Honors/Scholars Biology Lab Ecology: Predator-Prey Simulation

Objective: Students will simulate predator prey interactions, the numbers of predator and prey in their "ecosystem" will be recorded and graphed.

Materials

200 small squares cut from index cards (approximately 1 inch squared) -- the **prey** population
50 large squares cut from index cards (cut index cards in half) -- the **predator** population
Data table,blank graph paper

Part I: Simulation

Procedure: Your lab table represents your ecosystem (please clear all objects)

1. Place 3 "prey" on your table.
2. Toss 1 predator onto the table (evenly dispersed) and attempt to make the card touch as many "prey" as possible. In order to survive, the predator must capture at least 3 prey.
   It will be impossible for your predator to survive at this point.
3. Remove any "prey" captured and record your data for the 1st generation.
4. The "prey" population doubles each generation.
   Count how many hares you have left on your table, double that number and add prey cards to the table.
   Record the number in the data table under the 2nd generation "number of hares". (It should be 2x the number you have under the "hares remaining" for generation 1)
5. Your predator died during the first round, but that's okay, a new predator moves in for the second round.
   If your predator died, put 1 in the "number of predators" for generation 2 to represent the new arrival.
   Repeat the tossing procedure and record your data for the second generation.
6. Again, number or prey doubles, if your predator didn't "capture" 3 prey, it died.
   But a new one moves in for the next round. Keep going, adding to the number of prey each round.
7. Eventually your predator will be able to capture enough prey to survive. Guess what happens?
   The number of predators double. Add to your predator population by adding predator cards. Now when you toss your predators, you will be tossing more than one. Don't forget to remove any "captured" prey.
8. Continue to record the data through 20 generations.

Construct a graph. On the X-axis, put generations 1 through 20, on the Y-axis you will have the population numbers for each generation (number of predators, number of prey). Use one line for the predator and one line for the prey to graph the data.

Name _____

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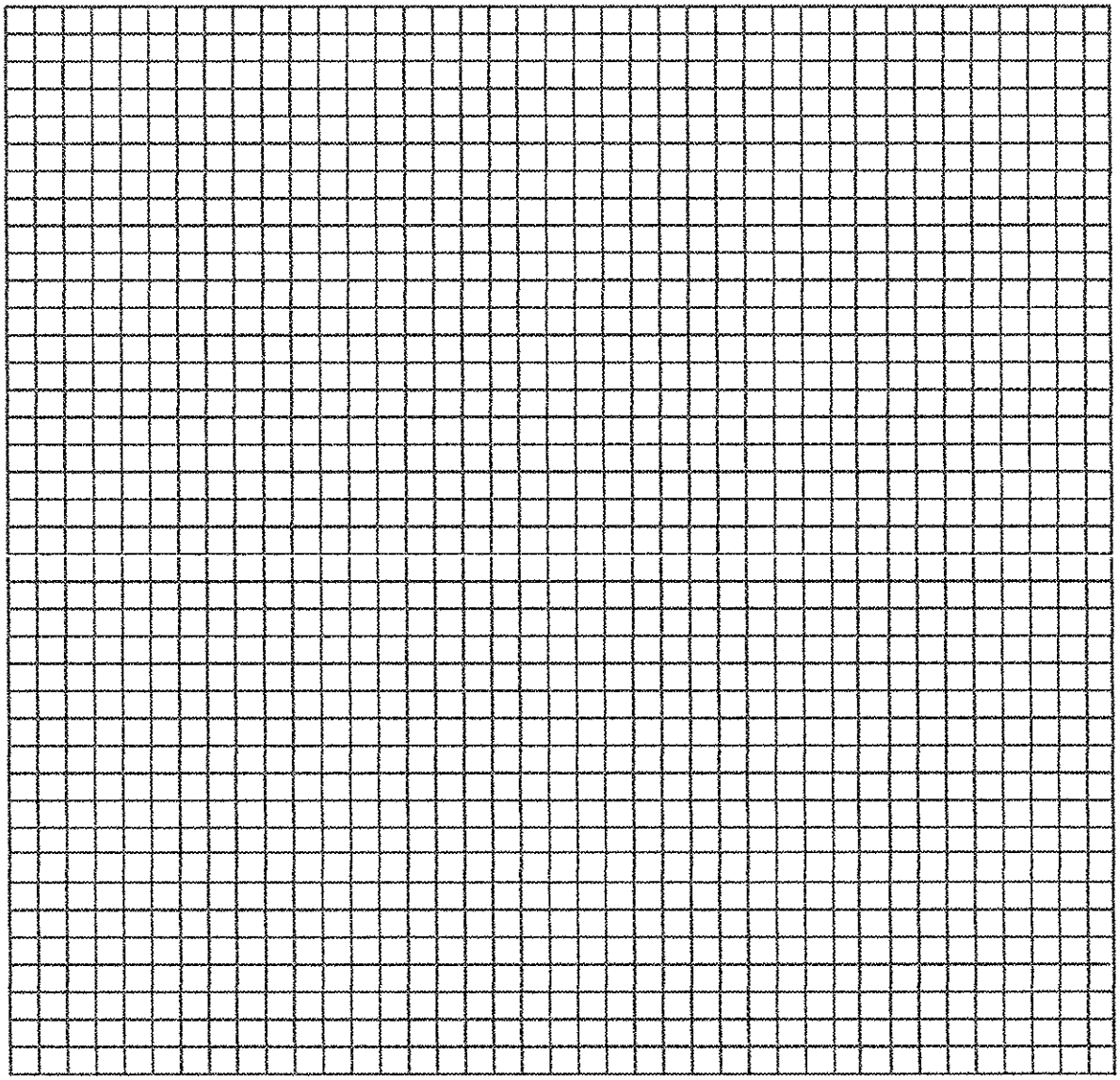
Data Table

	Generations																		
	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13ths	14th	15th	16th	17th	18th	19th	20th
Number of Predators																				
Number of Prey																				
Number of Predators remaining																				
Number of Prey remaining																				

Graph



Analysis

1. Define and describe the relationship between predators and prey in an ecosystem.

2. As the numbers of the prey and predators change, explain how this affects each groups. Be sure to reference the data from your simulation to explain your answer.

3. What type of correlation between the prey and predators is demonstrated in your graph? Explain.

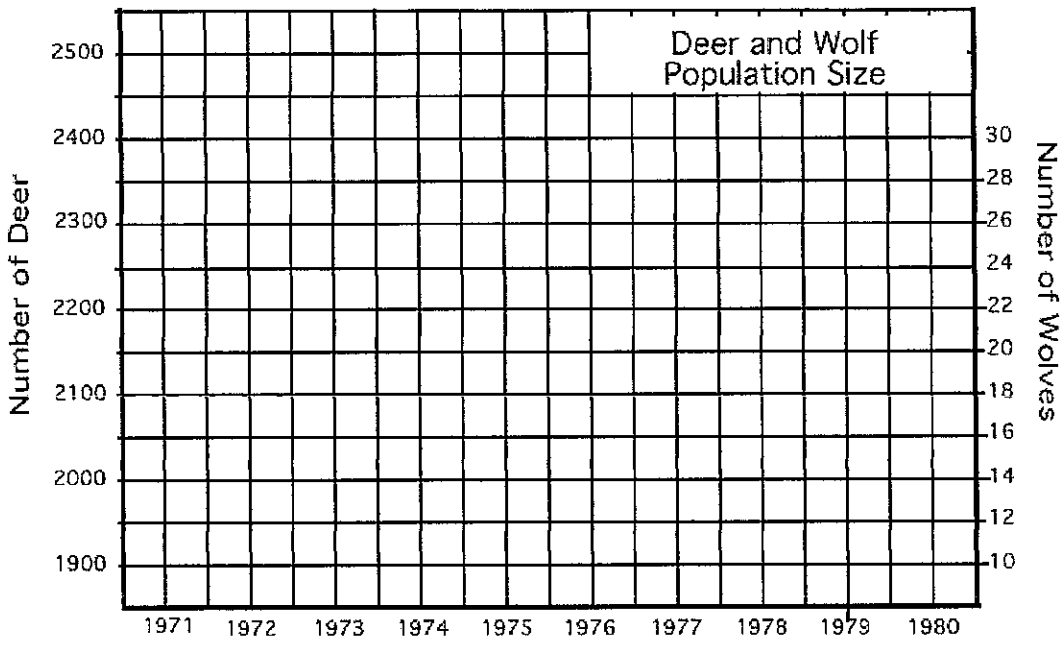
Part II
Deer: Predation or Starvation

Introduction: In 1970 the deer population of an island forest reserve about 518 square kilometers in size was about 2000 animals. Although the island had excellent vegetation for feeding, the food supply obviously had limits. Thus the forest management personnel feared that overgrazing might lead to mass starvation. Since the area was too remote for hunters, the wildlife seervice decided to bring in natural predators to control the deer population. It was hoped that natural predation would keep the deer population from becoming too large and also increase the deer quality (or health), as predators often eliminate the weaker members of the herd. In 1971, ten wolves were flown into the island.

The results of this program are shown in the following table. The Population Change is the number of deer born minus the number of deer that died during that year. Fill out the last column for each year (the first has been calculated for you).

Year	Wolf Population	Deer Population	Deer Offspring	Predation	Starvation	Deer Population Change
1971	10	2,000	800	400	100	+300
1972	12	2,300	920	480	240	
1973	16	2,500	1,000	640	500	
1974	22	2.360	944	880	180	
1975	28	2,224	996	1,120	26	
1976	24	2,094	836	960	2	
1977	21	1,968	788	840	0	
1978	18	1,916	766	720	0	
1979	19	1,952	780	760	0	
1980	19	1,972	790	760	0	

1. Graph the deer and wolf populations on the graph below. Use one color to show deer populations and another color to show wolf populations.



Analysis

1. Describe what happened to the deer and wolf populations between 1971 and 1980.

2. What do you think would have happened to the deer on the island had wolves NOT been introduced?

Most biology textbooks describe that predators and prey exist in a balance. This "balance of nature" hypothesis has been criticized by some scientists because it suggests a relationship between predators and prey that is good and necessary. Opponents of this hypothesis propose the following questions:

1. Why is death by predators more natural or "right" then death by starvation?

2. How does one determine when an ecosystem is in "balance"?

3. Do predators really kill only the old and sick prey? What evidence is there for this statement?

4. What is your opinion of the balance of nature hypothesis? Would the deer on the island be better off, worse off, or about the same without the wolves. Defend your position.