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Predator/Prey Lab: Lynx and Hare Populations in the Balance

Background: Canadian Lynx and Snowshoe Hares

In the study of the dynamics of a single population, we typically take into consideration such factors as the “natural” growth rate and the “carrying capacity” of the environment. Mathematical ecology requires the study of population that interact, thereby affecting each other’s growth rates. In this module we study a very special case of such an interaction, in which there are exactly two species, one of which – the predators – eats the other – the prey. Such pairs exist throughout nature:

* Lions and Gazelles
* Birds and Insects
* Koalas and Eucalyptus trees
* Venus Fly Traps and Flies

To keep our model simple, we will make some assumptions that would be unrealistic in most of these predator-prey situations. Specifically, we will assume that:

* The predator species is totally dependent on a single prey species as its only food supply
* The prey species has an unlimited food supply
* There is no threat to the prey other than the specific predator

Procedure:

1. Find an area roughly 2 feet in diameter either on the floor or a table top. The square represents the area inhabited by a population of snowshoe hares.
2. Begin the simulation by populating the habitat with 3 hares, spatially dispersed (spread out) within the square.
3. 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. (see back page)
4. The **hare population doubles between generations, so at this stage, 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.
5. 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).
6. As the population builds, it is important to separately tally each lynx kill and to **remove 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 7 hares, 3 lynx enter the next generation: the original lynx and 2 offspring. Individual lynx capture numbers should be kept track of on a separate piece of paper (scratch paper is fine) and only totals entered in the table.
7. 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 3 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.

Data Table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Generation | # of Hares | # of Lynx | Hares Eaten (total) | Hares Remaining | Lynx Starved | Lynx Surviving | Lynx Offspring |
| 1 |  |  |  |  |  |  |  |
| 2 |  |  |  |  |  |  |  |
| 3 |  |  |  |  |  |  |  |
| 4 |  |  |  |  |  |  |  |
| 5 |  |  |  |  |  |  |  |
| 6 |  |  |  |  |  |  |  |
| 7 |  |  |  |  |  |  |  |
| 8 |  |  |  |  |  |  |  |
| 9 |  |  |  |  |  |  |  |
| 10 |  |  |  |  |  |  |  |
| 11 |  |  |  |  |  |  |  |
| 12 |  |  |  |  |  |  |  |
| 13 |  |  |  |  |  |  |  |
| 14 |  |  |  |  |  |  |  |
| 15 |  |  |  |  |  |  |  |
| 16 |  |  |  |  |  |  |  |
| 17 |  |  |  |  |  |  |  |
| 18 |  |  |  |  |  |  |  |
| 19 |  |  |  |  |  |  |  |
| 20 |  |  |  |  |  |  |  |

Name(s): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Hour 1 2 3 4 5 6

Predator/Prey: Lynx and Hare Lab sheet

Using the data you gathered from the lab, please answer the following questions:

1. In the space provided, graph the “Hares Remaining” and the “Lynx Surviving” for generations 5-15. Use one color for the Hares and one color for the Lynx. Do not forget to NAME AND LABEL YOUR GRAPH.
2. Describe what happened to the hare and lynx populations. BE SPECIFIC.

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1. Using the knowledge you have gained in class about carrying capacities, explain what would happen to the hare population if all the lynx were taken out of the ecosystem?

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