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The Lynx Eats the Hare

A Classroom Simulation of a Predator–Prey Interaction

Introduction

Perform this simple pencil and paper simulation of the interspecific interaction between a predator population and that of its primary prey. Students will discover the inextricable link between the two populations in this surprisingly realistic and involving activity.

Concepts

- Predator
- Prey
- Population growth

Materials (for each group)

- Flat surface, 12" × 12" square
- Paper squares, one-inch (snowshoe hares), 300
- Graph paper
- Paper cutter or scissors
- Colored tape or masking tape
- Cardboard square, three-inch (represents a Canadian lynx)
- Population data table

Safety Precautions

This activity is generally considered nonhazardous. Follow all normal laboratory guidelines.

Preparation

Use tape to make a square with 12" sides, on a table top or other flat surface. The square represents the area inhabited by a population of snowshoe hares. Cut out and decorate with appropriate images, 300 one-inch paper hares and a three-inch cardboard lynx (these numbers are for each group conducting the simulation). A paper cutter is an indispensable asset at this stage. Prepare a data table to record the population tallies by following the example below. Allow enough space for 20 to 25 generations.

Generation of Hares	Number of Lynx	Number of Hares	Hares Eaten (Total)	Hares Remaining	Lynx Starved	Lynx Surviving	Lynx Offspring
1	1	3					
2							

Procedure

1. Begin the simulation by populating the habitat with three hares—spatially dispersed within the square.
2. Toss the cardboard lynx into the square in an effort to capture (i.e., land on any portion of) as many hares as possible. In order to survive and reproduce, the lynx must capture at least three hares when tossed. With the hare population at this stage, lynx survival is virtually impossible. Remove any hares captured and enter the tallies for the first generation.
3. The hare population doubles between generations—multiply "Hares Remaining" by two and enter the resulting number in the "Number of Hares" column for the second generation. Place the required number of hares in the square. If no lynx survived the previous generation another moves into the area. Toss the newly recruited lynx—repeating step 2. Remove any captured hares and enter the new tallies.
4. By generation 5 the lynx should be able to capture three hares when tossed. If successful, the lynx survives until the next generation and also produces offspring—(one per each three hares captured.) Toss the lynx square once for each lynx.

- As the population builds it is important to separately tally each lynx's kills, removing captured hares after each lynx is tossed. Determine lynx survival and reproduction using individual lynx capture numbers. Remember, lynx produce one offspring for each three hares captured. If a lynx captures seven hares, three lynx enter the next generation—the original lynx and two offspring. Individual lynx capture numbers should be tallied on a separate sheet of paper and only totals entered in the table.
- 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 18–20 generations, by which time the cycle will be well on its way to repeating and the next few generations can be (relatively accurately) predicted.

Discussion

The data is best analyzed graphically. For each animal make a plot of population totals (the first two columns) versus generation number. By plotting the hare population and the lynx population side by side on the same graph, the relationship between the two becomes abundantly clear.

The most evident pattern is the near exponential initial increase in the prey (hare) population followed by a proportional increase in the predator (lynx) population. Students should note the lag time between the two populations. The predator population responds directly to fluctuations in the prey population—recovery follows recovery and crash follows crash.

Students should keep in mind that, as in any simulation (even sophisticated computer models), certain assumptions are made and many variables overlooked. Natural populations are subject to myriad pressures and disturbances such as immigration, emigration, overgrazing, disease, floods, droughts, fires, and extreme cold spells—to name a few. Many of these factors compound each other. Disease spreads more easily as population density increases. Hares intensively competing for food in overpopulated areas will be less able to resist droughts or freezes. The enormous complexity of a relatively simple system is mind-boggling.

If several groups are conducting the simulation, you may wish to introduce other variables. Disease or fire could reduce the hare population at any stage in the cycle. Human hunting or trapping activity could impact either population. Ask the students to imagine the outcome if the lynx were exterminated. Note the well-known impact on deer populations throughout North America—populations no longer regulated by natural predators. Studies have shown that natural predation pressure maintains the overall health and size of prey populations at optimal levels.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

- Systems, order, and organization
- Evidence, models, and explanation

Content Standards: Grades 5–8

- Content Standard A: Science as Inquiry
- Content Standard C: Life Science, reproduction and heredity, regulation and behavior, population and ecosystems, diversity and adaptations of organisms.

Content Standards: Grades 9–12

- Content Standard A: Science as Inquiry
- Content Standard C: Life Science, interdependence of organisms; behavior of organisms.

References

- Green, N. P. O.; Stout, G. W.; Taylor, D. J.; Soper, R. *Biological Science 1: Organisms, Energy, and the Environment*, 2nd ed.; Cambridge University Press, Cambridge, 1990.
- Purves, W. K.; Orians, G. H.; Heller, H. C. *Life: The Science of Biology*, 3rd ed.; Sinauer Associates, Sunderland, MA, 1992.

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The Lynx Eats the Hare is available from Flinn Scientific, Inc.

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FB1880	The Lynx East the Hare—Environmental Science Predator–Prey Activity
FB1884	Lynx Eats the Hare, Card Deck

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