Modified from Winterton and Gaimari (2017). Drawn after Kelsey (1969). Photograph by J. Pohjoismäki

Figure 21 Identification of Scenopinidae A male *Scenopinus fenestralis* Linnaeus, 1758. Hanko, Note the three stripes on the abdomen caused by the white integument protruding between the tergites. These should not be confused with white bands of microtomentum on tergites of some *Scenopinus* species. B illustration of *Caenoneura* wing. Arrow pointing the petiole on r5. C generic *Scenopinus* wing. D wing venation in albicinctus-group with R4 branching from R5 beyond the middle of cell r5 (arrow; compare with C) E Wing of *Scenopinus griseus* (Kröber, 1913) (Kröber) with narrow cu cell

Later, moved the two genera to Bombyliidae, within the subfamily Heterotropinae. In the same subfamily, classified the genus *Caenotoides*. Moved some *Prorates* into the new genus *Alloxytropus*, described the subfamily *Proratinae*, again in Bombyliidae, and moved the genera *Alloxytropus*, *Caenotoides*, *Caenotus*, and *Prorates*, including the genus *Apystomyia*. The following year a significant revision, moving the entire subfamily, except the genus *Apystomyia*, into the family Scenopinidae, defining the subfamilies Caenotinae and Proratinae and placing *Caenotus* in the first and other genera of the second, respectively, previous reviews and included two recently described genera, *Acaenotus* and *Jackhallia*, among Proratinae. Finally, in more recent times, described the new genus *Cyrtosarthe*; however, having intermediate characters between Proratinae and Caenotinae, the genus finds colocation in the family as incertae sedis (Figure 22) [20,21].



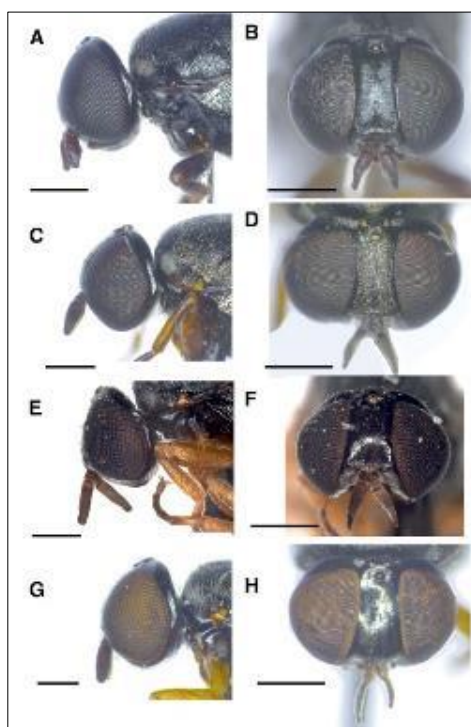
Source: Photograph by D. Schimroszyk and Photograph by Susanne Leidenroth. Pohjoismäki J, Haarto A. *Scenopinus jerei*, a new species of window fly (Diptera, Scenopinidae) from Finland. ZooKeys. 2021; 1059: 135-156

Figure 22 Habitus of northern European *Scenopinus fenestralis* Linnaeus, 1758 group species of Scenopinidae A holotype male of *Scenopinus jerei* Pohjoismäki & Haarto 2021, Finland B paratype female of *S. jerei*, Finland C male of *S. fenestralis*, Finland D female of *S. fenestralis*, Finland E male of *Scenopinus vitripennis* Meigen, 1824, Germany. F female of *S. vitripennis*, Warszawa, Poland. G female of *Scenopinus glabrifrons* Meigen, 1824

In light of recent reviews, the internal systematics of Scenopinidae includes three subfamilies, in which 24 genera are distributed and another genus incertae sedis. In general, more than 420 species are described, most belonging to the subfamily Scenopininae:

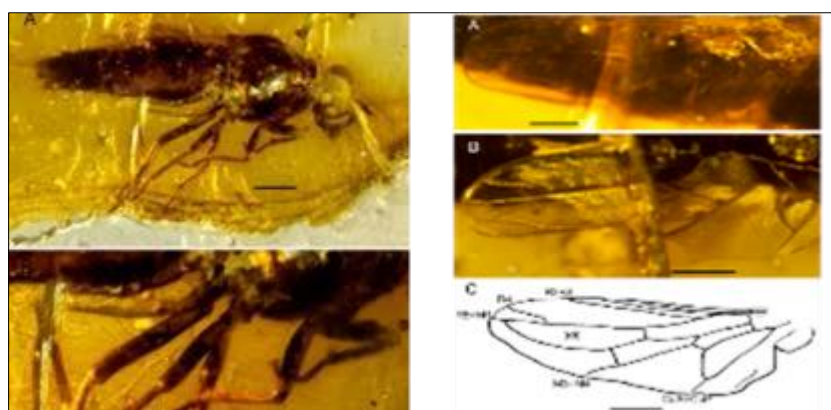
Subfamily Caenotinae. Genus: *Caenotus*.

Subfamily Proratinae. Genus: *Acaenotus*, *Alloxytropus*, *Caenotoides*, *Jackhallia* and *Prorates* (Figure 23)



Source: Photograph D. Schimroszyk

Figure 23 Female heads of *Scenopinus* species A lateral view of paratype *Scenopinus jerei* Pohjoismäki & Haarto 2021, November, female head B frontal view of paratype *S. jerei*, head C lateral view of *Scenopinus fenestralis* Linnaeus, 1758, female head D frontal view of *Scenopinus vitripennis* Meigen, 1824, female head E lateral view of *S. vitripennis* female head, F frontal view of *S. vitripennis* female head. G lateral view of *Scenopinus glabrifrons* Meigen, 1824, female head H frontal view of *S. glabrifrons* female head.



https://www.researchgate.net/publication/299372634_The_oldest_accurate_record_of_Scenopinidae_in_the_Lowermost_Eocene_amber_of_France_Diptera_Brachycera

Figure 24 *Eocenotrichia magnifica* gen. et sp. nov., holotype PA 16841. A. general habitus; B. legs; C. antenna (scale bars represent 1 mm for A, B, 0.1 for C). *Eocenotrichia magnifica* gen. et sp. nov., holotype PA 16841, left wing. A. general view; B. detail of apex; C reconstruction

Subfamily Scenopininae. Genus: *Belosta*, *Brevitrichia*, *Caenoneura*, *Heteromphrale*, *Irwiniana*, *Metatrachia*, *Neopseudatrachia*, *Paramonova*, *Paratrachia*, *Prepseudatrachia*, *Propebrevitrichia*, *Prorarites*, *Pseudatrachia*, *Pseudomphrale*, *Riekiella*, *Scenopinus* and *Stenya*.

Incertae sedis. Genre: *Cyrtosarthe* (Figures 24 and 25).



Source: <https://www.mapress.com/pe/article/view/palaeoentomology.3.5.6>

Figure 25 The oldest record of window fly supports a Gondwanan origin of the Family (Diptera: Scenopinidae)

Only one fossil species is known, *Metatrachia pria* Yeates & Grimaldi, 1993, dating from the Cenozoic era [20,21,22,23,24].

Objective

The objective of this manuscript is to carry out a survey of the ethology and bioecology of the Scenopinidae Family (Insecta: Diptera).

2. Methods

The method used to prepare this mini review was Marchiori 2021 methodology [25].

3. Studies conducted and selected

3.1. Study 1

3.1.1. Family Scenopinidae

Family consisting of approximately 60 species. The adults (flies) measure between 2 and 7 mm; they are generally black, prominent thorax, short antennae. When at rest, the wings fold or stay in position one on top of the other. The larvae are vermiform, thin, long, with an elongated head, covered with a hard and elastic cuticle [26,27,28,29].

3.1.2. Species



Source: Manuel Lopez

Figure 26 *Scenopinus fenestralis* Linnaeus, 1758

Scenopinus fenestralis Linnaeus, 1758 (window fly) (Figure 26).

3.1.3. Description

The adult is a black fly, 3 to 6 mm long, the thorax is covered with grayish-yellow hairs, the abdomen is dark and flattened, and the legs are grayish with brown femurs (Figure 27).



Source: <https://eol.org/pages/738015>

Figure 27 *Scenopinus fenestralis* Linnaeus, 1758

The larva has no legs, is elongated and measures up to 20 mm when fully developed; yellowish white in color and with very active movements. The abdominal segments are subdivided and give the impression that there were around 17, this allows them to be differentiated from other more or less similar larvae.

3.1.4. Food

Predator of larvae and pupae of weevils and moths (moths) (Figure 28).



Source: <https://bugtracks.wordpress.com/tag/scenopinidae/>

Figure 28 Larva of *Scenopinus fenestralis* Linnaeus, 1758

3.1.5. Distribution

All over the world

3.1.6. Biology

Like all Diptera, it undergoes complete metamorphosis. The adult usually perches on the windows of the mills or the buildings of warehouses and silos. The larva is generally found in accumulations of flour or grain dust from mills, silos, and warehouses.

Importance. It is considered a beneficial insect due to its predatory action on other insects that damage grains and stored products, although its biological control action is not enough to reduce their populations [26,27,28, 29].

3.2. Study 2

The Iberian Peninsula was represented, until now, by 9 species of the Scenopinidae family. Of these, only 2 had been cited from mainland Portugal.

In this note these numbers are increased to ten and four, respectively, thanks to the recent material of this family captured by the second author (RA leg.). The material consists of only 54 specimens and, although only two species have been identified (MC-T det.), they have turned out to be very interesting.

Therefore, they are cited and commented on below. The material is preserved in alcohol (70%) in the collections of both authors.

3.2.1. *Scenopinus lesinensis* Strobl, 1902 (Figure 29).



Source: Louis Weitten: France: Distroff: 57925: 30/06/2016 Altitude: 206 m - Size: 6 to 7 mm Ref.: 166113. Louis Weitten: France: Distroff: 57925: 06/30/2016 Altitude: NR - Size: 6 to 7 mm Ref.: 166117

Figure 29 Pupae and adults of the species *Scenopinus lesinensis* Strobl, 1902

Portugal: Porto: Massarelos, 25.6.2010 1 female, 7.6.2011, 1 female, 11.7.2011, 1 female.

This species was only known from Austria and Yugoslavia (Croatia), so it is now reported for the first time from Portugal (and the Iberian Peninsula), and consequently the geographical distribution of this species is considerably extended towards Western Europe.

3.2.2. *Scenopinus verrucosus* Carles-Tolrá, 2001 (Figure 30).



Source: <https://naturdata.com/especie/Scenopinus-verrucosus/40502/0/>

Figure 30 *Scenopinus verrucosus* Carles-Tolrá, 2001

Portugal: Vila Nova de Gaia: Canidelo, 29.6.2001, 36 males, 2 females (RA coll.), 13.7.2011, 9 males, 4 females (MC-T coll.).

All captured by mango on the banks of the Duero River estuary. This species was described from the province of Zaragoza (Carles-Tolrá, 2001) and had recently been recaptured in the Region of Murcia. Therefore, it was only known from Spain, which means that these new captures represent the first record of this species for Portugal, significantly expanding its peninsular distribution to the west [30,31,32,33,34,35].

3.3. Study 3

The Neotropical region has a poor fauna of Scenopinidae; only 22 species in 6 genera. *Metatrichia robusta* Kröber, 1914, shows a discontinuous distribution; is represented by only one species in the Neotropics, *M. robusta* recorded so far from southern South America, Paraguay, Argentina and Brazil (Figure 31)



Source: <https://www.mapress.com/zootaxa/2009/f/zt02094p051.pdf>

Figure 31 *Metatrichia robusta* Kröber, 1914

There is no information available about the habit of Scenopinidae species that occur in this region, which is why the annual occurrence of *M. robusta* in an area near Manaus, Amazonas.

The catches of *M. robusta* were carried out uninterruptedly from September/78 to August 1979 in Malaise traps, at the University Campus of Fundação Universidade do Amazonas (FUA), located in 'periphery of Manaus. the place where they stayed the traps, of swampy terrain, presented low vegetation, with predominance of Graminaea and Cyperaceae (Figure 32).



Source: <https://www.mapress.com/zootaxa/2009/f/zt02094p051.pdf>

Figure 32 *Metatrichia robusta* Kröber, 1914

The distribution of *M. robusta*, the only species of the genus known in the Neotropical region, was restricted to the south of South America. In insect collections carried out near Manaus, more than 25p specimens of *M. robusta* were captured, expanding the distribution of this species to the Amazon and making it possible to record the seasonal occurrence, with higher population density in the dry season (July - December) than in the rainy season (January - June) (Figure 33).

The correlation with precipitation was negative ($r = -0.57$): $p < 0.05$; 10g.1. For this population, there was no significant correlation between relative density and temperature and relative humidity, this in view of the average temperature and relative humidity, average of each month, to be uniform, with little fluctuation during the year (Figure 34).



Source: <https://www.mapress.com/zootaxa/2009/f/zt02094p051.pdf>

Figure 33 *Metatrichia robusta* Kröber, 1914



Source: <https://www.flickr.com/photos/63075200@N07/albums/72157687806390380/>

Winterton S. An unusual new species of *Scenopinus* Latreille (Diptera: Scenopinidae) from Australia. *Zootaxa*. 2008; 1895(1): 8.

Figure 34 *Scenopinus fenestralis* Linnaeus, 1758

All captured adults were females, with little variation in size. Only one specimen performed well. Larger, with a more humped chest. No, we can conclude whether this specimen is of another species, as only one female was collected (Figure 35).



Source: http://www.spessart-fliegen.de/diptera/scenopinidae/scenopinus/scenopinus_niger/scenopinus_niger.html

Figure 35 *Scenopinus niger* (De Geer, 1776)

In other insect collections, in different areas of the Amazon, using various types of traps, this species has never been as abundant as in the location listed above; This is probably related to the type of vegetation and the existing swampy condition at the collection site, perhaps conducive to the development of larvae, apparently predators and aquatic (Figure 36).



Source: http://www.spessart-fliegen.de/diptera/scenopinidae/scenopinus/scenopinus_niger/scenopinus_niger.html

Figure 36 *Scenopinus niger* (De Geer, 1776)

The best-known representative of the family is the cosmopolitan window fly *Scenopinus fenestralis* Linnaeus, 1758, commonly found in artificial homes. In addition to the window fly, another species, *Scenopinus niger* (De Geer, 1776), was also known in Finland [36,37,38].

3.4. Study 4

Only about 420 species of window flies are known, most of them from arid regions of the world. Likewise, Nordic species are associated with dry habitats, such as animal nests, where their larvae feed on other insects. The common window fly can be considered beneficial as its larvae are predators of indoor pests (Figure 37).



Source: <https://zookeys.pensoft.net/article/70085/>

Figure 37 *Scenopinus jerei* sp. nov.

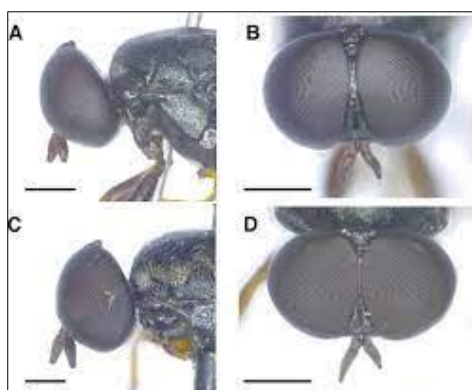
The newly described species lives in hollow bird nests in boreal forest habitats and is common but rare in Finland. The species is so far only known in Finland, but is expected to be found in suitable habitats in adjacent countries as well (Figure 38).



Source: <https://zookeys.pensoft.net/article/70085/>

Figure 38 *Scenopinus jerei* sp. nov.

The existence of a third species of *Scenopinus* in Finland has been known for a few decades, although initially with a mistaken identity. The first person to suspect that the species was new to science was Mr. Jere Kahanpää, a dipteran specialist and digitization manager at the Finnish Museum of Natural History (Figure 39).



Source Krivosheina NP. Taxonomy of fenestralis group species of the genus *Scenopinus* Latr. (Diptera, Scenopinidae). Bulletin of Zoology. 1981; 4: 24–31.

Figure 39 Male heads of *Scenopinus* species A lateral view of holotype *Scenopinus jerei* sp. nov., male head B frontal view of holotype *Scenopinus jerei* sp. nov., head C lateral view of *Scenopinus fenestralis* Linnaeus, 1758 male head D frontal view of *S. fenestralis* male head. For the illustrations of male heads of *Scenopinus vitripennis* Meigen, 1824 and *Scenopinus glabrifrons* Meigen, 1824

As window flies are a little-known group, with few experts even globally, the species' identity has remained unclear for years. However, thanks to a project to increase knowledge of Finnish biodiversity, supported by the Ministry of the Environment of Finland, the work has already been completed and the new species named, as well as formally approved by the scientific community (Figure 40).



Source: Image credit: Pohjoismäki, Haarto, doi: 10.3897/zookeys.1059.70085

Figure 40 Frontal view of male *Scenopinus jerei* sp. nov.

The authors of the work, Jaakko Pohjoismäki and Antti Haarto, named the species *Scenopinus jerei* sp. nov. to recognize the central role of Mr. Jere Kahanpää on his discovery. In addition to the species description, the published article also contains identification keys to determine all European window fly species (Figure 41).



Source: Image credit: Pohjoismäki & Haarto, doi: 10.3897/zookeys.1059.70085

Figure 41 Holotype male of *Scenopinus jerei* sp. nov. From Kouvola, Finland

The fact that a species hitherto unknown to science can be discovered in a relatively species-poor and well-studied Nordic country underscores the fact that local biodiversity is not yet known [39].

4. Conclusion

In general, Scenopinidae larvae colonize the sandy soils of arid environments or bedding and feed by preying on other terrestrial arthropods. However, they can often be found, always as predators, in other habitats, such as wood and other decaying organic substrates, burrows and nests of mammals and birds, and sometimes in domestic environment.

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