Predator-Prey Model

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Abstract

To be added.

BACKGROUND

Modeling the interactions between predator and prey is a question of great ecological importance, as accurate models can allow one to make reliable predictions and thereby inform decisions in conservation, habitat preservation, hunting regulations, etc. There exist a variety of methods for modeling the interactions between predator and prey, and these models, though simple, are often in quite good agreement with what is observed. Take the classic Lotka-Volterra Model as an example. While this model is nothing more than a set of first-order nonlinear differential equations that one may solve numerically for a particular set of initial conditions, the model is capable of providing a qualitatively accurate description of the data, as is shown in Fig. 1.

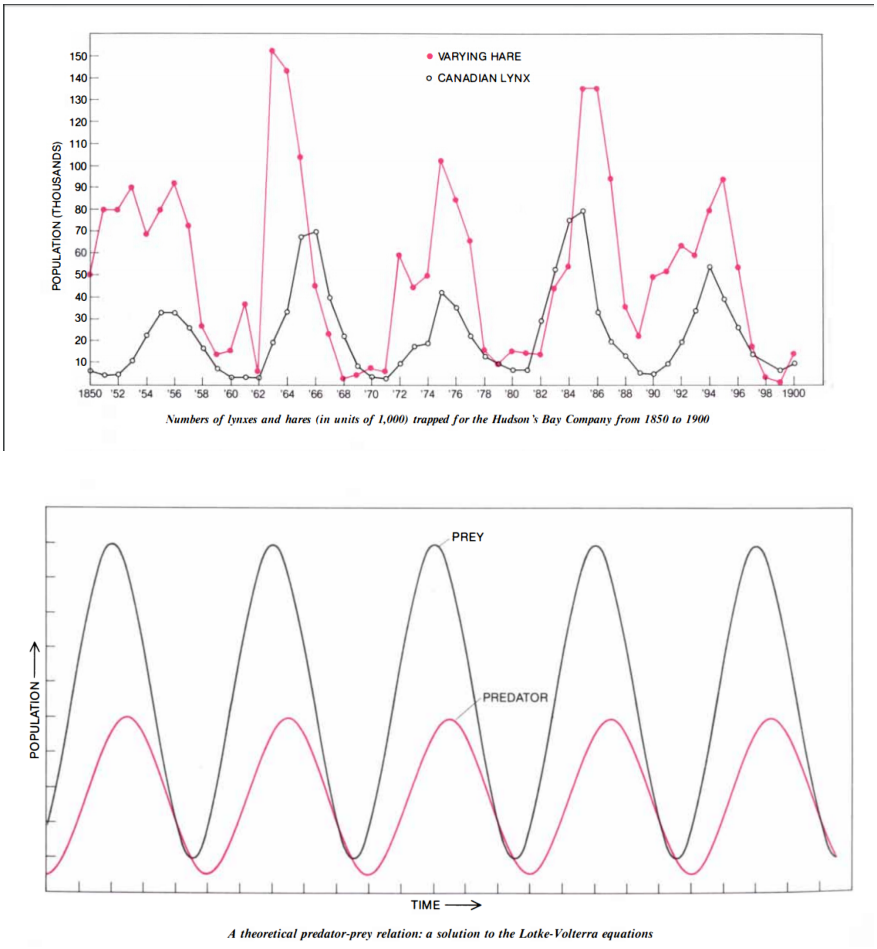

FIG. 1: (Top) Experimental data of Hare and Lynx populations, (Bottom) predictions from the Lotka-Volterra equations.

In this work we study the behavior of a slightly different model, one that is similar to the Lotka-Volterra Model in that it consists of only a simple set of rules, but the nature of the actual simulation is quite different. In our case, we consider two populations, sharks and fish living on a two-dimensional lattice. We simulate the movement and behavior of each shark and fish individually and can observe fluctuations of the two populations as a function of time. Unlike the Lotka-Volterra Model, however, we are able to see exactly where all of the sharks and fish are and this allows us to attain a deeper understanding of what causes the fluctuations in populations and the conditions that may lead to extinction.

IMPLEMENTATION

NUMERICAL RESULTS

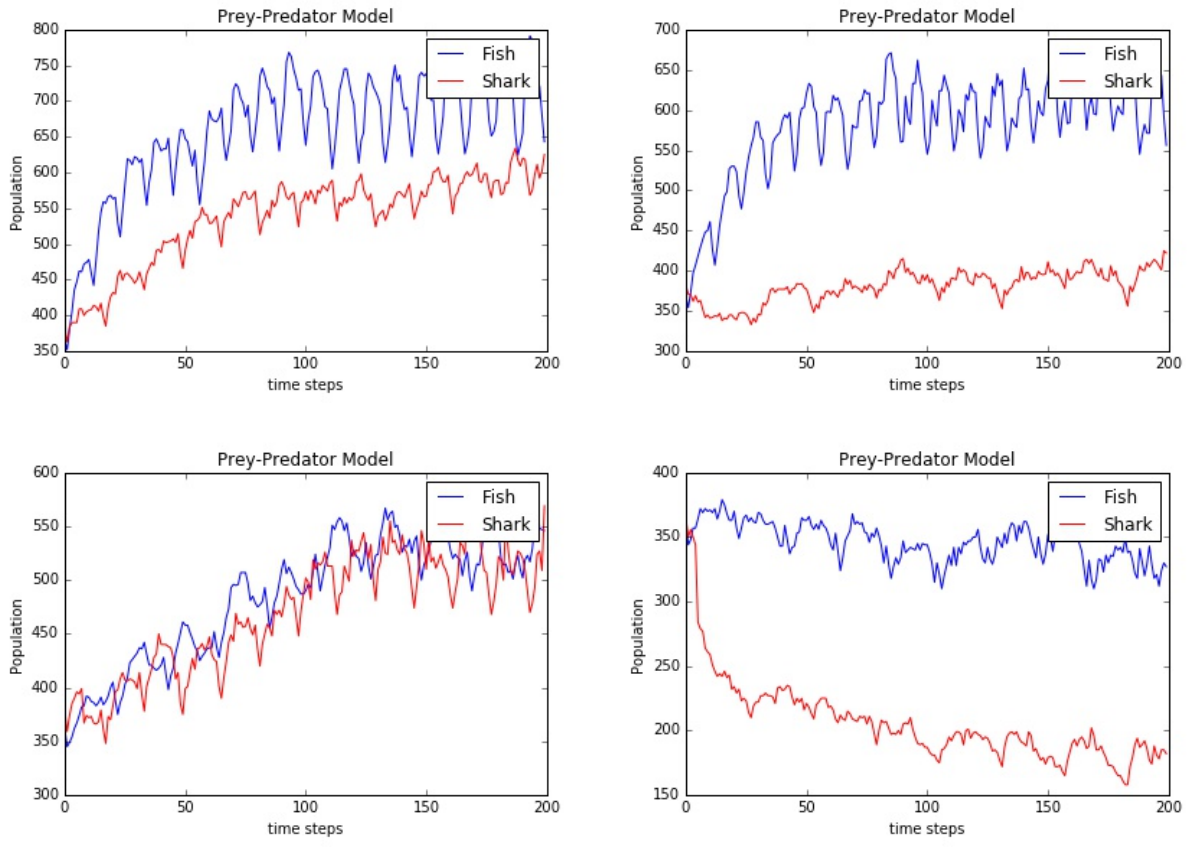

FIG. 2: Other typical clusters grown using the DLA method

CONCLUSION