



Prescription Treatment[®] brand Pest Management Bulletin

Volume 7

Small Fruit Fly Management

Drosophila, commonly known as the small fruit fly, are one of the most fascinating of all insect groups. They are used by thousands of scientists daily throughout the world as a model for the study of genetics, development, behavior and mechanisms of genetic disease. We know more about the biology of small fruit flies than any other multi-celled organism on earth.

Ironically, at the same time scientists are using the small fruit fly to reveal the complexities of biology, thousands of Pest Management Professionals (PMPs) are struggling with small fruit fly infestations in restaurants, hospitals, food plants and office buildings.

DROSOPHILA MELANOGASTER

According to experts, there are an estimated 177 species of *Drosophila* in the U.S. and Canada and a reported eight species common in North America. PMPs in the U.S. have historically dealt with what was believed to be a single species of small fruit fly, *Drosophila melanogaster* (Figure 1). First discovered on the east coast of the U.S. in the 1870's, this bright red-eyed species is approximately 3.0 mm in length, has a yellow to pale brown thorax and a yellow abdomen with a few black dorsal bands.



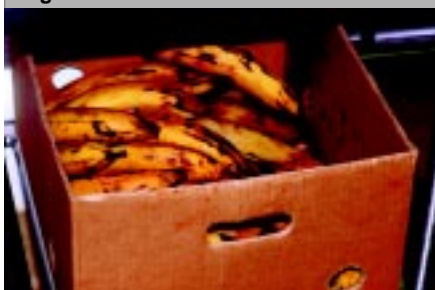
Figure 1



Figure 2



Figure 3



DROSOPHILA REPLETA

Recently, PMPs report what appears to be a small fruit fly except that it is larger than *D. melanogaster*. It is approximately 3.5 mm in length, has dark red eyes and a brownish to black abdomen. Some of these fly specimens have been identified as *Drosophila repleta* (Figure 2). While there is no common name, it has been referred to as the black fruit fly. In the U.S. it is a major pest for confined poultry and swine.

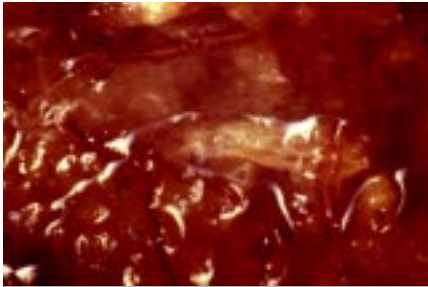
DROSOPHILA HYDEI

Unfortunately, species within the *D. repleta* group can be difficult to distinguish. As a result, it may be that the flies reported frequently by PMPs are, in fact, *Drosophila hydei* (Figure 3), a closely related species to *D. repleta* with an even darker body. This fly has also been collected in commercial food accounts in the past several years.

Both *D. repleta* and *D. hydei* can be distinguished from *D. melanogaster* by a longer body length (3.0 to 3.5 mm) and bristles or hairs on the mesonotum (the dorsal surface of the 2nd thoracic segment) each arising from a separate dark spot. While these spots may be fused together, they typically create a freckled appearance on the mesonotum. Also, in *D. melanogaster* the yellow bands on the abdomen are broad while those on *D. repleta* and *D. hydei* are narrow. *D. melanogaster* and *D. repleta* are cosmopolitan species.

SMALL FRUIT FLIES AND HUMANS

Many species of *Drosophila* have been associated with humans for centuries. The presence of decaying fruit, garbage and feces as breeding sites bring small fruit flies into close proximity to human dwellings where poor sanitation provides ideal conditions for fly abundance. In fact, many of the common names used for small fruit flies, such as vinegar fly and pomace fly, reflect this relationship.



Fruit Fly Larva



Fruit Fly Pupa



LIFE CYCLE

The life cycle of small fruit flies includes the egg, three larval instars, pupa and adult. For *D. melanogaster* the life cycle can be completed in as few as eight to ten days under warm temperature conditions. It has been reported that *D. repleta* completes its life cycle in approximately 21.7 days at 20 degrees. The average adult life span for both *D. melanogaster* and *D. repleta* is 40 to 50 days.

Depending on the species, females will oviposit in decaying fruit and vegetables, filthy mops, under garbage can liners, recycling bins, floor drains and in the feces of humans, chickens and pigs. *D. repleta* larvae feed on yeasts, bacteria, molds and fungi found on decaying matter. Both *D. melanogaster* and *D. repleta* have been reported in pit privies and *D. hydei* is reported to prefer filth such as that found in drains and sewers. *D. repleta* and *D. hydei* are much more tolerant of desiccation and cold than *D. melanogaster*.

CASE STUDY

Our case study involves a bar and grill experiencing chronic small fruit fly infestations. A PMP was called by restaurant management to inspect the facility and implement a solution.

Using this case study, we will demonstrate the process of assessing and solving a pest control problem using the Prescription Treatment® pest management approach: Inspect, Prescribe, Treat, Communicate and Follow-up.



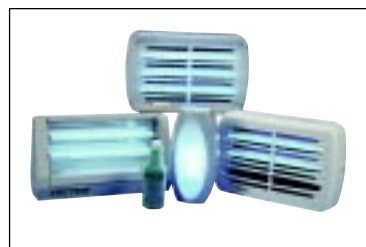
INSPECT

Inspection of the facility revealed a full service restaurant with a large bar. The horseshoe-shaped bar included an elaborate island in the center. The top of the island was a preparation area and the area below was used for storage. The floor behind the bar was unfinished concrete with six floor drains located around the interior perimeter of the bar, providing numerous harborage sites for small flies.

There was an enormous number of small fruit flies observed behind the bar. Fruit flies were also found around tables in dining areas, kitchen and dishwashing areas. Fruit flies were observed throughout the entire facility.

Visual inspection indicated that the area behind the bar was the likely source of most of the flies. Large numbers of fruit flies were seen flying in and out of floor drains and emerging from holes and gaps in construction of the center island where it met the floor. Pupae were found along plywood edges where the bar rested on the floor. Large numbers of flies were also observed in the storeroom in the back of the bar and there were a few wooden duckboards in use behind the bar. Also, sanitation was poor. It was obvious that large amounts of beer and soft drinks were continually spilled on the floor and in the floor drains.

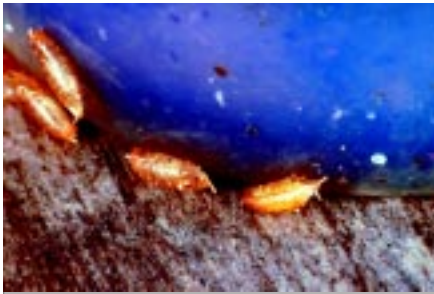
Three PT® brand Vector® insect light traps were installed in the facility including one behind the bar, dining area and kitchen. After operating for one night, the number of trapped flies confirmed that the source of the infestation was behind the bar. Flies trapped at the back of the dining area and in the kitchen did not develop in those locations. Instead, they dispersed from the area behind the bar. While installation of the PT Vector light traps and analysis of the glueboards was not necessary in this case to identify the breeding site, it was extremely useful in convincing management that the area behind the bar was the source and that extreme steps were needed to eliminate the problem.



Vector Family



Vector Classic



Fruit Fly Pupae



In this case, there was not only a large amount of fermenting liquids available for small fruit fly breeding, there was also a structural problem. Unfinished wood, sheetrock and masonite had been used in the construction of the bar and the island. These building materials rested directly on the concrete floor and continually absorbed the spilled liquids and were completely saturated with a combination of water, beer and soft drinks. As these materials delaminated and began falling apart, small fruit flies began using this as another egg-laying site.

The source of this infestation was easy to find, unfortunately this will not always be the case. The new PT 960 Vector fruit fly trap is best for accounts with multiple breeding sites. It is inexpensive compared to light traps and can be set in a matrix or grid pattern similar to the PT Allure® stored product pest traps. After inspection of the traps, set the traps with low capture closer to the traps with high capture counts. This will help you quickly pinpoint the source of infestation.



PRESCRIBE

When writing a prescription, your goals should be clear. In this case, we had two goals:

- 1) To control or eliminate the source of the infestation to achieve long term fruit fly control.
- 2) To eliminate or reduce the symptom (the number of adult flies in the facility.)

Controlling the source first requires locating the source, which we did during our inspection. We have several options for dealing with the breeding sites uncovered:

- ▶ Steam cleaning
- ▶ Use PT Vector Bio-5® for drain and surface cleaning
- ▶ Use PT 960 Vector fruit fly trap to locate the breeding source and capture adults
- ▶ Use residual and contact insecticides
- ▶ Implement habitat modification

As with other filth-breeding flies, removal of the larval breeding media is the ultimate method of control. Non-residual pyrethroid or pyrethrin space sprays such as PT ULD® BP-100 or PT P.I.® are effective in knocking down adults. Residual insecticides such as PT Cy-Kick® CS, both labeled for use in food areas, can be used for crack and crevice® or spot application in locations where flies breed in and behind elements of construction. Insect light traps such as PT Vector Classic and PT Vector Super Nova® are helpful in removing adult flies and for use in monitoring programs. PT Vector Bio-5 drain cleaner can be used to clean and maintain drains and floors, which will stop small fruit flies from breeding. The new PT 960 Vector fruit fly trap is also an excellent tool for attracting and destroying adult small fruit flies. The PT 960 Vector fruit fly trap uses a special highly attractant liquid within a small disposable container.

The prescription also included recommendations for rebuilding the bar and the internal island. However, until these structural changes could be implemented, it was also recommended they clean the area behind the bar, including under the island, in the storage area and all lower wall surfaces.

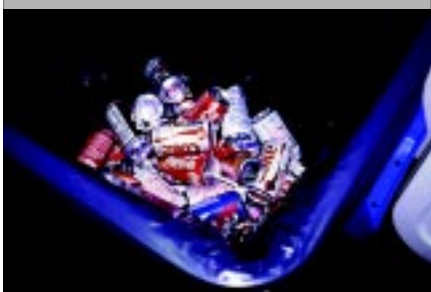


TREAT

Since reconstruction of the bar area was not going to be done immediately, PT Cy-Kick CS pressurized residual was injected into all cracks and crevices throughout the bar. Particular attention was focused on those near the floor where fruit flies were observed breeding. Spot treatments were also made to areas under the bar, including the backside of sinks.

Three PT Vector insect light traps were permanently installed behind the bar beneath the service counter. Also, PT Vector Super Nova light traps were placed in the kitchen and two PT Vector Discreet® traps were placed in the dining room.

A high-pressure steam cleaner was used to clean floor drains. Wooden duckboards were replaced with non-absorbent synthetic duck mats. All wet cardboard boxes used for storage were thrown away from behind the bar and



the PMP advised the customer not to use cardboard boxes for storage. All storage behind and under the bar was limited to a minimum of four to six inches off the floor. And all previously used mop heads and brooms were discarded because during inspection it was discovered that small fruit flies were breeding in both.

The new PT 960 Vector fruit fly trap was perfect for this situation. The small, easy to use traps were placed in a variety of out-of-the-way areas including under the bar and behind equipment. PT Vector light traps and PT 960 Vector fruit fly traps served not only as devices for the removal of adult small fruit flies, but also as monitoring traps to detect small fruit fly activity.

After cleaning the floor drains with high-pressure steam, the drains were treated with PT Vector Bio-5 drain cleaner on a monthly basis. For the first week after the clean up and installation of the PT Vector fly system, PT ULD® BP-100 was applied twice to the entire facility at the rate of one ounce per thousand cubic feet using a PT E-2 fogger.



COMMUNICATE

A vital component in this type of situation is behavior modification, which was addressed by the PMP to employees that worked behind the bar and to the clean up crew. Apparently, clean up behind the bar consisted only of hosing the area down with water. This approach contributed to the spread of liquid materials suitable for small fruit fly breeding and the deterioration of the structural components of the bar itself.

Another contributing factor was poor sanitation behind the bar due to construction, which was not conducive to easy maintenance and care. This was pointed out to management at the beginning of the program. However, even under the current circumstances, employees could be trained to better care for this area. Improved sanitation behind and around the bar was essential to the success of the program. Even a small thing can make a big difference. A fan was placed by the bar to dry spilled material, creating enough airflow to make it difficult for adult fruit flies to breed and lay eggs.



FOLLOW-UP

The PMP serviced the facility twice a month and each time he counted the number of small fruit flies in PT Vector glueboards and the PT 960 Vector fruit fly trap and inspected the level of sanitation behind the bar.

Management was advised of the findings and encouraged to continually stress the importance of proper cleaning in the bar area. Within two months of the initial treatment, it was agreed by all parties that the problem was at least 95% resolved and that control was inevitable within 30 to 60 days with continued emphasis on sanitation and the support of the PT Vector light traps and PT Vector Bio-5 floor drain treatments.

A final word: It is clear that there are at least two separate species of small fruit flies currently causing PMPs problems in buildings. Regardless of the species, the first priority in any small fruit fly control program is the removal of the larval breeding sites. These sites and the types of material used by the flies may vary by species. Since *D. repleta* is known to breed in feces and to loiter around urinals, a thorough inspection of both the interior and exterior of any infested building is essential. Any area where even the smallest amounts of decaying organic matter can occur should be suspect.

For additional information and photos visit: www.pt-u.com/fruitflies.com



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