Lab: Predator/Prey Interaction

(modified from Addison-Wesley Publishing)

Background: Organisms interact in many different ways. Some of the interactions have to do with feeding patterns. These feeding relationships make up what are called food chains. Predators depend on the population of prey organisms. Correspondingly, the number of prey organisms is limited by the number of predators that feed on them. In other words, the size of predator and prey populations are dependent on each other. This relationship depends on the specific kinds of organisms and the conditions in which they live. In this investigation, you will model interactions between a population of owls and their prey, a population of mice.

Procedure:

a. Using masking tape, create a 30 cm by 30 cm square on your table, representing the habitat that owls and mice live in. Mice will be represented by small paper squares. Owls will be represented by larger cardboard squares. You need 200 mice and 4 owls to begin.

b. Place 100 of the mice randomly in the habitat. Do not allow any to overlap. This set of 100 mice represent the first generation of mouse population. Set aside the remaining 100 mice for later use.

c. Hold an owl at a height of 30 cm above the habitat square and drop it randomly. Any mouse that is at least partially covered by the owl is a catch. Remove and count caught mice. Repeat his process with the second owl. You must drop the owl squares multiple times to simulate more than two individual owls.

d. An owl must catch at least three mice to survive each generation. If an owl catches less than three mice, it starves. Record the number of mice caught and the number of owls starved in columns D and E.

e. Record the number of surviving mice and owls in columns F and G.

f. Each surviving mouse is assumed to produce one offspring. Each surviving owl is assumed to produce one offspring. However, there are very important rules governing the two populations:

There is no limit on the number of additional mice added per generation.
The total mouse population cannot exceed 200 at any time.

Owls cannot exceed three additional owls per generation.
There is no limit on the total number of owls at any time.

g. Using the rules from procedure f, Record the number of mice and owls in columns A and B of generation two.

h. Repeat steps c through g until Mr. Rush/Ms. Magee confirm your results. This will typically take 9-12 generations.

i. On a sheet of graph paper, use the data in columns B and C to create a double-line graph showing the number of mice and owls per generation. Use two y-axes to even achieve a more comparable relationship.

Prelab Questions:

1. Create a hypothesis for this lab. Be sure to use the words “if” and “then”.
2. What factors might be limiting the mouse population to no more than 200 individuals?
3. What factors might be limiting the owl population to no more than three additional owls per generation?
4. Which of the two species is a K-selected species? How does this influence their population?
5. Which of the two species is an r-selected species? How does this influence their population?

Data:

A	B	C	D	E	F	G
Generation	# of Mice at start of generation	# of Owls at start of generation	# of Mice caught	# of Owls starved	# of surviving Mice	# of surviving Owls
1	100	4				
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						

Analysis Questions:

6. What happened to the mouse population during the first few generations? What happened to the owl population?
7. What happened to the mouse population towards the end of the simulation? What happened to the owl population?
8. Was your hypothesis correct? Support this answer with data.
9. Based on your graph, relate the trends in population sizes of mice and owls.
10. Suppose you were given an unlabeled graph of owl and mouse populations. Given what you have observed, how could you infer which curve represented the owls and which curve represented the mice?
11. Compare your model of interactions between the owl and mouse populations with what might actually occur in a community that includes owls and mice. What would be the major differences?