

Student Guide

Predator-Prey Populations BioKit®

Name _____

Date _____

A new meadow develops in a forest as a result of a fire. Mice migrate into the meadow and begin to reproduce. As the mouse population increases, a weasel is also attracted into the meadow. In the following exercise the meadow (habitat) is represented by a shallow dish, the mouse population (prey) by beads, and the weasel population (predator) by a spoon.



Assumptions

1. The surviving mice of a generation always double their numbers.
2. In each generation at least 10 mice are initially present in the meadow (by immigration if necessary).
3. The maximum number of mice that the meadow can support is 100.
4. In each generation at least one weasel is initially present in the meadow (by immigration if necessary).
5. In order for a weasel to survive in the meadow, it must capture at least 5 mice. (If a weasel does not capture at least 5 mice, it will either starve in the meadow or leave in search of food elsewhere.)
6. For each 5 mice that a weasel captures, it will produce 1 offspring. (If one weasel captures 7 mice and a second captures 2, the first weasel will survive in the meadow and produce 1 offspring, but the second will neither survive in the meadow nor produce offspring.)

Procedure

Each team should obtain a spoon, dish, and 100 beads (fill the measuring cup to the 40 mL mark with beads; this will be approximately 100).

To become familiar with the methods of this exercise, use the following directions to complete the first 4 generations of Tables I and II on the Data Sheet. One team member should fill in the Data Sheet while the other works with the dish, beads, and spoon.

Generation 1

Begin with 10 mice and one weasel in the meadow (place 10 beads in the dish). The capture of mice by the weasel is simulated by scooping the spoon once through the dish for each weasel present. However, we will assume that in the first generation the weasel does not capture any mice. In Table I enter 0 for prey captured by predator 1 of the first generation. Also enter 0 for offspring produced by the predator. Then fill in generation 1 of Table II. The 10 surviving mice double their numbers; therefore, add 10 more beads to the dish for a total of 20.

Generation 2

As there were no predator survivors or offspring in the first generation, we will assume that another weasel immigrates into the meadow. Scoop once through the dish, picking up 4 beads. In Table I enter 4 for prey captured by predator 1 of the second generation, and 0 for predator offspring. Then fill in generation 2 of Table II. Sixteen mice survive; therefore, add 16 more beads to the dish.

Generation 3

Again, assume that another weasel immigrates into the meadow. Scoop once through the dish, this time picking up 7 beads. In Table I enter 7 for prey captured by predator 1 of the third generation. Also enter 1 for the offspring produced by this predator. Fill in generation 3 of Table II. Twenty-five mice survive; therefore, add 25 more beads to the dish.

Generation 4

There are 2 predators in generation 4 (add predator survivors and predator offspring of generation 3). Scoop once through the dish for the first predator, picking up 13 beads. In Table I enter 13 for prey captured by predator 1 of the fourth generation, and 2 for the offspring produced by this predator. Scoop once through the dish again for the second predator, picking up 7 beads. In Table I enter 7 for prey captured by predator 2 of the fourth generation, and 1 for the offspring produced by this predator. Then fill in generation 4 of Table II. Thirty mice survive; therefore, add 30 more beads to the dish.

Completing the Exercise

Continue as outlined above to complete Table II. **Important:** In simulating the capture of mice by the predator, scoop the spoon through the diameter of the dish, *do not look at the dish while doing this*, and do not deliberately attempt to scoop up all the beads. In Table II remember that Initial Prey never falls below 10 and Initial Predators never falls below 1. When Table II is complete, graph the results as directed on the Data Sheet.

Questions

1. Which population (predator, prey) shows the first increase in numbers?

2. Does a peak in weasel population come at the same time as or after a peak in mouse population? What is the explanation for this?

3. What factor seems to determine the size of the weasel population in the meadow in any given generation?

4. What factor seems to cause the decline of the mouse population in the meadow?

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Data Sheet

Table I

Predator	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1	C																			
2	O																			
3	C																			
4	O																			
5	C																			
6	O																			
7	C																			
8	O																			
9	C																			
10	O																			
11	C																			
12	O																			
13	C																			
14	O																			

C = prey captured by each predator O = offspring produced by each predator

Table II

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Initial Prey															
Total Prey Captured															
Initial Predators															
Surviving Predators															
Predator Offspring															

Graphing Results

When Table II is complete, graph the results recorded in the Initial Prey and Initial Predator rows. Use an m to locate each point on the graph for prey and a w for each point on the graph for predator (or use different colors). Connect all prey points with a line and each predator point with a separate line to complete the graph.

