

# Definition of the Biology of the Families of Diptera (Arthropoda: Insecta).

Carlos Henrique Marchiori<sup>1</sup>

<sup>1</sup> Instituto Federal Goiano

Potential competing interests: No potential competing interests to declare.

**Co-authors: Marco Vinícios de Oliveira Santana<sup>2</sup> and Klebert de Paula Malheiros<sup>3</sup>.**

<sup>2-3</sup>Instituto Marco Santana, Goiânia, Goiás, Brazil.



Diptera families. Source: <https://www.intechopen.com/chapters/78012>.

Diptera is characterized by having only one pair of wings for flight, while the second pair, common to other orders of insects, which have two pairs of wings, is reduced, and modified into dumbbells that help control the balance of flight [1-2].

Some dipterans are of fundamental medical and veterinary importance since they can produce myiasis and act in the transmission of pathogens to humans and other animals. Diptera is valuable for Forensic Entomology, larval therapy, pollination, decomposition of organic, necrophagous, matter, predators, parasitoids, ectoparasitic mammals, and vectors of pathogens. The occurrence, distribution, and predominance of these flies in metropolitan areas are factors of great importance in public health. In rural areas, they can lead to a decrease in egg production and animal diseases, in addition to causing discomfort to the population neighboring the creations [2-6].

### **Family Acartophthalmidae**

Adults are known to live in woodland, where they are associated with several decaying substances such as wood, fungi, carrion, and droppings. The larvae are saprophagous, and the immature stages have been described and have been found mostly in forests and have been reared from dead wood and decaying organic material [7].

### **Family Acroceridae**

As far as is known, all Acroceridae are parasitoids of spiders. They are most collected when a spider from the field is brought into captivity [8].

### **Family Agromyzidae**

The larvae are phytophagous and attack different parts of the plant. Most species are miners. Species of considerable economic importance [9].

### **Family Anthomyiidae**

They are pollinators feeding on nectar and pollen. Other species are attracted to honeydew or fermented sap caused by lesions on the bark of trees and fruits, or they may feed on excreta and decaying animal or vegetable organic matter. The larvae have varied eating habits, the vast majority of which are phytophagous or saprophagous and are found in stems, roots, and aerial parts of living or decaying plants [10].

### **Family Anthomyzidae**

Flies probably breed in feces falling to the rolled leaves' bottom. Larvae have been reported in decomposing dicotyledonous plants, in fungi they are phytophagous or saprophagous [11].

### **Family Apioceridae**

Adults usually visit flowers to feed, while larvae usually live on a substrate and are predatory. They are important pollinators of flowers and are often found near water sources. The distinctive long legs of Apioceridae help them reach deep into flowers to feed on nectar and pollen [12].

### **Family Apystomyiidae**

Unfortunately, the immature stages of Apystomyiidae are still unknown [13].

### **Família Apsilocephalidae**

Apsilocephalidae são visitantes florais, com maior ocorrência em regiões áridas e arenosas [14].

### **Family Asilidae**

They are active predators of insects in general and arachnids. Larvae live in soil or decaying wood and prey on eggs, larvae, and pupae of other insects [15].

### **Family Asteiidae**

The larvae can scavenge in the excrement of other insects [16].

### **Family Atelestidae**

The biology is poorly known [17].

### **Family Athericidae**

The diet of adults is generally glycyphagic, with a food base probably represented by the rincoti honeydew. They are instead hematophagous mammals and stingers, including humans [18].

### **Family Aulacigastridae**

The larvae develop in plant exudates, even very viscous, emitted from the wounds of various arboreal plants, or in phytotelmae collected from the leaves [19].

### **Family Australimyziidae**

They have saprophagous larvae [20].

### **Family Austroleptidae**

The biology is poorly known [21].

### **Family Axymyiidae**

The larvae live in dead wood, free of bark and moss, mainly in forest swamps and on the banks of small forest streams. It feeds on the ingested wood mass and probably on the microorganisms it contains [22].

### **Family Bibionidae**

The larvae live in the soil, generally in moist substrates rich in organic matter. They are often found in manure or other organic substrates used as fertilizers. In the early larval stages, they are saprophagous, feeding primarily on fungi and organic matter ingested with the soil, while later eroding organic materials, including plant roots [23].

### **Family Blephariceridae**

Blephariceridae se alimentam do biofilme formado por algas diatomáceas e outros materiais orgânicos na superfície das rochas. existem algumas espécies predadoras e insetívoras and organic matter [24].

### **Family Bolitophilidae**

The biology of the Bolitophilidae is poorly known [25].

### **Family Bombyliidae**

The adults have some protection from predators. The postembryonic development is of the type hypermetamorphic, with parasitoid or hyperparasitoid larvae [26].

### **Family Borboropsida**

Little is known about the biology of these families. Bolitophilid larvae are often found in sporophores of fleshy Fungi [27].

### **Family Brachystomatidae**

The biology of the Brachystomatidae is poorly known [28].

### **Family Braulidae**

These insects can be found in places where bees congregate, such as flowers or water and mineral sources (salt pans), waiting to grab hosts (parasitism) from uninfected hives [29].

### **Family Calliphoridae**

The larvae rely on organic matter in decomposition or can cause death in humans and other animals. Adults can mechanically transmit pathogens from material in decomposition to the human environment. Family of importance in Forensic Entomology, larval therapy, medical and veterinary [30].

### **Family Camillidae**

The lifestyle is largely little known. The larvae probably feed on decaying plant matter and animal feces. Adults are found feeding on flowers [31].

### **Family Campichoetidae**

Biology is not known [32].

### **Family Canacidae**

They feed on infusoria and other tiny organisms [33].

### **Family Carnidae**

The larvae are saprophagous or coprophagous and live in the remains of bird nests [34].

### **Family Cecidomyiidae**

Most cecidomyiids have their mouthparts to feed on liquids. Longer-lived adults do this, using water and nectar. Most gall-causing species probably do not feed in adulthood [35].

### **Family Celyphidae**

The biology of the family is poorly known. Adults are found along streams and rivers, and in wet grassy areas. Larvae are saprophagous [36].

### **Family Ceratopogonidae**

Ceratopogonidae sucks blood from vertebrates, are ectoparasites in larger insects, and are also predators [37].

### **Family Chamaemyiidae**

The larvae of all Chamaemyiidae whose food is known are predators of coccids and aphids. Adults feed on the sugary secretions of larval prey. The larvae of the most primitive groups feed on coccids that live on stems and roots of cereals, and those of slightly more advanced genera feed on coccids on the leaves and branches of various plants [38].

### **Family Chaoboridae**

Adults feed on nectar. They feed mainly on small insects, such as mosquito larvae, and crustaceans [39].

### **Family Chironomidae**

Many species feed on plant secretions. Most larvae are aquatic, others occur in moist soil, under tree bark, or in decomposing organic matter [40].

[39] Marchiori CH. Chironomidae Family (Diptera: Chironomidae) in biogeochemical processes in lake sediments. Open Access Research Journal of Life Sciences. 2022, 03(01): 088–126 [41].

### **Family Chloropidae**

They are saprophagous or phytophagous, feeding on a wide variety of plants or decomposing organic vegetable matter. There are predatory or parasitic species that can become pests. and can transmit pathogens that cause ophthalmia through the diet of eye secretions [42].

### **Family Chyromyidae**

Females lay their eggs in small batches on fresh algae beds. The larvae feed in a bacteria-laden mass and are decomposers of organic matter on beaches, being better represented in temperate zones [43].

#### **Family Clausiidae**

Most species are phytophagous and some feed on nectar, sap, or feces, and the decay of wood [44].

#### **Family Coelopidae**

The larvae are decomposers of organic matter on beaches, being better represented in temperate zones. Females lay their eggs in small batches on fresh algae beds. The larvae feed in a bacteria-laden mass [45].

#### **Family Conopidae**

They are often found on flowers sipping nectar. Conopid larvae are internal parasitoids (endoparasitoids), and most are Hymenoptera, particularly those of the Aculeata group, wasps bees, and orthopterans [46].

#### **Family Corethrellidae**

The Corethrellidae receive the popular name of frog-biting mosquitoes due to the habit of their females feeding on the blood of anuran amphibians. It was found that they are blood parasites, euglenozoans of the genus *Trypanosoma* [47].

#### **Family Cryptochetidae**

The larvae are of biological and economic interest, being endoparasitoids of coccids [48].

#### **Family Ctenostylidae**

The biology of the species is little known. The morphology of the mouthparts indicates that adults do not feed [49].

#### **Family Culicidae**

It feeds on liquids such as nectar, sap, or blood. Both sexes feed on nectar, but the female is also capable of hematophagy. Females do not need blood to survive, but they do need supplemental substances such as protein and iron. In others, they are made up of predatory larvae [50].

#### **Family Curtonotidae**

The immature stages are recorded as scavengers inside pods of the desert locust, using human feces. Others were found in wild boar and ant burrows [51].

#### **Familia Cylindrotomidae**

The larvae are all phytophagous and are found living on terrestrial, semi-aquatic, and aquatic mosses [52].

#### **Family Deuterophlebiidae**

The larvae are mainly herbivorous and with their highly specialized mouthparts, they feed on the thin layer of algae attached to submerged rocks and on bacteria and organic matter. Adults are predators of other insects and probably feed on flower nectar [53].

#### **Family Diadocidiidae**

The biology of the Diadocidiidae is poorly known [54].

#### **Family Diastatidae**

Nothing is known about the habits of the immature stages [55].

#### **Family Ditomyiidae**

The biology is poorly known [56].

#### **Family Dixidae**

Larvae are filter feeders, using bristles in the buccal regions to obtain food, mainly microalgae [57].

#### **Family Dolichopodidae**

Other groups are found on trunks of trees damaged by bark beetles. Adults often are seen in a characteristic predatory posture standing high on their legs on the ground or vegetation, tree trunks, or rocks, and some species walk about on the surface of still water [58].

#### **Family Drosophilidae**

The larvae of most species feed on microorganisms in spoiled fruits, slime fluxes, fungi, rotting cacti, or other decaying organic matter and damage [59].

#### **Family Dryomyzidae**

The larvae of members of this family feed on decaying organic matter, carrion, dung, and fungi [60].

#### **Family Empididae**

The immature stages are little known. The larvae are predators [61].

#### **Family Ephydriidae**

That was visited by Ephydriidae, which have in common the fact of having composite or numerous inflorescences of small, clustered flowers. The species that feed on nectar are considered the main pollinators [62].

#### **Family Eurychoromyiidae**

The biology of the Helosciomyzidae is poorly known [63].

### Family Fanniidae

The larvae have a saprophagous habit and develop in a wide range of substrates, such as decomposing organic matter, fungi, and feces, or associated with waste from bee nests or bird nests and can cause economic impacts, while others have forensic and public health importance [64].

### Family Fergusoninidae

All species of *Fergusonina* for which biology is known are gall-feeders in the living tissue of Myrtaceae and are involved in an obligate mutualistic association with nematodes in the genus *Fergusobia* Currie 1937 [65].

### Family Glossinidae

Glossinidae includes only flies that transmit the trypanosome that causes sleeping sickness. The problems caused by the fact that this insect is the transmitter of sleeping sickness have led health authorities to consider extermination its main [66].

### Family Gobryidae

The immature stages are unknown [67].

### Family Heterocheilidae

Larvae typically feed on seaweed [68].

### Family Helcomyzidae

Are attracted to carcasses and feces. Larvae feed on decaying plant and animal matter, mushrooms, and various fungi [69].

### Family Heleomyzidae

Adults are attracted to carcasses and feces. Larvae feed on decaying plant and animal matter, mushrooms, and various fungi. The larvae are saprophagous of organic plant and animal matter and others are mycophagous [70].

### Family Helosciomyzidae

The biology is poorly known [71].

### Family Hesperinidae

The biology is poorly known [72].

### Family Hilarimorphidae

The biology is poorly known [73].



### **Family Hippoboscidae**

The Hippoboscidae family includes species with very different morphological characteristics, reflecting the adaptation to different hosts since all species are obligate hematophagous ectoparasites of mammals and birds [74].

### **Family Hybotidae**

Adults are predators and are found perched on vegetation or flying in search of prey [75].

### **Family Inbiomyiidae**

Nothing is known of the habits of the immature stages [76].

### **Family Keroplatidae**

They have varied eating habits and can be mycophagous or predators. These larvae occasionally feed on pupae of these species or dead insects. There are also records of parasitic larvae, such as ants [77].

### **Family Lauxiniidae**

The larvae of this family are mainly saprophagous, commonly found in fallen leaves, rotting wood or straw, decaying vegetation, and bird nests [78].

### **Family Limoniidae**

Larvae feed on algae and decaying material, and rare species are predators, such as many Limnophilinae [79].

### **Family Lonchaeidae**

The larvae are mainly phytophagous, feed on damaged plant tissues, and can also be coprophagous, mycophagous, saprophagous, or predatory [80].

### **Family Lonchopteridae**

Lonchopteridae are common in moist, shady, grassy areas, where the larvae are found within decaying vegetation. The larvae are found within decaying vegetation [81].

### **Family Lygistorrhinidae**

Lygistorrhininae is commonly called long-beaked fungus gnats [82].

### **Family Manotinae**

The biology is poorly known [83].

### **Family Marginidae**

Very little is known of their distribution or biology [84].

### **Family Megamerinidae**

The larvae live under the bark of dying or dead deciduous trees, where they prey on or scavenge the larvae of other insects [85].

### **Family Mesembrinellidae**

Some genera are found along the seashore, in the middle of the pebble, where they feed on small insects or other invertebrates. Adults are associated with population control of other arthropods, including dipterans themselves. Certain species are nectarivorous and promote plant pollination [86].

### **Family Micropezidae**

The larvae commonly develop in decomposing plant organic matter and can also be reared in manure [87].

### **Family Milichiidae**

Diptera are attracted to the bodily fluids of prey or predators. All groups are associated with the decomposition of plant and animal matter and are of potential importance in their forensic role; Many predators are myrmecophiles or pollinators [88].

### **Family Mormotomyiidae**

Larvae of Mormotomyiidae were collected from bat guano. It is believed that adult flies feed on the body secretions of bats [89].

### **Family Muscidae**

Adults can be predators, hematophagous, and detritivores or feed on numerous types of exudates from plants or animals. Larvae appear in a variety of habitats, including decaying vegetation or animals, dry or moist soil, insect, or bird nests, fresh or stagnant water, and droppings. Have great medical and veterinary importance, since can carry various pathogens that cause parasitic and infectious diseases to the man and domestic animals [90].

### **Family Mycetophilidae**

They are found close to plant matter in decomposition. The larvae appear to feed on mycelium, sporophytes, or fungal hyphae. Some species attack decaying fruits, with at least one known case of a galling species [91].

### **Family Mydidae**

Larvae of several species feed on immature Coleoptera and can be found in ant nests [92].

### **Family Mythicomyiidae**

The immature ones are parasitoids of young stages of other insects or egg predators and the adults feed on nectar and

pollen, acting in pollination [93].

### **Family Nannodastiidae**

They are found along coasts and in bat caves rich in guano [94].

### **Family Nemestrinidae**

All known larvae of Nemestrinidae are internal parasitoids of nymphs and adults of grasshoppers and beetle larvae.

Nemestrinid adults are often found hovering around flowers, where they feed on nectar [95].

### **Family Neriidae**

They feed on decomposing organic plant tissue. Some species may be associated with human crops, such as pumpkin, cotton, banana, gourd, and papaya [96].

### **Family Nothybidae**

The biology is poorly known, and the larval habitat is unknown [97].

### **Family Nycteribiidae**

They are wingless flies, similar in shape to spiders, hematophagous, ectoparasites exclusive to bats [98].

### **Family Nymphomyiidae**

Their larvae feed on herbaceous plants, feeding on periphytic film in riffle substrates, and the adults appear to be short-lived homopterous insects [99].

### **Family Ocoidae**

Biology is poorly known, and the immature stages are unknown [100].

### **Family Odoniidae**

The adults of some species feed on polypore fungi on trees. Palearctic species were created associated with xylophagous beetles or trees attacked by these coleoptera, and moths. The diverse possibilities of saprophytic to predatory life history [101].

### **Family Oestridae**

Family Oestridae includes the largest proportion of species whose larvae cause myiasis and are obligate parasites within the mammalian body. Their larvae attack and pierce living or dead trees, forming galleries that probably feed on accumulated organic matter or its fermentation. this insect the environment and agriculture, it is known that it can be a pest that attacks various cultures [102].

### **Family Opetiidae**

Adults were found in decaying wood [103].

### **Family Opomyzidae**

The larvae are endophytic phytophages and develop inside the stems of herbaceous plants. They cause damage that leads to the destruction of the vegetative point [104].

### **Family Oreoleptidae**

They feed on mayfly larvae as predators [105].

### **Family Pachyneuridae**

Often found together with larvae of the fungus gnat [106].

### **Family Pallopteridae**

Adults have been found on flowers and low hanging branches in shady habits. Known larvae are phytophagous or carnivorous some species preying on beetles - Cerambycidae and Scolytidae. One species is recorded as preying on larvae of C ecidomyiidae. Some have been found in flower buds and stems [107].

### **Family Pantophthalmidae**

The larvae are xylophagous and live in trunks of more than 15 families of plants [108].

### **Family Paraleucopidae**

The biology is poorly known [109].

### **Family Pediciidae**

Larvae develop in fungi and are mycetophagous, while larvae of other genera are predators [110].

### **Family Pelecorhynchidae**

Adults are nectarivores of mountain flowers. Little is known about the biology of the adults, although some have been found feeding on flowers. Larvae are predators that eat earthworms and other invertebrates [111].

### **Family Pelidnoptera**

Adults drink dew and nectar. Larvae attack or become parasitic on gastropods (slugs and snails) and millipede parasitoids [112].

### **Family Periscelididae**

Larvae and adults have been associated with sap spilled from deciduous trees such as oak, white poplar, elm, and cotton [113].

### **Family Perissommatidae**

The larvae live in decaying leaves in moist sclerophyll or cold tropical forests. Some species are suspected of being associated with fungi [114].

### **Family Phaeomyiidae**

The adults drink dew and nectar. The larvae prey on or become parasites of gastropods (slugs and snails) [115].

### **Family Phoridae**

The most versatile saprophages ever known, feed on a huge variety of decaying organic matter and even unusual substrates such as blue paint. They are parasitoids of termites, ants, bees, ticks, and triatomines. Can be predators, parasites, parasitoids, herbivores, decomposers, pollinators, fungivores, and omnivores [116].

### **Family Piophilidae**

They pollinate adults. Larvae are decomposers, feeding on decomposing matter rich in proteins, both of plant and animal origin species to attack human cadavers the larvae develop mainly in the protected parts of the carcass depending on the degree of decomposition [117].

### **Family Pipunculidae**

The larvae are endoparasitoids of auchenorrhynch hemipterans, mainly nymphs, and adults of Delphacidae, Cicadellidae, and Cercopidae [118].

### **Family Platypezidae**

The larvae appear to feed in moist fungal forests. The adults feed on honeydew leaves and other deposits on the leaves [119].

### **Family Platystomatidae**

Adults are found on tree trunks and foliage and are attracted to flowers, decaying substances, feces, sap, fruit, decaying snails, and even human sweat and dead snails [120].

### **Family Pseudopomyzidae**

The biology and immature stages are unknown for Neotropical members, but larvae likely develop in decaying organic plant matter such as trunks and branches [121].

### **Family Psilidae**

Larvae are almost exclusively phytophagous. They live in stems or roots. Some can cause galls. Several species are known as pests. Some associations are well documented, from horticultural and agricultural data, pests of crops, especially carrots. The larvae feed on plants, often in roots, tubers, and stems [122].

### **Family Psychodidae**

Phlebotominae is the best-known subfamily within Psychodidae, precisely because it contains several vector species of pathogenic protozoa [123].

### **Family Ptychopteridae**

The larvae feed on small organic particles [124].

### **Family Pyrgotidae**

The larvae of the family Pyrgotidae are abdominal endoparasites of Coleoptera belonging to the Scarabaeidae family [125].

### **Family Rangomaramidae**

The family, members of which are known as long-winged fungus gnats, was erected. This insect mainly damages ornamental plants and causes great damage to seedlings of different crops, such as citrus, tobacco, strawberry, and others. These mosquitoes can carry harmful pathogens, that is, they can carry and spread diseases to your plants [126].

Eating habits are little known, some species feed on pollen and nectar. Larvae known from other regions are aquatic, predatory, saprophagous, or coprophagous [127].

### **Family Rhiniidae**

The females of some species are attracted to soils rich in organic matter and exhibit predatory behavior [128].

### **Family Rhinophoridae**

These flies are classified by their feeding habits as saprophagous, obligate, or facultative parasites. The larvae are internal parasitoids of terrestrial Isopoda [129].

### **Family Richardiidae**

The larvae are saprophagous, but few studies address the biology of some species. Pests are one of the most important limitations of pineapple production among which we find [130].

### **Family Ropalomeridae**

The larvae of some species have been found in decaying plant matter or the resins of some trees. The Ropalomeridae are saprophytic, feeding mainly on rotting fruits [131].

### **Family Sarcophagidae**

They are parasites of insects and other arthropods. Other larvae are found in decaying animal organic matter, including human feces, and often visit flowers [132].

### **Family Scatopsidae**

Are aquatic predators and are predators of other insect larvae in moist environments, such as piles of decaying vegetables, algae, or manure. Adults are predators of other insects. They are often found in flowers where they are usually stalking prey, not looking for pollen or nectar [133].

### **Family Scenopinidae**

Adults feed on nectar. The larvae are predators of dermestids and mites and have been found. in dry places with accumulation of dust in human homes, in bird nests, rodent nests, and in xylophagous termite mounds [134].

### **Family Sciadoceridae**

The biology of is poorly known [135].

### **Family Sciomyzidae - Phaeomyiidae**

They are predators or parasitoids of terrestrial or aquatic molluscs. Research has been conducted to use these insects in the biological control of molluscs, which represent trematodes of medical importance [136].

### **Family Sepsidae**

They are usually found around dung or decaying plant and animal material. Adult flies are found mainly in the excretions of mammals, including humans, and in decomposing organic matter [137].

### **Family Simuliidae**

Most species have a hematophagous habit, needing to feed on blood for egg maturation. Sucking blood mainly in the ankle region of people, and during blood grazing create relatively large wounds, making infection of the region easy [138].

### **Family Somatiidae**

Adults feed on dead caterpillars, and some specimens have been reported as visitors to extra-floral nectaries of various plants [139].

### **Family Sphaeroceridae**

The larval stages of most species develop in decaying organic matter. In the adult stage, they are often found in large numbers in association with the excrement of domestic mammals [140].

### **Family Stratiomyidae**

Family adults are generally floral visitors and use resources such as nectar to feed themselves, acting as pollinators.

Larvae of the Stratiomyidae family can be terrestrial, mainly associated with the decomposition of plant or animal organic matter; or aquatic associated with vegetation [141].

### **Family Streblidae**

Bats maintain parasitic relationships, such as parasites and hematophagous dipterans. Cases of ectoparasite over population in bats are rare, as they would result in significant damage to the host, comprising from minor problems to severe injuries, such as blood loss, malnutrition, and skin and fur damage [142].

### **Family Synneuridae**

The biology is poorly known [143].

### **Family Syringogastridae**

The immature stages are unknown [144].

### **Family Syrphidae**

Many species visit flowers, where they obtain nectar and pollen as food, and the family is considered one of the most important pollinators among Diptera. The larvae are predators of aphids, thrips, and lepidopteran larvae, saprophagous, coprophagous, mycetophagous, or phytophagous other species are harmful to crops, destroying bulbs and tubers of ornamental plants [145].

### **Family Tabanidae**

The highest concentration of blood-sucking flies is found in places that harbor high population densities of potential guests. The events that lead to the mechanical transmission of pathogens [146].

### **Family Tachinidae**

Most species are parasitoids, although some are known that do not kill the host and are therefore called parasites. Due to this characteristic, tachinids are very important enemies of many arthropods, especially larvae of the Order Lepidoptera. decaying organic matter, carrion, dung, and fungi [147].

### **Familia Tanyderidae**

The biology and immature stages of tropical species are unknown [148].

### **Family Tanypezidae**

Little is known of the biology of tanypezid species, which is known from low vegetation in humid deciduous woodlands, often around running water [149].



### **Family Teratomyzidae**

The habits of Neotropical species are unknown, but in other regions, the larvae are associated with feeding on fungal spores [150].

### **Family Tethinidae**

Adults are sometimes abundant in decaying seaweed. and knows about the immature stages of the family, although presumably most are associated with decaying seaweed [151].

### **Family Thaumaleidae**

They feed by grazing on diatoms [152].

### **Family Tephritidae**

These insects are an important group of pests in the fruit industry worldwide, as they have a life cycle in which their larval period develops especially inside the fruits, feeding, in general, on their pulp. Direct damage to production, damage during marketing, and closing of export markets [153].

### **Family Therevidae**

Some species feed on nectar, pollen, and plant exudates. Some species may even be cannibals and others are phytophagous. Highly sclerotized white larvae are predators [154].

### **Family Tipulidae**

Most larvae feed on decomposition products, being mainly detritivores, but some feed on other larvae and roots. The larvae are predators and feed on mosquito larvae [155].

### **Family Thyreophoridae**

Semi-exaruit cadaver animalis [156].

### **Family Trichoceridae**

They live on decaying plant matter. Larvae are found in plant residues, animal excrement, and fungal mycelia, but are scavengers [157].

### **Family Trixoscelididae**

The immature stages are unknown [158].

### **Family Ulidiidae**

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. In addition to the damage caused by the larvae themselves, their activity facilitates the entry of pathogens into plants [159].

### Family Vermileonidae

Vermileonidae larvae are voracious predators of some species of Neuroptera of the Myrmeleontidae family, the so-called ant lions [160].

### Family Xenasteiidae

Was found infesting coconut, banana, custard apple, mango, sapota, guava, and several ornamental plants [161].

### Family Xylomyidae

Adults of the Xylomyidae are saprophagous or predatory. The larvae live under loose bark and in decaying wood where they are scavengers or predators of small invertebrates [162].

### Family Xylophagidae

Adults normally appear in wooded areas or herbaceous vegetation and are known as nectar, sap, or honeydew feeders. The larvae of Xylophagidae species are found under the bark of logs, rotten wood, or decomposing plants (Tables 1-8) [163].

**Table 1.** Diptera: Forensic Importance/ Pollinators/ Vectors.

Forensic	Pollinators	Vectors
Calliphoridae	Apioceridae	Calliphoridae
Fanniidae	Ephydriidae	Culicidae
Mesembrinellidae	Fanniidae	Mesembrinellidae
Milichiidae	Mesembrinellidae	Milichiidae
Muscidae	Mythicomysiidae	Muscidae
Neriidae	Mydidae	Oestridae
Piophilidae	Milichiidae	Psychodidae
Richardiidae	Phoridae	Psilidae
Sarcophagidae	Piophilidae	Psychodidae
Sepsidae	Tachinidae	Sarcophagidae
Thaumaleidae	Ulidiidae	Sciomyzidae
Utilidae	-----	Tabanidae
-----	-----	Ulidiidae

**Table 2.** Diptera medical and veterinary.

Calliphoridae	<u>Mycetophilidae</u>
Culicidae	Psychodidae
Fanniidae	Odoniidae
Glossinidae	Oestridae
Hippoboscidae	Piophilidae
Mesembrinellidae	Psilidae
Muscidae	Tabanidae

**Table 3.** Diptera parasitoids.

Acroceridae	Nemestrinidae
Asilidae	Phoridae
Bibionidae	Pipunculidae
Bombyliidae	Pyrgotidae
Conopidae	Rhinophoridae
Cryptochetidae	Sarcophagidae
Phaeomyiidae	Sciomyzidae
Keroplatidae	Tabanidae
Lonchaeidae	Tachinidae
Milichiidae	Tachiniscidae
Mythicomyiidae	-----

**Table 4.** Diptera predators.

Apioceridae	Mesembrinellidae
Asilidae	Mydidae
Bombyliidae	Milichiidae
Blephariceridae	<u>Mycetophilidae</u>
Brachystomatidae	Mythicomyiidae
Chamaemyiidae	Odoniidae
Ceratopogonidae	Oreoleptidae
Chloropidae	Pallopteridae
Chaoboridae	Pediciidae
Deuterophlebiidae	Pelecorhynchidae
Dolichopodidae	Phoridae
Drosophilidae	Rangomaramidae
Empididae	Rhiniidae
Fergusoninidae	Sarcophagidae
Hybotidae	Scenopinidae
Keroplastidae	Sciomyzidae
Limoniidae	Syrphidae
Lonchaeidae	Therevidae
Megamerinidae	Tipulidae
-----	Vermileonidae

**Table 5.** Diptera: Saprophytes, decaying organic matter, carrion, dung, and fungi.

Acartophthalmidae	Clusiidae	Nannodastiidae	Richardiidae
Anisopodidae	Coelopidae	Neriidae	Ropalomeridae
Anthomyiidae	Curtonotidae	Nothybidae	Sarchophagidae
Anthomyzidae	Drosophilidae	Nymphomyiidae	Scatopsidae
Asilidae	Dryomyzidae	Odoniidae	Sciaridae
Asteiidae	Eurychoromyiidae	Oestridae	Sepsidae
Aulacigastridae	Fanniidae	Opetiidae	Somatiidae
Australimyzae	Lauxiniidae	Pachyneuridae	Stratiomyiidae
Axymyiidae	Limoniidae	Paraleucopidae	Sciomyzidae
Bibionidae	Lonchaeidae	Periscelididae	Synneuridae
Blephariceridae	Lonchopteridae	Platystomatidae	Tanyderidae
Borboropsida	Lygistorrhinidae	Perissommatidae	Tethinidae
Bolitophilidae	Manotinae	Phoridae	Trichoceridae
Calliphoridae	Micropezidae	Piophilidae	Thyreophoridae
Camillidae	Milichiidae	Platypezidae	Tipulidae
Canthylloscelidae	Mormotomyiidae	Pseudopomyzidae	Ulidiidae
Carnidae	Mycetophilidae	Ptychopteridae	Valeseguyidae
Celyphidae	Pallopteridae	Rangomaramidae	Xylomyidae
Chironomidae	Muscidae	Rhiniidae	Xylophagidae
Chloropidae	-----	Richardiidae	-----
Chyromyiidae	-----	-----	-----
	-----	-----	-----

**Table 6.** Diptera: Ingestion of minions, plankton, bacteria, fungi, roots, tubers, stems, algae, and flowers

Apsilocephalidae	Lonchaeidae	Phoridae
Aulacigastridae	Lygistorrhinidae	Platypezidae
Camillidae	Mesembrinellidae	Platystomatidae
Cecidomyiidae	Mycetophilidae	Psilidae
Chaoboridae	Mythicomyiidae	Rangomaramidae
Chironomidae	Nemestrinidae	Rhinophoridae
Chloropidae	Odoniidae	Scatopsidae
Chyromyidae	Opomyzidae	Scenopinidae
Chyromyidae	Pachyneuridae	Stratiomyiidae
Conopidae	Pallopteridae	Syrphidae
Cylindrotomidae	Pantophthalmidae	Teratomyzidae
Deuterophlebiidae	Pediciidae	Thaumaleidae
Dixidae	Pelecorhynchidae	Therevidae
Phaeomyiidae	Pelidnoptera	Trichoceridae
Heterocheilidae	Periscelididae	Xylophagidae
Keroplastidae	Perissommatidae	Apsilocephalidae
Limoniidae		

Table 7. Harm-causing.

Agromyzidae	Mycetophilidae
Anthomyiidae	Oestridae
Anthomyzidae	Opomyzidae
Axymyiidae	Pediciidae
Cecidomyiidae	Psilidae
Clusiidae	Psychodidae
Cryptochetidae	Rangomaramidae
Drosophilidae	Richardiidae
Fanniidae	Sarcophagidae
Lonchaeidae	Sciomyzidae
-----	Tephritidae
-----	<u>Xenasteiidae</u>

Table 8. Diptera Parasitic.

Anthomyiidae	Nycteribiidae.
Athericidae	Oestridae.
Aulacigastridae	Pelidnoptera
Braulidae	Phoridae
Calliphoridae	Psychodidae
Ceratopogonidae	Pyrgotidae
Chloropidae	Rangomaramidae
Corethrellidae	Rhinophoridae
Hippoboscidae	Sarcophagidae
Keroplastidae	Simuliidae
Muscidae	Streblidae
-----	Tabanidae

References

[1] Carvalho CJB, et al. Insects from Brazil: diversity and taxonomy. 1st ed. Ribeirão Preto: Holos Editora. 2012.

[2] Alves ACF, Santos E, Creão-Duarte AJ. Diptera (Insecta) of forensic importance of the neotropical region. Entomotropica. 2014; 29: 77-94.

[3] Lamb KBB. Development and metamorphosis of 15 families of Diptera Brachycera (Hexapoda, Insecta) [P.h.D. dissertation]: Brasília: Universidade de Brasília; 2018.

[4] Carvalho CJB. Diptera Linnaeus, 1758. In: Rafael JA, Melo GAR, Carvalho CJB, Casari S, Constantino R, eds. Insects from Brazil: diversity and taxonomy. 2nd ed. Manaus: National Amazon Research Institute; 2024. P. p. 783-831.

[5] Brooks SE. Audacious predatory lifestyles exploring the diversity of flies (Diptera). Biodiversity. 2002; 3(4): 3–27.

[6] Carvalho CJB, et al. Main Brazilian collections of Diptera: historical and current situationIn Ibero-American Network Project of Biogeography and Systematic Entomology, PrIBES 2002. Third Millennium Monographs. 2nd ed. Zaragoza: Aragonese Entomological Society. 2002.

[7] Marchiori CH. Survey of conceptual and taxonomic characteristics of the families Acartophthalmidae, Canacidae, and Carnidae (Insecta: Diptera). Open Access Research Journal of Science and Technology. 2023; 7(1): 44–71.

[8] Marchiori CH. Family Acroceridae (Insecta: Diptera) as parasitoids of spiders (Arthropoda: Arachnida). Journal of Biology and Nature. 2023; 15(1): 30-47.

[9] Marchiori CH. Agromyzidae (Insecta: Diptera) species is an important agricultural pest. International Journal of Science and Technology Research Archive. 2022; 2(1): 17–032.

[10] Marchiori CH. The characteristics of the families Anisopodidae and Mycetophilidae (Insecta: Diptera). International Journal of Life Science Research Archive. 2023; 5(2). 96–108.

- [11] Bortolanza M, Carvalho CJB, Lara APC. A new species of *Coenosopsia* Malloch (Diptera, Anthomyiidae) from southern Brazil and a reappraisal of the cladistic analysis of the genus. *Zootaxa*. 2006; 1242: 37–52.
- [12] Iberfauna. Family Anthomyzidae [Internet]. Madri: The iberian fauna data bank. National Museum of Natural Sciences (CSIC); @2005 [cited 2024 Feb 12]. Available from <http://iberfauna.mncn.csic.es/showficha.aspx?rank=J&idtax=3748>.
- [13] Cazier MA. A revision of the North American flies belonging to the genus *Apiocera* (Diptera, Apioceridae). *Bulletin of the American Museum of Natural History*. 1982; 171(4): 287–467.
- [14] Nagatomi A, Liu N. Apystomyiidae, a new family of Asiloidea (Diptera). *Acta Zoologica Academiae Scientiarum Hungaricae*. 1994; 40(3): 203–218.
- [15] Trautwein MD. Multi multigene phylogenetics to resolve key areas in the fly tree of life. [Ph.D dissertation]. Raleigh, North Carolina State University; 2009.
- [16] Marchiori CH. Bionomics of the Asilidae Family (Insecta: Diptera). *Open Access Research Journal of Life Sciences*. 2022; 3(1): 1–16.
- [17] Chagas CB. Asteiidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2048>.
- [18] Chvála M. The Empidoidea (Diptera) of Fennoscandia and Denmark II. General Part. The families Hybotidae, Atelestidae and Microphoridae. *Fauna Entomologica Scandinavica*. 1983; 12: 1–279.
- [19] Marchiori CH. Biology, ecology, and biogeography of the Athericidae family (Hymenoptera: Athericidae). *International Journal of Frontiers in Science and Technology Research*. 2022; 2(2): 41–54.
- [20] Rung A, Wayne NM, Papp L *Curiosimusca*, gen. nov., and three new species in the family Aulacigastridae from the Oriental Region (Diptera: Opomyzoidea). *Zootaxa*. 2005; 1009: 21–36.
- [21] Brake I, Mathis W. Revision of the genus *Australimyza* Harrison (Diptera: Australimyziidae). *Systematic Entomology*. 2007; 32(2): 252–275.
- [22] Fachin DA, Santos CMD. Austroleptidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/195286>.
- [23] Matthew W, Courtney GW. The distribution and life history of *Axymyia furcata* McAtee (Diptera: Axymyiidae), a semi-aquatic wood-dwelling fly. *Proceedings of the Entomological Society of Washington*. 2011; 113(3): 385–398.
- [24] Marchiori CH. Contribution to the knowledge of the family Bibionidae (Insecta: Diptera). *International Journal of Science and Research. Archive*. 2022; 6(2): 52–08.
- [25] Gil-Azevedo LH, Santos DS. Family Blephariceridae. *Zootaxa*. 2016; 4122: 182–186.



- [26] Ševaík L, Papp J. Bolitophilidae (Diptera) from Taiwan: a family new to the Oriental region. *Journal of Zoology of the Hungarian Academy of Sciences*. 2004; 50(1): 55–62.
- [27] Falaschi RL, Amorim DS. Catalogue of the type-specimens of Bolitophilidae, Diadocidiidae, and Ditomyiidae (Diptera, Bibionomorpha) in the Natural History Museum, London. *Revista Brasileira de Entomologia*. 2013; 57(2): 119–128.
- [28] Marchiori CH. Establishing the phenology of the Bombyliidae Family (Insecta: Diptera). *Open Access Research Journal of Life Sciences*, 2022; 3(1): 61–87.
- [29] Câmara JT, Rafael JA. Brachystomatidae. Taxonomic catalog of the fauna of Brazil. Taxonomic catalog of the Fauna of Brazil [Internet]. Brasília: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2039>.
- [30] Gracioli G. Braulidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasília: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/756>.
- [31] Marchiori CH. Calliphoridae family (Insecta: Diptera) is of importance in Forensic Entomology, larval therapy, medical, veterinary, and vector of pathogens. *Journal of Modern Agriculture and Biotechnology*. 2022; 1(4): 20: 1-23.
- [32] Papp L. A key of the World species of Camillidae (Diptera). *Acta Zoologica Hungarica*. 1985; 31: 217-227.
- [33] Mathis ML, Wayne N. World catalog of the family Canacidae (including Tethinidae) (Diptera), with keys to the supraspecific taxa. *Zootaxa*. 2010; 2471: 1–84.
- [34] McAlpine JF. A revision of the genus *Campichoeta* Macquart (Diptera: Diastatidae). *Canadian Entomologist*. 1962; 94:1-10.
- [35] Ozerov AL, Krivosheina MG. To the fauna of Carnidae (Diptera) of Asia. *Euroasian Entomological Journal*. 2022; 31(1): 87–91.
- [36] Marchiori CH. Mini review of the conceptual and taxonomic aspects of the Cecidomyiidae family (Insect: Diptera). *Access Research Journal of Life Sciences*. 2022, 3(1): 88–126.
- [37] Gaimari SD. The dipteran family Celyphidae in the new world, with discussion of and key to world genera (Insecta, Diptera). *Zookeys*. 2017. 711: 113–130.
- [38] Marchiori CH. Biology and feeding behavior of adult ceratopogonids (Diptera: Ceratopogonidae). *International Journal of Frontiers in Science and Technology Research*. 2021: 1(2): 7–24.
- [39] Chagas CB. Chamaemyiidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasília: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2048>.
- [40] Gil-Azevedo LH, Corrêa CCD. Chaoboridae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasília: Developed

by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbj.gov.br/fauna/faunadobrasil/2422>.

[41] Marchiori CH. Chironomidae family (Diptera: Chironomidae) in biogeochemical processes in lake sediments. Open Access Research Journal of Life Sciences. 2022, 3(1): 88–126.

[42] Zeina B. A comparative morphology of Oscinellinae genera (Diptera: Chloropidae): a framework towards a phylogeny of the subfamily [P.h.D. dissertation]. Ribeirão Preto: Universidade de São Paulo; 2019.

[43] Ebejer MJ, Bartak M. Chyromyidae (Diptera, Acalyptrata) of Turkey. Zookeys. 2019; 872: 69-75.

[44] Marchiori CH. Description of the Clausiidae family. International Journal of Biological and Pharmaceutical Sciences Archive, 2023; 5(2): 56–67.

[45] Mathis WN. Coelopidae (kelp flies). In: Brown B, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA, eds. Manual of Central American Diptera. 2nd ed. Ottawa: National Research Council Research Press; 2010. p. 1010-1013.

[46] Marchiori CH. Conopidae larvae (Diptera: Conopidae) the endoparasitoids of Aculeata. International Journal of Science and Technology Research Archive. 2022; 3(2): 112–132.

[47] Gil-Azevedo LH, Corrêa CCD. Corethrellidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2254>>.

[48] Richards OW, Davies RG. Imms' general textbook of Entomology. Structure, Physiology and Development. Classification and Biology. 2nd ed. Berlin: Springer. 1977.

[49] Korneyev VA. Ctenostylidae (Ctenostylid flies). In: Brown B, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA, eds. Manual of Central American Diptera. 2nd ed. Ottawa: National Research Council Research Press; 2010. p. 963–969.

[50] Burton J, Bogitsh, Clint E, Carter T, Oeltmann N. Arthropods as vectors. Human Parasitology. 5th ed. Cambridge; Academic Press; 2019. 331-360.

[51] Kirk-Spriggs AH. A revision of Afrotropical Quasimodo flies (Diptera: Curtonotidae: Schizophora). The genus *Axinota* van der Wulp, with the description of three new species. African Entomology. 2010; 18: 99–126.

[52] Carvalho-Filho FS, Esposito MC. Redescription of *Pseudopomyzella flava* Hennig (Diptera: Cypselosomatidae) and the first record from Brazil. Neotropical Biota. 2011; 11:1–3.

[53] Schneeberg K, Courtney GW, Beutel RG. Adult head structures of Deuterophlebiidae (Insecta), a highly derived "ancestral" dipteran lineage. *Arthropod Structure & Development*. 2011; 40(1): 93–104.

[54] Falaschi RL. Family Diadocidiidae. Zootaxa: 2016; 4122: 53–55.

[55] Mathis WN. Diastatidae (Diastatidae flies). In: B. Brown B, Borkent A, Cumming JM, Wood DM, Woodley NE,

Zumbado MA, eds. Manual of Central American Diptera. 2nd ed. Ottawa. National Research Council Research Press; 2010. p. 1207–1210.

[56] Falaschi RL. Ditomyiidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasília: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1855.fev/2022>.

[57] Corrêa CCD, Gil-Azevedo LH. Dixidae. Taxonomic catalog the fauna of Brazil [Internet]. Brasília: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1844>>.

[58] Capellar RS. List of species of Dolichopodidae (Insecta, Diptera) from the State of Mato Grosso do Sul. Iheringia, Zoology Series. 2017; 107: e2017135.

[59] Whitem NK, et al. Mining the plant-herbivore interface with a leafmining *Drosophila* of Arabidopsis. Molecular Ecology. 2010; 20(5): 995–1014.

[60] Mathis WN, Sueyoshi M. World catalog and Conspectus on the Family Dryomyzidae (Diptera: Schizophora). Myia. 2011; 12: 207–233.

[61] Wahlberg E, Johanson KA Molecular phylogenetics reveals novel relationships within Empidoidea (Diptera). Systematic Entomology. 2018; 43(4): 619–636.

[62] Marchiori CH. Study of the bionomy of the Ephydriidae Family (Insecta: Diptera). International Journal of Science and Technology Research Archive. 2022; 2(2): 69–94.

[63] Evenhuis NL. Family Eurychoromyiidae. In: Evenhuis NL, eds. Catalog of the Diptera of the Australasian and Oceanian Regions. 1st ed. Honolulu: Bishop Museum Press & E.J. Brill; 1989. p. 1- 593.

[64] Albuquerque DO, Pamplona D, Carvalho CJB. Contribution to the knowledge of *Fannia* RD, 1830 from the Neotropical region (Diptera, Fanniidae). Archive of the National Museum of Rio de Janeiro. 1981; 56: 9–34.

[65] Scheffer SJ. Phylogenetics of Australasian gall flies (Diptera: Fergusoninidae): Evolutionary patterns of host-shifting and gall morphology". Molecular Phylogenetics and Evolution. 2017; 15: 140–160.

[66] Marchiori CH. Study of the characteristics of the Glossinidae family (Muscoidea, Oestroidea). International Journal of Science and Technology Research Archive. 2021; 01(02): 088–107.

[67] McAlpine DK. Gobryidae, a new family of acalyptrate flies (Diptera: Diopsoidea), and a discussion of relationships of the diopsoid families. Records of the Australian Museum. 1997; 49(2): 167–194.

[68] McAlpine DK. The Australian genera of Heleomyzidae (Diptera: Schizophora) and a reclassification of the family into tribes. Records of the Australian Museum. 1985; 36(5): 203-251.

[69] Mathis WN. World Catalog and conspectus on the Family Heterocheilidae (Diptera: Schizophora). MYIA. 2011; 12: 281–289.

- [70] Calhau J, Ale-Rocha R. Heleomyzidae. Taxonomic catalog of the fauna of Brazil. [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1464>.
- [71] Carvalho CJB. Diptera Linnaeus, 1758. In: Rafael JA, Melo GAR, Carvalho CJB, Casari S, Constantino R, eds. Insects from Brazil: Diversity and Taxonomy. 2nd ed. Manaus: National Amazon Research Institute. 2024; 783-831.
- [72] Schelesky-Prado DC, Falaschi RL. Notes on presumed Neotropical records and species of *Hesperinus* Walker, 1848 (Diptera: Bibionidae). EntomoBrasilis. 2023;16: e1059.
- [73] Webb DW. A revision of the genus *Hilarimorpha* (Diptera: Hilarimorphidae). Journal of the Kansas Entomological Society. 1974; 47(2): 172–222
- [74] Torp PF, Rudolf MK, Narayanan S, Wiegmann BM. The phylogeny and evolution of host choice in the Hippoboscoidea (Diptera) as reconstructed using four molecular markers. Molecular Phylogenetics and Evolution. 2007; 45(1): 111–122.
- [75] Ale-Rocha R, Freitas-Silva RAP. Hybotidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1413>.
- [76] Riccardi PR. Inbiomyiidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/198468>.
- [77] Falaschi RL. Keroplatidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1632>.
- [78] Silva VC. Family Lauxaniidae. Zootaxa. 2016; 4122(1): 622-634.
- [79] Podeniene V, Gelhaus JK. Review of the last instar larvae and pupae of *Hexatoma* (*Eriocera*) and *Hexatoma* (*Hexatoma*) (Diptera, Limoniidae, Limnophilinae). Zootaxa. 2015; 4021(1): 93-118.
- [80] Macgowan I. World catalogue of the family Lonchaeidae (Diptera, Cyclorrhapha, Acalyptratae). Zootaxa. 2023; 5307(1): 1-96.
- [81] Miranda GFG. Lonchopteridae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1347>.
- [82] Oliveira SS, Amorim DS. Family Lygistorrhinidae. Zootaxa. 2016; 4122(1): 62-64.
- [83] Gee S, Vockeroth JR, Matile L. Families of Sciaroidea. In: Papp L, Darvas B, eds. Manual of Palaearctic Diptera. Appendix. 1st ed. Berkeley: Science Herald; 2000. p. 49-92.
- [84] McAlpine DK. Marginidae, a new Afrotropical family of Diptera (Schizophora? Opomyzoidea). Annals of the Natal Museum. 1991; 32: 167–177.

- [85] Marchiori CH. Study of the biological and taxonomic characteristics of the families Megamerinidae, Nemestrinidae and Therevidae (Insecta: Diptera). Open Access Research Journal of Biology and Pharmacy. 2023; 7(2): 43–074.
- [86] Marchiori CH. Research of the family Mesembrinellidae (Insecta: Diptera). Open Access Research Journal of Science and Technology. 2023; 8(2): 29–39.
- [87] Ferro GB, Carvalho CJB. A pictorial key and diagnosis of the Brazilian genera of Micropezidae (Diptera, Neriodea). Revista Brasileira de Entomologia. 2014; 58: 52–62.
- [88] Marchiori CH. Investigation of the characteristics of the Milichiidae Family (Arthropoda: Insecta: Diptera). Journal of Modern Agriculture and Biotechnology. 2023; 2(2): 1-9.
- [89] Kirk-Spriggs AH, Kotrba M, Copeland RS. Further details of the morphology of the enigmatic African fly *Mormotomyia hirsuta* Austen (Diptera: Mormotomyiidae). African Invertebrates. 2011; 52(1): 145-165.
- [90] Carvalho CJB. Classification of Muscidae (Diptera): a proposal through cladistic analysis. Brazilian Journal of Zoology. 1989; 6(4): 627–648.
- [91] Bauernfeind R, Schneeberg K, Beutel RG. The larval head of *Exechia* (Mycetophilidae) and *Bibio* (Bibionidae) (Diptera). Arthropod Structure Development. 2015; 44(4): 326-45.
- [92] Calhau J, Lamas CJE, Nihei SS. Review of the *Gauromydas* giant flies (Insecta, Diptera, Mydidae), with descriptions of two new species from Central and South America. Zootaxa. 2015; 4048: 392–411.
- [93] Evenhuis NL. Catalog of the Mythicomyiidae of the world. Bishop Museum Bulletin in Entomology. 2002; 10: 1-85.
- [94] Papp L, Mathis WN. A review of the family Nannodastiidae (Diptera). Proceedings of the Entomological Society of Washington. 2001; 103: 337–348.
- [95] Rafael JA, Marques Almeida DK, Limeira-De-Oliveira F. *Atriadops macula* (Wiedemann) inhabiting the canopy: The first record of Nemestrinidae (Diptera) in the Amazon Basin. Zootaxa. 2020; 4722(5): 486–490.
- [96] Buck M. Neriidae. In: Brown BV, Borkent A, Cumming JM, Wood DM, Woodley NE, Zumbado MA, eds. Manual of Central American Diptera. 2st: Ottawa: NRC Research Press; 2010. p. 815–819.
- [97] Paiero S, Marshall SA. Indirect *Trophalaxis* and courtship behavior in the Nothybidae. Journal of Insect Behavior. 2014; 27(6): 712–715.
- [98] Marchiori CH. Family Nycteribidae (Insecta: Diptera). Open Access Research Journal of Multidisciplinary Studies. 2023; 7(1): 17–25.
- [99] Schneeberg K, Friedrich F, Courtney GW, Wipfler B, Beutel RG. The larvae of Nymphomyiidae (Diptera, Insecta) ancestral and highly derived? *Arthropod Structure & Development*. 2012; 41(3): 293-301.

- [100] Yeates DK, Irwin ME, Wiegmann BM. Ocoidae, a new family of asiloid flies (Diptera: Brachycera: Asiloidea), based on *Ocoa chilensis* gen. and sp. nov. from Chile, South America. *Systematic Entomology*. 2003; 28: 417–431.
- [101] Carvalho-Filho FS, Esposito MC, Santos RCO. A new species of *Helgreelia Gaimari* (Diptera: Odiniidae) from Brazil, with a key to the Neotropical species of Odiniidae. *Zootaxa*. 2009; 2219: 61–68.
- [102] Marchiori CH. Study of the characteristics of the Oestridae family (Muscoidea, Oestroidea). *Open Access Research Journal of Biology and Pharmacy*. 2021; 3(1): 1–18.
- [103] Amorim DS, Silva CV, Victor B. *Puyehuemysia chandleri*, gen. nov., sp. nov. (Diptera, Opetiidae): remnants of a Cretaceous biota in Chile. *American Museum Novitates*. 2018; 3892: 1–2
- [104] Marchiori CH. Family Opomyzidae fly pests of cereal crops (Insecta: Diptera). *Open Access Research Journal of Multidisciplinary Studies*. 2022; 4(2): 30–45.
- [105] A Tabanomorpha fly. *Oreoleptis torrenticola* (Oreoleptidae) [Internet]. Helena: Montana field guide. Montana Natural Heritage Program; @2024 [cited 2024 Feb 05]. Available from <https://FieldGuide.mt.gov/speciesDetail.aspx?elcode=IIDIP0J010>.
- [106] Arnett RHJr. *American insects: A Handbook of the insects of America North of Mexico*. 2nd ed. Boca Raton: CRC Press. 2000.
- [107] Morge G. The Lonchaeidae and Pallopteridae of Austria and the adjacent areas. The Pallopteridae. *Natural history yearbook of the city of Linz*. 1967; 13: 141–212.
- [108] Marchiori CH. Study on the Pantophthalmidae family (Diptera: Pantophthalmidae). *International Journal of Frontiers in Science and Technology Research*. 2022; 3(1): 38–058.
- [109] Wheeler TA, Sinclair BJ. Systematics of *Paraleucopis* Malloch with proposal of Paraleucopidae, a new family of acalyptrate Diptera. *Zootaxa*. 2019; 4668 (3): 301–328.
- [110] Obona J, Stary J. Description of the larva and pupa of *Nasiternella regia* Riedel, 1914 (Diptera, Pediciidae) from Slovakia, with notes on ecology and behavior. *Biology*. 2013; 68(2): 345 - 350.
- [111] Pelecorhynchid flies (Pelecorhynchidae) [Internet]. Lincoln: Landcare research; @2024 [cited 2024 Feb 05]. Available from <https://www.landcareresearch.co.nz/contact-us-company/>.
- [112] Vala JC, Bailey PT, Gasc C. Immature stages of the fly *Pelidnoptera nigripennis* (Fabricius) (Diptera: Phaeomyiidae), a parasitoid of millipedes. *Systematic Entomology*, 1990; 15: 391–399.
- [113] Silva GF. Taxonomic revision of the neotropical genus *Scutops* Coquillett, 1904 (Diptera: Periscelididae) [Internet]. Manaus: Instituto Nacional de Pesquisas da Amazônia- INPA; @ 2014 [cited 2023 Nov 19]. Available from [https://repositorio.inpa.gov.br/bitstream/1/12470/1/tese\\_inpa.pdf](https://repositorio.inpa.gov.br/bitstream/1/12470/1/tese_inpa.pdf).

- [114] McAlpine DK. Note on aerial swarming of '*Perissomma*' (Diptera: Perissommatidae). Australian Entomologist. 1987; 14(1–2): 29–30.
- [115] Vala JC, Bailey PT, Gasc, C. Immature stages of the fly *Pelidnoptera nigripennis* (Fabricius) (Diptera: Phaeomyiidae), a parasitoid of millipedes. Systematic entomology. 1990; 15: 391–399.
- [116] Ament DC. List of species of Phoridae (Insecta, Diptera) from the State of Mato Grosso do Sul. Iheringia, Zoology Series. 2017; 107: e2017136.
- [117] Marchiori CH. The sanitary and forensic importance for the Piophilidae Family (Insecta: Diptera). Open Access Research Journal of Multidisciplinary Studies. 2021; 2(1): 127–138.
- [118] Marchiori CH. Family Pipunculidae (Diptera) as endoparasitoids of the cicada: Agricultural pest (Homoptera). Open Access Research Journal of Multidisciplinary Studies. 2022; 4(01): 1–16.
- [119] Kessel EL. *Maggioncalda* 1968. A revision of the genera of Platypezidae, with the descriptions of five new genera, and considerations of phylogeny circumversion, and *Hypopygia* (Diptera). The Wasmann Journal of Biology. 1968; 26(1): 33–106.
- [120] Whittington AE. The economic significance of the signal fly genus *Rivellia* Robineau-Desvoidy (Diptera: Platystomatidae). Israel Journal of Entomology. 2019; 49(2): 35–160.
- [121] Buck M, McAlpine DK. Pseudopomyzidae. In: Brown BV, Borkent A, Cumming JM, Wood DM, Diptera. 2nd ed. Ottawa: NRC Research Press; 2010. p. 821–825.
- [122] Ale-Rocha R. Psilidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04] Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1623>.
- [123] Cordeiro DP. Phylogeny of *Psychoda* sensu lato (Diptera, Psychodidae, Psychodinae) and the use of molecular markers in correlation of sexes and identification of species in Brazil [Ph.D. dissertation]. Curitiba: Federal University of Paraná; 2013.
- [124] Eskov KY, Lukashevich ED. On the history of ranges of two relict nematoceran families, Ptychopteridae and Tanyderidae (Insecta: Diptera): a biogeographical puzzle. Russian Entomological Journal. 2015; 24: 257–270.
- [125] Aczél M. Partial revision of the Neotropical and Antarctic Pyrgotidae, with a synopsis of the genera and species (Diptera, Acalyprtratae). Brazilian Journal of Entomology. 2024; 1056; 4: 161–184.
- [126] Falaschi RL. Rangomaramidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2358>.
- [127] Coscarón S, Coscarón MDC. A revision of the southern realm species of genus *Chrysopilus* Macquart (Diptera, Rhagionidae). Entomological Treatises. 1995; 56(14): 259–275.



- [128] Ferrar P, El-Hawagry MS, El-Azab SA. Catalog of the Calliphoridae, Rhiniidae, and Sarcophagidae of Egypt (Diptera: Oestroidea. Egyptian Journal of Biological Pest Control. 2019; 29(1): 1-1.
- [129] Verves Y, Zeegers T, Barták M, Kanavalová L. The family Rhinophoridae (Diptera) in the Czech Republic and new records from Jordan and Bulgaria. In: Kubík Š, Barták M, eds. 11th Workshop on biodiversity. 1st ed. Jevany: Czech University of Agriculture in Prague Faculty of Agrobiology, food and natural resources; 2019. p. 163–173.
- [130] Alencar LB, Wendt LD, Ale-Rocha R. *Richardia* Robineau-Desvoidy (Diptera, Tephritoidea, Richardiidae) from Central Amazon, Brazil. Brazilian Journal of Entomology. 203; 57: 202.
- [131] Marques APC, Ale-Rocha R, Ronchi-Teles B. Population Fluctuation of *Willistoniella* Mik and *Rhopalomera* Wiedemann (Diptera: Rhopalomeridae) in the Central Amazonia. Neotropical Entomology. 2004; 33(5): 661-664.
- [132] Marchiori CH. Biology of Sarcophagidae (Diptera): Mini review. Open Access Research Journal of Life Sciences. 2021; 2(1): 34–046.
- [133] Marchiori CH. Importance of the Scatophagidae family as efficient predators of blowflies (Insecta: Diptera). International Journal of Science and Technology Research Archive. 2022; 2(2): 33–05.
- [134] Marchiori CH. Occurrence of the Scenopinidae Family in animal droppings (Insecta: Diptera). Open Access Research Journal of Science and Technology. 2022; 6(1): 28–49.
- [135] Disney RHL. Sciadoceridae (Diptera) reconsidered. Fragmenta faunistica. 2001; 44(2): 309–317.
- [136] Knutson L, Bredt A. Two new species of snail-killing flies from west-central Brazil (Diptera, Sciomyzidae). Papéis Avulsos de Zoologia. 1976; 30(7): 113–118.
- [137] Marchiori CH. Family Sepsidae associated with the decomposition of organic matter (Insecta: Diptera). Open Access Research Journal of Science and Technology. 2022; 5(2): 16–38.
- [138] Hamada N, Nascimento JMC. Family Simuliidae. In: Hamada N, James H, Thorp JH, Rogers CD. The and Covich's Freshwater Invertebrates. 4th ed. London: Academic Press; 2018; p. 701-718.
- [139] Carvalho-Filho F. Aggregation of *Somatia aestiva* (Fabricius) (Diptera: Somatiidae) on leaves of *Solanum stramonifolium* Jacq. Entomobrasilis. 2017; 10: 54–56.
- [140] Papp L. On apterous and reduced-winged forms of the family Drosophilidae, Ephydriidae, and Sphaeroceridae (Diptera). Journal of Zoology of the Hungarian Academy of Sciences. 2017; 25: 357–374.
- [141] Marchiori CH. Biological aspects of the (Insecta: Diptera). Open Access Research Journal of Life Sciences. 2021; 2(1): 81–99.
- [142] Graciolli G. Streblidae. Taxonomic catalog of the fauna of Brazil [Internet]. Brasilia: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/2624>>.



- [143] Geir EES, Uta G, Økland B. Synneuridae and Pachyneuridae one new and one poorly known family of Diptera in Norway (Diptera, Nematocera). *Fauna Norvegica. Ser. B.* 1994; 41: 49-52.
- [144] Câmara JT, Rafael JA. Syringogastridae. Taxonomic catalog of fauna of Brazil [Internet]. Brasília: Developed by COPPETEC-UFRJ; @2022 [cited 2024 Feb 04]. Available from <http://fauna.jbrj.gov.br/fauna/faunadobrasil/1913>.
- [145] Wong D. The phylogeny and evolutionary ecology of hoverflies (Diptera: Syrphidae) inferred from mitochondrial genomes. *Molecular Phylogenetics and Evolution.* 2023; 1: 107-759.
- [146] Marchiori CH. Medical-veterinary and economic importance of the Tabanidae family. *Open Access Research Journal of Multidisciplinary Studies.* 2023; 6(2): 1–15.
- [147] Shigueo NS. Family Tachinidae. *Zootaxa.* 2016; 4122(1): 904–949.
- [148] Wipfler B, Courtney GW, Craig DA, Beutel RG. First  $\mu$ -CT-based 3D reconstruction of a dipteran larva-the head morphology of *Protanyderus* (Tanyderidae) and its phylogenetic implications. *Journal of Morphology.* 2012; 273(9): 968-80.
- [149] Lonsdale O. Review of the families Tanypezidae and Strongylophthalmyiidae, with a revision of *Neotanypeza* Hendel (Diptera: Schizophora). *Smithsonian Contributions to Zoology.* 2013; 641(1): 1–60.
- [150] Albuquerque DO. On a genus and a new species of “Thyreophoridae” of Brazil (Diptera, Haplostomata). *Brazilian Journal of Biology.* 1953; 13(2): 109–112.
- [151] Munari L. Contribution to the knowledge of Afrotropical Tethinidae. II. Taxonomic considerations on the subfamily Horaismopterinae Sabr. and description of a genus and two new species (Diptera, Tethinidae). *Venetian Society of Natural Sciences - Works.* 1986; 11: 41–52.
- [152] Sinclair BJ. Immature stages of Australian *Austrothaumalea* Tonnoir and *Niphta* Theischinger (Diptera: Thaumaleidae). *Australian Journal of Entomology.* 2000; 39: 171-176.
- [153] Marchiori CH. Study of the ecology of the Tephritidae family (Insecta: Diptera). *Open Access Research Journal of Life Sciences.* 2021; 2(1): 47–80.
- [154] Irwin ME, Webb DW. Brazilian Therevidae (Diptera): a checklist and description of species. *Acta Amazonica.* 1991; 21: 85–121.
- [155] Marchiori CH. Family Tipulidae (Insecta: Diptera) as a natural enemy of Culicidae (Diptera). *International Journal of Frontiers in Science and Technology Research.* 2022; 3(2): 19–51.
- [156] McAlpine JF. A revised classification of the Piophilidae, including Neottiophilidae' and 'Thyreophoridae' (Diptera: Schizophora). *Memoirs of the Entomological Society of Canada.* 1977; 109(103): 1-66.
- [157] Petrašiūnas A, Kvifte G. New records of Trichoceridae (Diptera) from the island of Mallorca . *Biodiversity Data*

Journal. 2016; 4: e7610.

[158] Woźnica AJ. Order Diptera, family Trixoscelididae. Arthropod fauna of the UAE. 2009; 2: 752–763.

[159] Marchiori CH. Diversity of the Ulidiidae Family (Insecta: Diptera). Qeios. 2023; 1-33.

[160] Stuckenberg BR. A new genus and species Vermileonidae (Diptera: Brachycera) from Madagascar. Journal of Entomology. 2002; 145: 1–8.

[161] Carles-Tolrá M. Nemestrinidae, Vermileonidae, Xylophagidae, Borboropsidae, Cryptochetidae and Xenasteiidae: six families of new Diptera to Portugal (Insecta: Diptera). Bulletin of the Aragonese Entomological Society (S.E.A.). 2016; 59: 157–158.

[162] Fachin DA, Amorim DDS. Taxonomic revision of the Neotropical genus *Arthropeina* Lindner, 1949 (Diptera: Xylomyidae). Zootaxa. 2014; 3827(2): 231–257.

[163] Krivosheina NP, Krivosheina MG. New data on rare xylophagous flies of the genus *Xylophagus* (Diptera, Xylophagidae). Zoological Journal. 2000; 79(10):1216-1228.