

Backyard Evolution 2022

Participate in a
citizen science project!

The Bergland Lab at UVA is recruiting
volunteers to collect and preserve flying
insects from their compost piles this
spring, summer, and fall.

We provide gear
and training!

It's free!
Sign up here



Capture evolution in your own backyard!

Questions?
Contact virginia.backyard.flies@gmail.com

The Science Behind It

Your compost pile is teeming with life, and fruit flies are an important part of that ecosystem. You'll likely find a dozen different fruit fly species in your compost (in addition to many other walking, crawling, and flying invertebrates). For some of these species, up to 15 generations can pass between the spring and fall because they have a rapid development time. The nutritional and thermal environment changes over the growing season, challenging fruit flies to adapt to their surroundings in hopes their offspring will survive (we call this natural selection). As the fruit fly populations grow, they evolve to these changing environments. By sampling fruit flies from your compost pile over the growing season, we can track the evolutionary dynamics of fruit flies in real time through the analysis of DNA. Most individuals in a population have different genomes, allowing us to infer the evolutionary history of the population and species. In some cases, such patterns reveal the more distant past, like large scale migration events. In other cases, we identify regions of the genome that recently evolved, like over seasons. Patterns of variation not only tell the story of the past, but also the present.

Will you commit to sampling and preserving small flying insects from your compost pile twice each month from June - December?*

*It is okay if you miss a week or two!

Participate in a world-wide effort!

Your samples will contribute to an ongoing, international collaboration of fruit fly biologists to study the genomes of flies sampled throughout the world.

Read more about this at:
<http://dest.bio>

To sign up visit: <https://www.bergland-lab.org/backyard-evolution/>

Privacy Statement:

We will only use your contact information to remind you to collect. For research purposes, we will use latitude and longitude associated with your house along with the answers to your survey questions. Your name will not be linked to your address for any publication and your house will only be presented as coordinate points.



Compost Collection



THE KIT

- 1 Drosophila net
- 2 Collection vials
- 3 Preservation tubes
- 4 75% ethanol
- 5 Eye dropper
- 6 Specimen labels
- 7 Funnel
- 8 Collection log
- 9 Collection manual



There are ~50 flies in this vial; multiple vials might be necessary!

HERE'S WHAT YOU'LL BE DOING:

Goal: We want you to sample ~100-200 fruit-flies every several weeks over the growing season and into early winter.

Fruit flies are most active in the early morning (6:00AM-9:00AM) or evening (6:00PM-9:00PM), and will be easier to collect then. They may be hiding in the heat of the day.

To sample, first hold a large collection vial in your non-dominant hand; keep the lid nearby. Then, with your other hand, sweep your net back and forth in a gentle motion and kick or tap your compost pile with your foot. Many small flying things will emerge. Capture as many as you can in your net. Keep sweeping the net back and forth to keep the flies in the tip of your net. Then, in a swift motion, place your collection vial in the net tip and tap the flies into the vial. Using a tapping motion, tap the flies to the bottom of the vial and cover the vial with two or three fingers, tapping the flies down on your knee. Then, take the lid and screw it onto the vial. It might take a couple of tries. If the flies escape, give them a minute to settle down on the pile and then try again.

Your sample likely contains anywhere from 10-100 flies and multiple species. Take a look at your vial. How many unique species do you think there are? Write down your estimate on your sample label.

To preserve your flies for genetic analysis, you will be storing them in 75% ethanol. First, take a preservation tube and fill it ~1/3 full with 75% ethanol using your plastic eye-dropper. Place your funnel in the opening to the preservation tube and seat both upright, using your specimen box. Using a tapping motion, tap your vial down to knock the flies to the bottom of the collection tube. Unscrew the vial and place two or three fingers over the top. In a swift motion, invert the collection vial into the funnel and tap* the flies down, into the ethanol.

Ideally, you will fill the preservation tube more than half way full with flies. You might need to take multiple samples from your pile on a collection day to get that many. If, after two or three nettings, you cannot get the vial half full, then stop. Once your collection is complete, firmly press the cap down (it'll snap) and place vial upright in the freezer. This ensures that DNA will be preserved in a high quality state.

Record your sample by filling in the date and time of collection on your specimen label and apply to the vial. Please use a pencil or ball-point pen, as Sharpies tend to bleed when exposed to ethanol. Your labels will contain a unique collector ID (that's you!) and a sample number. For safety, record the sample number, time, and date on your collection log.

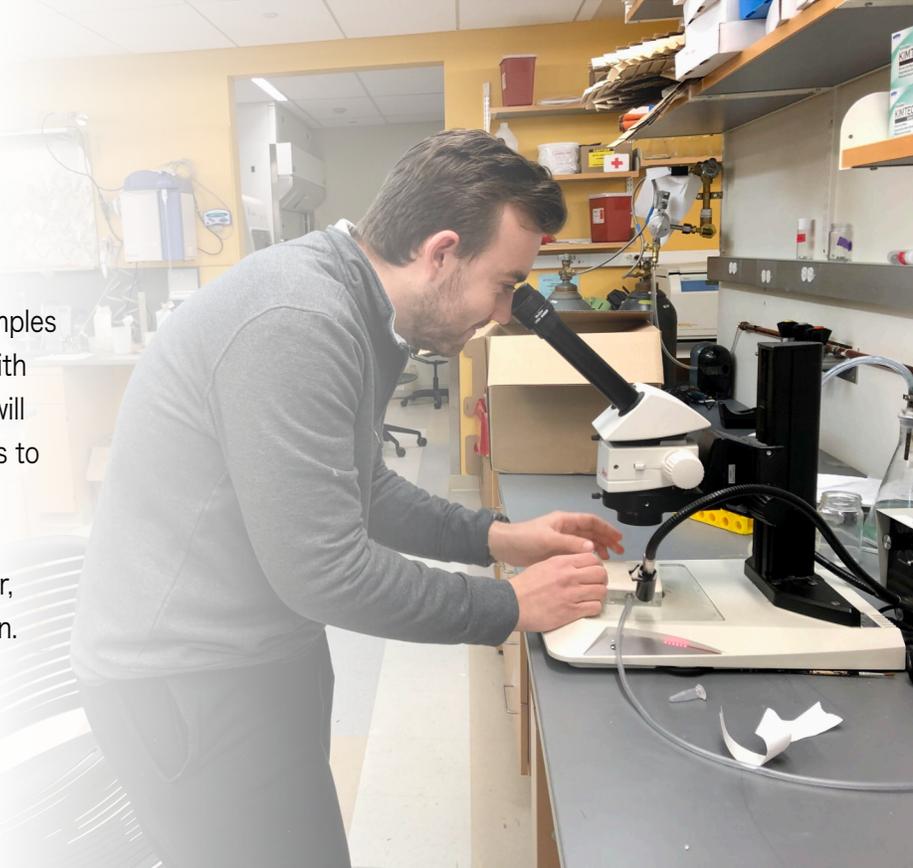
We will **pick-up** your samples at the end of the year (December 1-15 2022, or earlier upon request). We will **remind** you to collect every two weeks via text message or email (your choice!).

***Cold shock your flies.** If you are having a difficult time transferring your flies from the collection vial to the preservation tube, place the collection vial in the freezer for ~1-2 minutes. This will slow the flies down.

What happens to the flies?



Samples that you collect will be sorted by students at UVA. We will characterize the species distributions of your compost pile samples and compare the community composition with samples collected from local orchards. We will use genetic information from your samples to ask whether your compost pile has a resident community of flies or if colonization happens recurrently every year, and to study the genetic basis of adaptation.



The Bergland Lab is often involved with the Biology Outreach and Inclusion Program at UVA! Samples that you collect, along with other samples from across the state, are brought to science booths at farmer's markets in the Harrisonburg, Staunton, and Charlottesville areas to showcase the model organisms that can be found in our own local, Virginia environment! The Bergland Lab also presents research and projects at the Virginia Master Gardener Association's annual meeting (many of our volunteers are Master Gardeners!). The samples you collect will additionally be beneficial for educational collaborations with students at Piedmont Virginia Community College.



Previous Findings

D. hydei

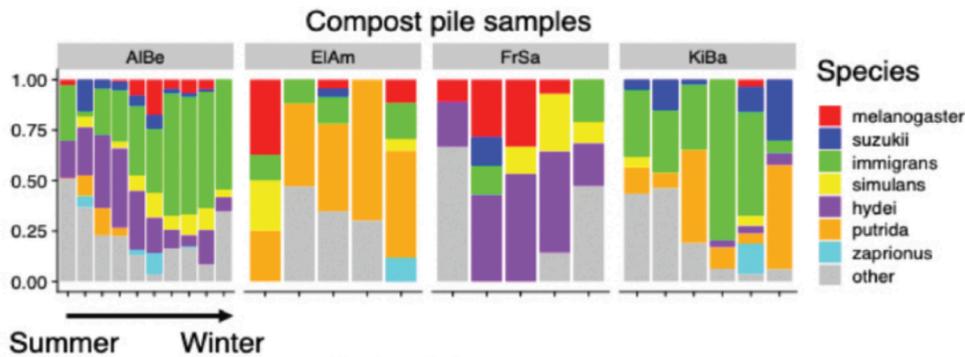


Fun Fact:
D. hydei females can start mating at 3 days old, where the males don't start mating until they are 9 days old

D. suzukii



Fun Fact:
D. suzukii is native to southeast Asia; it became a common invasive species in North America around 2008



This figure shows the species distribution from samples collected by four Backyard Evolution Collectors in 2020 from their compost piles.

D. melanogaster

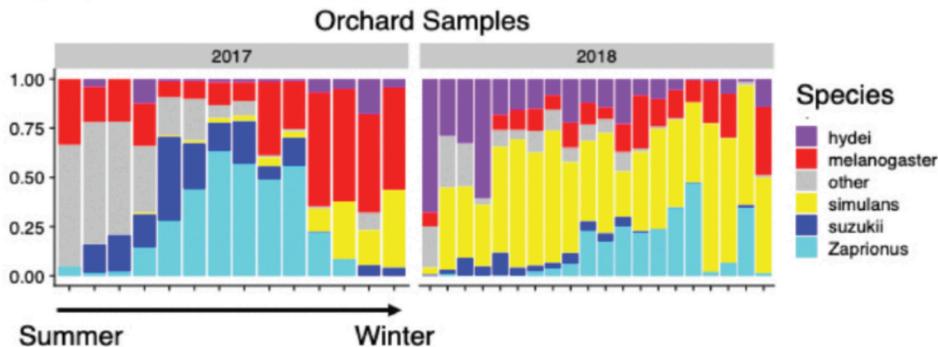


Fun Fact:
D. melanogaster has become a model system for studying alcohol abuse due to its high tolerance to ethanol

Zaprionus



Fun Fact:
Males perform two songs as part of their courtship ritual for mating, and females respond with their own, unique songs



This figure shows the species distribution from samples collected by the Bergland Lab from orchards across the state of Virginia in 2017 and 2018.

Common Drosophilids of the Midwest and Northeast

Thomas Werner & John Jaenike



Leucopenga varia females



Chymomyza amoena females



Hirtodrosophila duncani males



Hirtodrosophila duncani females



Drosophila melanogaster males



Drosophila melanogaster females



Drosophila simulans males



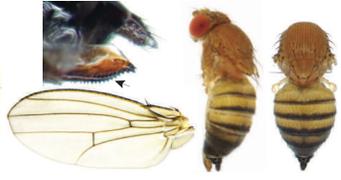
Drosophila simulans females



Drosophila suzukii males



Drosophila suzukii females



Drosophila algonquin males



Drosophila algonquin females



Drosophila athabasca males



Drosophila athabasca females



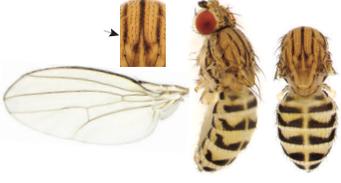
Drosophila affinis males



Drosophila affinis females



Drosophila busckii females



Drosophila robusta females



Drosophila paramelanica females



Drosophila hydei females



Drosophila immigrans males



Drosophila immigrans females



Drosophila putrida males



Drosophila putrida females



Drosophila neotestacea males



Drosophila neotestacea females



Drosophila falleni females



Drosophila recens females



Drosophila quinaria females



Drosophila palustris females



Drosophila subpalustris females



Drosophila tripunctata females

