Owl Pellets

Purpose
Students will be introduced to owl digestive physiology and will investigate the skeletal anatomy of small rodents.

Background
(following info is from http://www.owlpages.com/physiology/digestion.html)

Owl pellets are not what you think. Owls have a stomach divided into two parts. The glandular part is called the proventriculus. muscular stomach, also known as a gizzard. There are no digestive glands in the gizzard, and in birds of prey, it serves as a filter, holding back insoluble items such as bones, fur, teeth and feathers. Several hours after eating, the indigestible parts (fur, bones, teeth & feathers that are still in the gizzard) are compressed into a pellet the same shape as the gizzard. This pellet travels up from the gizzard back to the proventriculus. It will remain there for up to 10 hours before being regurgitated. Because the stored pellet partially blocks the Owl's digestive system, new prey cannot be swallowed until the pellet is ejected. Regurgitation often signifies that an Owl is ready to eat again. When the Owl eats more than one prey item within several hours, the various remains are consolidated into one pellet.

The pellet cycle is regular, regurgitating the remains when the digestive system has finished extracting the nutrition from the food. This is often done at a favourite roost. When an Owl is about to produce a pellet, it will take on a pained expression - the eyes are closed, the facial disc narrow, and the bird will be reluctant to fly. At the moment of expulsion, the neck is stretched up and forward, the beak is opened, and the pellet simply drops out without any retching or spitting movements.

To see a repeating video of an owl expelling a pellet, click on http://www.owlpages.com/physiology/gho_pellet.html

Materials (for each student)
Owl pellet
Dissecting kit (probes)
Bone identification worksheet
Gloves (optional)
Butcher paper or placemats
White cardstock paper
Glue

Procedure
1. Give students introductory material about owl pellets.
2. Students will work individually on their own pellet.
3. Offer gloves to students who wish to use them.
4. Allow about an hour for students to dissect the pellet. You may want to use extra time after lunch for students to complete the project.
5. Students will glue their bones in the shape of the identified rodent onto the cardstock.
6. Allow the students to take their completed projects home.
Pellets, or castings, are composed of the undigested portions of food items eaten by owls and regurgitated through the mouth. The pellets contain the bones, beaks, claws, and teeth of mammals, birds, reptiles, amphibians, and fish. These hard parts of food items are usually enclosed by softer substances such as fur, feathers, or vegetable fibers. Thus, the pellet provides valuable clues about the type of prey an owl eats.

PURPOSE:
1. To dissect one complete owl pellet.
2. To attempt to identify the animals whose skeletons are found in the pellet.
3. To reconstruct the skeleton of an animal found in the pellet.
4. To construct a food chain with the owl at the highest level.

PROCEDURE:
1. Work with one partner.
2. Place a pellet on a sheet of white paper.
3. Record the size of the pellet.
   length: __________ cm width: __________ cm
   mass (weight): __________ grams
4. Using dissecting needles, separate the bones of the animals from the fur and feathers. Clean the bones and sort them according to type, using the Identification Chart.
5. Glue the bones on poster board to create a complete skeleton.

OBSERVATIONS:
1. How many skulls (or pairs of jaw bones) did you find in your pellet? _______
2. What kind of animal bones do you think were in the pellet? ________________
3. Assume one owl produces one pellet per day, how many animals does the owl eat each year? ________________
4. Scientists are concerned about the accumulation of certain poisons in the systems of predators. Why do you suppose owls and eagles are often the most threatened animals in a community that is exposed to DDT or mercury? ________________
5. In the space below, draw one of the skulls that you found in your owl pellet.

6. On the back of this page, construct a possible food chain that resulted in this owl pellet.
<table>
<thead>
<tr>
<th></th>
<th>Rodent</th>
<th>Shrew</th>
<th>Mole</th>
<th>Bird</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skull</td>
<td>![Skull Rodent]</td>
<td>![Skull Shrew]</td>
<td>![Skull Mole]</td>
<td>![Skull Bird]</td>
</tr>
<tr>
<td>Scapula</td>
<td>![Scapula Rodent]</td>
<td>![Scapula Shrew]</td>
<td>![Scapula Mole]</td>
<td>![Scapula Bird]</td>
</tr>
<tr>
<td>Fore Limb</td>
<td>![Fore Limb Rodent]</td>
<td>![Fore Limb Shrew]</td>
<td>![Fore Limb Mole]</td>
<td>![Fore Limb Bird]</td>
</tr>
<tr>
<td>Hind Limb</td>
<td>![Hind Limb Rodent]</td>
<td>![Hind Limb Shrew]</td>
<td>![Hind Limb Mole]</td>
<td>![Hind Limb Bird]</td>
</tr>
<tr>
<td>Pelvic Bone</td>
<td>![Pelvic Bone Rodent]</td>
<td>![Pelvic Bone Shrew]</td>
<td>![Pelvic Bone Mole]</td>
<td>![Pelvic Bone Bird]</td>
</tr>
<tr>
<td>Rib</td>
<td>![Rib Rodent]</td>
<td>![Rib Shrew]</td>
<td>![Rib Mole]</td>
<td>![Rib Bird]</td>
</tr>
<tr>
<td>Vertebrae</td>
<td>![Vertebrae Rodent]</td>
<td>![Vertebrae Shrew]</td>
<td>![Vertebrae Mole]</td>
<td>![Vertebrae Bird]</td>
</tr>
</tbody>
</table>
Identification Chart

Types of Skulls:

1. Vole - Microtus

2. Shrew - Sorex

3. Rat - Rattus

4. House Mouse - Mus

5. Deer Mouse - Peromyscus
INTRODUCTION

Owl pellets are the undigested remains of prey ingested by an owl. The owl swallows its prey whole, and during the process of digestion, the soft parts of the prey are dissolved and passed on to the intestine for absorption. The hard, non-digestible parts - bones, teeth, fur, feathers, and chitonous remains of insects are compressed in the gizzard and passed on to the proventriculus where the pellet remains until it is expelled. These pellets are not eliminated as feces, but are regurgitated through the mouth.

Pellets are not found exclusively within the owl families. There are many species of birds known to regurgitate pellets; hawks, eagles, kites, harriers, falcons, and even robins are some of the more familiar ones. Out of all types of pellet ejectors, the efficiency of the process is probably as high in owls as in any other bird.

The Common Barn Owl feeds in early morning and early evening and will usually produce one to two pellets per day. Glossy black when fresh, the pellet remains smooth and dark in color when dry. These pellets can provide valuable information pertaining to the diet of owls. By studying the contents of owl pellets, one may discover seasonal, regional, and habitat differences and even differences in individual tastes between owls. Also, pellets can be used to effectively illustrate the nature of food chains, to demonstrate the role of avian predators within the ecosystem, and to provide information about the presence and relative abundance of animals in a particular area. As an educational tool, pellets can also be used to introduce students to skeletal anatomy and to teach others how to identify an animal by its skull and jaw bones.

The pellets in this Pak are from one of the two owl families, Tytonidae or Strigidae. Each pellet has been fumigated to eliminate the presence of any insects and then individually wrapped for preservation. Unless otherwise stated, the pellets in this Pak are from the family Tytonidae and more specifically, the Common Barn Owl (Tyto alba).

PROCEDURE

1. Work in pairs or teams as your instructor advises.

2. Measure the length and width of the pellet with the ruler provided.

3. Dissect the pellet by first breaking off a piece using your fingers. Take the piece of fur and roll it between your thumb and index finger, feeling for any hard substance. Dissecting the pellet can also be aided by using a probe, tweezers, or any other dissecting tool. Separate the bones from the fur and/or feathers and then sort the bones into different categories.

4. Identify the general family of prey in the pellet by using the skulls below and/or the "Key to Skulls found in Owl Pellets" which you can obtain from your instructor. Enter your findings in the student record below and also in the class chart your instructor has created on the chalkboard. When the class has completed the chart, enter the data in the class record below.

What was in your pellet?

Number of skulls or pairs of jawbones found in your owl pellet. _____

<table>
<thead>
<tr>
<th>Prey Found</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vole</td>
<td>Mole</td>
</tr>
<tr>
<td>Shrew</td>
<td></td>
</tr>
</tbody>
</table>

Class Findings

<table>
<thead>
<tr>
<th>Prey Found</th>
<th>Vole</th>
<th>Mole</th>
<th>Shrew</th>
</tr>
</thead>
<tbody>
<tr>
<td>Totals</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

- Total number prey items found _____
- Total number of pellets dissected _____
- Average number of prey items per pellet _____

Family Talpidae: Mole

Genus Rattus: Rat

Subfamily Microtinae: Vole
5. Most pellets contain a Vole (Microtus). Obtain the “Vole Stick Sheet” from your instructor, identify the individual bones of the vole skeleton, and paste/tape the bones in the appropriate places. If your pellet does not contain a vole, you should be able to get the different bones from someone else in the class that has found 2 or more voles in their pellet or from the extra bones the class may have. If your instructor wishes for you to reconstruct the vole skeleton, first identify the bones as above, then secure the bones together using a toothpick to apply the glue.

6. Answer the questions below.

**QUESTIONS**

1. What are owl pellets?
2. How are owl pellets formed?
3. Do only owls produce pellets?
4. What important information can be obtained from owl pellets?
5. In reference to your classroom data, what kind of prey seems to be most abundant? Least abundant?
6. Is it possible that the prey identified from the pellets does not reflect the true mammal population in the wild? Why or why not?
7. Assuming that the barn owl regurgitates one pellet per day, how many prey items would the owl that produced your pellet consume per year?
8. During the nesting season the young need an enormous amount of food for growth. If the nest contains three young and each of the young eat five mice per night for a month and the two adults eat four per night, how many mice would the parents have to capture in 30 days?
9. On a separate sheet of paper, create a food chain for each of the prey items found in your pellet. Place the owl at the highest trophic level.

Optional: Placing the owl at the highest trophic level, create a food web using the following items: vole, deer mouse, mole, house mouse, weasel, shrew, snake, starling, frog, salamander, spider, (grubs, earthworms, centipedes), cranefly, (seeds, plants, roots).