Name _____ **Owl Pellet Lab**

Introduction

The pellets that you will use in this lab are produced by the Barn Owl (*Tyto alba).* Barn Owl pellets have been chosen because these owls swallow small birds and rodents whole, and the resulting pellets generally contain the complete skeletons of these prey. Pellets begin forming in the digestive tract of the owl as soon as the prey is swallowed.

Enzymatic juices break down the body tissues of the prey but leave the bony materials and hair of feathers undigested. Depending upon the prey eaten, the undigested portions may include beaks, claws, scales, or insect exoskeletons. This type of material has little nutritional value and must be passed from the body.

Predatory mammals such as bobcats and wolves have teeth to grind up bones and claws, and a digestive tract adapted to pass these ground parts. Owls, on the other hand, do not have teeth for grinding and cannot pass whole bones and claws through their digestive tract safely. Instead, these materials form a bolus (or pellet) which is surrounded by the hair or feathers of the consumed prey. The pellets are then orally expelled, and the owl begins feeding once more.

The pellets can be used to identify the diversity of available prey.

Objective Activity 1

To dissect one Barn Owl pellet from the Pacific Northwest

Materials

1 Barn Owl pellet

1 Dissecting needle

Procedure

To dissect pellets, first remove them from the foil casing. Label a clean sheet of paper with your name and place the owl pellet on it. Using the dissecting needle provided, begin to loosen the hair and/or feathers of the owl pellet. As bones are uncovered, carefully remove them and place them to the side of your sheet of paper. After you have removed the skulls and bones, you can begin to identify the prey.

ACTIVITY 2
Using a Dichotomous Key

Objective

To use a dichotomous key to identify the skulls obtained from the raptor pellets.

Materials (per team of 2 students)

1 Dichotomous Key

Procedure

Pellet contents can be identified using two methods. The first of these methods is a dichotomous key. To use a dichotomous key, simply compare the first pair of statements and determine which one best fits the article you are trying to identify. After you pick one of the paired statements, you will be directed to other paired statements until you reach an answer. For example, assume that you want to identify a common U.S. coin using a dichotomous key. The key might read as follows:

1. Coin edge smooth _____ go to 2
   Coin edge grooved _____ go to 3

2. Coin copper in color _____ Penny
   Coin silver in color _____ Nickel

3. Picture of Roosevelt on front _____ Dime
   Picture of Washington on front _____ Quarter

Use the Dichotomous Key and Skull Characteristics chart to identify the skulls of small mammals found in your pellets and record the number of each type on the accompanying worksheet labeled "Pellet Contents" (Page 4). If birds, insects, etc. are found, then no further identification is needed.

Note: Undigested beetles and pillbugs are sometimes found in owl pellets. These are small animals that find expelled raptor pellets and use them as a food source and nursery for their eggs and larva. Therefore, these organisms should not be included as owl prey.

Optional Method

Required: WARD'S—Owl Pellet Skull Display Set 36 W 5491

Another method of identifying raptor prey is through comparison to materials that have already been identified. Most biologists keep a set of identified skulls and hair/feather samples. These can be very useful when identifying prey remains. This can speed up the identification of large numbers of similar items by eliminating the need for a key once all of the common items have been identified.

Dichotomous Key

Skulls of Small Mammals Found in Northwest Barn Owl Pellets

No gap (diastema) between incisors and cheek teeth _____ Order: Insectivora

Gap (diastema) between incisors and cheek teeth _____ Order: Rodentia

Order INSECTIVORA (Moles and shrews)

Zygomatic arch complete, skull flat and broad _____ (Mole) *Scapanus*

Zygomatic arch not complete, skull not flat and broad _____ (Shrew) *Sorex*

Order RODENTIA (Rats, voles, and mice)

1. Infraorbital canal not present _____ Go to 2

   Infraorbital canal present _____ Go to 3

2. Upper incisors distinctly grooved _____ (Mouse) *Perognathus*

   Upper incisors not distinctly grooved _____ (Pocket Gopher) *Thomomys*

3. Skull flat and broad; cheek teeth acutely angled and may appear as one continuous tooth _____ (Vole) *Microtus*

   Skull generally rounded; cheek teeth lobed or rounded and easily distinguished individually _____ Go to 4

4. Upper incisors distinctly grooved _____ (Harvest Mouse) *Reithrodontomys*

   Upper incisors not distinctly grooved _____ Go to 5

5. Posterior edge of palate ending even with or only slightly beyond last cheek teeth; cheek teeth not capped with enamel _____ (Deer Mouse) *Peromyscus*

   Posterior edge of palate ending beyond last cheek teeth; cheek teeth capped with enamel _____ Go to 6

6. Upper incisors notched, mandible length less than 16mm _____ (House Mouse) *Mus*

   Upper incisors not notched, mandible length greater than 18mm _____ (Rat) *Rattus*

WARD'S

Pellet Contents

WARD'S

ACTIVITY 3
Diet of a Barn Owl

Objective

To study prey contributions to an owl's diet by number and biomass.

Materials

Skulls from dissected owl pellet
Owl Prey Chart

Procedure

As you have seen from the dichotomous key, there are many genera of prey that occur in the Northwest. The following chart contains nine mammalian prey types that account for 96-100% of the prey that your class will find in your investigations. Any other prey will be composed of birds, bats, and insects. These are occasional and too diverse to address in detail. These prey are listed as "other prey" at the bottom of the worksheet. Different numbers of asterisks (*) have been placed next to each prey type under both geographic regions. These represent the frequency of occurrence for each prey as shown in the following scale:

(****) - Very Common
(***) - Common
(**) - Occasional
(*) - Rare
( ) - Does not occur

After the owl pellets have been dissected, your instructor should gather class totals for each type of prey. After this has been determined, record these in the "Total" column of your worksheet. Use these numbers to multiply the "Prey Weight" for each prey type. Write this number in the "Total Biomass" column. For example, if you record "5" in the Total column for *Thomomys*, multiply by the prey weight of 150g: 5 x 150g = 750g. This is the total biomass that the prey contributed to the diet of this Northwest Barn Owl. Do this for each prey type found by the class. Your class may also want to add up all the types of prey in a certain category. For example, add up all of the mice; this should include *Peromyscus*, *Mus*, *Reithrodontomys*, and *Perognathus*.

Owl Prey Chart

Prey	Occurrence	Number Found	Prey Weight (Biomass)	Total # Found By Class	Total Biomass
Pocket Gopher					
Thomomys	(***)		150g		
Rat					
Rattus	(*)		150g		
Vole					
Microtus	(****)		40g		
Mice					
Peromyscus	(**)		22g		
Mus	(***)		18g		
Reithrodontomys	(**)		12g		
Perognathus	(**)		25g		
Mole					
Scapanus	(*)		55g		
Shrew					
Sorex	(**)		4g		
Other Prey					
Bats	(**)		7g		
Birds	(**)		15g		
Insects	(**)		1g		

WARD'S

ACTIVITY 3 (cont'd.)

Questions

1. How would a crash in the shrew population affect the Barn Owl population?

2. How would a crash in voles affect the Barn Owl population?

3. If an owl needs 120g of food per day, how many *Sorex* would it need to capture? How many *Microtus*?

4. Assume an owl eats fifty 1g insects and one 100g rat. In terms of biomass, did the insects or rat contribute the most to the owl's diet? How does foraging time affect this?

5. Is quantity or quality of prey more important?

ACTIVITY 4
Constructing a Food Web

Objective

To construct a food web with a Barn Owl at the highest trophic level and grass and seeds at the lowest level.

Procedure

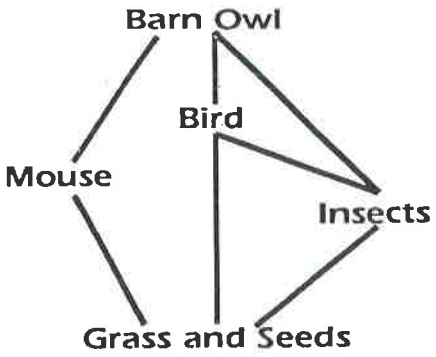
A food web is a relationship diagram showing organisms arranged by energy flow from organisms at lower trophic (feeding) levels to higher trophic levels.

Energy passes from one organism to another on a higher level through the consumption of that lower organism. With the Barn Owl, for instance, energy is passed from grass and seeds to insects, which are in turn eaten by birds, who are finally consumed by the owl. There are many different combinations in how energy is passed from one trophic level to another; several examples are shown in the diagram below.

There are usually three trophic levels found in a food web. The first is a primary consumer, which consumes photosynthetic products such as grass. Secondary consumers on the next trophic level are carnivores (meat-eaters) that also eat herbivores (plant-eaters). Tertiary consumers are carnivores that eat other carnivores, and are usually found at the top of the food chain.

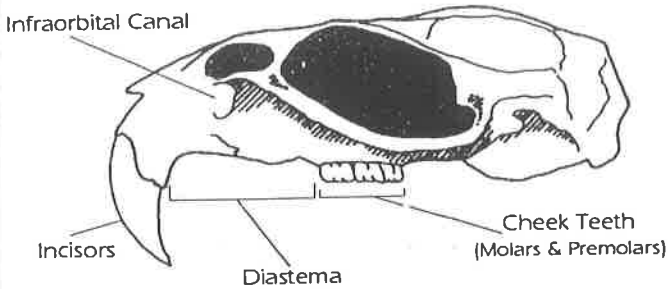
On the bottom of this sheet, construct a food web. The food web should contain a Barn Owl at the highest trophic level and grass and seeds at the base. The intermediate organisms that you show may include every prey type listed on the chart or only those prey found by the class.

Here is one example of a food web:

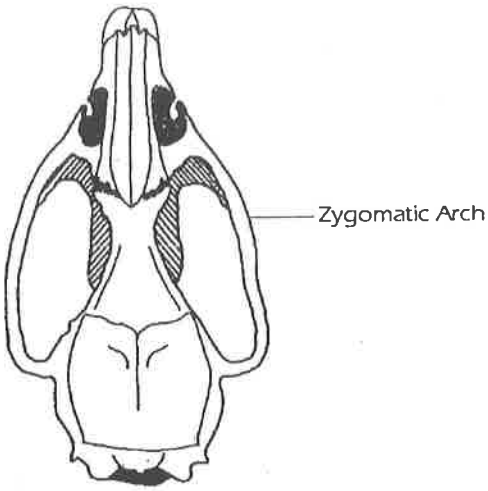


Skull Characteristics

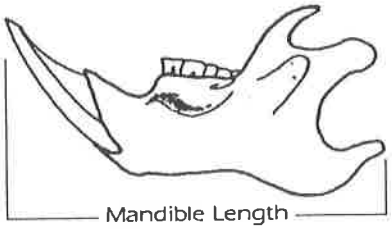
Side View of Skull



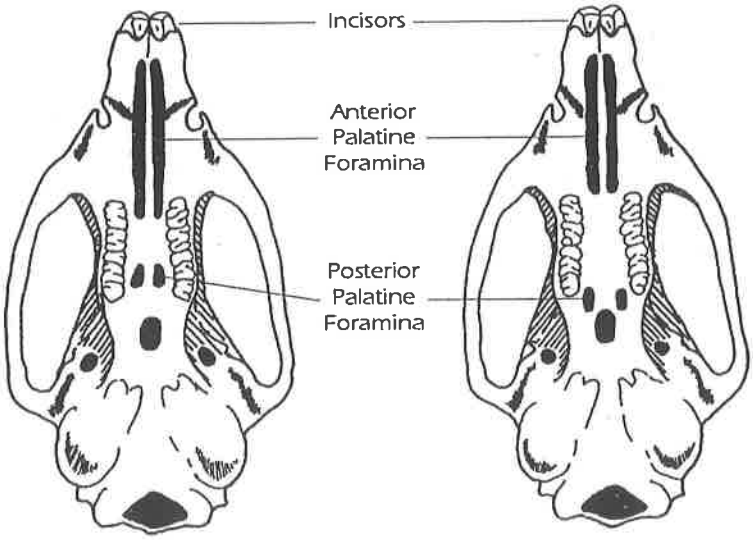
Top View of Skull



Side View of Mandible (Jaw)



Bottom View of Skulls



Anterior and Posterior Palatine Foramina location will vary from species to species. Use these as examples only.

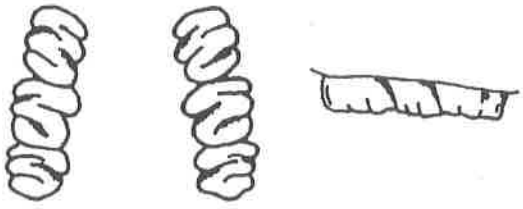
Cheek Teeth Types

Acute (Bottom View)

Acute (Side View)

Unicusp (Bottom View)

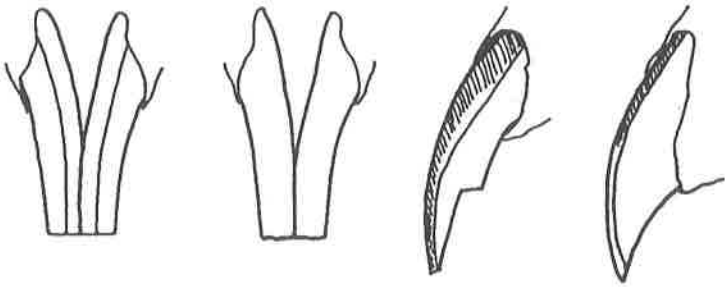
Unicusp (Side View)



Lobed "S" Shaped (Bottom View)

Lobed "S" Shaped (Side View)

Incisor Types



Grooved Incisor (Front View)

Smooth Incisor (Front View)

Notched Incisor (Side View)

Unnotched Incisor (Side View)

WARD'S