

PREDATOR-PREY SIMULATION

PURPOSE

To study the relationship between the sizes of the predator and prey populations.

MATERIALS

Per team of 2: Tape, Meter Stick, Scissors

INTRODUCTION

Animals spend much of their time looking for and consuming food. Some eat plants, some eat meat and some eat both. Many meat-eating animals obtain their meat by hunting other animals. The hunters are known as predators and the hunted animals are known as prey.

In this lab you will do a simulation of a predator/prey relationship, with owls as predators and mice as prey. In nature, owls and mice are often found living in forests. The forest in your simulation will be Hoot Woods.

Owls are excellent hunters. The various kinds of owls eat many different kinds of animals, including rabbits, squirrels, rats, mice, shrews, birds, fish, and insects. To simplify the simulation, you will limit the owl's food supply to mice.

PROCEDURE

Each team should cut out the 300 mice squares and 1 owl rectangle. Fold the rectangle in thirds to make an owl square about 6 cm on a side. Tape the triangle to hold the shape.

Each team should mark off a square approximately 50 cm on a side on their table. This square represents Hoot Woods, where the mice and owls live.

You will simulate 25 generations of owls and mice. The mice can be eaten and the owls can starve. Surviving mice and owls can reproduce. To make calculations easier, each surviving mouse and owl will be considered capable of producing one offspring.

In each generation, the surviving mouse population will double to form the next generation. For example, if six mice are living in the woods and two are caught by an owl, then four mice will survive. These four mice will each produce one offspring, and the next generation will begin with eight mice. Remember, the number of offspring is always the same number as the number of surviving mice. At any one time, the maximum mouse capacity of Hoot Woods is 300 mice.

In order to survive, each owl must catch at least three mice in every generation. If an owl does not catch three mice, it will starve. For each three mice that an owl catches, it produces one offspring. For example, if an owl catches eight mice it will reproduce two new owls, making a total of three owls to begin the next generation.

At the beginning of each generation, there must be at least three mice and one owl in the woods. If the populations drop below these numbers (by being eaten or starving), new mice and owls will migrate in. For example, if just one mouse survives the first generation, just one offspring will be produced, for a total of two mice. One mouse must migrate in to bring the mouse total to three. If all owls die, one owl must migrate in.

A. HOOT WOODS SIMULATION

The simulation is played as follows. Place the mouse squares at random in Hoot Woods. Then from a height of about 30 cm, drop the owl square into the woods. Try to hit as many mice as you can in one drop. When an owl square fully or partly covers a mouse square(s), that is a “catch”. If there is more than one owl in a generation, drop the owl square once for each owl.

Remove and count the number of mice caught by each owl (at each drop). Keep all the mice from each owl in separate stacks. Record the data on the chart. You might want to have one team member make the catches while the other records the data.

For example, suppose generation 3 begins with 20 mice and 2 owls. You make a drop for the first owl and catch 7 mice. On the second drop, the second owl catches only 2 mice. the owls have caught a total of 9 mice. There are 11 mice left in Hoot Woods, and they reproduce 11 mice. The next generation will start with 22 mice. Because the first owl caught 7 mice, it reproduces 2 offspring for the next generation. The second owl only caught 2 mice; it starves and does not survive.

The data chart for this example would look like this:

Generation	Number of Mice at Start *	Number of Owls at Start **	Number of Mice Caught	Number of Owls Starved	Number of Surviving Mice + Offspring	Number of Surviving Owls + Offspring
3	20	2	9	1	11+11=22	1+2=3
4	22	3				

Generation	Number of Mice at Start *	Number of Owls at Start **	Number of Mice Caught	Number of Owls Starved	Number of Surviving Mice + Offspring	Number of Surviving Owls + Offspring
1	3	1				
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
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20						
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22						
23						
24						
25						

*There always must be at least three mice at the start; if necessary, have mice migrate in.

**There always must be at least one owl at the start; if necessary have one owl migrate in.

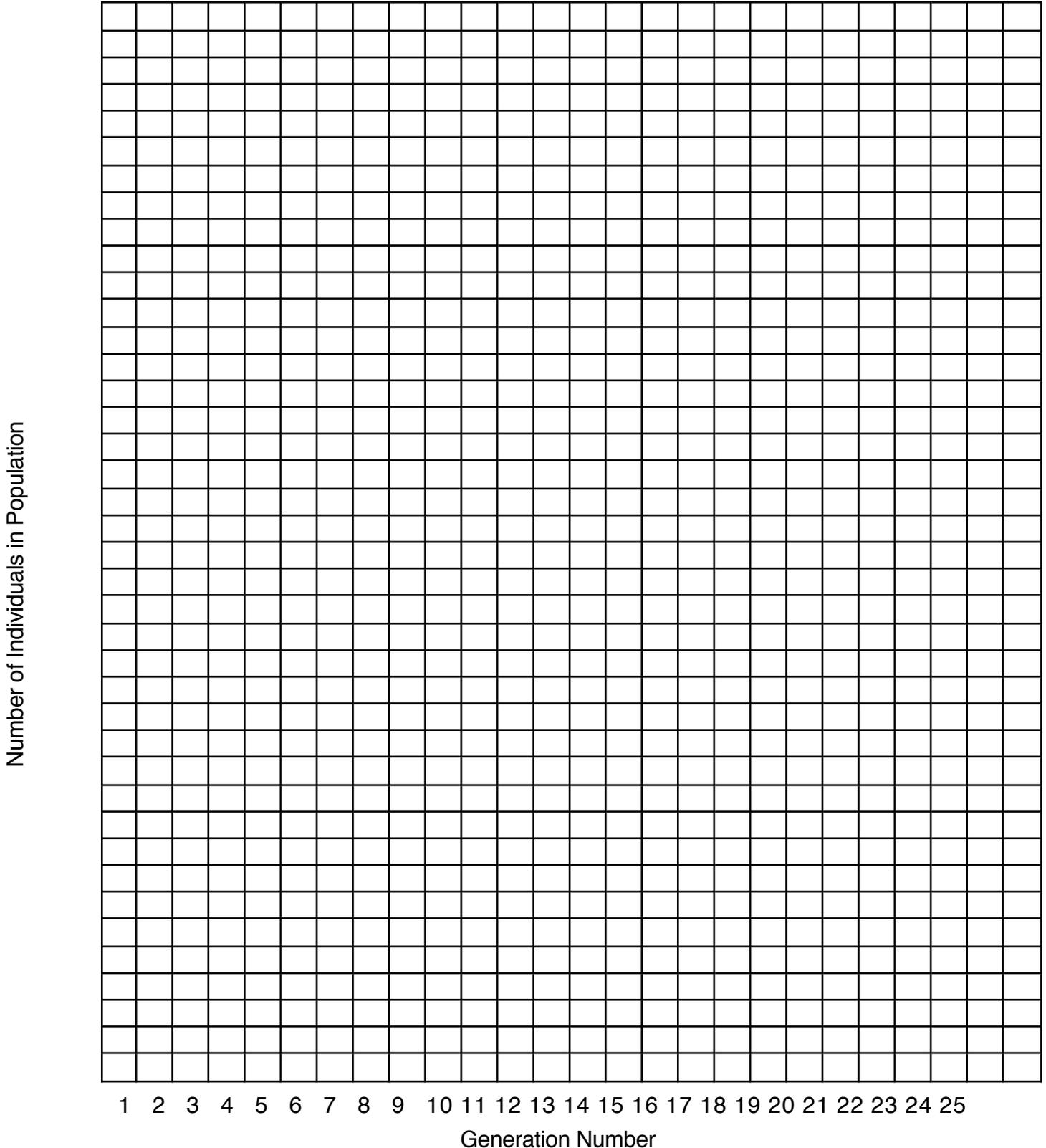
Now, gather the data for 25 generations. Remember to remove the caught mice and starved owls, and to add the offspring mice and owls. Always place randomly in the woods.

B. GRAPHING DATA

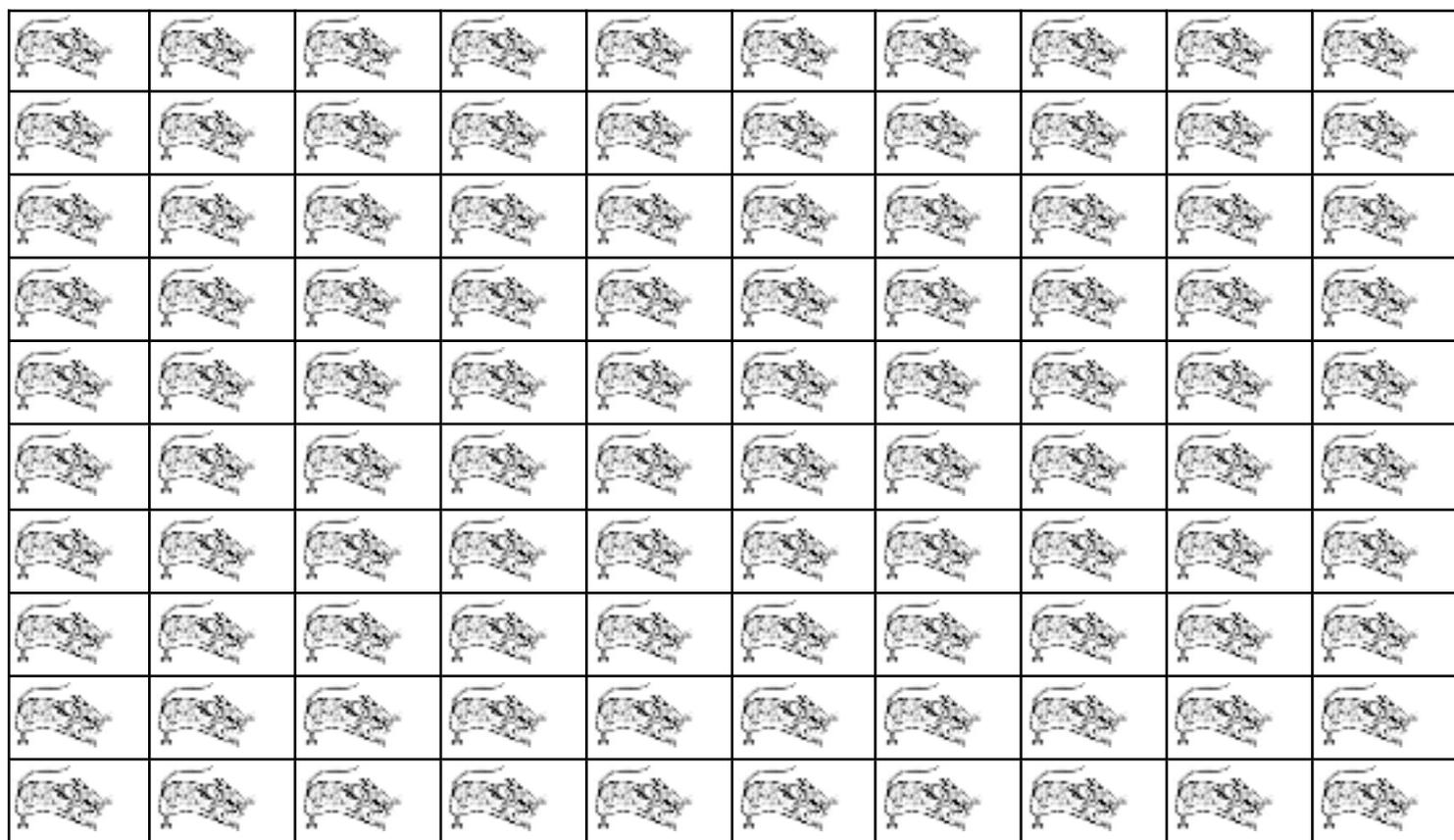
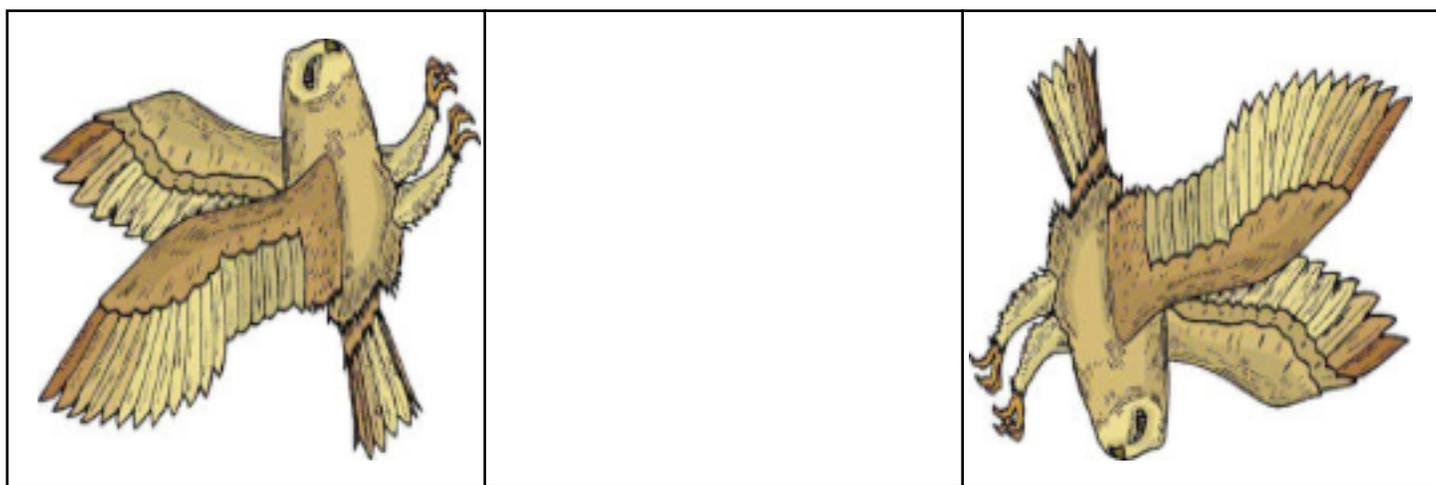
When you have finished gathering data, plot your data on population size on the graph provided. Use Xs for the owl data and dots for the mouse data. Design the Y-axis so that most of the graph is used.

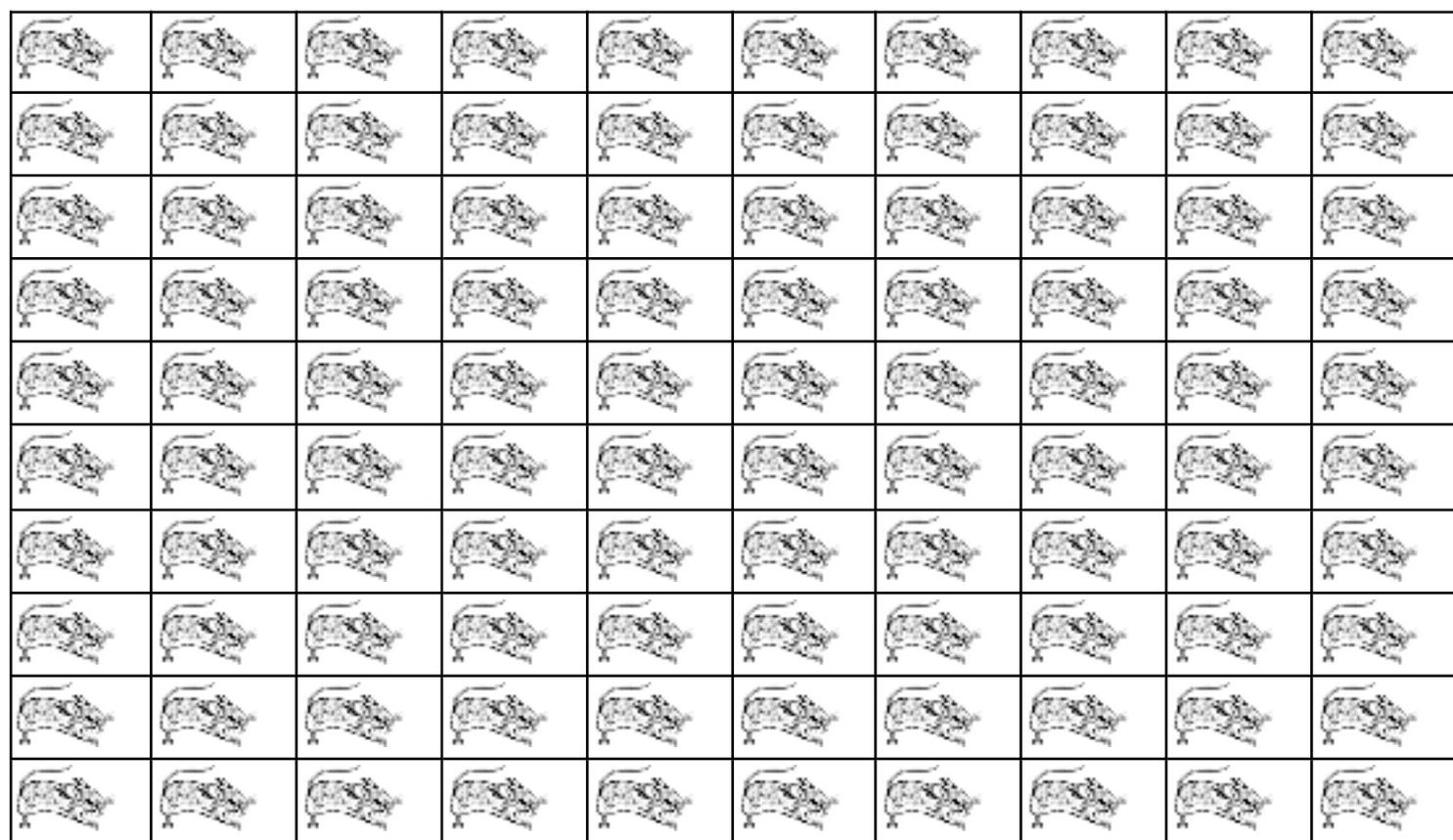
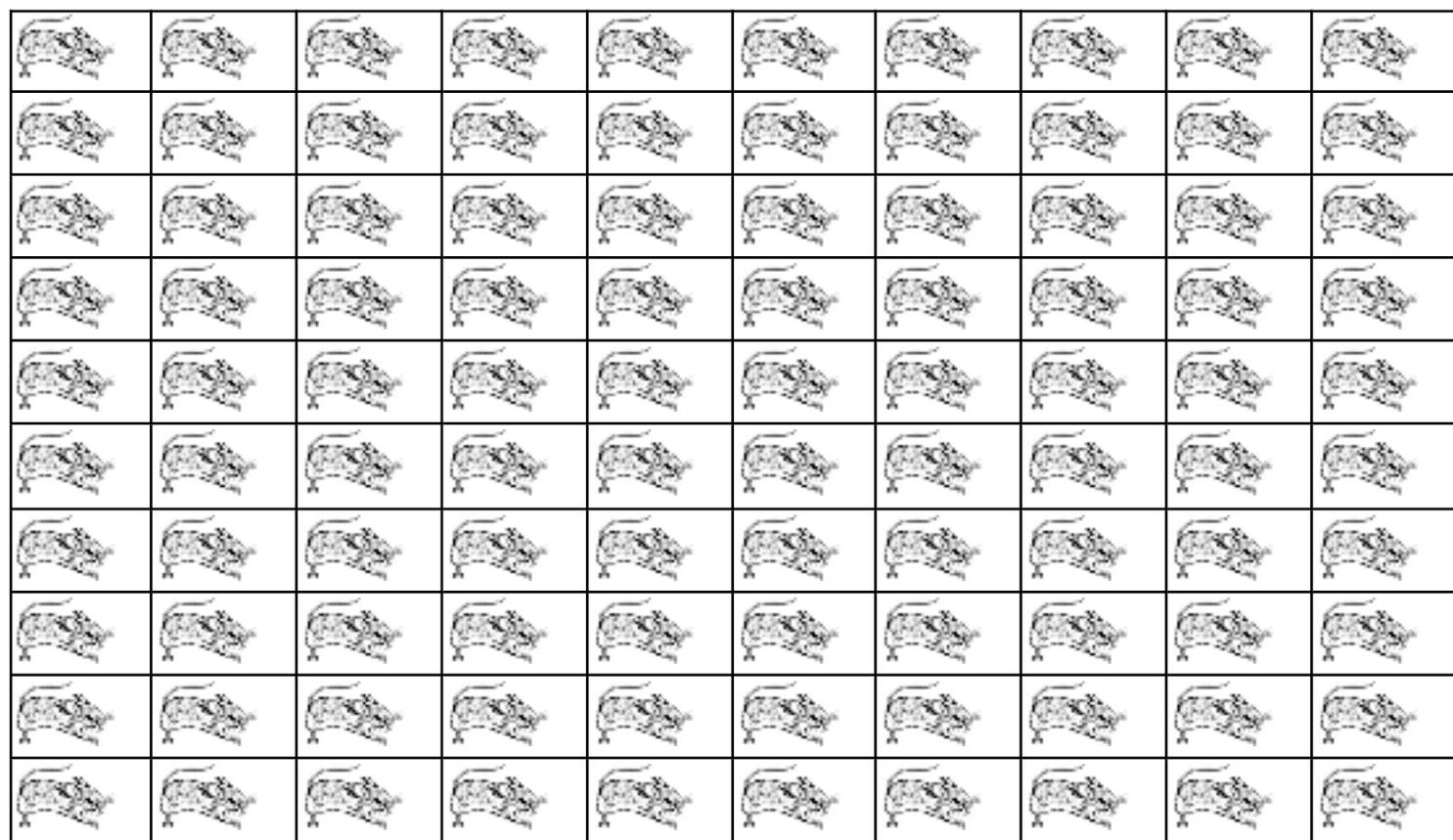
Connect the data points of each population using different lines. Your graph should have two distinct lines: one for the owl population and one for the mouse population.

Owl and Mouse Populations in Hoot Woods



On this page are 100 mice and the owl. On the next page are the remaining 200 mice.





ANALYSIS

1. Which population first increases in size?
2. Describe the pattern of the fluctuations in the sizes of the two populations.
3. By looking only at the graph, can you tell which species is the prey and which is the predator?
How can you tell?
4. Which species attains the greater number of individuals? Why?
5. What do you think would happen to the mouse population in Hoot Woods if the owls were all hunted to extinction? Why?