HOW DO ORGANISMS GET ENERGY?

Overview

Students will dissect an owl pellet to determine what organism(s) the owl ate to obtain energy.

Objectives

On successful completion of this lesson, students will be able to:

- determine the length, width and mass of a owl pellet;
- identify the bones and the organism found in an owl pellet;
- list the different prey found in the pellets the class dissected; and
- draw a food chain for the owl.

Alaska Standards

Alaska Science Standards / Grade Level Expectations

[6] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating*

[6] SC3.1 The student demonstrates an understanding that all organisms are linked to each other and their physical environments through the transfer and transformation of matter and energy by recognizing that organisms can cause physical and chemical changes (e.g., digestion, growth, respiration, photosynthesis) to matter and recognizing the importance of energy transfer in these changes

Alaska Cultural Standards

[E] Culturally knowledgeable students demonstrate an awareness and appreciation ofthe relationships and processes of interaction of all elements in the world around them. Students who meet this cultural standard are able to:

[E.2] understand the ecology and geography of the bioregion they inhabit.

Bering Strait School District Scope & Sequence

M.S. Sequence 6.3: Cycling of Matter and Energy

D. Identify the roles of of a producer and a consumer and where they appear on a food chain/food web.

M.S. Sequence 6.9 Ecosystems

Materials

- Owl pellets
- Tweezers
- Toothpicks or bamboo skewers
- Disposable gloves (optional)
- Construction paper or manila folders
- Hand lens
- Rulers
- Balance or scale
- White glue
- Identifications charts
- Food web poster
- Student Worksheet: Owl Pellet Dissection

Additional Resources

Glencoe Life Science Ch 20-21

Glencoe Earth Science

- A version of this lab can be found in the Nature of Science section

Bone charts for owl prey species identification

- Bird skeleton chart:
  www.carolina.com/pdf/activities-articles/birdskeleton.pdf
- Mole skeleton chart:
  http://www.carolina.com/pdf/activities-articles/moleskeleton.pdf
- Rat skeleton chart:
  http://www.carolina.com/pdf/activities-articles/ratskeleton.pdf
- Bone identification chart:
  http://www.carolina.com/pdf/activities-articles/Owl_Pellet_Bone_Chart_grid.pdf
- Skull identification chart:
  http://www.carolina.com/pdf/activities-articles/bonechart.pdf
- Owl Pellet Bone Chart:
  http://www.biologycorner.com/resources/Owl_Pellet_Bone_Chart_grid.pdf

Activity Preparations

1. Make copies of the Student Worksheet, bone-sorting chart, and various identification charts.

Whole Picture

Owls are very good hunters. They usually hunt at night using their sensitive hearing and large eyes to locate prey. Their hearing is so good that they can even find prey under a blanket of snow. In Alaska there are ten species of owls. In western Alaska the Snowy, Great Horned, Short-eared, and Northern Hawk Owl can be found.

Owls, like other birds, do not chew their food. Some birds, such as hawks and eagles, tear their food apart, but owls eat their prey whole. The tissue of the prey is digested, but the indigestible material, such as fur and bones form a pellet that must be regurgitated before the owl can eat again. If several prey are eaten in a short period of time one pellet will form that contains the skeleton of the animals consumed. The pellet forms a few hours after eating, but it usually is not ejected for approximately 20 hours afterwards.

Vocabulary

producer an organism that makes it own food

consumer an organism that eats other organisms

food chain a sequence of connected producers and consumers

food web a group of connected food chains in an ecosystem

owl pellet a solid mass of fur and bones that is regurgitated from an owl

carnivore an animal the gets its energy from eating flesh

herbivore an animal that gets its energy from eating plants

omnivore an animal that get's its energy from eating both plants and animals

Activity Procedure

1. Introduce the activity by asking students where they get their energy. Ask them to name some of the foods they eat. Ask what foods other animals, such as a moose, salmon, and ptarmigan consume for energy. Ask what a bear eats and how they could determine what it has been feeding on.
2. Show the class an owl pellet and ask if anyone knows what it is. If necessary tell students it is an owl pellet and explain how they are formed. Explain they are going to dissect an owl pellet so they can determine what the owl had been feeding on.

3. Distribute the materials for the dissection. Tell students that the pellets have been sterilized, but they should wash their hands when they are finished with the dissection. Some students may want to wear disposable gloves.
4. Before starting the dissection students will need to take measurements of the owl pellet and record their observations on the Student Worksheet.
5. Assist students with dissection of the pellets and identification of bones.
6. Have students write the type of animal they found on the board to compile a class list of prey found in the pellets
7. As a class, draw an owl food web on the board using the different types of organism found in the owl pellets.

Extension Activities

- Make a bar graph of the number and types of animals found in the owl pellets dissected in class.
- Use the measurements to find out if there is a relationship between the size of the pellet and the number or type of organisms found in it.

Answers

1. Answers will vary. If straw is found it might have been found in a barn. Needles would indicate a coniferous forest. Dirt would be from the ground.
2. Answers will vary. Typically voles, moles, shrews, mice, or small birds are found.
3. Carnivores
4. Answers will vary. Examples could be: plants -> vole -> owl or plants -> insect -> mole -> owl. An arrow should show energy moving from the producers towards the owl.
5. Since they don't have a complete skeleton it would be difficult to tell what type of organism they ate.
6. The population of owls would also decrease.

References

http://www.carolina.com/teacher-resources

http://www.adfg.alaska.gov/index.cfm?adfg=owls.main

http://www.npwrc.usgs.gov/resource/birds/chekbird/r7/bering.htm

Student Worksheet: Owl Pellet Dissection

Name _____

Overview

Energy flows through a food chain from producer to consumers. Owls are consumers near the top of the food web. They are effective hunters that can find prey even under a blanket of snow. After consuming their prey whole they must regurgitate indigestible material as a pellet before they eat again. By examining an owl pellet you can find out what the owl ate.

Procedure

1. Use a ruler to measure the length and width of your owl pellet. Use a balance to determine the mass. Write the answers in the data section of the student worksheet.
2. Carefully examine the outside of the owl pellet and write a description of the pellet.
3. Place the owl pellet on a piece of construction paper or folder.
4. Using tweezers, skewers, and/or toothpicks, carefully loosen the hair from the owl pellet. As bones are uncovered use the tweezers to set them aside on a clean piece of paper. Work slowly and carefully to avoid breaking the bones. Continue working to find all the bones in the pellet.
5. Use the bone-sorting chart to identify the type of skeleton you found in the owl pellet.
6. Place the skeletal bones next to the diagram of each bone on the chart. Use a hand lens to identify the smaller bones.
7. Complete the data table by counting the number of bones listed on the table.
8. Use glue to attach the bones to the bone-sorting chart.
9. List on the board the type of organism(s) you found.

Student Worksheet: Owl Pellet Dissection

Name _____

Observations

Describe what your owl pellet looks like. Can you identify any items that are stuck on the outside? For example, is there straw, needles, or feathers? List any items that you find on the outside of the pellet.

Data

Measurements

Length _____ mm Width _____ mm

Mass _____ gr

Data table

Bone	Number
skull	
mandible (jaw)	
pelvis	
ribs	
vertebrae	
scapula	
forelimb	
hindlimb	

Questions

1. Based on your observation of the outside of the owl pellet where do you think the owl pellet was found?

2. What types of animals were found in the owl pellets your class dissected?

3. Are owls carnivores, omnivores, or herbivores?

4. Draw a food chain that includes an owl, the organism it ate and a producer. Include a arrow that shows the direction that energy moves through the food chain.

5. Hawks and eagles tear their prey into small pieces, and avoid eating the fur and bones. In addition they have strong stomach muscles for digesting most of the material they eat. A small amount of indigestible material would be regurgitated like an owl's. Explain why a hawk or eagle pellet would not be as useful as an owl's pellet for dissection.

6. If the population of small mammals (voles, shrews) were to decrease what would happen to the population of owls?