

DATA *Nugget*

Blinking out?

Featured scientists: Christie Bahlai and Julia Perrone from Kent State University

Research Background:

The longest surveys of fireflies known to science was actually started by accident!

At the Kellogg Biological Station Long-Term Ecological Research Site, scientists work together to answer questions that can only be studied with **long-term data**. Their focus is to collect data in the same way over many consecutive years to look for patterns through time. One of these long-term studies, looking at lady beetle populations, was developed to keep watch on these important species. To count lady beetles, scientists placed yellow sticky card traps out in the same plots year after year. These data are used to figure out if lady beetle numbers are changing over time.

Because sticky traps catch everything small that flies by, other insect species get stuck as well. One day, a research technician noticed this and decided to add a few new columns to the data sheet. That way they could start recording data on the other insect species found on the sticky traps. Each year the technician kept adding to the record and over time, more and more data were collected. One of those new columns happened to record the number of fireflies caught. Though the exact reason for this data collection is lost to history, scientists quickly realized the value of this dataset!

Several years later, Julia became the lab technician. She took over the responsibility of the sticky trap count,



A technician recording data from sticky traps in the field. If you look at the lower, right hand side of the photo you can see a firefly that was caught! Photo Credit: K. Stepnitz, Michigan State University.

adding to the dataset. Christie joined this same lab as a scientist and stumbled upon the data on fireflies that Julia and the previous technician had collected. She wanted to take advantage of the long-term data and analyze whether firefly populations had been increasing or decreasing.

Many people have fond memories of watching fireflies blink across open fields and collecting them in jars as children. This is one of the reasons why fireflies are a beloved insect species. Julia grew up in southwest Michigan and fondly recalls spending summers watching them blink over yards and open fields, catching them in jars to watch them for a little while. Christie did the same in her parent's yard in rural Ontario! That fondness never really went away and both enjoy watching the fireflies around Northeast Ohio where they currently live. Fireflies are also an important part of the ecosystems where they live. Larvae spend most of their time in the soil and are predators of insects and other small animals, such as snails.

Many scientists and citizens alike have noticed that they aren't seeing as many fireflies as they used to. Habitat loss and light pollution could be causing problems for fireflies. This is where the importance of long-term data really comes into play. Long-term data are critical to identifying and understanding natural population cycles over long periods of time that we wouldn't be able to see with just a few years of data. It also gives scientists opportunities to answer unanticipated research questions. In



All the insects collected on a yellow sticky card trap over the course of one week. Photo credit: Elizabeth D'Auria, Michigan State University.

this situation, even though the data were collected without a specific purpose in mind, having the dataset available offered new opportunities! Christie and Julia were able to look at the long-term changes in southwest Michigan firefly populations, something they would not have been able to do before the research technician added those extra columns. In order to start answering this question, they compiled all of the years of firefly data and began to compare the average counts from year to year. Although data were collected in multiple different habitat types, they focused on data from open fields because fireflies use these areas to find mates.

Scientific Question: Are firefly populations in Southwest Michigan in decline?

Scientific Data: When Christie and Julia were preparing the firefly dataset to analyze, they noticed that the number of traps put in the fields varied each year. There are many factors that affect data collection, and one of them is **sampling effort**. Some variables that would determine sampling effort would be how many traps are set out, how often, the amount of time they are left in the field, and where they are placed. The number of traps set out wasn't always consistent across years. So, to account for the difference, the number of traps used was always recorded to account for sampling effort on the raw data collected.

Use the data below to answer the scientific question:

Year	Species ID	Number of adult fireflies	Number of traps	Adult fireflies/trap
2004	LAMPY	155	262	
2005	LAMPY	265	259	
2006	LAMPY	131	296	
2007	LAMPY	62	350	
2008	LAMPY	21	330	
2009	LAMPY	77	360	
2010	LAMPY	245	390	
2011	LAMPY	292	240	
2012	LAMPY	97	450	
2013	LAMPY	83	480	
2014	LAMPY	66	387	
2015	LAMPY	337	360	
2016	LAMPY	165	509	
2017	LAMPY	426	450	
2018	LAMPY	162	449	
2019	LAMPY	190	450	
2020	LAMPY	66	390	

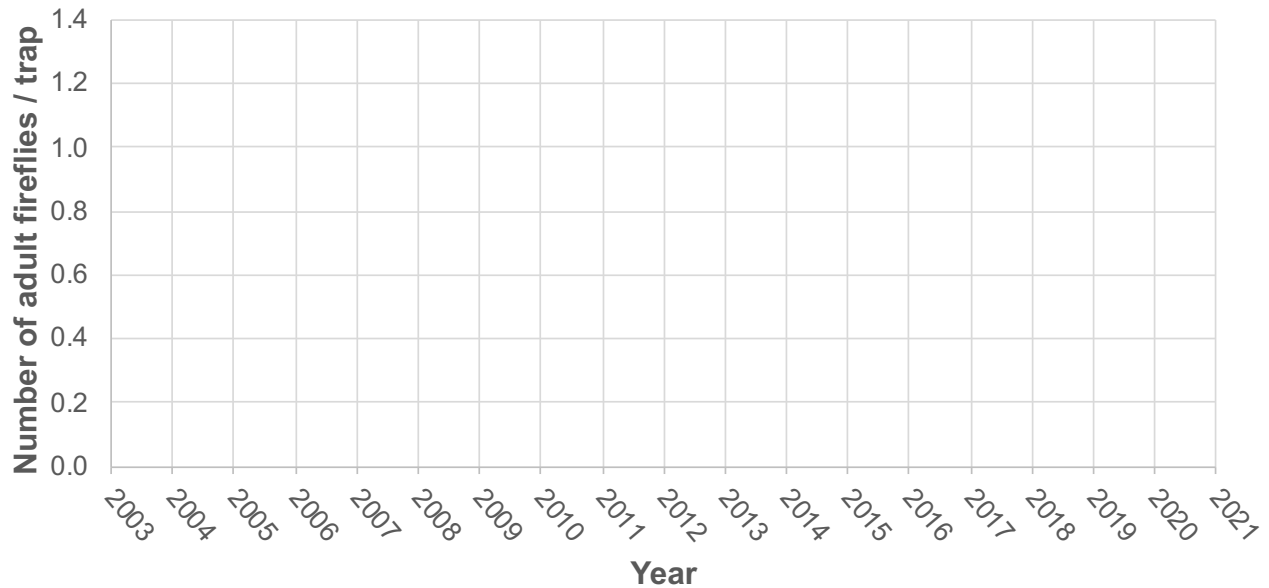
What data will you graph to answer the question?

Independent variable: _____

Dependent variable: _____

Name _____

Draw your graph below: Identify any changes, trends, or differences you see in your graph. Draw arrows pointing out what you see, and write one sentence describing what you see next to each arrow.



Interpret the data:

Make a claim that answers the scientific question.

What evidence was used to write your claim? Reference specific parts of the table or graph.

Name _____

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about the value of long-term data collection.

Your next steps as a scientist:

Science is an ongoing process. What new question(s) should be investigated to build on Christie and Julia's research? How do your questions build on the research that has already been done?

What future data should be collected to answer your question?

Independent variable(s): _____

Dependent variable(s): _____

For each variable, explain why you included it and how it could be measured.

Name_____

What hypothesis are you testing in your experiment? A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

