

Modelling Natural Selection

Introduction

In this activity you will model the effects of predation on a prey population. The prey consists of paper squares that represent a variation in the shade of individuals in a species. You and your classmates will be the predators. By analyzing the selective effects of predation in this model, you will gain a better understanding of how natural selection can change the average characteristics and variation of a population.

Objectives – The objectives of this activity is for you to:

1. Determine the “typical-ness” (average) of a population
2. Observe how a typical characteristic of a population can change over time.
3. Determine the variation in a population
4. Examine how an environment (habitat and predator) affects the both the typical characteristic and the variation in a population.

Materials (per team of 3)

- 2 petri dishes
- 1 sheet of paper, either Habitat A (Pink) or Habitat B (Yellow).
 - Half of the class will have pink half will have yellow
- 30 pink squares, 30 yellow squares
- 1 pair of forceps.

Data Table

Generation #	Starting Population		Surviving Population	
1	10	10		
2				
3				
4				

Procedure

1. Select Roles:

- One member of your team will play the role of predator which feeds on the paper squares. As a predator, you will hunt paper squares (the prey) in their habitat (the piece of paper).
- The second member will be the “Game master” and set out the coloured squares on the coloured mats. The third person will be the recorder who will keep track of the hunting. You can rotate roles for each coloured mat.
- The coloured squares represent individuals of a particular species. The individuals of this species can be one of two shades.

2. Predators:

- Obtain petri dish (your “stomach” where you will put the squares you eat)
- Face AWAY from the habitat.

3. Game Master:

- Spread the Starting Population (10 of each colour) squares throughout the habitat. Spread the squares as uniformly as possible so that no squares are sticking together or covering other squares.

4. Begin a round of Predation

- Game Warden: Direct the predators to face the habitat and begin picking up squares (prey); say “Stop” after 15 seconds.
- Predators: Pick up as many paper squares (prey) as possible until the game warden says “Stop.”
 - Use only your eyes to locate your prey. Use only your forceps to pick up the prey.
 - Pick up one square at a time and put each square into your petri dish before taking another square.

5. Measure the variation in the Surviving Population

- Collect the remaining paper squares from the paper and sort them by colour.
- Record the number of each colour of the remaining paper squares.

6. Create a new generation

- Simulate reproduction among the paper squares by adding two paper squares for each remaining square of the same colour. The two paper squares of each colour represent offspring.

7. Measure the variation in the new Starting Population.

- Record the number of each shade of paper square in your table in the next generation row.

8. Repeat Steps 2—7 for two more rounds of predation.

-----Do not continue unless you are now at the end of generation 3! -----

9. Calculate the Starting Population for generation 4.

- Calculate the number of each colour of paper square; if each surviving paper squares from generation 3 were to produce two offspring. Record this information as Fourth Generation Starting Population.

10. Clean-Up

- Sort the shaded squares into their respective plastic bags, and then return the bags to your materials bin.

Discussion Questions

1. Which, if any, colours of paper squares survived better than others in the second, third, and fourth generation starting populations of paper squares?

2. What might be the reason that predators did not select this colour as much as they did other?

3. What effect did capturing a particular colour square have on the numbers of that colour in the following generations?

4. a) How has the average characteristic of the population changed over time?

5. a) How has the amount of variation in the population changed over time?

6. What affect do you think the environment (habitat and predator) has on the average characteristic and the variation of a population?

7. Create a line graph to illustrate the population of colours over the four generations of BOTH colours (ie two lines on one graph) Include a legend

