



Dangerous Invaders:

Researchers Embark on Study of Asian Fruit Fly

Male *D. suzukii*, 3 mm

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Scientists think that, sometime in the 1980s, *Drosophila suzukii* arrived in Hawaii from Japan. By 2008, the Asian fruit fly had hit California, and by June 2011, had blazed a trail of destruction through the fruit farms it encountered on its journey to the Northeast.

Also known as Spotted Wing Drosophila (SWD) because of the distinctive black spots on the male’s wings, SWD is bad news for agriculture in the United States. A 2009 study estimates that the species caused yield losses in California ranging from negligible up to 80 percent.

SWD is related to the common fruit fly, but it harbors a menacing difference: The female’s serrated ovipositor, the organ she uses to deposit her eggs, is razor-sharp, allowing her to lay her progeny under the skins of unripened blueberries, raspberries and other soft-skin fruit. The eggs mature and the larvae develop, eating the fruit from the inside, causing it to collapse and turn to mush, rendering it inedible and vulnerable to bacterial infection.

The presence of this pest on the East Coast is of concern to New Jersey blueberry farmers, but it’s also present in Pennsylvania, where it came to the attention of three Saint Joseph’s biologists who formed a long-term collaboration to examine SWD from three perspectives: ecology, behavior and molecular biology.

“I’ve been studying the genetics and behavior of *Drosophila* for more than 30 years, but the situation with SWD is a rare scientific opportunity,” says **Scott McRobert, Ph.D.**, professor of biology. “Since *D. suzukii* is an invasive agricultural pest, unlike most *Drosophila* species, which only lay eggs in spoiled fruit, our work is directed at finding a solution to an environmental problem.”

Surveying the *Drosophila* Community

In 1986, McRobert ran a survey of the *Drosophila* community near Saint Joseph's that found nine different species. *D. affinis* and *D. melanogaster* were most prevalent in spring and summer, and *D. immigrans* was most prevalent in the fall. McRobert and biology major Leigh Ann Tiffany '14 replicated the study last year, which was published in *Drosophila Information Service*. According to McRobert, the findings are interesting, and troubling.

"Leigh Ann's research is important because she found that *D. suzukii* was the most common species found throughout 2013," McRobert says. "It wasn't found at all in 1986."

Now, McRobert and his associates are running a life-history analysis of SWD, which includes courtship displays, copulation rates, offspring production and re-mating frequency. He is also interested in determining offspring rates in different foods, as well as which food it finds most attractive.

Analyzing the DNA

Evolutionary biologist **John Braverman, S.J.**, assistant professor of biology, is conducting a survey of genetic variation in SWD with his group to help determine its migratory path. He and graduate student Philip Freda '14 (M.S.) documented that SWD had arrived in Philadelphia using population genetics. Their work, which was published in *Entomological News* in 2013, established a positive identification for SWD by sequencing and studying a specific gene found in several individuals. That data is held in GenBank, a DNA database of the National Center for Biotechnology Information.

"We now want to determine what genetic variation looks like in different locations," says Fr. Braverman. "So far, it appears there is little variation among the sites, probably due to the species' recent arrival."

In the meantime, Freda has reached out to blueberry farmers in South Jersey who are interested in Fr. Braverman's group collecting flies from their fields.

"For economic motives, they, too, want to understand how SWD extends its range," says Fr. Braverman. "The spread of SWD to the East Coast is both an interesting question in basic science, as well as important to the regional economy."

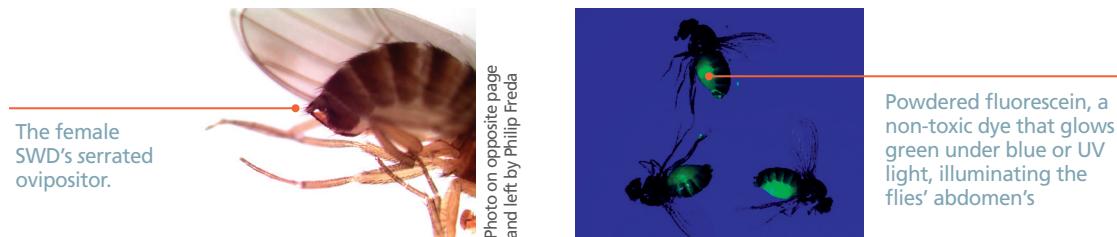
Tagging the Flies

Jonathan Fingerut, Ph.D., associate professor of biology and director of the Environmental Science and Sustainability Program, studies how insects disperse in environments. Fingerut worked with biology major Kristina Orbe '14 who discovered how to make fruit flies glow, which is a way to tag the flies. Orbe added powdered fluorescein to their food, a non-toxic dye that glows green under blue or UV light, and the flies' abdomens lit up several hours after feeding. This work was published in *Drosophila Information Service* in 2012.

"We want to know how SWD interacts with and moves about within the environment," says Fingerut. "This means running release and recapture studies, so we needed a good method to tag the released flies that distinguishes them from the flies already in wild populations."

Recently, Fingerut's group started work on a trap and bait to test in the field. They also plan to develop mesocosms, which are enclosures containing elements that flies need to remain viable throughout the year. "This will help us understand how SWD overwinters in Pennsylvania," says Fingerut. ♀

— Patricia Allen '13 (M.A.)



Timeline of *D. suzukii* Discovery

