Name_____

DATA Nugget

The science of stamen loss

Featured scientist: Jeff Conner (he/him) from the W.K. Kellogg Biological Station.
Written with Kirsten Salonga, Research Experience for Teachers.

Research Background

Plants and animals have **adaptations**, or traits that help them survive and pass on more of their genes to the next generation. Flowers are a key adaptation for plants because they help the attract pollinators and reproduce.

A pollinator visiting a mustard flower, drinking nectar and picking up pollen from anthers.

Flowers come in many different shapes, sizes, colors, and forms. While flowers as a whole are an adaptation, traits within flowers are often adaptations themselves. For example, different flower colors attract different types of animals to the plant. Some flowers make nectar that gives animals a food reward for visiting. Other plants have small flowers with no petals so that pollen can be easily picked up and travel by wind.

Many of the animals that visit the plant serve as pollinators. **Pollinators** help plants reproduce by bringing reproductive parts together. Pollination happens when pollen from the **stamen** reaches the **stigma.** This is needed for seeds to form. By moving pollen, pollinators help plants make more seeds. More seeds lead to more plants in the next generation. Small differences in flower traits can change which plant is the most successful at reproducing and setting seed.

A mustard flower, showing the 4 long stamens (top and bottom) and 2 short stamens (left and right).

Jeff is a scientist studying a very particular flower shape seen in plants of the mustard family. Most plants in this family have flowers with 4 long stamens and 2 short stamens. No other plants have this shape, and no one knows why! The short stamens are a particular mystery.

Jeff wanted to see why mustards might have these short stamens. He thought that short stamens are an adaptation because they make it harder for pollinators to reach the pollen, so that more pollen would be left over for later pollinators. This might be beneficial because the first pollinator visiting the flower wouldn't be able to take all the pollen, leaving none for the following visitors. If his hypothesis was

correct, he predicted that short stamens would have less pollen removed with each pollinator visit compared the long stamens.

To collect his data, Jeff and other scientists in his lab needed to measure how much pollen was removed by pollinators on short and long stamens. To do this, they grew mustard plants in the greenhouse and let them flower. This made sure no pollinators could visit the plants before the experiment. Next, they exposed the plants to the three most common pollinators for mustards – bumblebees, small bees, and syrphid flies. To test honeybees, plants were put into flight cages with bees inside. To test small bees and syrphids, plants were put outside. Pollinators chose the flower to visit. After each visit, the lab counted the pollen on the visited flower. They then compared it to the amount of pollen on a flower that was not visited. They used these values to calculate the percent pollen removed. This was repeated for short and long stamens.

(Left) Members of the Conner Lab taking measurements of pollen found on the anthers of short and long stamens. (Right) Jeff observing some of the mustard flowers.

Scientific Questions: How does pollen removal compare on short and long stamens in mustards? Is the effect consistent across pollinator types?

What is the hypothesis? Find the hypothesis in the Research Background and underline it. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies.

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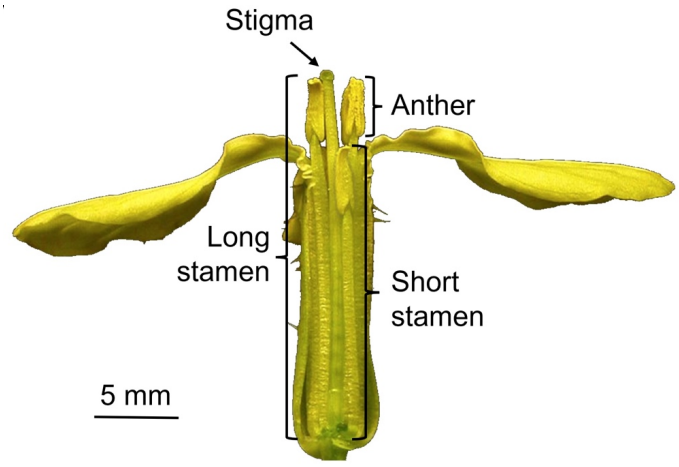
Scientific Data:

Use the data below to answer the scientific questions:

	% pollen removed from *long stamens* each visit
Honey bees	63
Small bees	40
Syrphid flies	29

	% pollen removed from *short stamens* each visit
Honey bees	38
Small bees	9
Syrphid flies	17

	Long Stamens	**Short Stamens**
Average number of grains on each stamen length	11,690	17, 356



What data will you graph to answer the questions?

Independent variable(s): _____

_____

Dependent variable(s): _____

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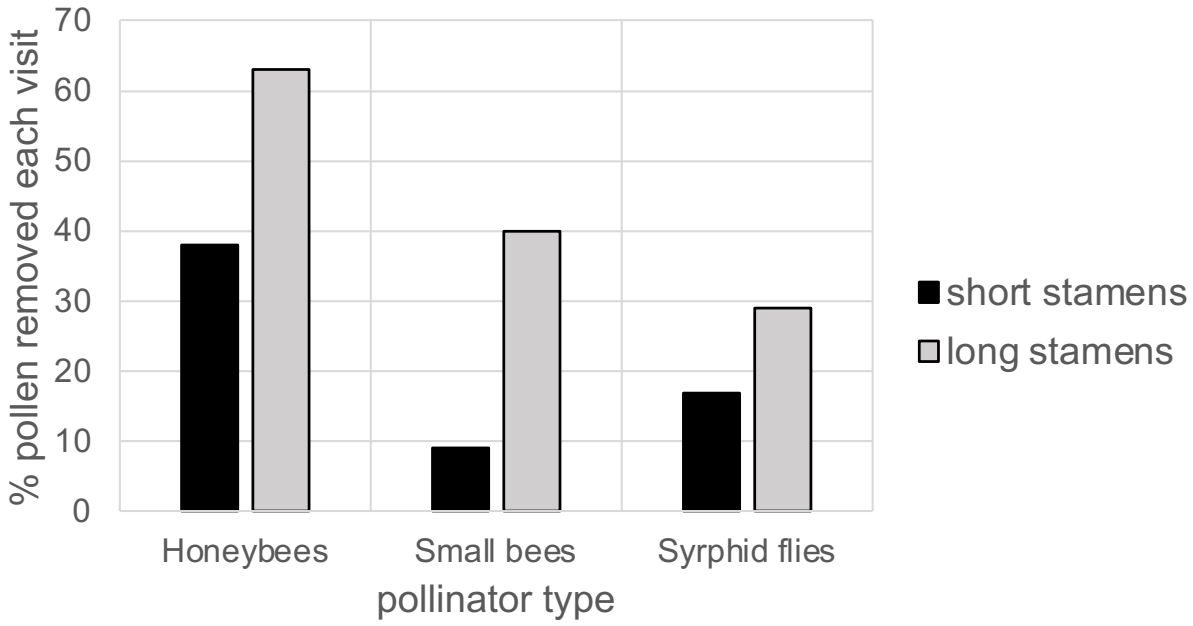
Name_____

Below is a graph of the data: 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 questions: How does pollen removal compare on short and long stamens in mustards? Is the effect consistent across pollinator types?

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

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Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about pollinators visiting flowers and moving pollen.

Did the data support Jeff's hypothesis? Use evidence to explain why or why not. If you feel the data are inconclusive, explain why.

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on Jeffrey's research? How do your questions build on the research that has already been done?