



Introduction

Overview

In this program, students explore a specific example of ecosystem interdependence through the dissection of owl pellets. They collect data, and discuss food webs. Students discuss the feeding habits of the barn owl and prey species preferences. Observations and discussions of changes in classroom aquariums continue.

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Big Idea: A food web describes the complex feeding links in an ecosystem.

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Purpose

For Students to Do

1. Measure and record the size and appearance of an owl pellet.
2. Observe and dissect barn owl pellets and identify the bones found by comparing them with pictures.
3. Share, compare and look for patterns in the barn owl pellet data.
4. Infer from owl pellet data how many prey are eaten.
5. Infer from owl pellet data the prey species eaten.
6. Organize observed data into tables and graphs.

For Students to Know

1. A predator is an animal that eats other animals.
2. Prey are animals which are eaten by other animals.
3. Animals may be predators, prey, or both.

Materials and Preparation

Advance Preparation

- Review the program guide.
- Organize the class into small groups for the activities.
- Collect and organize the materials needed for the activities.

Kit Materials

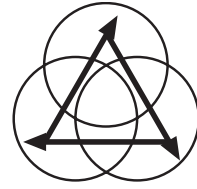
- owl pellets
- magnifiers
- forceps (tweezers)
- toothpicks

Teacher Provided Materials

- small containers for pellet contents
- paper or paper towel
- cm ruler (or use page 3:5)

Duplication

- Student Activity Sheets, pages 3:5, 3:8, 3:12
- Transparency Master, page 3:6
- Identification Key, page 3:11
- Skull Picture Key, page 3:13



Program Viewing Activity #1

Focus: Owl Pellets

Description

Students work in small groups to dissect owl pellets. The fur and bones of the owl's prey are examined and identified.

Materials

for each group of students:	source:
1 owl pellet	kit
– hand lens	kit
– tweezers	kit
– toothpicks	kit
– Student Activity Sheet	page 3:5
– white paper or paper towel	classroom
– cm ruler	classroom

optional:

– plastic baggies or cups	classroom
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(used to store the pellet contents for further dissection and investigation)

Leading the Activity

The studio teacher introduces the owl pellets and begins dissection, demonstrating how to open the pellet and reveal the bones. The classroom teacher facilitates the activity in the classroom, circulating the room to discuss observations with the students. Encourage the students to observe and compare contents of the owl pellets.

Range of Results

Some students may be hesitant to examine the owl pellets with their hands. Remind the class that the owl pellets are not fecal waste, but are simply a clod of fur, bones and other materials (some feathers, grass or leaves, or insect exoskeletons may also be present).

NOTE: The owl pellets have been made safe for handling.

Organizing the class into small groups will facilitate the activity. In a group of three or four students, there will probably be one or two students who are less hesitant or even eager to begin working on the pellet. Other students in the group will

usually begin to work on the pellets after one or two begin. Encourage the students to investigate the owl pellets and model a positive attitude toward the activity. Hesitant students will handle the pellets when they are ready—curiosity almost always prevails!

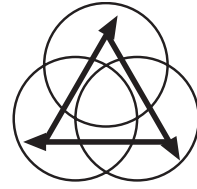
It is suggested that 12–15 of the pellets be used for this activity. Additional pellets have been included for the teacher to practice dissecting. There should be a few owl pellets left over for additional investigations.

Procedure

1. Observe the whole pellet. Record the size (length and width) of the pellet and other observations. Grasses, feathers or materials attached to the outside of the pellet may provide clues about where the pellet was found.
2. Using the fingers, gently pull the owl pellet into two pieces while twisting back and forth slightly as you pull. ***“Breaking” the pellet into pieces by bending it sharply may break the fragile bones inside the pellet.***
3. Pick apart the pellet, starting with any loose sections which are easily removed. (The pellets can be dissected using only the fingers, but toothpicks and tweezers may be helpful.)

NOTE: The skulls are often very thin and fragile—handle them with care.

4. Gently pull apart small sections of fur looking for small bones such as ribs.
5. Compare the bones found with the diagram of the vole skeleton on page 3:5. Try matching the bones by laying them on the diagram in the appropriate location.
6. Keep all of the fur and bones from each pellet together in a container.



NOTE: Identification of prey species is not important at this time. Most of the pellets (80% or more) will contain vole skeletons, the barn owl's preferred prey. Have the students compare their bones with those of the vole on the activity sheet. Other species can be compared with skeletons on page 3:6

Teacher • 2 • Teacher

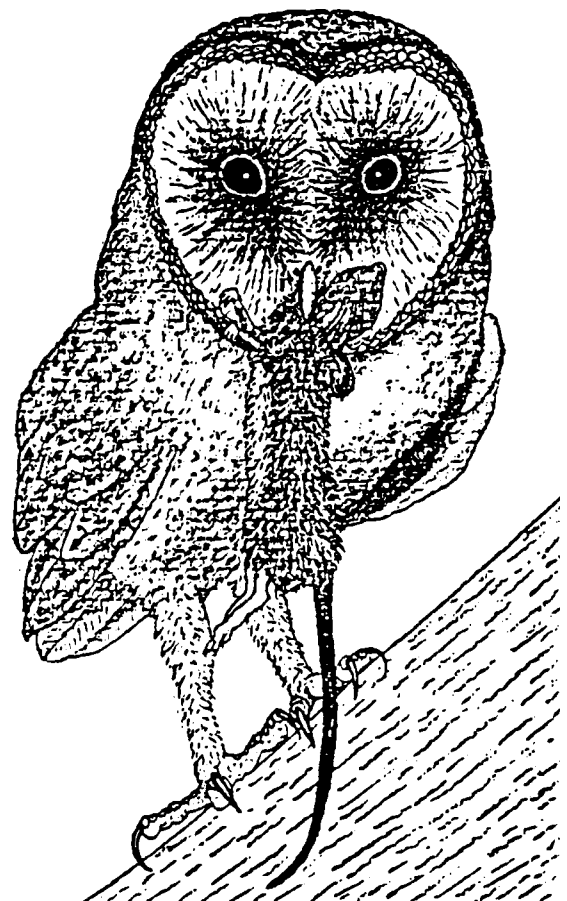
The barn owl can teach us many things about his habits even without the benefit of his physical appearance. The pellet is the final product of the interaction between this predator and its prey. It can serve as a window into life as it demonstrates the final link in the food chain that supports a barn owl's very existence. In short, each barn owl becomes an important participant in providing structure to the interweaving strands of the web of life.

Owl Pellets

An owl pellet is a clod of fur or feathers and bone. It is the indigestible remains of small animals eaten by a wild barn owl, *Tyto alba*. Because it usually swallows its prey whole and is able to digest only fleshy parts, the barn owl must regurgitate the remaining solid materials in the form of a compact pellet. Barn owl pellets are especially suited for study because they are large enough to be examined without the aid of a microscope. Generally a pellet contains the entire skeletons of animals that are eaten. There are almost always remains of two or more animals present in each pellet. It is possible that only portions of animals were eaten, which will make identification more difficult.

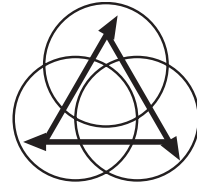
The life of a barn owl may well be a perfect model of the simplest food-chain: plant-herbivore-carnivore. However, the transfer of energy through even the simplest food chain is never completely efficient. The grasses on which mice feed convert only a small percentage of the solar energy that strikes their leaves into plant chemical energy. In digesting plant material, only a small fraction of the stored chemical energy is available for use by the mice. As energy for

the stored chemical energy is available for use by the mice. As energy for growth and locomotion is extracted by the owl from the chemical energy of mouse flesh, much energy is lost to the environment in the form of waste products and heat. The barn owl passes on both its stored energy and chemicals in death to the organisms called decomposers. Decomposers break down the remains of the owl, making raw materials available to other organisms, thereby maintaining the cycle.



Barn
Owl

Tyto alba



Owl Pellets

Focus Question: How can we find out what an owl has eaten?

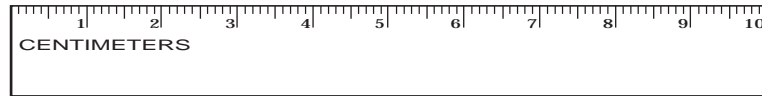
Purpose

To observe the skeletons of prey eaten by owls and compare the bones with a diagram of the skeleton.

Directions

1. Measure and record the length and width of the owl pellet.

2. Gently dissect the owl pellet as directed by your teacher.
3. Compare the bones with those on the diagram below and place them directly on the drawing so you can match them. Note: If your skeleton looks like it might be of another animal, your teacher has additional skeleton diagrams.
4. Save the bones and fur when you are done!—We will look at them again.

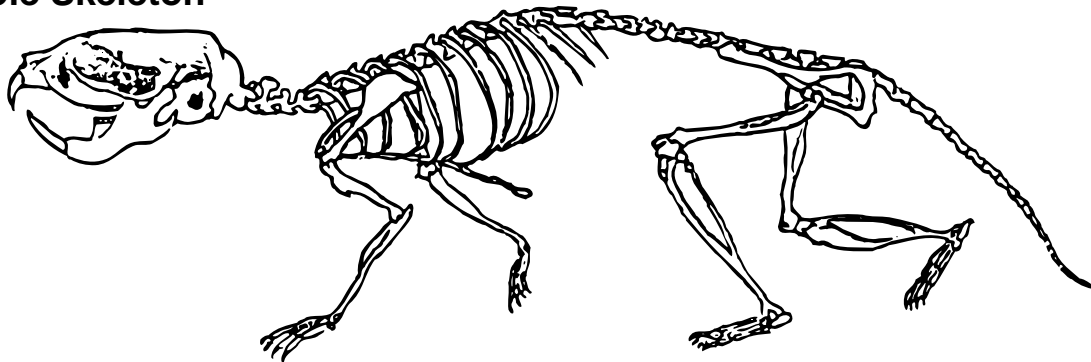


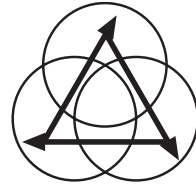
Pellet length _____

Pellet width _____

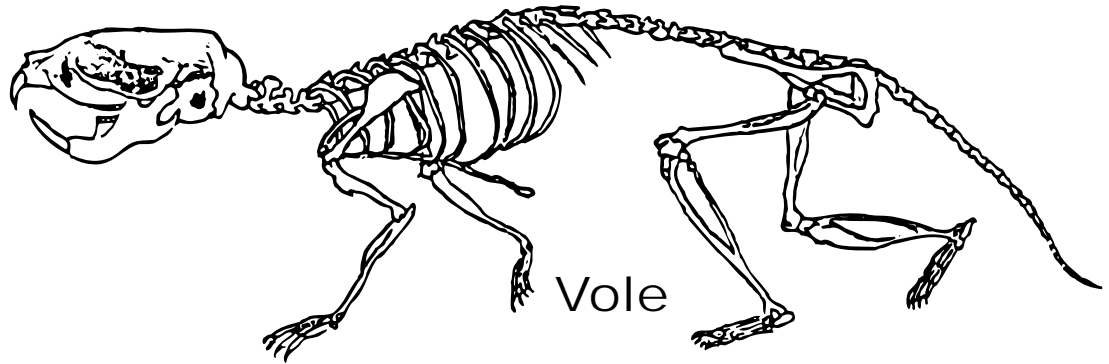
Other Observations: _____

Vole Skeleton

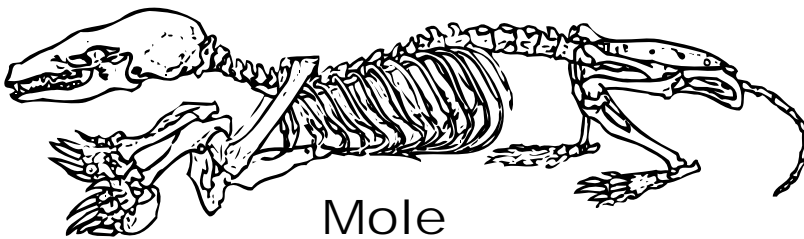




Owl Pellets - Prey Skeletons



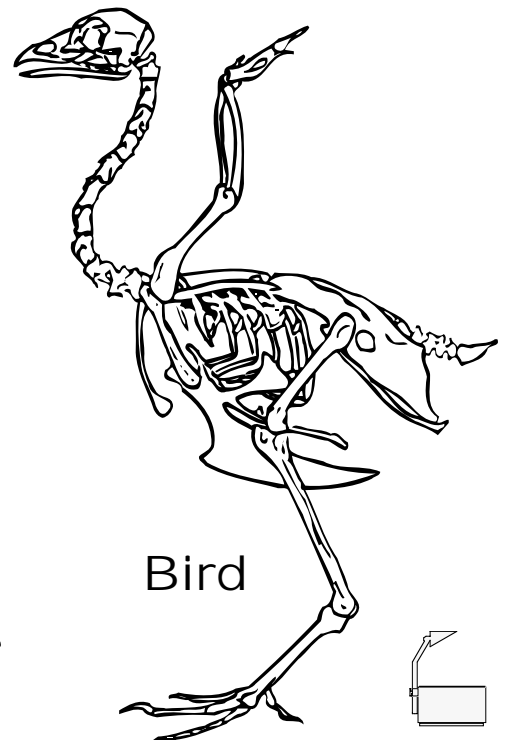
Vole



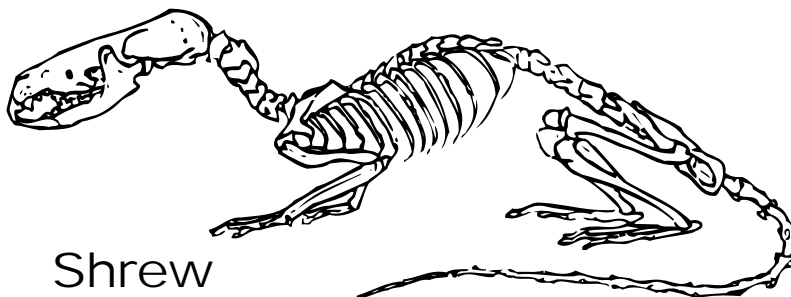
Mole



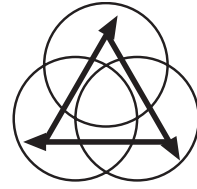
Mole
Forelimb



Bird



Shrew



Program Viewing Activity #2

Hands-On: Barn Owl Feeding Habits

Description

Dissected owl pellets are examined to gather data about the feeding habits of the owl. Students identify several bones which are good indicators of how many prey the owl has eaten in a night of foraging. Quantitative data for these bones is used to determine how many prey the owl has consumed during that feeding. This data is organized in a table.

Materials

<i>for each group of students:</i>	<i>source:</i>
1 dissected owl pellet	kit
– hand lens	kit
– tweezers	kit
– toothpicks	kit
– Student Activity Sheet	page 3:8
– white paper or paper towel	classroom
– cm ruler	classroom

optional:

- paper cups, zip-closure bags, etc. classroom

Leading the Activity

Tell the students they are going to examine the pellets to determine how many prey the owl eats each day. Encourage the students to make sure that they have separated all of the bones from the fur. The fur can be rolled between the thumb and forefinger to feel for bones which may have been overlooked. Once all of the bones have been removed, have the students arrange them into groups of similar bones. The bones from a single prey can also be seriated by size.

Have the students compare the bones with those listed on the activity sheet and count how many of each bone was found in their owl pellet. This data is recorded on the activity sheet. Several bones are

counted to check how many prey the owl has eaten. For example, two femurs indicate one prey—three femurs indicate two prey. The data for each pellet can be totaled and averaged to provide a picture of the feeding habits of the barn owl.

Range of Results

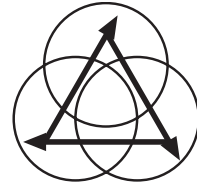
This activity requires the students to make inferences from data they have collected. Students may have difficulty using the data to determine how many prey were eaten by the barn owl. When they find three jaw bones, they may report that the owl ate three mice. Encourage the students to use the data sheet carefully, actually placing the bones on the sheet.

Although the barn owl tends to swallow its prey whole, some of the bones may be missing or broken. The skull, jaw, femur and hip or pelvis are fairly easy to identify by comparing the bones with the skeleton diagram. Students may be able to match and pair the bones from a single prey.

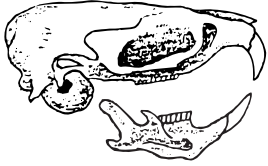
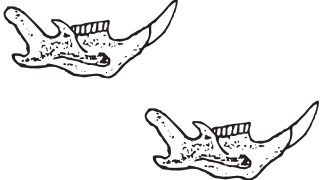
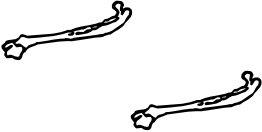
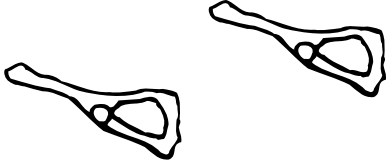
Students may find skeletons from other prey species. Skeletons of other prey species are illustrated on the transparency (page 3:6). The skull picture key on page 3:13 can also be used to identify the prey species.

Teacher • 2 • Teacher

The pellets supplied for this activity have been gathered in the Pacific Northwest states of Oregon and Washington. In this area the barn owl feeds primarily on the meadow vole, commonly known as the field mouse. It takes hundreds of voles to supply the energy needs of one owl for a year. By identifying a few types of bones in the pellet, we can draw conclusions about the feeding habits of the barn owl.



Barn Owl Feeding Habits

TYPE OF BONE	TOTAL FOUND	NUMBER IN EACH PREY	NUMBER OF PREY IN THE PELLET
 SKULL		1	
 JAW		2	
 FEMUR		2	
 PELVIC BONE		2	





Program Viewing Activity #3

Sharing Data: Observing Population Changes

Description

Students discuss and compare observations of changes in the plant and animal aquarium populations. Students pose "What if...?" questions about populations and discuss investigation experimental designs.

Materials

Previously recorded observations.

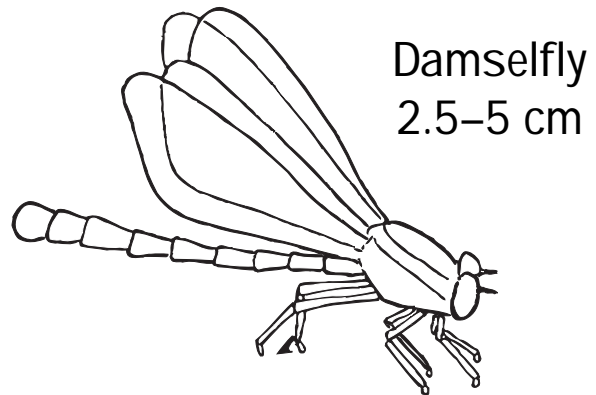
Leading the Activity

The studio teacher encourages classroom discussion of observations.

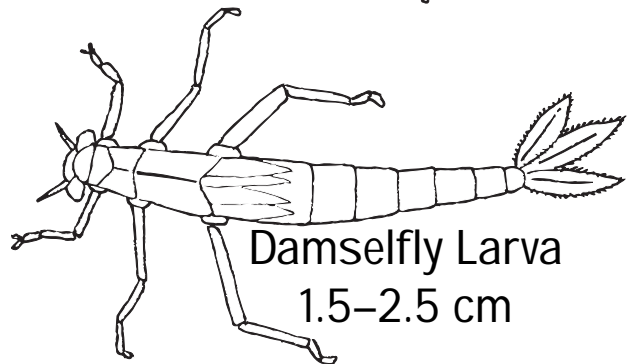
The classroom teacher facilitates student activity and discussion. Helps students organize the observations for efficient sharing in the Electronic Classroom, by fax or email. Involves students in the discussion of ideas about why certain populations increased or decreased.

New Questions

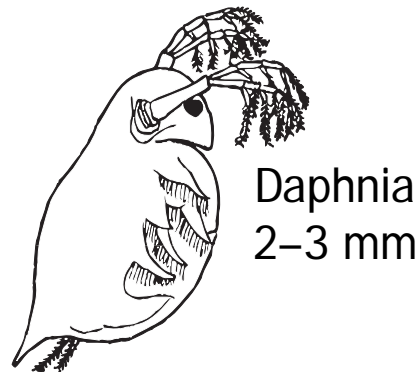
Continue to have students investigate their "What if...?" questions from Program #2 (Refer to Program Viewing Activity #3, page 2:11).



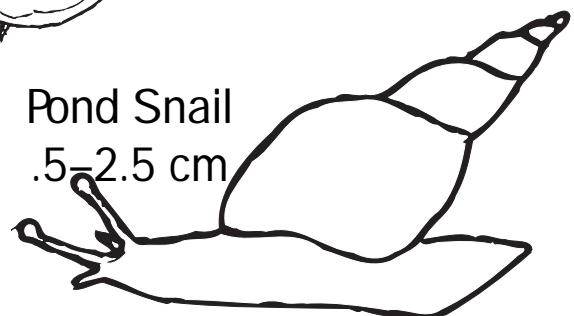
Damselfly
2.5–5 cm



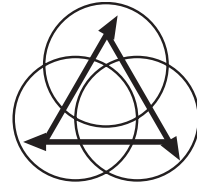
Damselfly Larva
1.5–2.5 cm



Daphnia
2–3 mm



Pond Snail
.5–2.5 cm



Follow-Up Activity #1

Hands-On: Barn Owl Prey Identification

Description

Skulls found in previously dissected owl pellets are compared with a picture key to identify the major prey species found in the pellets. Characteristics of the skulls are observed to reveal adaptations.

Materials

for each group of students:

- dissected owl pellet
- hand lens
- Student Activity Sheet
- Picture Key to Skulls

source:

- kit
- kit
- page 3:12
- page 3:13

Leading the Activity

Have the students compare the skulls they have found with the picture key provided. Encourage the students to discuss their ideas about which prey species the skull represents, citing specific characteristics of the skull they have observed. Discuss adaptations which the skulls reveal.

NOTE: Voles are the most common prey found in these barn owl pellets. Other prey species may also be found in the pellets. Encourage the class to compare the different skulls, observing characteristics which discriminate the skulls.

Procedure

Organize the class into small groups. Working together to compare the actual skulls found with the picture key encourages discussion. Guide the students to cite specific characteristics of the skull which indicate a certain species of prey.

Teacher • 2 • Teacher

Some of the characteristics which may be useful in identifying the prey skulls are listed below.

- The **vole** skull reveals that these rodents are herbivores. There are incisors for cutting and molars for grinding, but no canines for tearing

meat. Grass or other plants are cut with the incisors and then ground up with the molars. Like the incisors of many rodents, the front teeth are ever-growing and must continually be used to keep them worn down. An interesting adaptation is that vole molars are ever-growing. Look for molars which have fallen out of the sockets in the jaw.

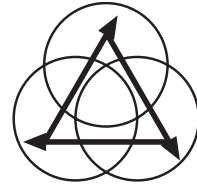
- The **shrew** skull is smaller (about 18 mm) and very fragile. A look at the teeth reveals that the shrew is well adapted as a predator. Students may report that the owl pellet contains many “baby mice” whose skulls are still thin. They are probably observing shrew skulls.

- A **rat** skull may also be found in the pellets. These skulls appear much like the vole, but they are larger (about 40 mm). Note adaptations similar to those of the vole in the teeth—this animal is an herbivore, with no teeth for tearing meat.

- A **mole** skull is similar in size to a vole (about 30 mm), and more streamlined. The streamlined skull is well-adapted for burrowing, and the teeth are adapted for eating worms and insects. The powerful forelimbs are especially interesting, revealing how well adapted the mole is for its life burrowing underground.

- A **weasel** skull will be about 30–40 mm long. The teeth will indicate that this animal is a predator—a meat eater.

- A **bird** skull will be obviously different from the rodents. There will be no teeth present in the skull and the beak indicates the tweezer-like adaptation of birds for probing and picking up small items of food or nesting material.



Identification Key

Field guides commonly use a dichotomous key to identify plants, animals, and other materials found in nature. A simplified key for identifying skulls commonly found in owl pellets is listed below. This key provides practice in using such a tool to identify an object. The key below uses only two observations, teeth and skull size, to identify the skull.

1. *Teeth Present?*

- a. teeth or tooth sockets are present..... go to #2
- b. no teeth or tooth sockets..... go to #5

2. *Gap Between the Teeth?*

- a. there is a wide gap between the front teeth and cheek teeth....go to #3
- b. there is little or no gap between the teeth..... go to #4

3. *Skull Size*

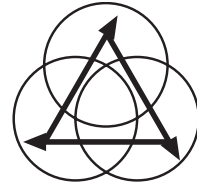
- a. skull over 32 mm in length **Rats**
- b. skull less than 32 mm in length **Voles and Mice**

4. *Skull Size*

- a. skull about 16 mm (tips of teeth usually reddish) **Shrews**
- b. skull about 30 mm **Moles**
- c. skull about 35 mm **Weasels**

5. *Skull Size*

- a. skull about 55 mm (long, probing beak) **Starlings**
- b. skull about 43 mm **Blackbirds**
- c. skull about 27 mm (short, pecking beak) **Sparrows**



Follow-Up Activity #1

Owl Pellets—Identifying Prey

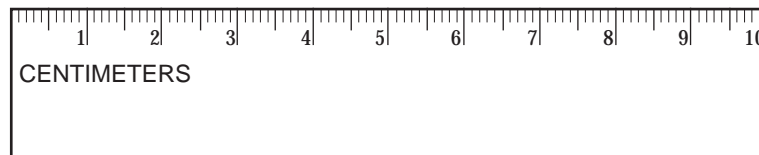
Focus Question: What types of prey has the owl consumed?

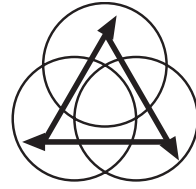
Purpose

To observe the skulls found in the owl pellets and compare them with a picture key to identify them.

Directions

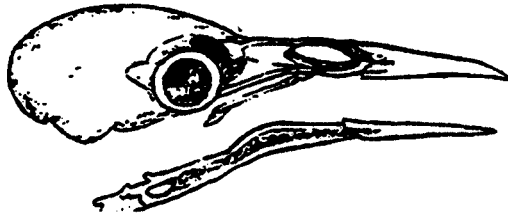
Observe the skulls you have found in the owl pellet and match them to the pictures of skulls. Use a cm ruler to measure the length of the skull. Record and describe the types of prey found in your owl pellet.





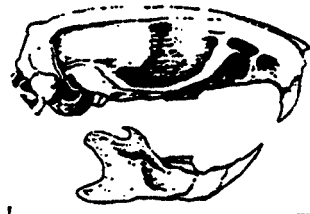
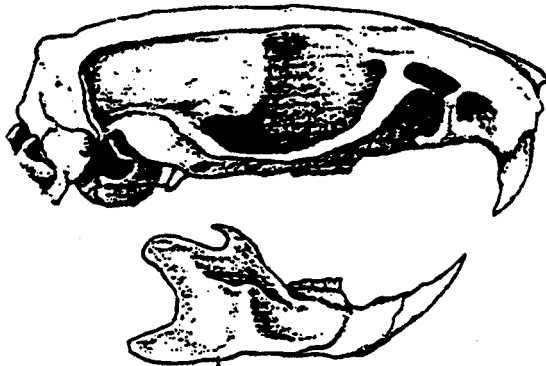
Owl Pellets—Picture Key to Skulls

Starling Skull



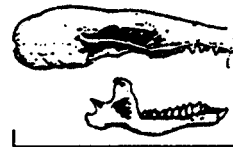
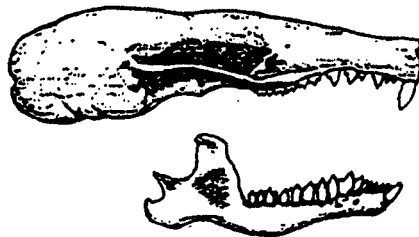
Actual size 55 mm.

Rat Skull



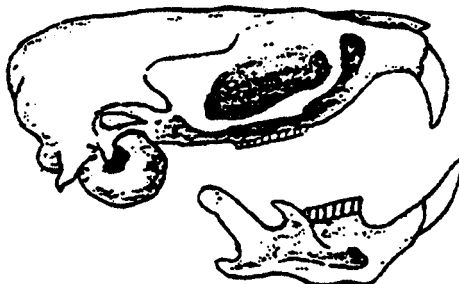
Actual size 40 mm.

Mole Skull



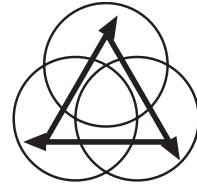
Actual size 30 mm.

Vole Skull



Actual size 25 mm.





Outline

Program Viewing Activities: Let's Do Science!

Focus: Owl Pellets

Students work in small groups to observe and dissect owl pellets. Contents of the pellets are examined.

(Program Viewing Activity #1, page 3:3)

Hands-On: Barn Owl Feeding Habits

Dissected owl pellets are examined to gather data and make inferences about the feeding habits of the barn owl.

(Program Viewing Activity #2, page 3:7)

Sharing Data: Observing Population Changes

Students discuss and compare observations of changes in the plant and animal populations.

(Program Viewing Activity #3, page 3:9)

Sharing Data: Schoolyard Mapping

Following Program 1, students recorded observations of the schoolyard environment on a map. In this program, students discuss and compare their observations.

(refer to Program 1, Follow-Up Activity #1, page 1:4)

Follow-Up Activities: Keep Doing Science!

Hands-On: Barn Owl Prey Identification

Students use a picture key to identify skulls found in the owl pellets. (Follow-Up Activity #1, page 3:10)

Hands-On: Observing Population Changes

Students continue to observe and record changes in the aquatic populations from Program 2.

(refer to Program 2, Program Viewing Activity #1, page 2:3)

Notes

