

Diversity of the Ulidiidae Family (Insecta: Diptera)

Carlos Henrique Marchiori¹

¹ Instituto Federal Goiano

Funding: No specific funding was received for this work.

Potential competing interests: No potential competing interests to declare.

Abstract

Ulidiidae makes their nests on the ground, making their eggs and young often very vulnerable to predation. They walk steadily on strong legs and big toes, pecking for food as they go. Many have interesting mating displays, such as inflating throat sacs or raising elaborate feather crests. The female lays three to five dark, speckled eggs in a scratch in the ground and incubates them on her own. In addition to the damage caused by the larvae themselves, their activity facilitates the entry of pathogens into plants, which may cause losses of up to 100% of production. They also carry enteric bacteria, being responsible for the transmission of infections. This mini-review aims to describe the Ulidiidae Family. The methodological basis of the present work consists of bibliographical research of scientific articles published in national and international academic scientific journals classified by the Coordination for the Improvement of Higher Education Personnel. The search criterion for articles was to prioritize articles that dealt with the topic. Document analysis was used as a data collection method to gather information on theoretical books, theses banks, university dissertations, scientific journals, documents, and websites:

https://www.researchgate.net/post/How_to_increase_the_research_results_visibility. (<https://goo.gl/gLTTTs>), HAL (<https://hal.archives-ouvertes.fr/submit/index>), SSRN (<https://hq.ssrn.com/login/pubsiginjoin.cfm>) and ResearchGate (<https://www.researchgate.net/signup.SignUp.html>).

Carlos Henrique Marchiori^{1,*}

¹ *Department of Biological Science, Instituto Federal Goiano, Goias, Brazil.*

*** Correspondence to:** *Carlos Henrique Marchiori, PhD, Professor, Department of Biological Science, Instituto Federal Goiano, Rua T-65 No. 1050, Goiânia, Goiás 74230120, Brazil; Email: chmarchiori@yahoo.com.br*

Keywords: Damage, CAPES, Acalypterae, Tephritoidea, Larvae.

1. Introduction

The "picture-winged flies" (Ulidiidae) are one of the larger families of the Diptera superfamily Tephritoidea, numbering approximately 800 species total, about 135 of which are found in the United States or Canada (some uncertainty remains regarding the exact number, due to limited research, taxonomic revisions, and the high number of *Euxesta* Loew). They are a family of acalyptrate flies, generally small to medium, and broadly recognizable by the distinctively patterned wings that grant the family its common name, though this trait is neither universal among nor exclusive to them ^{[1][2][3]}.

1.1. Description

The Ulidiidae (formerly Ottidae) (Acalyptratae, Tephritoidea) are predominantly neotropical dipterans, small to medium (2 to 14 mm), yellow to black in color, may have blue or green iridescence and wings usually spotted (Figures 1-10) ^[4].



Salvador Vitanza, Ph.D.

Figure 1. Diptera-Ulidiidae-*Euxesta*-Picture winged Flies, Female.

Sources: <https://www.biodiversity4all.org/taxa/125458-Ulidiidae> and Photo Katja Schulz



Figure 2. *Tetanops flavescens* Macquart, 1835

Sources: <https://www.biodiversity4all.org/taxa/125458-Ulidiidae> and Photo Jeremy Collison



Figure 3. *Callopistromyia annulipes* (Macquart, 1855)

Sources: Photos Luis Stevens, Katja Schulz and Lorin Timaeus and <https://www.biodiversity4all.org/photos/142070>

TRAITS COMMON TO ULIDIIDAE

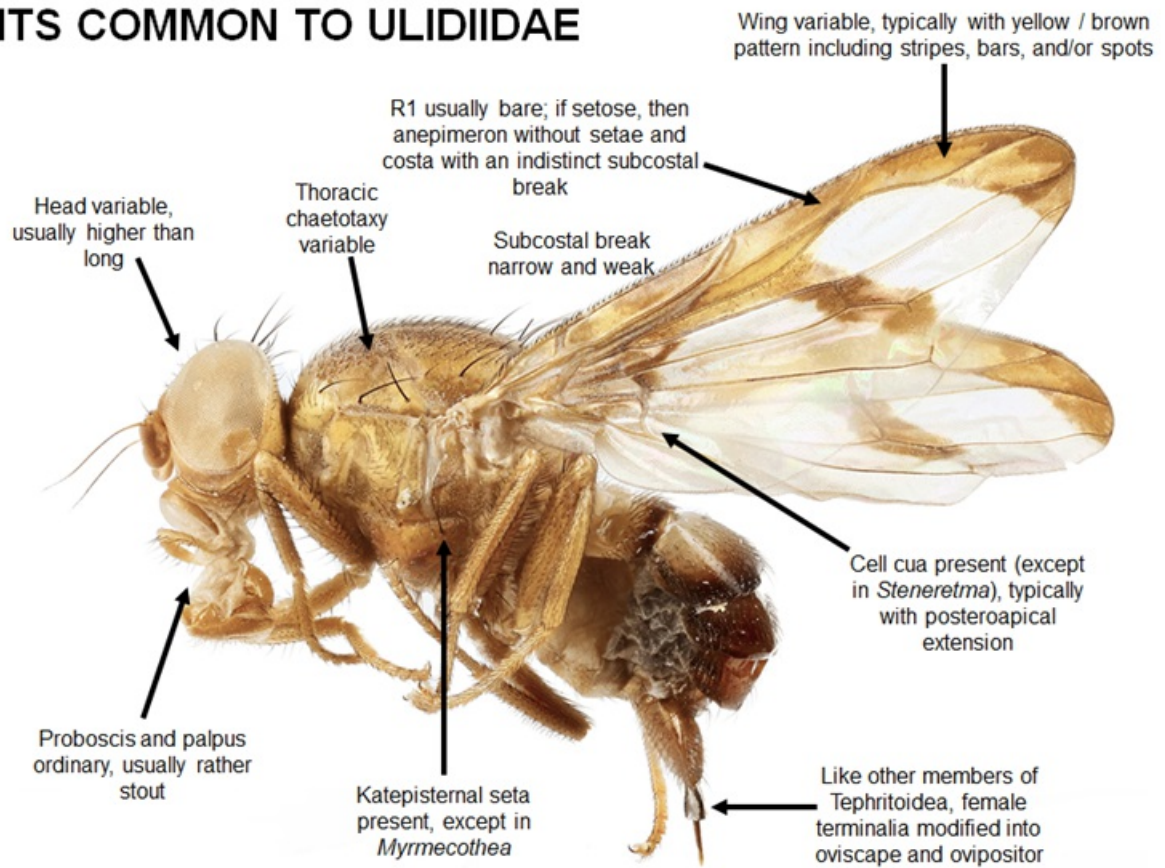


Figure 4. *Xanthacrona bipustulata* Wulp, 1899

Source: <https://cjai.biologicalsurvey.ca/articles/w-45/>

DIRECTIONAL TERMS

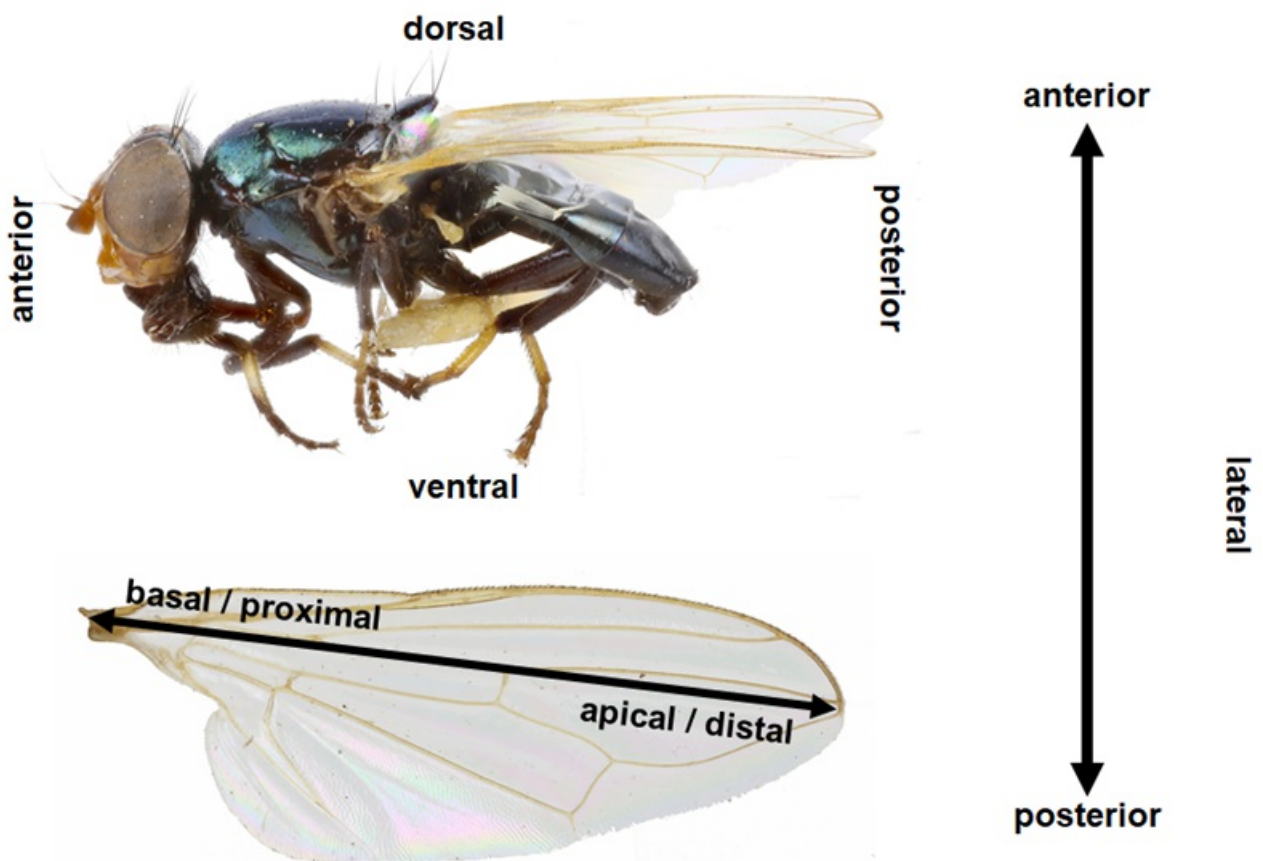


Figure 5. *Physiphora alceae* (Preyssler, 1791) from the Florida State Collection of Arthropods labeled with directional terms used throughout the text. The double-headed arrow indicates directional terms for the dorsal view

Source: <https://cjai.biologicalsurvey.ca/articles/w-45/>

ANTERIOR HEAD

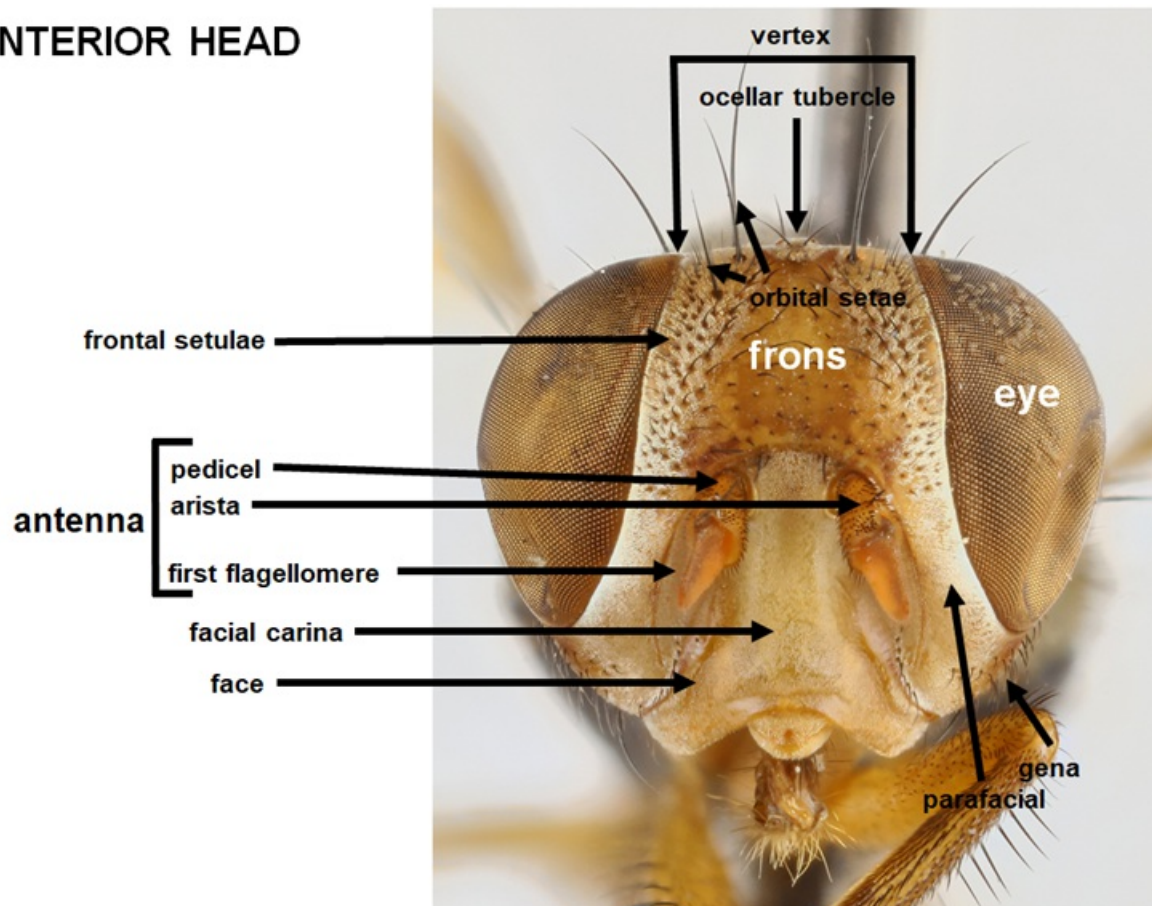


Figure 6. *Ceroxys latiusculus* (Loew, 1873) from the Florida State Collection of Arthropods, labeled with terms for different characters of the head

Source: <https://cjai.biologicalsurvey.ca/articles/w-45/>

LATERAL HEAD

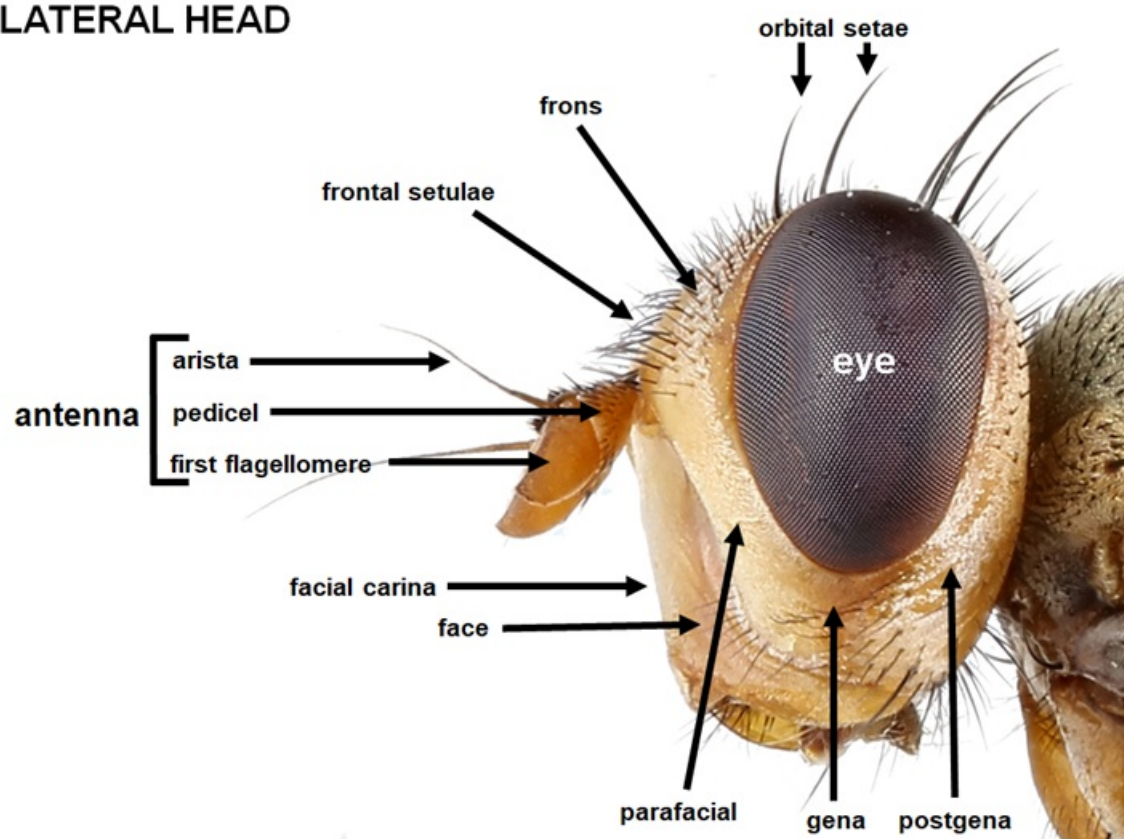


Figure 7. *Ceroxys latiusculus* (Loew, 1873) from the Florida State Collection of Arthropods, labeled with terms for different characters of the head

Source: <https://cjai.biologicalsurvey.ca/articles/w-45/>

DORSAL THORAX

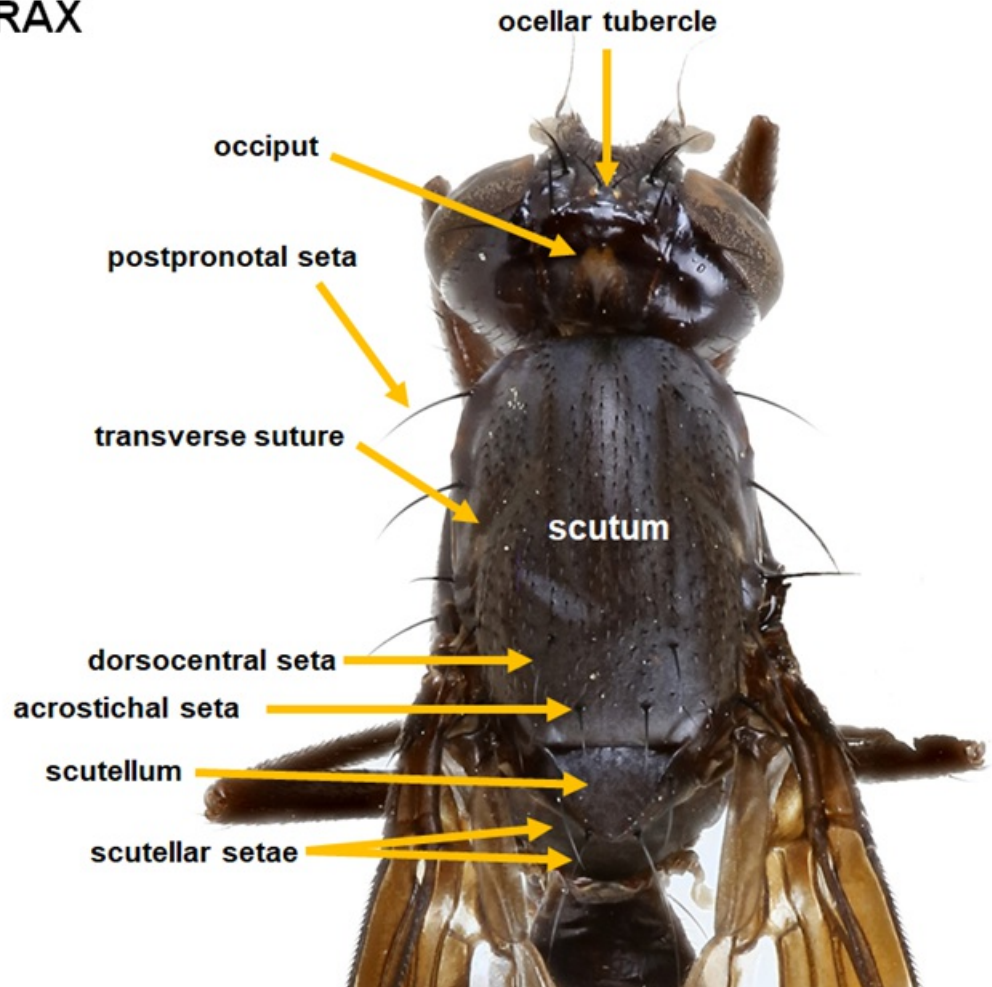


Figure 8. *Tritoxa flexa* (Wiedemann 1830) from the Florida State Collection of Arthropods, with labels for characters visible dorsally

Source: <https://cjai.biologicalsurvey.ca/articles/w-45/>

LATERAL THORAX

postpronotal seta

anepisternal seta

proepisternal seta

katepisternal seta

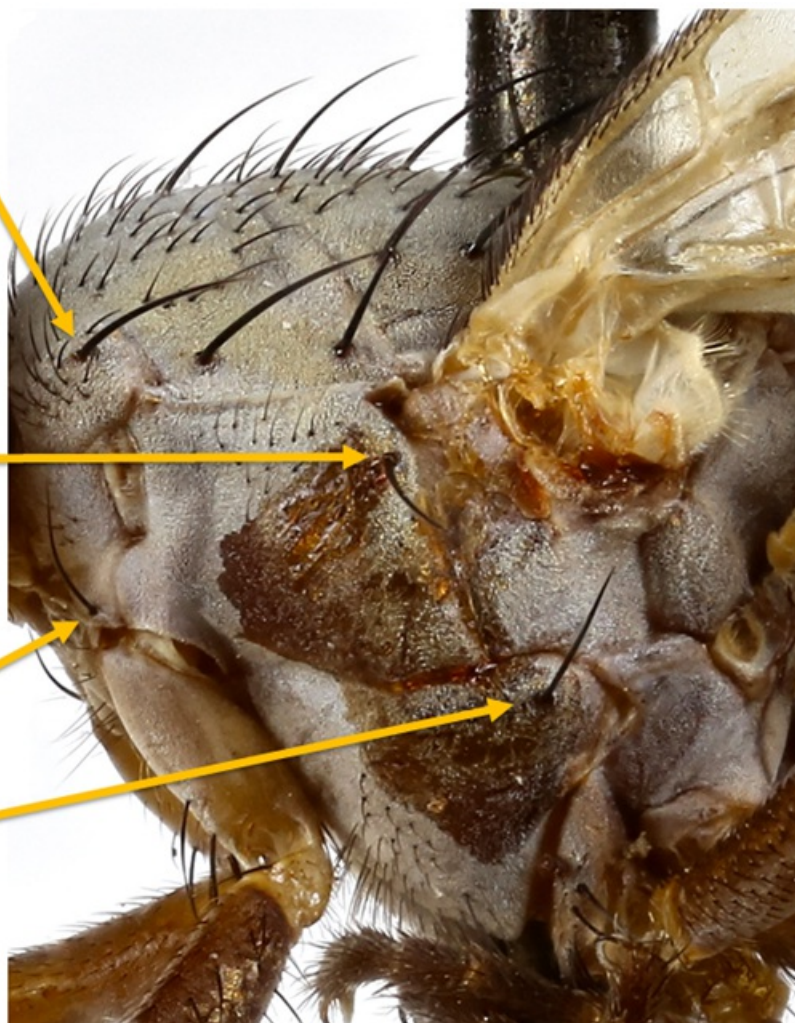


Figure 9. *Melieria picta* (Meigen, 1826) from the Smithsonian National Museum of Natural History Collection with thoracic setae used in this key labeled

Source: <https://cjai.biologicsurvey.ca/articles/w-45/>

WING VEINS AND CELLS

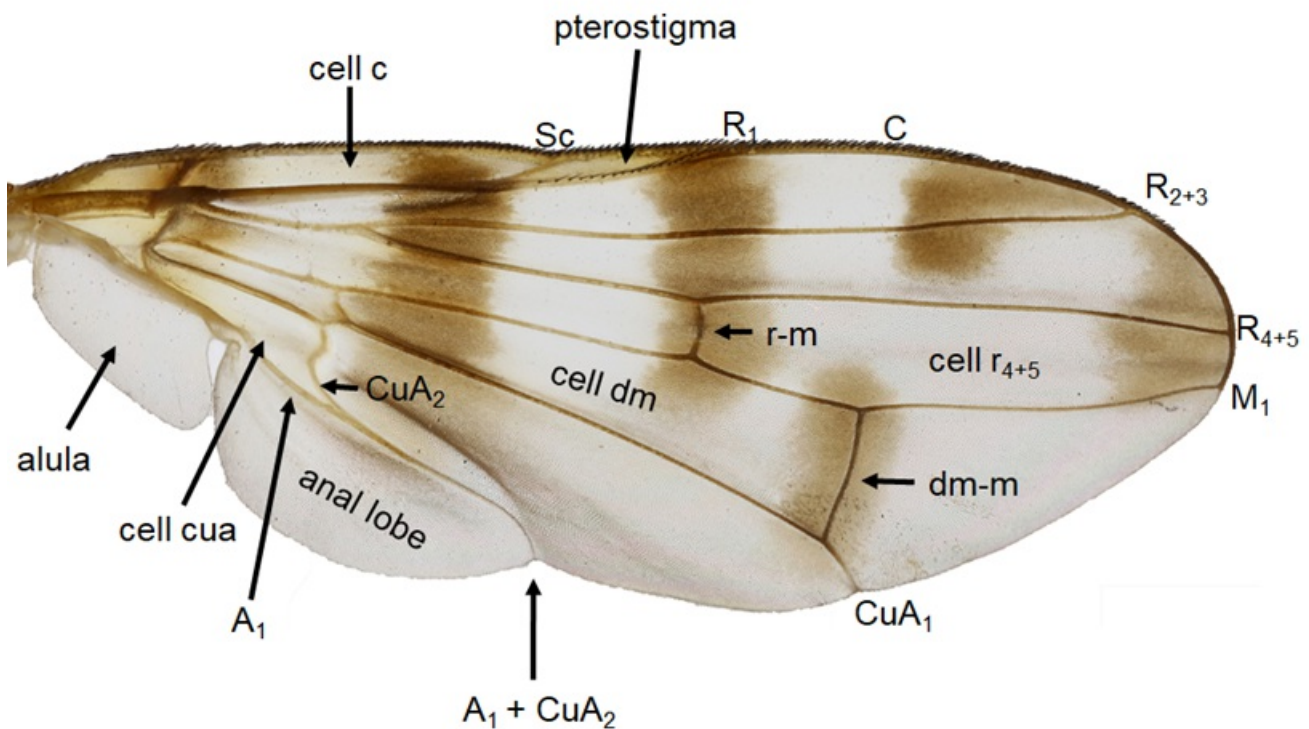


Figure 10. Wing of *Ceroxys latiusculus* (Loew, 1873) from the Florida State Collection of Arthropods with veins, crossveins, and cells used for identification in this key labeled

Source: <https://cjai.biologicalsurvey.ca/articles/w-45/>

1.2. Bioecology

Some adults in this family are pollinators but are generally attracted to decomposing plant organic matter such as logs, leaves, fruits, and feces, among others. Some species present phytophagous larvae and behave like agricultural pests of cultivars such as corn, agave, passion fruit, and beets (Figures 11-14) [5][6][7].



Figure 11. *Euxesta notata* (Wiedemann, 1830), on dog poop

Source: <https://www.wikiwand.com/fr/Euxesta>

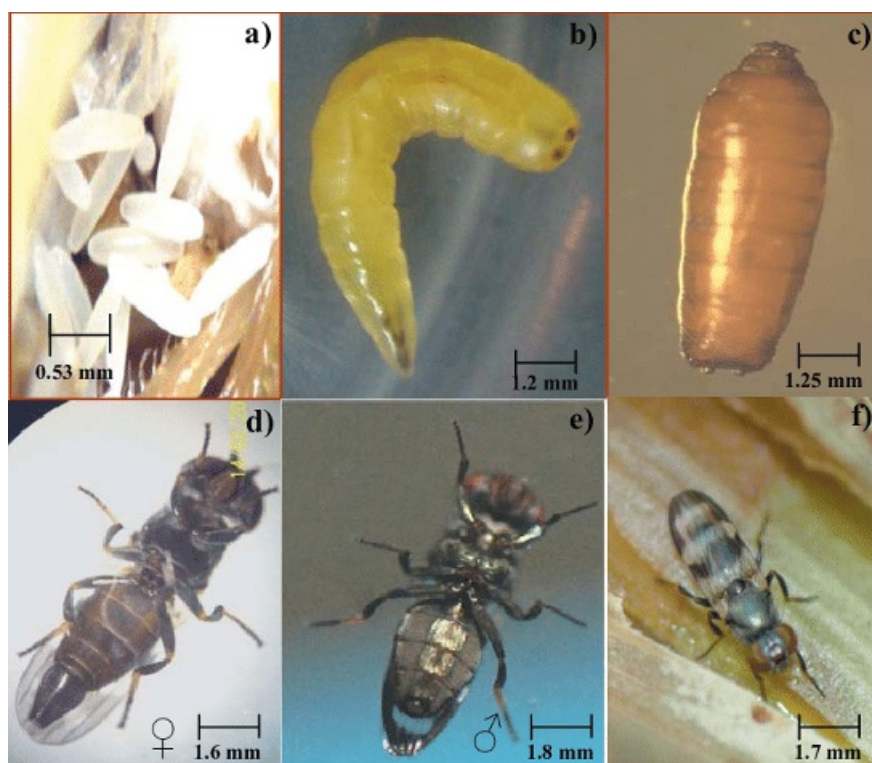


Figure 12. *Euxesta stigmatias* Loew, 1868, (a) eggs, (b) larva, (c) pupa, (d) adult, (e) adult ventral view, and (f) adult dorsal view

Source: https://www.researchgate.net/figure/Euxesta-stigmatias-a-huevecillos-b-larva-c-pupa-d-adulto-e-adulto-vista_fig1_276214202



Figure 13. Pollination carried out by specimen of the Family Ulidiidae (= Otitidae)

Source: Lorin Timaeus



Figure 14. Damage to sweet corn kernels by *Euxesta* spp. and *Chaetopsis massyla* (Walker, 1849) larvae

Source: Photograph by [Gregg Nuessly](#), University of Florida

Information about *Neomyennis*, however, the larvae of *Ottidae* (*Utilidae*) usually develop in organic matter at the beginning of decomposition. *Euxesta* species and *Pterocerine* are normally associated^[8].

With monocotyledonea plants, which in a way justifies their abundance. Some *Euxesta* species, even, can affect corn cob candy damaged by caterpillars of *Lepidoptera*^[8].

1.3. Damage

In addition to the damage caused by the larvae themselves, their activity facilitates the entry of pathogens into plants, which may cause losses of up to 100% of production. They also carry enteric bacteria, being responsible for the transmission of infections (Figures 15-17)^[9].



Figure 15. *Euxesta* sp. on sweet corn ear

Source: Photograph by [Gregg Nuessly](#), University of Florida



Figure 16. Damage to sweet corn silk by *Euxesta* spp. and *Chaetopsis massyla* (Walker, 1849) larvae

Source: Photograph by Gregg Nuessly, University of Florida



Figure 17. Damage by *Chaetopsis massyla* (Walker, 1849), larvae to sweet corn tassel within or just emerging from corn whorl

Source: Photograph by Gregg Nuessly, University of Florida

1.4. Life cycle

Utilidae make their nests on the ground, making their eggs and young often very vulnerable to predation. They walk steadily on strong legs and big toes, pecking for food as they go. Many have interesting mating displays, such as inflating throat sacs or raising elaborate feather crests. The female lays three to five dark, speckled eggs in a scratch in the ground and incubates them on her own (Figures 18-21) ^[10].



Figure 18. *Euxesta stigmatias* Loew, 1868, eggs in cornsilk

Source: Photograph by Megha Kalsi, University of Florida



Figure 19. Last instar larvae of the cornsilk fly, *Euxesta stigmatias* Loew, 1868

Source: Photograph by Matthew Hentz, USDA, ARS, Ft. Pierce, Florida

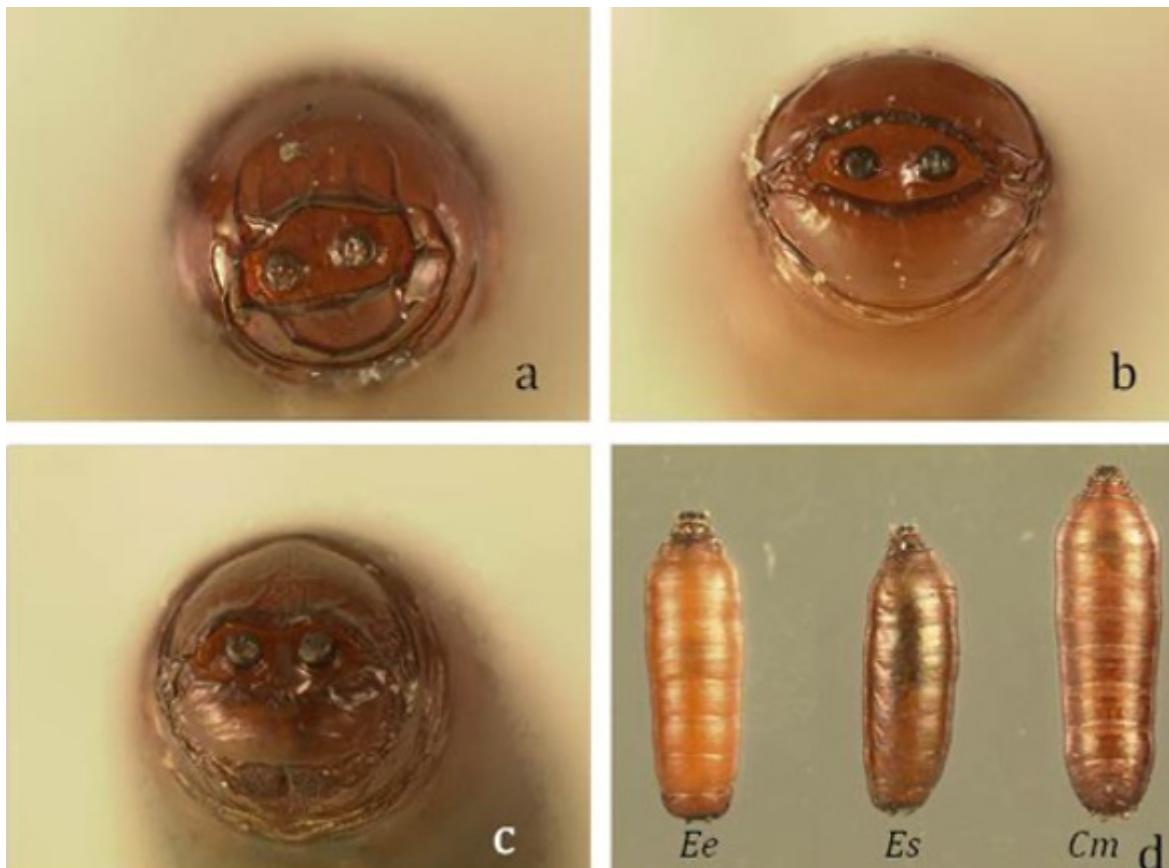


Figure 20. (a, b, c) larva (d) pupa of the Family Ulidiidae

Source: Photograph by Gaurav Goyal, University of Florida

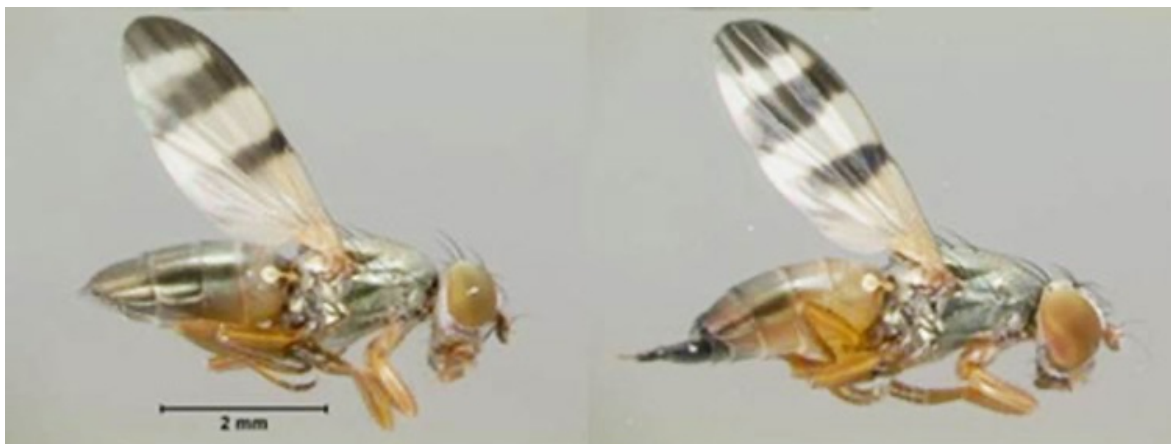


Figure 21. *Euxesta stigmatias* Loew, 1868, male (left) and female (right)

Source: Photograph by Gaurav Goyal, University of Florida

1.5. Taxonomy

It is the third family with the highest number of species within Tephritoidea, presenting 678 species in the World of which at least 285 are present in the Neotropics and about 60 species occur in Brazil ^[11].

Subfamily: Otitinae Aldrich, 1932, and Ulidiinae Macquart, 1835 (Figure 22).



Figure 22. Subfamily Ulidiinae, *Meliera* sp.1 and sp.2

Source: [https://www.semanticscholar.org/paper/New-Data-on-the-Subfamily-Otitinae-\(Diptera%2C-in-the-Namin-Nozari/a22599eeb89720ff3da5f88d4f57914c1eb65e11/figure/3](https://www.semanticscholar.org/paper/New-Data-on-the-Subfamily-Otitinae-(Diptera%2C-in-the-Namin-Nozari/a22599eeb89720ff3da5f88d4f57914c1eb65e11/figure/3)

Genus: *Plagiocephalus* Wiedemann, 1830b: *Stylophthalmyia* Frey, 1926. *Stylophthalmyia* Frey, 1926, *Ophryoterpnomyia* Hendel, 1936. *Terpnomyia* Hendel, 1909a, *Paragoniaeola* Blanchard, 1938, *Paragoniaeola* Blanchard 1938, *Eupterocerina*

Blanchard, 1938b, *Eupterocerina* Blanchard, 1938b and *Willineria* Blanchard, 1951 [12].

Some species: *Neomyennis appendiculata* (Hendel 1909), *Neomyennis zebra* Hendel, 1909, *Neomyennis* sp., *Euxesta sororcula* (Wiedemann, 1830), *Euxesta problemeluta* Loew 1868, *Problem scalaris* Blanchard, 1936, *Tetrapleura picta* Schiner, 1868, *Willineria orfilai* Blanchard, 1951, *Achias lobularis* Wiedemann, 1830, *Dorycera melanotica* Hennig, 1939, *Dorycera persica* Hennig, 1939, *Meliera nigratarsis* Becker, 1903, *Meliera unicolor* (Loew, 1854), *Melieri asiatica* (Hennig, 1939), *Ceroxys confusa* (Becker, 1913), *Ceroxys urticae* (Linnaeus, 1758) and *Ceroxys hortulana* (Rossi, 1790) (Figure 23) [13].

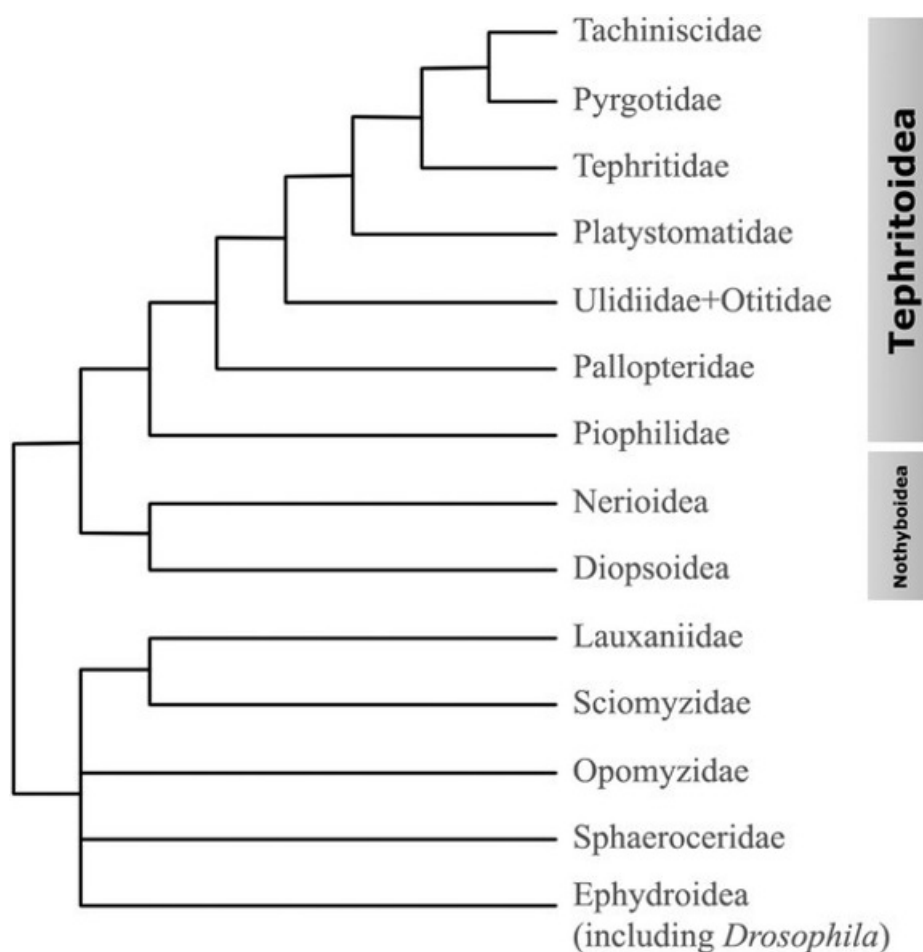


Figure 23. Phylogenetic relationships of Tephritoidea, Nothyboidea, and Ephydroidea flies (based on McAlpine (1981); Gibson et al. (2010); Wiegmann et al. (2011)). Outgroups were selected based on current hypotheses of phylogeny: the superfamily Nothyboidea (including Psilidae) forms a sister group to the superfamily Tephritoidea (including Ulidiidae). Drosophilidae (superfamily Nothyboidea) is a sister group to Nothyboidea ephritoidea.

Source: <https://zoologicalstudies.springeropen.com/articles/10.1186/s40555-014-0051-1>

1.6. Objective

This mini-review aims to describe the Utilidae Family.

2. Methods

The methodological basis of the present work consists of bibliographical research of scientific articles published in national and international academic scientific journals classified by the Coordination for the Improvement of Higher Education Personnel. The search criterion for articles was to prioritize articles that dealt with the topic. Document analysis was used as a data collection method to gather information on theoretical books, theses banks, university dissertations, scientific journals, documents, and websites:

https://www.researchgate.net/post/How_to_increase_the_research_results_visibility. (<https://goo.gl/gLTTTs>), HAL (<https://hal.archives-ouvertes.fr/submit/index>), SSRN (<https://hq.ssrn.com/login/pubsiginjoin.cfm>) and ResearchGate (<https://www.researchgate.net/signup.SignUp.html>).

3. Selected Manuscripts

3.1. Study 1

Natural Enemies

Eggs and larvae are consumed by earwigs (Dermaptera: Forficulidae), mites (Acarina), minute pirate bugs (Hemiptera: Anthocoridae: *Orius* spp.), lacewings (Neuroptera: Chrysopidae: *Chrysoperla* spp.) and rove beetles (Coleoptera: Staphylinidae). Rove beetle adults, lacewing larvae, and *Orius insidiosus* (Say, 1832). (Hemiptera: Anthocoridae) adults consumed 20 eggs and up to 35 1st and 2nd instar *Euxesta* spp. larvae per day in petri dish bioassays. *Orius insidiosus* nymphs also fed on eggs and small *Euxesta* spp. larvae. Assassin bugs, such as *Zelus longipes* (Linnaeus, 1767) (Hemiptera: Reduviidae) and many spider species feed on adults of all four 'cornsilk fly' species. *Zelus longipes* need 40 to 85 minutes to complete feeding on a *Euxesta* spp. adult depending on the sex of the predator and the fly species (Figures 24-27) ^{[14][15]}.



Figure 24. Adult *Orius insidiosus* (Say, 1832). (Hemiptera: Anthocoridae) feeding on a third instar larva of *Euxesta stigmatias* Loew, 1868

Source: Photograph by Megha Kalsi, University of Florida



Figure 25. First instar *Orius insidiosus* (Say, 1832) (Hemiptera: Anthocoridae) nymph feeding on a *Euxesta* spp. egg

Source: Photograph by Megha Kalsi, University of Florida



Figure 26. *Zelus longipes* (Linnaeus, 1767) Fabricius (Hemiptera: Reduviidae) feeding on *Euxesta stigmatias* Loew, 1868 in a sweet corn field

Source: Photograph by Megha Kalsi, University of Florida

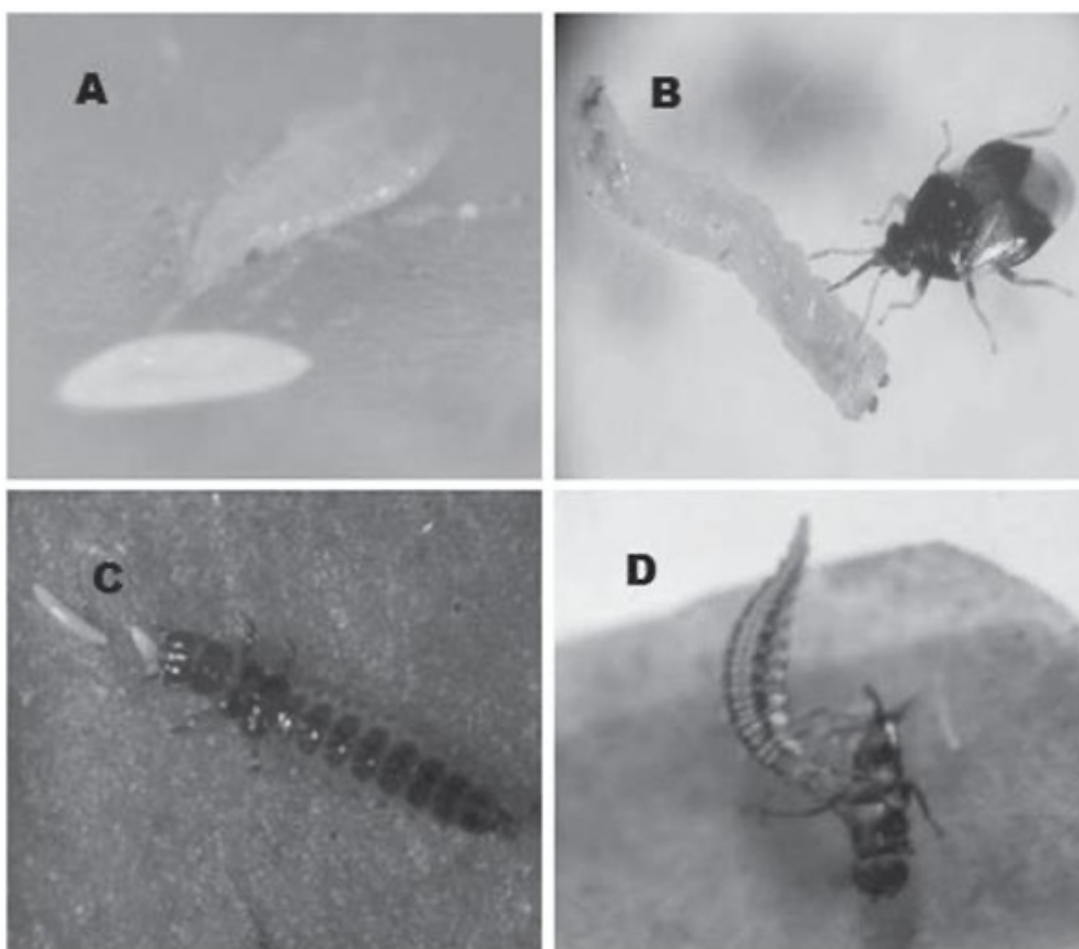


Figure 27 Predators of *Euxesta* spp. (A) First instar nymph of *Orius insidiosus* (Say, 1832) feeding on a *Euxesta* sp.

egg. (B) Adult of *O. insidiosus* feeding on a third instar larva of *Euxesta stigmatias* Loew, 1868. (C) *Anotylus insignitus* (Gravenhorst, 1806) (Coleoptera: Staphylinidae) larva feeding on *Euxesta* sp. eggs. (D) Larva of *Chrysoperla carnea* (Stephens, 1836) (Neuroptera: Chrysopidae) feeding on an adult *Euxesta* sp. fly.

Source: <https://bioone.org/journals/florida-entomologist/volume-97/issue-1/024.097.0123/Seasonal-Timing-Abundance-and-Predatory-Status-of-Arthropods-Associated-with/10.1653/024.097.0123.full>

3.2. Study 2

Tephritoidea and Ulidiidae Russia

The abdomen of tephritoid flies consists of 1-11 segments. In females, segments 1-6 are preabdomen (in males, the preabdomen is 1-5th segments). Abdominal tergites 1 and 2 fused to form syntergite. The first and the second sternite are not fused. The postabdomen of female tephritoid flies consists of modified 7th–11th segments forming a telescopic non-retractile ovipositor. The ovipositor consists of 7 syntergosternitis, an eversible membrane (covered with scales or spines, with two pairs of sclerotized strands), and an apical segment, aculeus, or blade of the ovipositor (consisting of derivatives of the 8th–11th segments and including 2 parts - an elongated base and a cercal segment). The membrane of the ovipositor is considered to be a derivative of the 7th segment (Figures 27-28) [16].

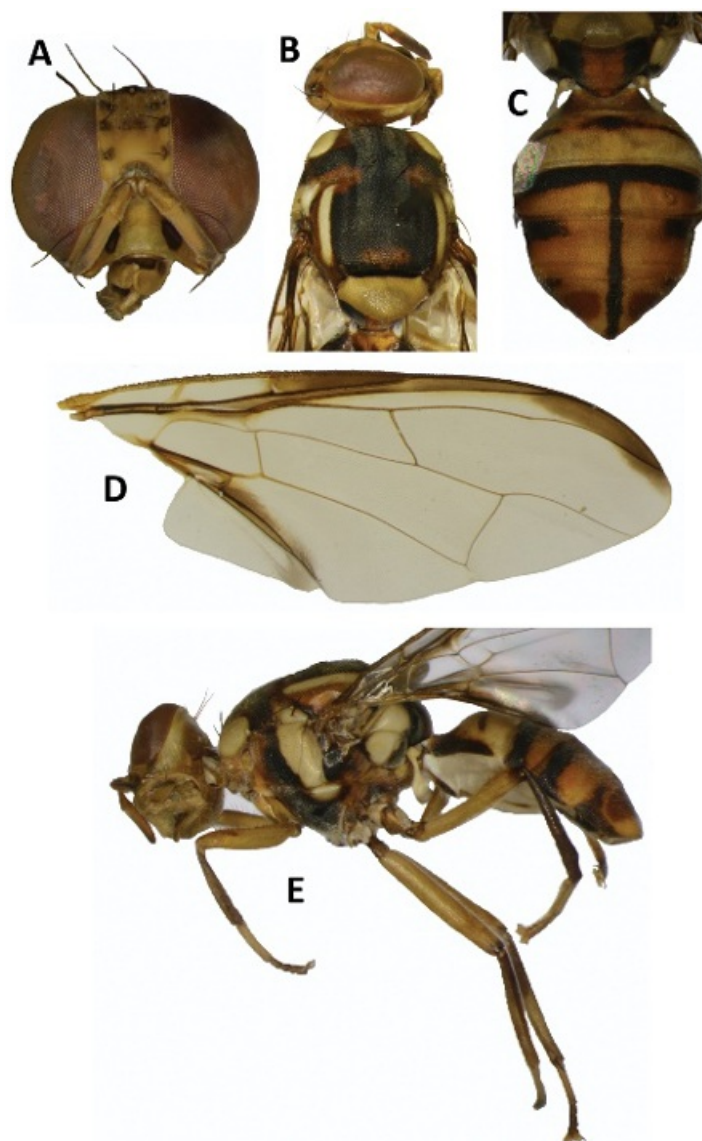


Figure 28. Tephritoidea collected in Bangladesh (A) head (B) head and scutum (C) abdomen (D) wing (E) lateral view

Source: <https://zookeys.pensoft.net/article/38096/zoom/fig/14/>

Ulidiidae, unlike the sister and more advanced group of Tephritidae, in the larval stage are mainly arophages or coprophages and lay eggs directly into the substrate. The eversible membrane of the female ovipositor studied representatives of these genera does not carry cuticular outgrowths or bears sparse small (5-10 μm long) microtrichia. This structure of the membrane does not prevent the free penetration of the ovipositor under the surface of various substrates and allows this fly to remain polyphagous (Figure 29) [16].

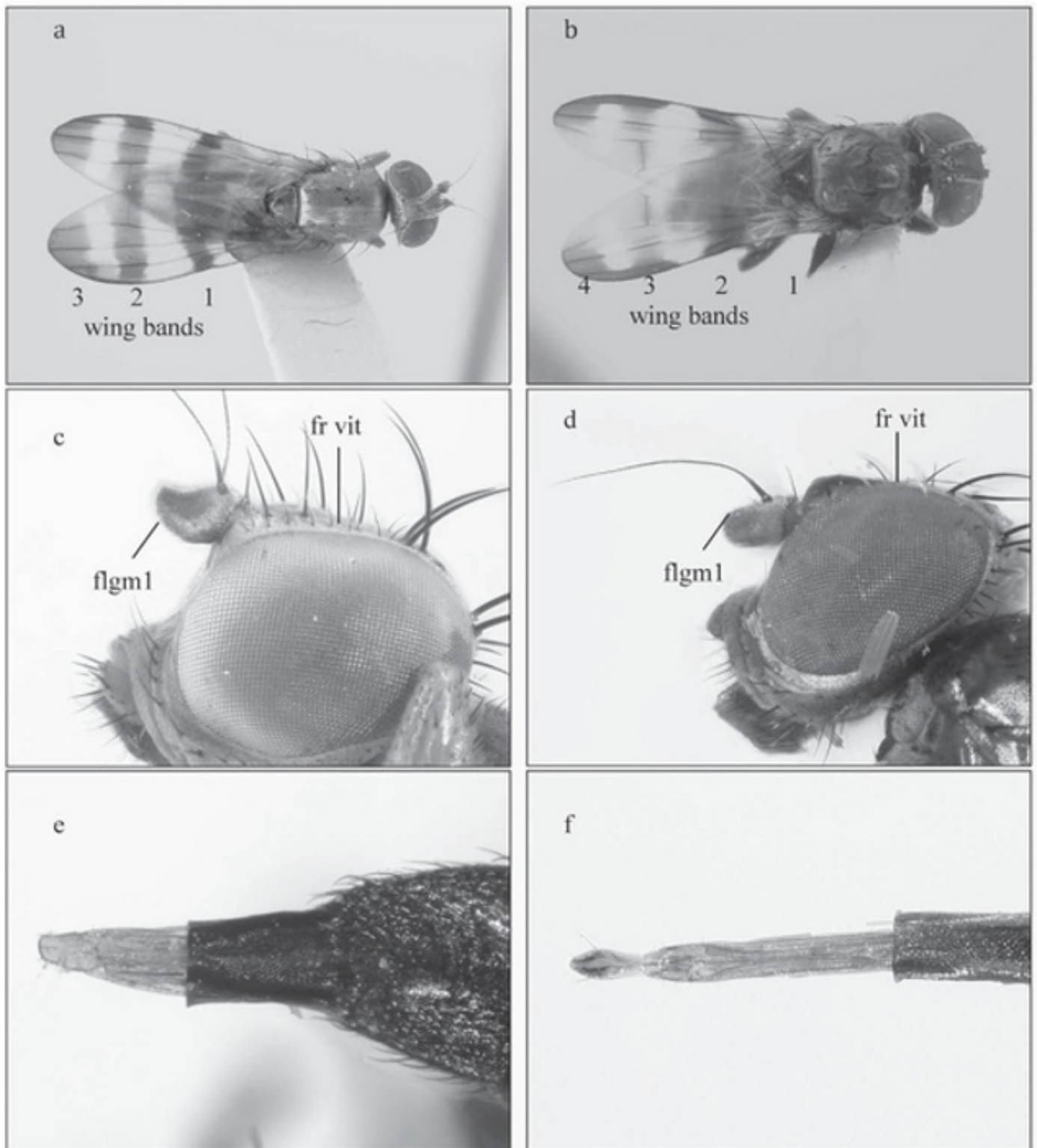


Figure 29. Adult females of *Chaetopsis massyla* (Walker, 1849) (a) and *Euxesta stigmatias* Loew, 1868 (Diptera: Ulidiinae) (b); heads of *C. massyla* (c) and *E. stigmatias* (d); ovipositors of *C. massyla* (e) and *E. stigmatias* (f); flgm1, first flagellomere; fr vit, frontal vitta

Source: https://journals.scholarsportal.info/details/00154040/v93i0002/198_nrocmuppocif.xml

Larvae of the genus *Homalocephala* develop under the bark of deciduous and coniferous trees; the ovipositor membrane bears short (3-5 μ m) microtrichia. Larvae genus *Melieria* develop on stems and roots of plants, and have

species preferences by substrate. The membrane of the ovipositor of this species genus bears long (15-20 μm) microtrichia. [16].

Probably, laying eggs in decaying plant substrates is associated with a greater need to anchor the ovipositor. The specificity of the shape of microtrichia on the eversible membrane of the egg is probably due to the fact that different *Melieria* species develop on different plant species and can serve as a reliable identification feature in the study of closely related species of the genus (Figure 30) [16].



Figure 30. genus *Melieria*

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

3.3. Study 3

The genus *Euxesta* Loew has the largest number of species in the family Ottidae (Steyskal 1968). Usually found in humid places, it is an abundant group in tropical and neotropical regions. Most species are saprophagous, although some feed on ripened fruits and vegetables and can cause economic damage [17].

Euxesta stigmatias Loew, 1868, is found in the American continent. In North and Central America, this species is considered a pest in corn (Figures 31-32) [17].



Figure 31. *Euxesta stigmatias* Loew, 1868

Source: <https://bugguide.net/node/view/1312283>

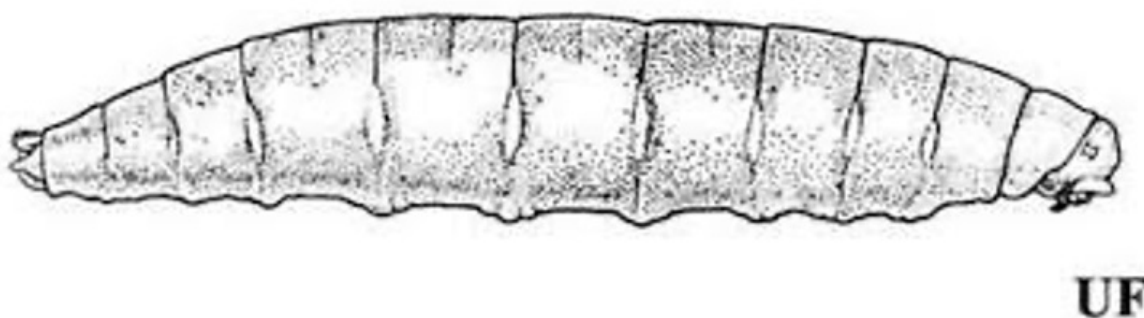


Figure 32. Larva of the cornsilk fly, *Euxesta stigmatias* Loew, 1868

Source: Credits: University of Florida

In collecting insects associated with sweet corn (*Zea mays* L.) (Poaceae), during the summer of 1982-1983, in Brasília, DF, the authors found the presence of Diptera larvae of the species: *Euxesta sororcula* Wiedemann (1830), *Euxesta eluta* Loew (1868), and *E. stigmatias*, feeding on the tips and hairs of the ear, in an environment of partial deterioration. In April 1983 at CNPH/EMBRAPA, located near Brasília, DF, it was observed, in an area destined for the production of carrot seeds. Brasília, that some roots had rotted shoulders (Figure 33) ^[17].



Figure 33. *Euxesta stigmatias* damage to corn *Zea mays* (Poaceae)

Source: <http://panorama.cnpms.embrapa.br/insetos-praga/identificacao/pragas-da-espiga/mosca-da-espiga-euxesta-spp-diptera-otitidae>

Inside the damaged area, the presence of Diptera larvae was observed, whose adults were determined to be the species *E. stigmatias*. In carrots (*Daucus carota* L.) cv. (Apiaceae), two types of damage were caused by the larvae of this species: 1) total destruction of the root shoulder, which prevents sprouting, making it impossible to development of the aerial part and subsequently resulting in the death of the subterranean part of the plant; 2) partial destruction of the root shoulder with subsequent suppression of the initial shoot of the plant, which forces the appearance of lateral shoots and causes a delay in the vegetative and reproductive development of the plant (Figures 34-35) [17].

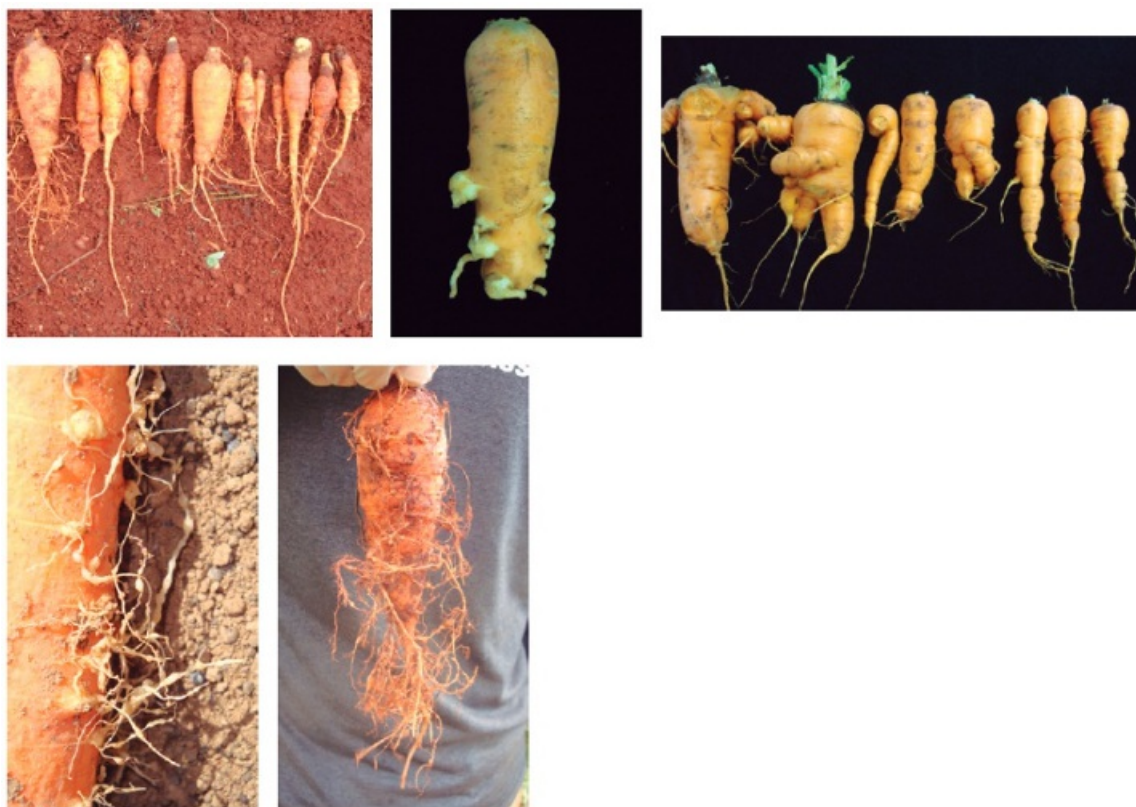


Figure 34. *Euxesta stigmatias* Loew, 1868 attacking carrots

Source: <https://www.embrapa.br/en/hortalicas/cenoura/doencas2>



Figure 35. *Euxesta stigmatias* Loew, 1868 attacking carrots

Source: <https://www.noticiasdejardim.com/legumes/cenouras/control-de-moscas-cenouras/>

3.4. Study 4

Cob fly, *Euxesta* spp. (Diptera, Ottidae)

The adult, five millimeters long, is dark in color and has colorless wings with dark spots. Oviposition is carried out on the stigma-styles and the hatching of the larvae takes place two to three days after laying. Despite being considered a secondary pest, currently, there has been an increase in the incidence of larvae on the ears, especially in sweet corn or corn with softer grains [18].

The larvae, once reaching the milky grains, penetrate inside where they complete larval development. Often the larvae penetrate the seed embryo, feeding entirely on the grain, leaving only the outer membrane. Two species occur in maize, *Euxesta eluta* Loew, 1868 and *Euxesta mazorca* Steyskal, 1974. These species can be separated by the intensity of the stripes on the wing which is complete in *E. eluta* (Figures 36-37) [18].



Figure 36. *Euxesta eluta* Loew, 1868

Source: <https://specialtycropindustry.com/battling-silk-flies-in-south-florida-sweet-corn/>



Figure 37. Damage caused to ears by *Euxesta* spp.

Sources: Photo Sinval Lopes

The control of the ear fly, one of the worst pests of this species, which attacks the sweet corn crop, gained an innovative technique (2021). Researchers from Embrapa Maize and Sorghum are using an innovative process of ecological control, which uses MacPhail traps in the fields to attract adult females of the insect, preventing their reproduction. This commercial trap model is already successfully used for monitoring fruit flies (2021) [18].

Traps that use food attractants to capture insects in a sweet corn field. The attractive feed is a hydrolyzed corn protein. The ear fly is usually associated with a bacterium that, when present in canned corn, can give the finished product an unpleasant smell, which makes it useless for consumption, causing economic losses for both the farmer and the agroindustry (Figure 38) [18].



Figure 38. Mcphail trap (detail)

Source: Photo Ademilson Rocha

4. Conclusion

The larvae, once reaching the milky grains, penetrate inside where they complete larval development. Often the larvae penetrate the seed embryo, feeding entirely on the grain, leaving only the outer membrane. Two species occur in maize, *Euxesta eluta* Loew, 1868 and *Euxesta mazorca* Steyskal, 1974. These species can be separated by the intensity of the stripes on the wing which is complete in *E. eluta*.

References

1. [^]Barnes JK, Slay ME, Taylor SJ. Adult Diptera from Ozark Caves. *Proceedings of the Entomological Society of*

Washington. 2009; 111(2): 335-353.

2. ^a Allen EJ, Foote BA. Biology and immature stages of *Chaetopsis massyla* (Diptera: Otitidae), a secondary invader of herbaceous stems of wetland monocots. *Proceedings of the Entomological Society of Washington*. 1992; 94: 320-328.
3. ^a McAlpine JF. Morphology and terminology – Adults. In: McAlpine JF, Peterson BV, Shewell GE, Teskey HJ, Vockeroth JR, Wood DM, eds. *Manual of Nearctic Diptera*. 1st ed. Ottawa: Research Branch Agriculture Canada; 1981. p. 9-63.
4. ^a Pape T, Blagoderov V, Mostovski MB. Animal Biodiversity – Order Diptera. *Zootaxa*. 2011; 3148: 222-229.
5. ^a Aguiar-Menezes EL Nascimento RJ, Menezes EB. Diversity of fly species (Diptera: Tephritoidea) from *Passiflora* spp. and their hymenopterous parasitoids in two municipalities of the Southeastern Brazil. *Neotropical Entomology*. 2010; 33(1): 113-116.
6. ^a Ribeiro MF, Köhler A, Boelter CR. Pollination of *Acianthera aptosa* (Lindl.) (Orchidaceae) by Otitidae (Diptera). *FZVA Magazine*. 2006; 13(2): 85-89.
7. ^a Rodrigues SR, Nantes LR, Souza SR, et al. Frugivorous flies (Diptera, Tephritoidea) collected in Aquidauana, MS. *Revista Brasileira de Entomologia*. 2006; 50(1): 131-134.
8. ^{a, b} Uchôa-Fernandes MA, Oliveira I, Molina RMS, Zucchi RA. Species diversity of frugivorous flies (Diptera: Tephritoidea) from hosts in the Cerrado of the state of Mato Grosso do Sul, Brazil. *Neotropical Entomology*. 2002; 31(4): 515-524.
9. ^a Uchôa-Fernandes MA, Oliveira I, Molina RMS, Zucchi RA. Biodiversity of frugivorous flies (Diptera: Tephritoidea) captured in citrus groves, Mato Grosso do Sul, Brazil. *Neotropical Entomology*. 2003; 32(2): 239-246.
10. ^a Steyskal GC. A new central american species of *Zacompsia* Coquillett, with a key to the described species (Diptera: Otitidae). *Proceedings of the Entomological Society of Washington*. 1971; 73: 247-248.
11. ^a Teskey HJ. Diptera larvae associated with trees in North America. *Memoirs of the Entomological Society of Canada*. 1976; 108: 1-53.
12. ^a Hickel ER, Nora I. Spotted-winged flies captured in fly flasks in the Rio do Peixe Valley Region. *Santa Catarina Agriculture*. 2007; 20(2): 47-50.
13. ^a Kameneva EP, Korneyev VA. Myennidini, a new tribe of the subfamily Otitinae (Diptera: Ulidiidae), with discussion of the suprageneric classification of the family. *Israel Journal of Entomology*. 2006; 35–36: 497–586.
14. ^a Al Dhafer HM, El-Hawagry MS. Records for the family Ulidiidae (Diptera, Tephritoidea) in Saudi Arabia. *African Entomology*. 2016; 24(1): 225–232.
15. ^a Gregg SN, Capinera JL. Entomology and Nematology Department [Internet]. Gainesville: University of Florida; © 2013 [cited 2022 Aug 28]. Available from https://entnemdept.ufl.edu/creatures/field/cornsilk_fly.htm.
16. ^{a, b, c, d} Galinskaya TV. Microtrichia on the ovipositor membrane of representatives Ulidiidae and Otitidae (Diptera). *Bulletin Moscow*. 2015; 120(4): 595-773.
17. ^{a, b, c, d} França FH, Vecchia PTC. Damages caused (*Euxesta stigmatias*) on carrot roots in commercial seed field. *Pesquisa Agropecuária Brasileira*. 1986; 21(7): 789-791.
18. ^{a, b, c, d} Cob fly, *Euxesta* spp. (Diptera, Otitidae) [Internet]. Sete Lagoas: Brazilian Agricultural Research Corporation - Embrapa; © 2022 [cited 2022 Aug 28]. Available from <http://panorama.cnpms.embrapa.br/insetos-praga/identificacao/pragas-da-espiga/mosca-da-espiga-euxesta-spp-diptera-otitidae>.

