

SMALL FLY MANAGEMENT IN HOMES AND OTHER STRUCTURES

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Many fly species can be present in homes and other structures. Some flies, especially the smaller species (under 5 mm long), may reproduce indoors, laying eggs on unusual surfaces such as fungus growing on house plant roots, organic matter lining drains, overripe or rotting fruit, and other decaying, often hidden, organic matter. While most flies found indoors are a nuisance, they also can harbor bacteria and contaminate food or food preparation surfaces and should not be ignored. This publication describes four common flies about 1/8 inch (3 mm) long that can reproduce and develop indoors and discusses their biology and best management practices.

In a 2022 survey of 141 participating pest management professionals, they indicated the number of small fly jobs increased by 35 percent in the past year. The majority of these professionals agree that the two most problematic species are fruit flies and drain flies, accounting for 74 percent of the small fly phone calls. With small fly issues rising, many pest control companies have begun offering a separate small fly service rather than including it in their general services. It is essential to know what measures can be taken to ensure these pests do not become established in a home or other structure.

Development

Flies are holometabolous insects, meaning they undergo complete metamorphosis. The larva of the flies mentioned in this publication (phorid flies, fruit flies, drain flies, and fungus gnats), also known as a maggot, lack legs and feed on moist decaying organic matter. The maggot molts several times until it reaches a critical size, pupates and eventually hatches from the puparium as an adult fly. The puparium is the last larval skin that acts as a hardened outer “shell” to protect the pupa as it develops. Female adult flies mate and begin laying eggs, starting the cycle again (Figure 1).

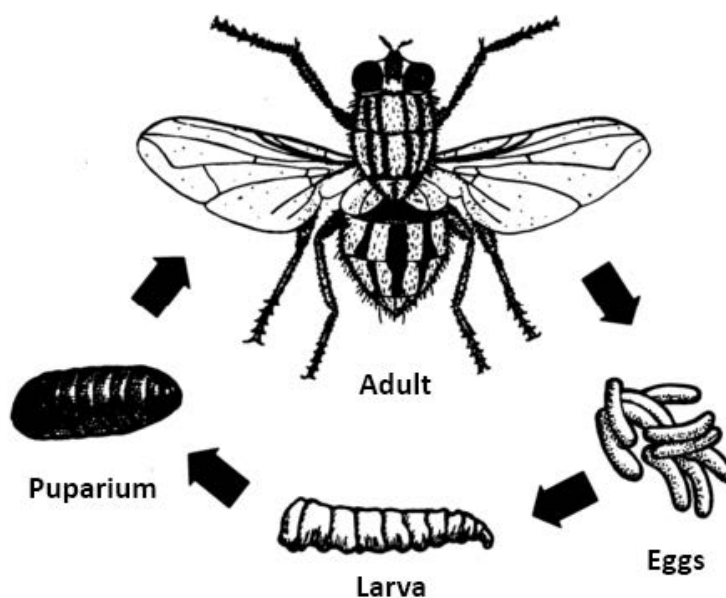


Figure 1. General life cycle of flies. Credit: Pratt, H. (1979). Life Cycle of the House Fly. Wikimedia Commons. CC0 1.0.

Drain Flies (or Moth Flies)

Drain flies (Family: Psychodidae), also called moth flies, are occasional pests in structures. Adults can be found around drains of sinks and bathtubs, on walls or on foliage. Larvae feed on the slimy or gelatinous material that commonly accumulates within drains. Adult drain flies are easy to identify because of the shape of the wings (oval with a pointed tip) (Figure 2) and how they rest in a “v” shape (Figure 3). The wings are hairy, and a closer look reveals nearly parallel venation with most of the wing lacking cross veins (Figure 2). A siphon tube and well-defined head help distinguish the larvae (Figure 4) from other fly larvae. The entire drain fly life cycle takes about 3-4 weeks from egg to adult, depending on ambient temperature.



Figure 2. Drain fly adult. Note the hairy wings and body, oval, but pointed wings, and parallel wing venation. Credit: Jackson Turner, UT E&PP



Figure 3. Drain fly adult resting on wall with wings held in a “v” shape. Credit: Jonathan Sawyer, UT Facility Services



Figure 4. Legless larva of the moth or drain fly with siphon tube (arrow). Credit: Makhali Voss, UT E&PP

An effective way of controlling drain flies, and most other household flies, is removing the larval food source. If there is no gelatinous material in the drain for the larvae to feed on, they cannot develop into an adult. A wire brush can mechanically remove organic materials from the drain walls. Wrapping the handle of a wire brush and covering the drain opening with a towel will help prevent bacteria in the drain from becoming airborne during the cleaning process. Once the drains are clean, regular use of enzymatic or microbial drain cleaners can help maintain a clean drain. Foam drain cleaners may work best on vertical surfaces. If the organic material is thick or hardened, steaming or pouring boiling water down the drain can loosen it. Keep drains clean, free of debris, and sanitized, and have your septic serviced when needed. Improperly sealed, broken, or degraded septic tanks and drain pipes can be another larval food source. Locating and removing the larval food source is essential to preventing the development of larvae to adults.

Fruit Flies

Fruit flies (Family: Drosophilidae), also known as vinegar flies, are among the smallest flies found in homes, generally measuring 2-4 mm in length. Their life cycle takes only eight to 11 days to complete, depending on temperature. These flies are attracted to overripe fruit or any other sources of fermenting materials, such as stale beer or soda. Fruit fly populations tend to be the greatest in late summer and early fall, as they often infest fruits before they are moved indoors.

Many fruit fly adults are about 2 mm long and have bright red eyes (Figure 5), but some, such as *Drosophila repleta*, *D. robusta*, and *D. hydei* (Figure 6), are slightly larger and have dark red eyes. These dark-eyed fruit fly larvae are more likely to be found in and near floor drains, below broken floor tiles or cover tiles at the wall's edges and sometimes in the unsanitary base of kitchen appliances. *Drosophila repleta* have also been found in bathroom urinals and poultry house manure. *Drosophila repleta* is also known to carry food-borne pathogens such as *Escherichia coli* and contribute to salmonella poisoning. Another species that can be found indoors is *D. suzukii*, which has a serrated ovipositor that allows it to penetrate intact fruit skin. This species is commonly known as “spotted-wing Drosophila” as the males of this species have a distinct dark spot near the tip of their wing (Figure 7).

To reduce the number of fruit flies, locate and remove larval food sources. In homes this may involve disposing of overly ripe fruit or fermenting liquids. Before disposing, beer or soda containers should be washed with soap to eliminate a potential larval feeding site. If you have a population that is already established, a commercial fruit fly trap or a hand-crafted trap constructed with common household items (Figure 8) can reduce adult fruit flies, but populations will not be reduced until the larval food source is eliminated. Fruit fly traps are often baited with vinegar to attract them to the trap. Fresh vinegar attracts adults to the trap where they eventually drown since they are unable to escape through the small openings they entered. However, as the vinegar ages and the water evaporates, the volatiles emitted may be preferred by adult phorid flies, which tend to be attracted to substances undergoing more fermentation than the common fruit fly *D. melanogaster* prefers. Evaporation from the trap can create a damp media, which is ideal for developing phorid fly larvae (personal communication, Jennifer Sweeney-Ingram, BCE). Therefore, fruit fly traps should be inspected frequently, and the vinegar changed regularly in order to prevent phorid flies from laying eggs into a potential food source for developing larvae, essentially trading one pest for another.



Figure 5. Adult fruit fly, *Drosophila melanogaster*. Credit: Jackson Turner, UT E&PP



Figure 6. Dark-eyed fruit flies, *D. repleta* (A), *D. robusta* (B), and *D. hydei* (C). Credit: (A) Bbski/ CC-BY-SA-3.0, (B) Katja Schulz via iNaturalist, (C) Darren J Obbard/ CC-BY-SA-4.0



Figure 7. Adult *D. suzukii*. Credit: Even Dankowicz via BugGuide/ CC-BY-ND-NC-1.0 DEED



Figure 8. Hand-crafted (A), old-timey (B), and commercial (C) adult fruit fly traps. Credit: Makhali Voss & Karen Vail, UT E&PP

Fungus Gnats

Adult fungus gnats (Family: Sciaridae and Mycetophilidae) are commonly found in windows or potted plant soil and can reach up to 1/4 inch (5-8 mm) long. Adults are typically dark in color (Figure 9) while their larvae are identifiable by a shiny black head and white thread-like body (Figure 10). These flies are drawn to windows because the adults are attracted to light, and they are drawn to the potted plants because their larvae will eat fungus in the soil or on plant root hairs. Occasionally, masses of fungus gnat larvae are seen crawling across outdoor substrates (Figure 11). They move together, creating a large mass of fungus gnat larvae resembling snakes or moving ropes.

Most of the fungus gnat's life cycle is spent in the immature stages, so targeting them as they develop is the best control strategy. This can be done by avoiding overwatering house plants, ensuring that containers can properly drain, and letting the soil dry in between watering to reduce the fungal food source they require. If plants do not seem to be the problem, then you should check for other moisture problems that may be nearby. Sprouting grain can be used as a decoy plant to attract the female fungus gnats, and they will then lay their eggs in the pot. This decoy plant should be changed out every two weeks to dispose of the eggs and larvae. If a plant is already infested, it should not be moved to an area where it can infest other plants. Depending on the situation, it may be best to throw out infested plants.

Control of these pests includes modifying the environment so it no longer supports fungal growth and preventing adult flies from entering the structure. This includes cleaning up any standing water, sealing or caulking leaky windows, screening openings into the home, and eliminating plumbing or irrigation leaks. Biopesticides produced from naturally occurring bacteria may be another tool to assist management. Spores from the bacteria *Bacillus thuringiensis israelensis* (Bti) ingested by fly larvae cause the gut to leak, eventually leading to death. Repeat applications of *Bti* to potted plant soil may be needed for long-term control. Be aware that the *Bti* harmful to fly larvae differs from the *Bti* that is labeled for caterpillars. See [SP341-C Fungus Gnats](#) for management of fungus gnats in various environments. As with all pesticides, it is essential to read and follow the pesticide label before making an application.



Figure 9. Adult fungus gnat. Credit: Jackson Turner UT E&PP



Figure 10. Light-colored body and shiny black head of the fungus gnat larvae. Credit: Makhali Voss, UT E&PP



Figure 11. Mass of fungus gnat larvae found outdoors after rain. Credit: Email submission to the UT Urban IPM Lab

Phorid Flies

Phorid flies (Family: Phoridae), also known as humpbacked flies or scuttle flies, are another common house pest. Adult phorid flies scuttling or running erratically over surfaces easily distinguishes these flies from others. Morphological characteristics of phorid flies include the unique wing venation (Figure 12) and enlarged femora of the adult (Figure 13) as well as the pupa's respiratory horns (Figure 14). The larvae of these flies are often found in decaying organic matter (feces, dead animals, fungi, and decaying plants). Their life cycle can vary, being as short as 11 days or as long as four weeks depending upon ambient temperature.

To manage these pests, sanitation and removing larval habitat are good starting points. Some examples include ensuring rotting food is not sitting in the sink, garbage, or garbage disposal, disposing of decaying plants properly, and keeping mop heads clean.

If many phorid flies are already established in your house, insect light traps (Figure 15) placed throughout the building may help determine if a larval food source is nearby. Light traps can help reduce adult fly populations but will have limited effect on the overall population. Adult flies will continue to be produced until the larval food sources are removed. In years of heavy rains, outdoor decaying vegetation may be responsible for many phorid flies found indoors.

If no larval food source can be found, a broken sewer or waste pipe may provide the larvae with food. A boroscope or other devices can be used to examine the pipes for breaks in rooms where large populations of phorid flies are captured or seen. Similar to drain flies, management of these flies may include removing the slab covering the pipe, repairing the broken pipe, excavating the contaminated soil, and repairing the concrete slab.



Figure 12. Unique wing venation of an adult phorid fly. Credit: Makhali Voss, UT E&PP



Figure 13. Enlarged femora (arrow) of the adult phorid fly. Credit: Makhali Voss, UT E&PP



Figure 14. Respiratory horns of the phorid fly pupa. Credit: Matt Bertone, NC State University

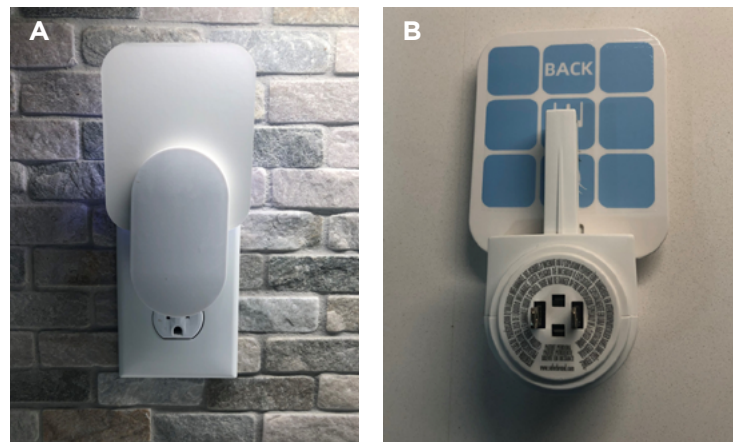


Figure 15. Front (A) and back (B) of a small light trap used to catch adult phorid flies. A light trap with high phorid fly activity (C) may indicate nearby larval food sources. Credit: Karen Vail, UT E&PP

Management

Management for the small flies described in this publication starts with sanitation. Sanitation can help by eliminating larval sites and sources of food. This includes proper disposal of ripe fruit, washing beer or soda bottles before discarding, and having completely enclosed garbage cans among other factors. Exclusion of adult flies is helpful, which includes the use of screens, and ensuring there are no openings where adult flies can enter the house. If flies have already been observed in your home, insect traps can catch the adults, but a long-term reduction of adult flies will not be achieved unless the larval food sources are removed. Specific trapping methods, sanitation suggestions, and pesticide recommendations can be found at tiny.utk.edu/managinghomepests for residents and tiny.utk.edu/PestMgmtforPMPs for pest management professionals. Additional information on small flies and their management is shown in Table 1.

Table 1. Summary of small fly information

Fly type	Characteristics	Larval food sources/ where they are commonly found	General management
Drain Flies (Moth Flies)	Adults are approximately 2 mm long and resemble a tiny moth due to hairs on their wings and body. Wings exhibit nearly parallel venation with most of the wing lacking cross veins. A siphon tube and well-defined head help distinguish the larva.	In addition to the gelatinous materials lining drains, larval food sources of moist organic solids may include sewer backup or leaks, septic tanks, dirty trash cans, potted plant saucers, bird baths or feeders, clogged roof gutters, storm drains, AC drip lines, and moistened compost piles.	Eliminate larval food sources. Keep drains clean, free of debris, and sanitized. Steam, boiling water, or wire brushing can be used to break up microbial growth that lines drains. Enzyme foam cleaners are especially useful on vertical surfaces.
Fruit Flies	The adults are approximately 2 mm long and have red eyes. The dark-eyed fruit flies are slightly larger, approximately 3 mm.	Fruit flies are found on fermenting organic matter such as overripe fruits, vegetables, and leftover beverages. Additional larval food sources may be found on mops and brooms. Dark-eyed fruit fly larvae may be found in and near floor drains, below broken floor tiles or cove tiles at the wall's edges, unsanitary areas around the base of kitchen appliances, bathroom urinals and poultry house manure.	Dispose of overripe foods, and clean beer and soda bottles before disposal. In commercial accounts, a wire brush, or foam application of microbials or botanical drain cleaners to labeled sites will help clean neglected and difficult-to-reach areas of potential larval food sources. This effort may need to be repeated.
Fungus Gnats	The adult fungus gnat can be up to 1/4 inch (5-8 mm) long, and are typically dark. Their larvae are identifiable by their shiny black head and white thread-like body.	Larval food sources include, but are not limited to, overwatered plants, decomposing grass clippings, compost, and mulches.	Avoid overwatering house plants and dispose of any decaying house plants. Apply Bti to infested soil and let the soil dry between watering.
Phorid Flies	Adult phorid flies are about 3 mm long and will "scuttle" or run erratically across surfaces. The adult wing venation is used to distinguish this fly, as is its enlarged femora. The wings exhibit prominent veins on the upper edge. The pupa's respiratory horns help distinguish it from other small household flies.	Larvae can be found in the bottom of trash cans, in cracks under appliances or equipment, inside garbage disposals, in rotting vegetables and meats, mop heads, septic systems, overwatered potted plants, in flower vases, mausoleums, and soiled bedding of animals.	Remove larval food sources. Ensure drains are thoroughly cleaned and no food remnants remain in the sink or garbage disposal.

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Precautionary Statement

To protect people and the environment, pesticides should be used safely. This is everyone's responsibility, especially the user. Read and follow label directions carefully before you buy, mix, apply, store, or dispose of a pesticide. According to laws regulating pesticides, they must be used only as directed by the label and registered for use in your state.

Disclaimer Statement

This publication contains pesticide recommendations that are subject to change at any time. The recommendations in this publication are provided only as a guide. It is always the pesticide applicator's responsibility, by law, to read and follow all current label directions for the specific pesticide being used. The label takes precedence over the recommendations found in this publication. Use of trade or brand names in this publication is for clarity and information; it does not imply approval of the product to the exclusion of others which may be of similar, suitable composition, nor does it guarantee or warrant the standard of the product. The author(s), The University of Tennessee Institute of Agriculture and the University of Tennessee Extension assume no liability resulting from the use of these recommendations.



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