Name_____

DATA Nugget

Hold on for your life! Part I

Featured scientist: Colin Donihue from Harvard University

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Research Background:

On the Caribbean islands of Turks and Caicos, there lives a small brown **anole lizard** named *Anolis scriptus*. The populations on two small islands, called Pine Cay and Water Cay, have been studied by researchers from Harvard University and the Paris Natural History Museum for many years. In 2017, Colin, one of the scientists, went to these islands to set up a long-term study on the effect of rats on anoles and other lizards on the islands. Unbeknownst to him, though, a storm was brewing to the south of the islands, and it was about to change the entire trajectory of his research.

Anolis scriptus, the Turks and Caicos anole, on Pine Cay.

While he was collecting data, Hurricane Irma was developing into a massive category 5 hurricane. Eventually it became clear that it would travel straight over these small islands. Colin knew that this might be the last time he would see the two small populations of lizards ever again because they could get wiped out in the storm. It dawned on him that this might be a serendipitous moment. After the storm, he could evaluate whether lizards could possibly survive a severe hurricane. He was also interested in whether certain traits could increase survival. Colin and his colleagues measured the lizards and vowed to come back after the hurricane to see if they were still there. They measured both male and female lizards and recorded trait values including their body size, femur length, and the toepad area on their forelimbs and hindlimbs.

Colin was not sure whether the lizards would survive. If they did, Colin formed two alternative hypotheses about what he might see. First, he thought lizards that survived would just be a random subset of the population and simply those that got lucky and survived by chance. Alternatively, he thought that survival might not be random, and

some lizards might be better suited to hanging on for their lives in high winds. There might be traits that help lizards survive hurricanes, called **adaptations**. He made predictions off this second hypothesis and expected that survivors would be those individuals with large adhesive pads on their fingers and toes and extra-long legs – both traits that would help them grab tight to a branch and make it through the storm. This would mean the hurricanes could be agents of natural selection.

Not only did Hurricane Irma ravage the islands that year, but weeks later Hurricane Maria also paid a visit. Upon his return to Pine Cay and Water Cay after the hurricanes, Colin was shocked to see there were still anoles on the islands! He took the measurements a second time. He then compared his two datasets from before and after the hurricanes to see if the average trait values changed.

Scientific Question: Is there evidence that anoles have adaptations allowing them to survive better in hurricanes?

What is the hypothesis? Find the two hypotheses in the Research Background and underline them. A hypothesis is a proposed explanation for an observation, which can then be tested with experimentation or other types of studies. Having two alternative hypotheses means that more than one mechanism may explain a given observation. Experimentation can determine if one, both, or neither hypotheses are supported.

Scientific Data:

Use the data below to answer the scientific question:

	Before Hurricane				After Hurricane			
	Male (n = 39)	SE	Female (n = 39)	SE	Male (n = 61)	SE	Female (n = 52)	SE
Average Body Size (mm)	56.91	0.89	44.11	0.40	53.68	0.75	43.52	0.49
Average Femur Length (mm)	12.99	0.21	9.9	0.19	11.81	0.19	9.31	0.12
Average Forelimb Toepad Area (mm2)	1.93	0.06	0.93	0.03	2.03	0.07	1.13	0.05
Average Hindlimb Toepad Area (mm2)	3.05	0.09	1.44	0.05	3.1	0.1	1.76	0.07

**Standard error (SE) tells us how confident we are in our estimate of the mean, and depends on the number of replicates in an experiment and the amount of variation in the data. A large SE means we are not very confident, while a small SE means we are more confident.*

What data will you graph to answer the scientific question?

Independent variable(s): _____

Dependent variable(s): _____

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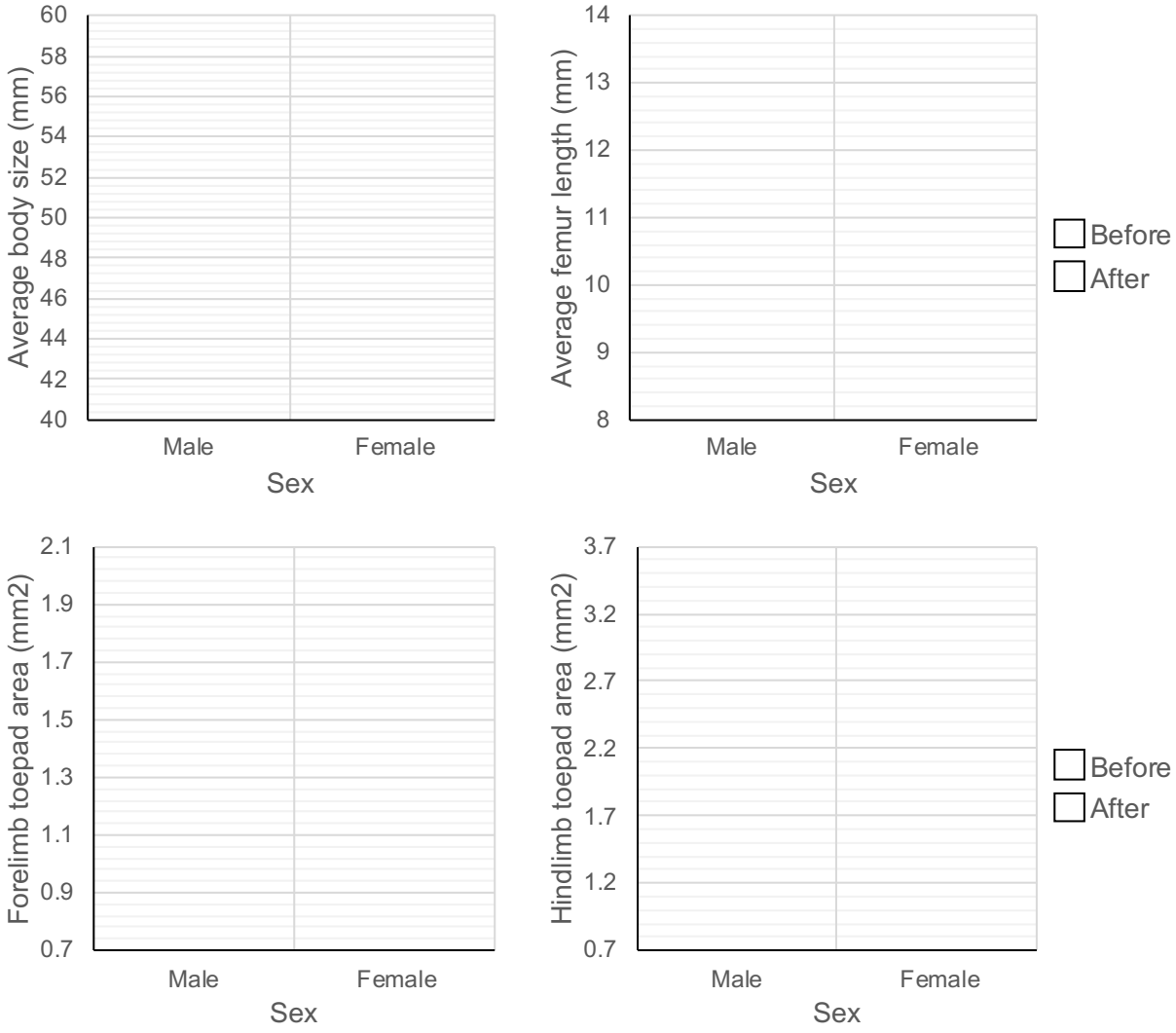
Name_____

Draw your graphs below: Identify any changes, trends, or differences you see in your graphs. 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.

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

Explain your reasoning and why the evidence supports your claim. Connect the data back to what you learned about how traits may be adaptive and help anoles better hold on tight during hurricane winds.

Did the data support one, both, or neither of Colin's two hypotheses? Use evidence to explain why or why not. If you feel the data were inconclusive, explain why.

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