Name_____

DATA Nugget

Sexy smells

Featured scientist: Danielle Whittaker from Michigan State University

Research Background:

Animals collect information about each other and the rest of the world using multiple senses, including sight, sound, and smell. They use this information to decide what to eat, where to live, and who to pick as a mate. Choosing a mate is an important decision that requires a lot of information, such as how healthy a potential partner is, and information about their genes. Mate quality can affect how many offspring an animal has and if their genes will get passed on to the next generation.

Danielle holding a male dark-eyed junco. Notice the white feathers in his tail.

Many male birds have brightly colored feathers that are attractive to females. For example, the peacock has bright and elaborate tail feathers that are thought to communicate a male's quality to the females. Besides using their sense of sight to see feathers, female birds may use their other senses to gather information about potential mates as well. Danielle is a biologist and she wanted to figure out if birds use vision and their other senses, such as smell, to determine the quality of potential mates.

Danielle decided to research how dark-eyed juncos communicate through their sense of sight and smell. Dark-eyed juncos are a type of sparrow. They are not colorful birds like peacocks, but they do have bright white feathers in their tails. Male dark-eyed juncos have more tail-white than females. Danielle thought is possible that females use the amount of white in a male's tail to determine whether he is a high quality mate. Danielle was also interested in several chemical compounds found in junco preen oil, which birds spread on their feathers. This preen oil contains compounds that give birds their odor. Danielle found that males and females have different odors! Just as males have more white in their tail feathers, they also produce more of a chemical called 2-pentadecanone. Danielle wanted to test whether this chemical functioned as a signal to females of mate quality.

To test her two potential hypotheses, Danielle captured male juncos at Mountain Lake Biological Station in Virginia. She measured the amount of tail-white by estimating the proportion of each tail feather that was white, and adding up the values from each feather. She also took preen oil samples and measured the percent of each sample that

was made up of 2-pentadecanone. She followed these birds for one breeding season to find out how many offspring they had. If females pick mates based on visual ornaments, then she predicted males with more tail-white would have more offspring. If females pick mates based on smell, then she predicted males with more 2-pentadecanone would have more offspring.

Scientific Question: How do female juncos determine the quality of potential mates?

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.

A preen gland where dark-eyed juncos produce preen oil.

Danielle removing preen oil from a junco.

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Scientific Data:

Use the data below to answer the scientific question:

Bird Number	Number of Offspring	Amount of Tail-White	Percent 2-pentadecanone
160143611	0	2.4	3.8%
160143709	0	2.3	1.4%
188171045	0	2.5	2.8%
192131040	0	2.7	1.9%
222157229	0	2.6	2.3%
232170101	0	2.3	1.5%
232170210	0	1.7	2.1%
160143081	1	2.6	2.1%
222157314	1	2.4	3.1%
222157618	2	2.4	3.8%
232170003	2	2.0	4.6%
232170007	2	1.8	4.5%
232170008	2	2.1	3.2%
232170017	2	2.4	4.0%
222157149	3	2.3	2.6%
222157216	3	2.6	4.8%
160143435	4	1.8	1.6%
192131111	4	2.6	4.1%
222157404	4	1.9	6.6%
232170004	5	2.7	3.8%
192131513	6	2.4	4.2%
232170110	7	3.0	4.7%

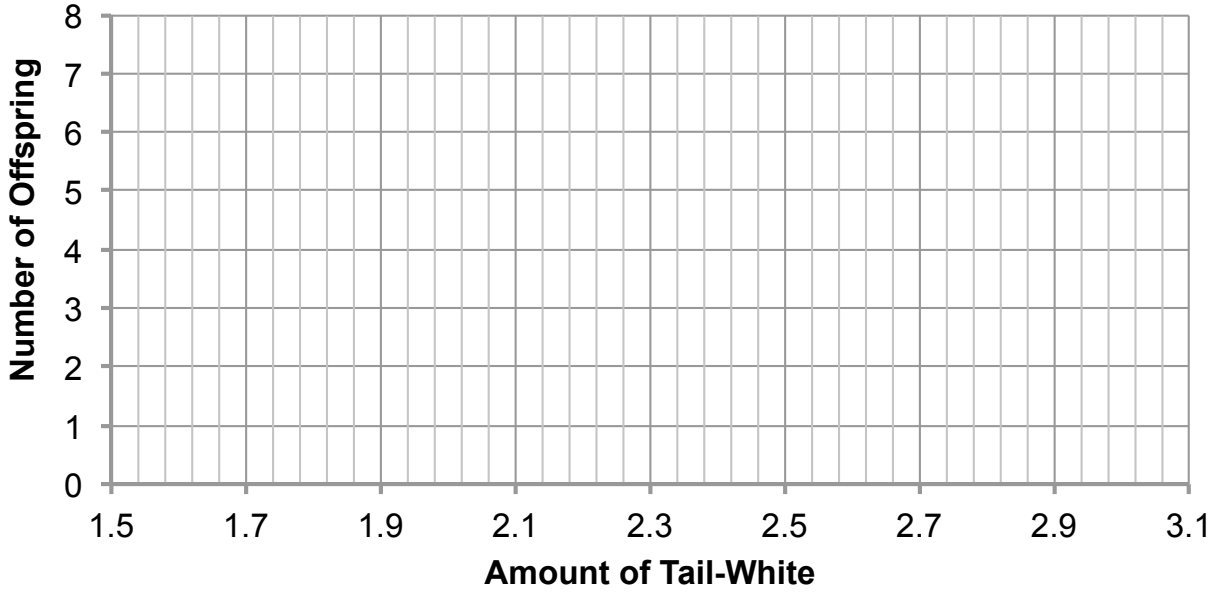
What data will you graph to answer the question?

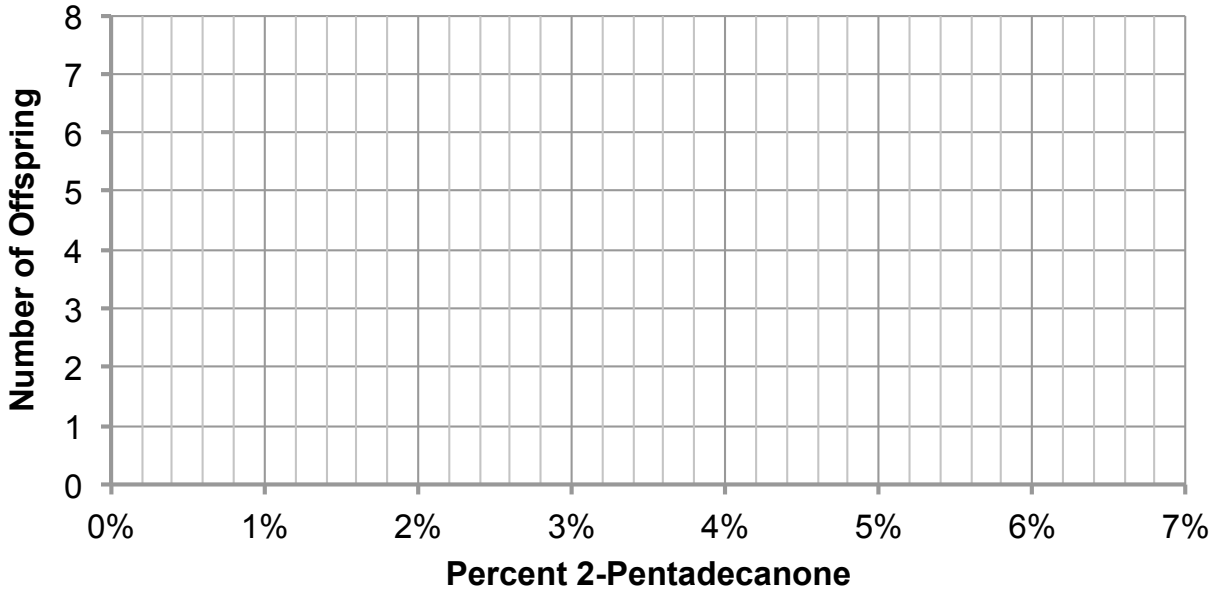
Independent variables: _____

Dependent variable: _____

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.





Name_____

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 graphs.

Explain your reasoning and why the evidence supports your claim. Connect the data back to the different ways that females collect information on potential mates, and why it is important to identify high quality mates.

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

Your next steps as a scientist: Science is an ongoing process. What new question(s) should be investigated to build on Danielle's research? What future data should be collected to answer your question?