

Purdue University  
Department of Entomology  
Undergraduate Capstone  
Project Summary

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**Project Title:**

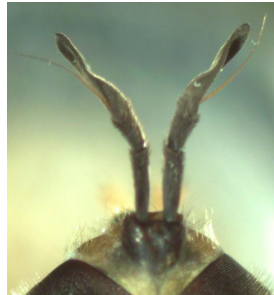
A Dichotomous Key to Select Families of Diptera of Public Health Importance

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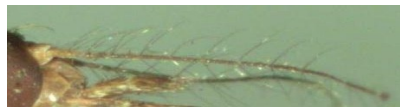
A Dichotomous Key to Select Families of Diptera of Public Health Importance  
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Amy Lockwood  
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April 23 2009

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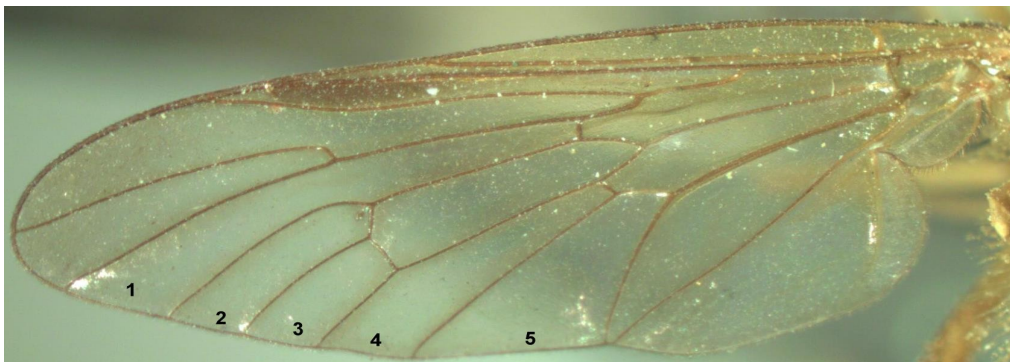
1. a) Antennae with 5 or fewer (often 3) segments.....2



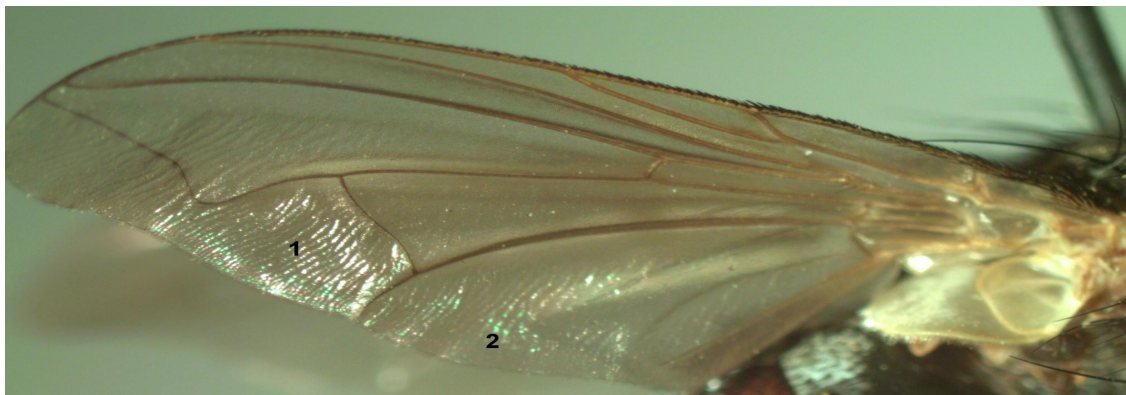
b) Antennae with 10 or more segments.....16



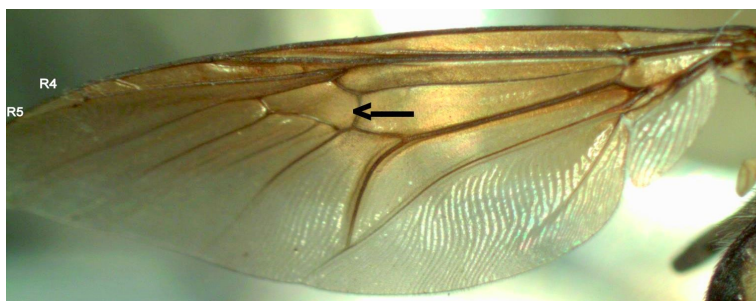
2. a) Antennae with more than 3 segments; wings with 4 or 5 posterior cells.....3



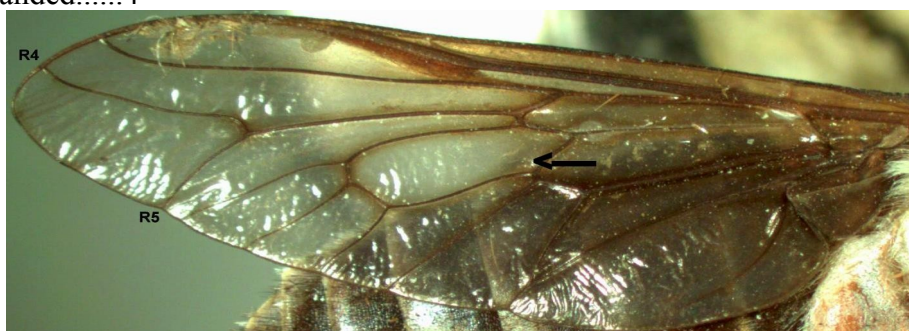
b) Antennae with 3 segments; wings with 3 or less posterior cells.....5



3. a) Wings with small central discal cell, R4 and R5 end before wing tip...**Stratiomyidae**



b) Wing tip enclosed by R4 and R5, discal cell elongate, wings may be spotted or banded.....4



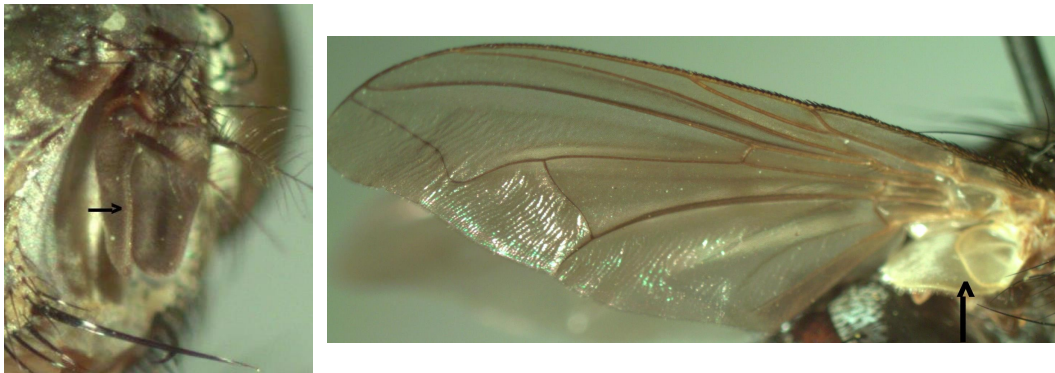
4. a) Head half-moon shaped; antennae arising below middle of the head...**Tabanidae**



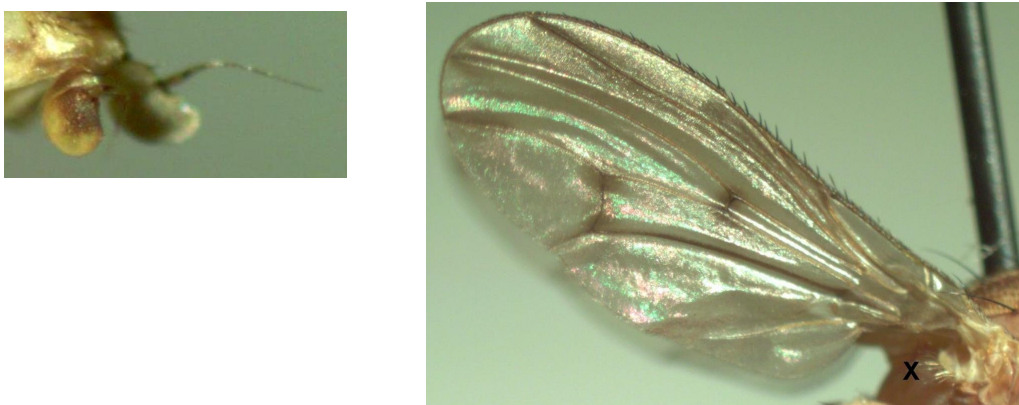
b) Head rounded with cylindrical eyes, front tibia with apical spur....**Rhagionidae**



5. a) Second antenna segment with suture; calypters at wing base well developed....6



b) Second antenna segment lacking suture; calypters not well developed or absent....9



6. a) Hypopleura bare.....**Muscidae**



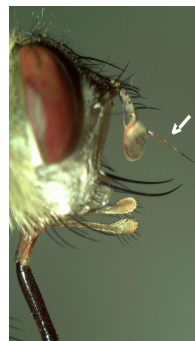
b) Hypopleura with bristles....7



7. a) Postscutellum undeveloped; arista usually with hairs.....8



b) Postscutellum large/developed; arista bare; body hairy.....**Tachinidae**



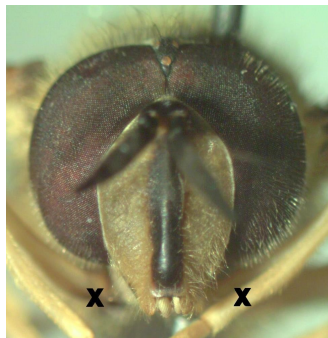
8. a) Four notopleural bristles; arista plumose at base; body usually with striped thorax.....**Sarcophagidae**



b) Two notopleural bristles; arista completely plumose; body often metallic.....**Calliphoridae**



9. a) Oral vibrassae absent from face.....10



b) Oral vibrassae mostly present.....13



10. a) Spurious vein present in wing.....**Syrphidae**



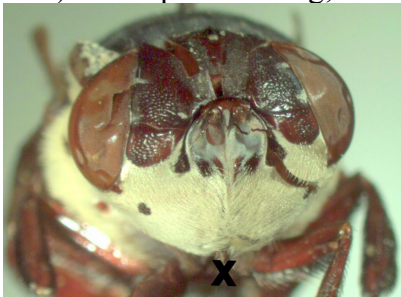
b) Spurious vein absent.....11

11. a) Wings with absent anal cell, costa broken twice along wing edge; bulging head.....**Ephydriidae**



b) Short anal cell present, costa unbroken.....12

12. a) Mouthparts lacking; robust flies; wings with calypters present.....**Oestritidae**



b) Mouthparts present; wings with broad calypters.....**Ulidiidae**



13. a) Body black and shiny; wings with anal vein present.....**Piophilidae**





b) Body dull or only somewhat shiny; wings with variable anal vein.....14

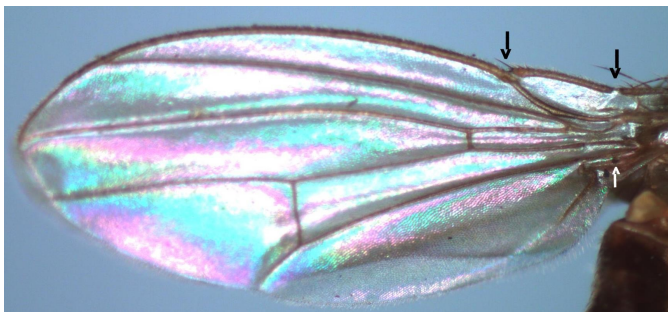
14. a) Antennae appears 1-segmented; wings with darkened costa, subcosta, and R1.....**Phoridae**



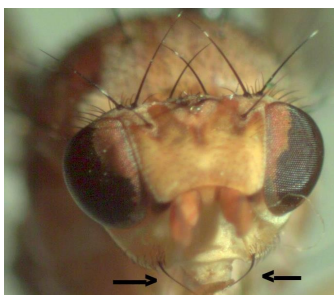
b) Antennae appears 2-segmented.....15



15. a) Wings with costa broken twice along wing edge, anal cell present; mouthparts not thick.....**Drosophilidae**



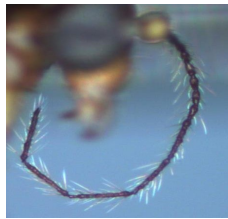
b) Wings unbroken, costa with spines, anal cell present; thick mouthparts; usually light in color.....**Heleomyzidae**



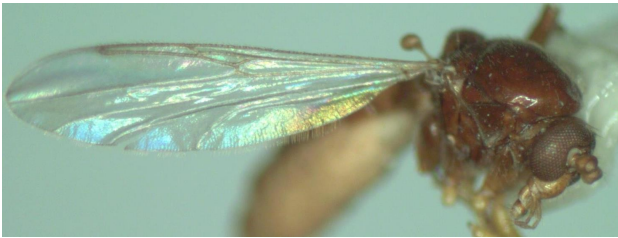
16. a) Antennae with 10-11 short segments; wings broad at base.....**Simuliidae**



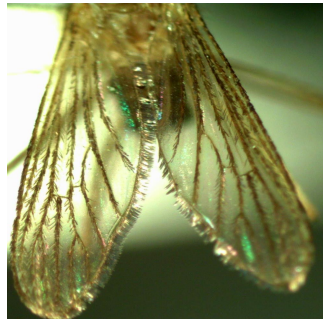
b) Antennae with 12-16 segments; wings variable.....17



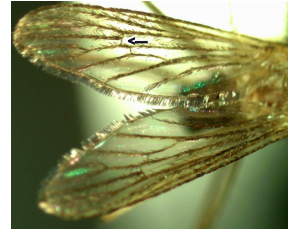
17. a) Wings without hairs or scales, reduced wing venation, sometimes patterned.....**Ceratopogonidae**



b) Wings with hairs or scales.....18



18. a) Wings covered with scales, crossveins to about middle of wings; long proboscis present.....**Culicidae**



b) Wings covered with hair, distinct rounded wings, wings without crossveins; without long proboscis .....**Psychodidae**



**Calliphoridae:** Blow flies; These insects are scavengers which mainly breed in carrion, excrement, or other detritive materials. Some species cause myiasis or feed on living tissues (screwworm fly.) These flies may also be mechanical vectors of disease.

**Ceratopogonidae:** Biting midges, "punkies"; These flies are found along shores of seas, rivers, or lakes. Though they are small, they have painful bites and are pests of humans and wild and domestic animals. Adults of this family may blood feed and are vectors of blood-borne viruses, protozoans, and nematodes. Common diseases include Oropouche fever (humans), bluetongue disease, epizootic hemorrhagic disease, African horsesickness, and onchocerciasis of animals.

**Culicidae:** Mosquitoes; Many of the females of this family require a blood meal for egg development. When mosquitoes take a blood meal they secrete saliva into the host. This transfer of fluids makes mosquitoes a prime vector to transmit diseases to humans either from animal populations or within the human population. Some of the most notable diseases associated with mosquitoes include Dengue, West Nile Virus, Japanese encephalitis, Yellow fever, Western and Eastern equine encephalitis, and Malaria. Malaria is the most important arthropod-borne disease to date, killing 1-2 million people worldwide annually.

**Drosophilidae:** Pomace flies; The larvae usually live in decaying vegetation, sap, fungi, or ripe fruit. Some may be parasites or predators of select ants and wasps. Members of this family of flies are commonly household pests which are attracted to decaying fruits and vegetables. They have the potential to be mechanical vectors of disease when they breed on animal waste. There are also recorded cases of these flies causing intestinal myiasis.

**Ephydriidae:** Shore flies; Adults of this family are attracted to damp areas so they may feed on fungi. Because of their feeding habits, they are prone to spread fungal pathogens. They can also swarm in large numbers and be considered nuisances.

**Heleomyzidae:** Heleomyzids; Adults of this family are found in moist shady places. The larvae live in decaying plant or animal matter or fungi.

**Muscidae:** House flies; Flies of this family breed in decaying plant material or manure. Most species are *endophilic*, though some maybe *exophilic*. Adults are most active in the daytime and are strong fliers. Though females of most species require blood meals to complete their initial egg development, both the males and females bite. These flies are not only nuisance biters, but they can be mechanical vectors of pathogens (often from direct/indirect contact with fecal matter.) The larvae may also cause myiasis.

**Oestridae:** Bot and Warble flies; Most adults of this family do not feed or take in

nutrients. The larvae, however, are parasites in specific regions of specific hosts. Generally the bot flies have coevolved to such a level with their host that there is little physical injury to the host. Humans are not normal hosts for bot flies, but can become infected. The flies are often attracted to mammals and may cause problems in livestock. Secondary infections are not common due to antibiotics produced by the larvae. Physical deformities can be caused by the bot fly leading to morbidity, and other myiasis causing diptera may exploit the mammal once the bot fly has emerged. The flies also cause damage to animal hides when they emerge.

**Phoridae:** Hump-backed flies; Adults of this family are most commonly found in decaying matter. The larvae may also be found in decaying matter, fungi, decomposing plant or animal matter, feces, sewage treatment areas, or bird nests. Flies of species *Megaselia* causes human myiasis.

**Piophilidae:** Skipper flies; The larvae of this family live in dead plant and animal matter. They can also be pests of meats and cheeses and may cause myiasis. They are so named because of their ability to jump and flip.

**Psychodidae:** Moth flies; The adult flies are minute and prevalent in sewers and drains. They breed in hidden sites, such as crevices in soil and stone, manure, wells, etc. The larvae may be found in decaying vegetation, mud, moss, or water. One subfamily (Phlebotominae) found in the Southern United States is blood feeding and act a vector of disease. Members of this subfamily ("sand flies") are nuisance biters and can transmit bacterial, protozoan, and viral diseases of humans and animals. Leishmaniasis and Sandfly fever are two examples. They can also cause myiasis.

**Rhagionidae:** Snipe flies; These flies are found in wooded areas, the western mountain areas, and coastal regions. While the majority of these flies feed on other insects, some females of *Symphoromyia* take blood meals. They will attack humans and other large mammals around the head area. Though the bites are painful and annoying, they are not known to transmit and diseases to date.

**Sarcophagidae:** Flesh flies; Adults in this family feed on sugar-containing materials (nectar, etc) but larvae feed on animal materials. Most will feed on dead animals, however some live as parasites of other insects (beetles and grasshoppers) while others will seek vertebrate hosts. Larvae within the subspecies of Sarcophaginae and Miltogramminae can feed on humans, causing myiasis.

**Simuliidae:** Black flies; Adult females are persistent blood feeders who viciously leave welts bleeding wounds on their victims. They are daytime feeders who are exophilic and exophagic. Females feed on humans and livestock and have been known to swarm in such numbers as to cause death in large mammals (humans included.) Adults are most

active in late spring/early summer. Larvae are found in streams. Adults can be biological vectors of disease, most notably onchocerciasis (Riverblindness)-- a disease caused by nematodes known for its high instances of morbidity.

**Stratiomyidae:** Soldier flies; Adults of this family are often brightly colored and wasplike, and are commonly found on or near flowers. Larvae can be found in aquatic habitats, in dung or decaying matter, under tree bark, or in other locations. Larvae of *Hermetica illucens* (black soldier fly) is the only species known to cause myiasis. They can develop in decaying fruits, vegetables, mammals, and human or animal waste. Intestinal myiasis is often cause by accident ingestion by eating overripe fruit or undercooked meat.

**Syrphidae:** Hover flies; Members of this family can be found in a wide variety of habitats, though they are often associated with flowers and in many cases closely resemble bees or wasps. They do not, however, bite or sting. While most larvae of this family prey on aphids, others live in nests of social insects, feed on decaying or rotten plant matter, or feed growing plants. Still other varieties prefer to live in highly polluted aquatic areas. Larvae of the genus *Eristalis* ("rattailed maggots") prefer polluted water and may cause intestinal myiasis in humans.

**Tabanidae:** Horse and Deer flies; Adults of this family are nuisance biters, but can be both biological and mechanical vectors of disease. One of the most important diseases transmitted is Loiasis. The larvae, found in water habitats, can also bite.

**Tachinidae:** Tachinid flies; Larvae of this family are predaceous on other insects, and can be good biological control agents. They attack caterpillars and larvae of beetles, flies, wasps, bees, and ants.

**Ulidiidae:** Picture-Winged flies; Some larval species of this family feed on plants and may cause damage to cultivated plants. Others feed on decaying matter. Adults are found in moist places.

**Accidental Parasitism:** Ingestion of a parasitic arthropod by a host that is not normally involved with the parasite's life-cycle.

**Anthropophilic:** preference to feed on humans

**Biological Vector:** When the disease is only carried by the arthropod (no development by disease agent)

**Endophagic:** Preference of arthropod to feed indoors

**Endophilic:** Preference of arthropod to rest indoors

**Exophagic:** Preference of arthropod to feed outdoors

**Exophilic:** Preference of arthropod to rest outdoors

**Mechanical Vector:** When the disease agent multiplies and/or develops in the arthropod

**Morbidity:** Illness

**Mortality:** Death

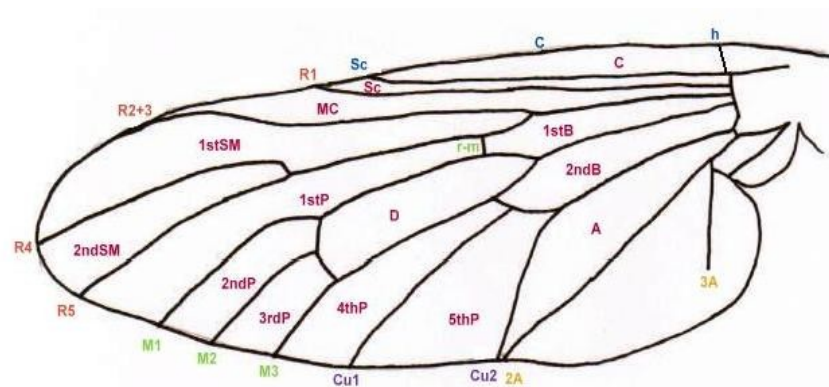
**Myiasis:** Invasion/infestation by larvae (maggot) of order Diptera

**Pathogen:** When the presence of a parasite causes injury to the host.

**Proboscis:** An elongated feeding tube, part of arthropod's mouthparts

**Wing Venation:**

C: costal cell  
 Sc: subcostal cell  
 MC: marginal cell  
 1st SM: 1st submarginal cell  
 2nd SM: 2nd submarginal cell  
 1st B: 1st basal cell  
 2nd B: 2nd basal cell  
 D: discal cell  
 1st-5th P: 1st-5th posterior cells  
 A: anal cell  
 h: humeral crossvein  
 c: costal vein  
 Sc: subcostal vein  
 R1-5: radial veins  
 r-m: radial medial crossvein  
 M1-3: medial veins  
 Cu1-2: cubital veins  
 A2-3: anal veins



## Sources

“Diptera: Pictorial Key to Principal Families of Public Health Importance” by H. R.

Dodge

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Mullen, Gary, and Lance Durden, eds. Medical and Veterinary Entomology. Amsterdam: Academic P, 2002.