

Predator-Prey Lab: The Lynx and the Hare DIRECTIONS

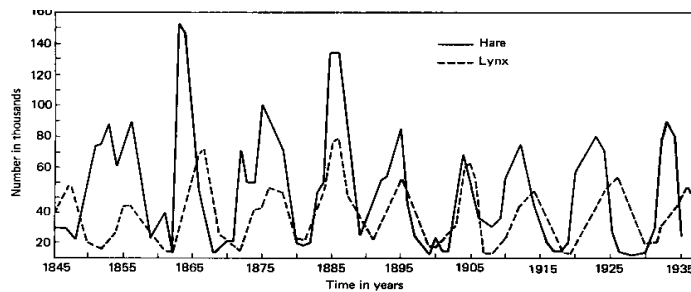
INTRODUCTION

Populations are always changing. Sometimes changes are the result of humans interfering with food webs or habitats. But even when humans do not interfere, populations will still naturally shift up and down or fluctuate. As an example, we will look closely at the relationship between the Canada lynx and its primary prey, the snowshoe hare.

The snowshoe hare is a common species of rabbit found in North America, its range extending throughout Canada, Alaska, and into the northern United States. One distinctive quality is its two different coloration patterns – brown in the summer, and white in the winter to better camouflage with the snow. Its diet consists of grasses, berries, twigs, bark and leaves.

The Canada lynx is a wild cat that resembles a large house cat with a short tail and prominent tufts on its ears. It is very secretive and even experienced hunters rarely see one in the wild. Its range overlaps with the snowshoe hare, on which it almost exclusively preys upon.

For over 300 years, the Hudson Bay Company has been involved in the fur trade in Canada. Detailed company records list the number of snowshoe hare pelts and the number of lynx pelts collected by hunters and trappers every year since the late 1700's. The data shows a 200 year history of cyclical population booms and busts in the snowshoe hare population and a slightly delayed population boom and bust in the lynx population. Native Americans observed this cycle long before Europeans began trapping the hares and lynx for their pelts.



MATERIALS

- Masking tape
- Ruler
- 140 Rabbit squares
- 1 Lynx square

PROCEDURE

1. Create a 12 inch x 12 inch square using masking tape.
2. Begin with a population of 3 hares **spread out** within the square.
3. **Toss** the lynx into the habitat square in an effort to capture (i.e. land on any portion of) as many hares as possible.
4. Remove any hares captured (if any) and enter the tallies for the first generation on the data table.
 - In order to survive and reproduce, the lynx must capture at least 3 hares.
 - If unsuccessful, the lynx dies and 1 new lynx will move into the area in the next generation.
5. Each hare remaining will reproduce creating 1 hare offspring (the surviving hare populations will double each generation). To calculate, multiply "Hares Survived" by two and enter the resulting number in the "Starting # of Hares" column for the next generation. Place the required number of offspring hares in the habitat square with the parent hares.
6. Toss the new lynx – repeating step 3. Remove any captured hares and enter the new tallies. When 1 lynx is finally able to capture 3 hares, move to step 7 AND 8.

7. By generation 5, the lynx should be able to capture three hares when tossed.
 - If successful, the lynx survives and produces offspring. (1 offspring for every 3 hares captured)
 - 1 lynx catches 0-2 hares = 0 offspring produced
 - 1 lynx catches 3-5 hares = 1 offspring produced
 - 1 lynx catches 6-8 hares = 2 offspring produces
 - 1 lynx catches 9-11 hares = 3 offspring produces
 - 1 lynx catches 12-14 hares = 4 offspring produces
 - Toss 1 lynx and remove hares BEFORE tossing the next lynx.

8. As the population builds it is important to keep a separate tally of EACH lynx's kills for the generation on another piece of paper and remove captured hares after EACH lynx is tossed. Determine lynx survival and reproduction using individual lynx capture numbers, but **record the totals for all lynx in the data table.**
 - Remember, lynx produce one offspring for each three hares captured. If lynx #1 captures 5 hares, lynx #2 captures 4 hares, only 2 new lynx offspring will enter the next generation NOT 3 lynx.
 - Example of lynx tally table for Generation 7
 - Lynx #1 – 5 hares and 1 new offspring
 - Lynx #2 – 4 hares and 1 new offspring
 - Lynx #3 – 6 hares and 2 new offspring
 - Totals entered into the data table: 15 hares eaten, 3 lynx survived and 4 lynx offspring
 - To calculate "Starting # of Lynx", add the "Lynx Survived" and "Lynx Offspring" columns.

9. Between generations 9 and 11, the populations will probably crash back to, or near, zero. If and when this happens be sure to begin subsequent generations with at least three hares. Carry the simulation through to at least 20 generations, by which time the cycle will be well on its way to repeating and the next few generations can be (relatively accurately) predicted.

ANALYSIS QUESTIONS

1. In which biome do the snowshoe hare and lynx live?
2. Using different colors, find and mark the following on your graph:
 - a. Peaks of the hare population
 - b. Peaks of the lynx population
 - c. One exponential growth of the hares
3. Between which generations did the population of lynx crash to a low point? Why did this occur?
4. How does the size of the hare population affect the lynx population?
5. Why does the lynx population lag behind the hare population during times of population growth and population crash?
6. At what generation (beyond 20) do you expect the hare population to crash again? How did you determine this?
7. Describe what would happen to the hare population if there were no predators.
8. How would the introduction of another hare predator into the lynx territory, such as wolves, affect the lynx population? (Assume that wolves and lynx do not eat each other)
9. Natural populations are subject to many pressures and disturbances (variables) in their habitats that were not shown in this simulation. List at least 4 different variables that would affect the lynx or hare populations. Specifically explain how each disturbance affects the population.

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DATA TABLE

Generation	Starting # of Hares	# of Hares Eaten	# of Hares Survived	Starting # of Lynx	# of Lynx Died	# of Lynx Survived	# of Lynx Offspring
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

GRAPH – create a **line graph** of your population data using the starting number of hare and lynx for each generation. Include a **title**, **labels** on each axis, and a **key to show which line is each organism**.