Activity #1

Penguin Feeding Habits Change with the Season

Activity Introduction

Animals need easy access to a food supply. A delicate balance exists between an animal and it's food source which effects both its own population numbers and where it can live.

Adelie Penguins start arriving at their breeding colonies on Ross Island in the last week of October. It is here that researchers can observe their breeding habits and behavior. One question researchers always want to know about birds is what they eat. Since penguins feed in the ocean, it takes a major ocean expedition to watch them feed directly. One aspect of foraging that they can observe on land is the penguins' diet. They can pump their stomachs, similar to what is done for people, to see what they were eating. In this activity you will simulate analyzing the penguins stomach contents to see if their diet changes over the season.

Part 1.

Your teacher will give you 6 envelops with dates on them. They represent the stomach contents of Adelie Penguins on Ross Island throughout the breeding season. Create a data table in your journal to record the number and kind of animal that the penguins eat. After you have made all the counts, create a histogram showing the diet of the penguin throughout the season. Put the dates on the X axis and the counts on the Y axis. You will need a different bar for each of the three food types.

1. Based on your graph, make a statement in your journal about the eating habits of Adelie penguins.

Part 2.

2. Compare your graphs with the rest of the groups in your class. Based on your graphs, make a statement about how the diet of Adelie penguins on Ross Island changes as the season progresses.

3. Make a list of questions you might ask about Adelie Penguin diet during the breeding season.

4. Select one of your questions. If you were the researcher, what data would you collect to determine the answer? Record your ideas in your journal.

Reflection on the Activity:

In this activity you collected data on the diet of one penguin over a breeding season. You data showed that as the season progressed the diet changed. When you compared your penguin with others penguins you found that the trends were similar for all penguins.

5. If you tested 3 more penguins in the same colony, what would you expect the histograms to look like for their diets?

6. There are over 6000 penguins in the study colony. Your class only collected data from a small sample. Is it okay for a researcher to make a statement about what all the birds are eating based on data collected from only a few? Discuss your ideas in your group and defend your answer. Share your answer with the class. Many of the products we buy have been tested for safety based on usage by a sample of people. How many people should test a product before we believe it is safe for all of us?

Activity 1

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Activity Introduction:

Based on data collection, students create a graph of the changes in Adelie feeding habits over the breeding season. Students come up with questions about the changes in feeding patterns.

Teacher note: If you do not have time to do Activity 1, you can use Fig 1.

Student Goals:

Students will

- Understand the southern ocean food web and the importance of fish, krill and squid.
- Understand the competition for food source between whales and penguins.
- Gain practice in reading and interpreting graphs and data tables.
- Practice scientific inquiry to solve problems.

Key Concepts:

Competition for food between predator species exists throughout the season and penguins must adapt by selecting other food sources.

Background for the Teacher:

Ice Krill (Euphausia crystallorophias) are found in the ice-covered, continental shelf portion (relatively shallow) of Antarctic oceans. About 4.0 centimeters in length these creatures an important food source for baleen whales, seals, Adelie penguins, and fish. They are a major consumer of phytoplankton in the southern ocean and breed under the ice from the end of December to February.

Advance Preparation:

Copy krill and fish diagram pages. For each team of students you will need **75** krill **59** fish, and **8** squid. Each team of students will need **6** envelopes with the dates and assortment of pictures of krill, squid and fish, according to the table below.

DATE	KRILL	FISH	SQUID
Nov 8	19	0	1
Nov 27	18	1	1
Dec 10	17	1	2
Dec 27	4	16	1
Jan 6	6	15	0
Jan 29	3	16	1
Feb 6	8	10	2

Part 1.

Students can work in small groups. Each group will need six envelops with the diet creatures in the correct amounts in each packet. See reproducible pages at the end of this activity. Students may need help making the graph. A bar or histogram graph is the most appropriate for this activity. Have students use different colored pencils for the different food items. See example under reproducible pages.

Variation: Make slight changes in the envelopes for the same date to vary the graphs between groups so they are not all alike. For instance for all the odd teams add a squid to each of the odd dated envelops and subtract a krill.

Students' responses.

1. As the season progresses Adelie Penguins change their diet from krill to fish and then back to krill.

Part 2.

Have students share their graphs with the rest of the class and their statements.

2. All the graphs show the same trend. During Dec. and Jan. the Adelie penguin diet changes

3. Here are some examples of statements:

- Do all the Antarctica penguins change their diets like the Adelies on Ross Island?
- Do Penguins have a preference for krill or fish or squid?
- Do all Antarctic penguins eat the same thing?
- Are krill, fish and squid in equal abundance in the ocean?
- Are either krill, squid or fish harder to catch?
- Is there a difference between what the males and females eat?
- Do penguins eat different things depending on the time of day they forage?
- Do the penguins change their food depending on when the chicks hatch?
- What causes the penguins to change their diet?

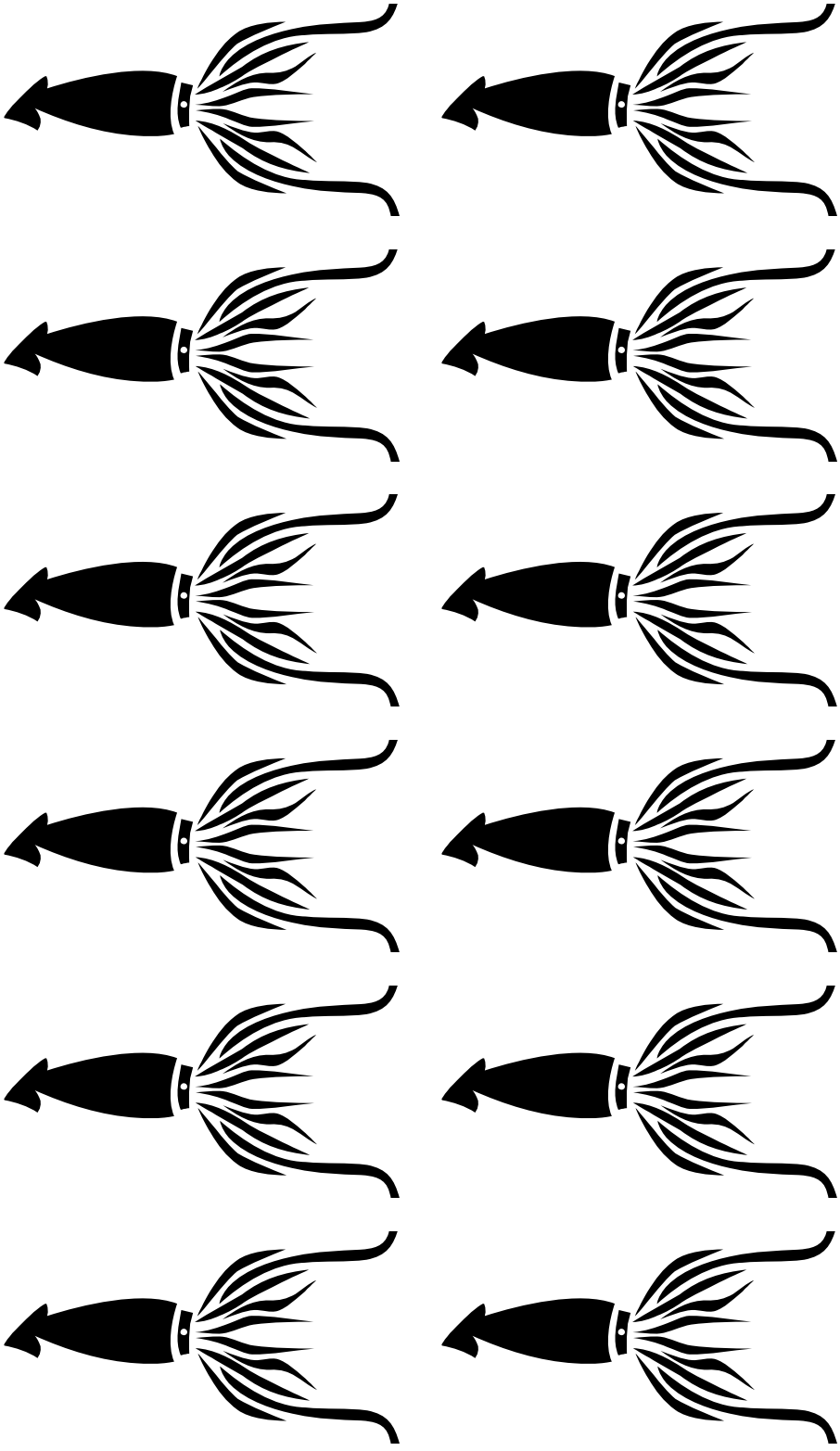
4. Answers will vary, students may need some help coming up with the data they need.

Reflection on the Activity

Researchers can not collect data from all the birds so they do a random sample. Best field practices dictate that researchers disturb as few birds as possible. However, the sample size must be large enough to represent the population. If they collect their samples correctly it is assumed that if they test more birds it would not change their conclusions.

5. If the sample size is appropriate, the next three penguins would show the same pattern of diet

6. Scientist work hard to make sure their sample sizes are appropriate so they have confidence in their conclusions. They sometimes call in the help of mathematicians who help make these decisions and give guidance. These mathematicians are called statisticians.



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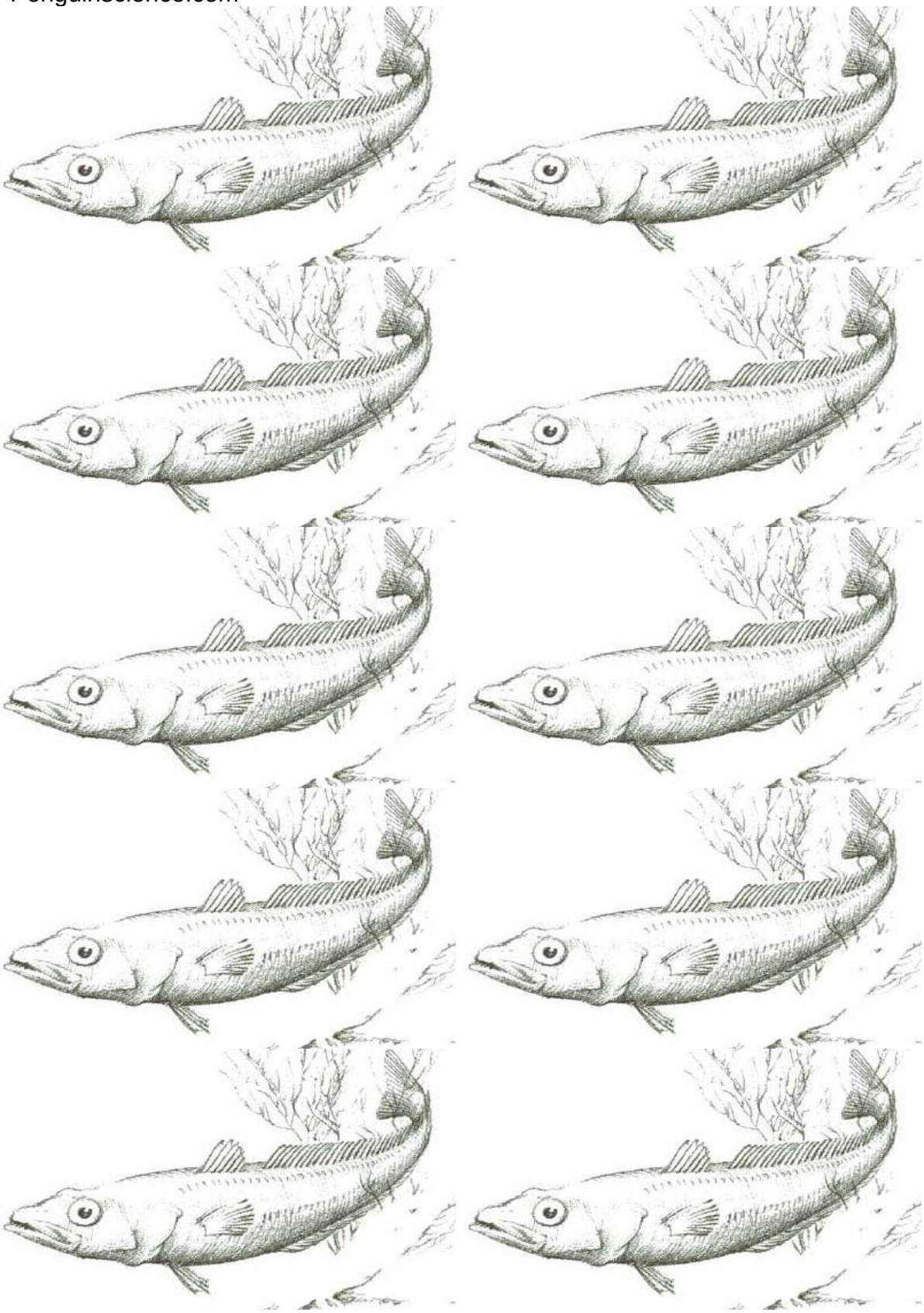

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