

Investigation of NW vs. SE Owl Pellets

1. Pre-lab Reading

Section 45.6 “Community Ecology” [Biology2e](#), Openstax

2. Purpose and Objectives

The purpose of this lab is to introduce the concept of community ecology and specifically to investigate predator-prey relationships.

3. Background Information

The term **community** in a biological context refers to all of the organisms that inhabit a particular area. It includes all populations of different species living close enough for potential interaction. These interactions include competition, predation, parasitism, and mutualism. In this lab, we will investigate the predatory behavior of the American barn owl (*Tyto furcata*, formerly a subspecies of *Tyto alba*).

You have been provided pellets produced by the barn owl. 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 within the digestive tract of an owl as soon as the prey is swallowed. Enzymatic juices break down the body tissues in the prey but leave the bony materials and hair or 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 adaptations such as 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 bone 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 prey consumed. The pellet is then orally expelled and the owl begins feeding once more.

Scientists take advantage of this **adaptation** by collecting these pellets and examining their contents. Since owls are not very selective feeders, these pellets can be used to estimate the diversity of available prey. The contents are also a direct indicator of what an owl has fed on; information that is crucial for species management and protection.

4. Dissecting Owl Pellets – Procedure

Each student will dissect one owl pellet. Before dissecting the pellet, obtain the weight (in grams), length (cm) and width (cm). Enter this information in your lab book.

To dissect pellets, first remove them from the aluminum foil casing. **BE SURE THAT YOU KEEP THE NORTHWEST AND SOUTHEAST PELLETS SEPARATE.** Label a sheet of clean paper with your name and the region (Northwest or Southeast) from which each owl pellet comes.

Using the dissecting needle provided, begin to loosen the hair of the owl pellet. As bones are uncovered, carefully remove them and place them to the side of your sheet of paper. Extra care should be taken to keep skulls intact and associated with their respective mandibles. Attempt to keep the bones from each prey item separate from one another. After you have removed all bones, you can begin to identify the prey.

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 a worksheet labeled "Pellet Contents". If birds, insects, etc. are found, then no further identification is needed.

Note: Undigested beetles and pill bugs 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/or larvae. Therefore, these organisms should not be included as owl prey.

There are many genera of prey that occur in both the Northwest and Southeast, as well as several that are exclusive to one of these areas. The Owl Prey chart on the data sheet contains 14 mammalian prey types that should account for 96-100% of the prey found in your investigations. Any other prey will be composed of birds, bats, insects, crayfish, and small reptiles. These are occasional and too diverse to address in detail. These prey are listed as "other prey" at the bottom of the Owl Prey chart on the data sheet. The number of asterisks (*) placed next to each prey type under both geographic regions represents the frequency of occurrence for each prey type.

After the owl pellets have been dissected, enter your data on the Data Sheet in the Owl Prey Chart. Collect data from everyone in the class and enter this as well. **Use these data (not simply your own results) for the analyses.** After these have been determined, record these in the "Total" column of your worksheet. Use these numbers to multiply the "prey weight" for each prey. For example, if you record "5" in the Total column for pocket gopher, multiply by the prey weight of 150g: $5 \times 150\text{g} = 750\text{g}$. This is the total weight, or biomass, that the prey contributed to the diet of the Northwest Barn Owl. This should be done for each prey type found for both geographic regions.

5. Diversity and Stability

Increased diversity = increased stability. If a predator depends on one prey type then a decline in that particular prey will lead to a decline in the predator. If the prey is eradicated through disease or over hunting, then the predator will have to relocate or it may also die. On the other hand, if a predator feeds equally on five prey types, a decline in one or two may cause some stress, but the predator may still feed on the remaining types.

Diversity (and thus stability) increases as one nears the equator. For example, Alaskan owls have a very limited selection of prey types and feed almost exclusively on

lemmings (*Lemmus*). Therefore, a decline in the lemming population will seriously affect the resident owls. Owls near the equator have a large diversity of prey from which to choose, and typically feed on 15-20 prey types ranging in size from insects to opossums (*Dedelphis*). While a particular species of owl may *feed* more heavily on one of these prey than the others, a decline in any one of these prey will not likely have a major impact on overall prey availability. This principle of greater diversity toward the equator can be seen (but with less dramatic differences) by comparing pellets from the Northwestern U.S. (Washington, Oregon) to those from the Southeastern U.S. (Mississippi, Alabama, Louisiana).

Table 1: Owl Prey Information

prey	Northwest		Southeast	
	Occurrence	Prey Weight (g)	Occurrence	Prey Weight (g)
Pocket Gopher				
<i>Thormomys</i>	(***)	150	()	
Rat				
<i>Sigmodon</i>	()		(****)	100
<i>Oryzomys</i>	()		(***)	80
<i>Rattus</i>	(*)	150	(*)	150
Vole				
<i>Microtus</i>	(****)	40	(***)	40
Mice				
<i>Peromyscus</i>	(**)	22	(**)	22
<i>Mus</i>	(***)	18	(***)	18
<i>Reithrodontomys</i>	(**)	12	(**)	12
<i>Perognathus</i>	(**)	25	()	
Mole				
<i>Scapanus</i>	(*)	55	()	
<i>scalopus</i>	()		(*)	55
Shrew				
<i>Blarina</i>	()		(***)	20
<i>Cryptotis</i>	()		(****)	4
<i>Sorex</i>	(**)	4	(*)	4
Other Prey				
bats	(**)	7	(*)	7
birds	(**)	15	(**)	15
insects	(**)	1	(**)	1
crayfish	(*)	5	(*)	5
small reptiles	(*)	20	(*)	20

The number of asterisks (*) placed next to each prey type under both geographic regions represents the frequency of occurrence for each prey type as shown in the following scale: (****) - Very common, (***) – Common, (**) – Occasional, (*) – Rare, ()- Does not occur

Data

Record both charts below in your Lab Notebook. Note that the “class data” will be posted on Canvas for multiple lab sections later in the week. Be sure to include this data in your lab assignment.

	NW	SE
Length of your owl pellet	_____	_____
Width of your owl pellet	_____	_____
Mass of your owl pellet	_____	_____

Table 2: Owl Prey Chart

	Northwest				Southeast			
Prey	your data	Prey Weight (g)	class data	Total Biomass	your data	Prey Weight (g)	class data	Total Biomass
Pocket Gopher		150				150		
Rat		110				110		
Vole		40				40		
Mice		20				20		
Mole		55				55		
Shrew		10				10		
Other Prey		See Table				See Table 1		

		1						
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6. Conclusion and Summary

1. Based on the **class data**, which type of prey contributed the most by number for each region? Did the same prey type contribute the most by number for both regions?
2. Which prey type contributed the most in biomass for each region? Did the same prey type contribute the most in biomass for both regions?
3. Which region has the greatest diversity of prey?
4. Which region has the most stability?
5. Would a crash in the shrew population seriously affect either region? Why or why not?
6. Would a crash in the vole population seriously affect either region? Why or why not?
7. According to Table 1, if an owl needs 100 g of food per day, how many *Sorex* does it need to capture? How many *Sigmodon*?
8. If the population of owls and other predators declines in an area, what would you expect to happen to the population of small mammals? What problems might this cause?

References

www.biologycorner.com

http://cas.bellarmine.edu/tietjen/Laboratories/Owls2/owl_lab.htm