Algae, Rotifers, and the Predator-Prey Model

1. Algae

Algae are photosynthetic organisms found in aquatic environments such as lakes, rivers, and oceans. They can be unicellular, like phytoplankton, or multicellular, like seaweeds.
Through photosynthesis, algae convert sunlight into chemical energy, forming the base of many aquatic food webs. Their growth and abundance greatly influence ecosystem balance and productivity.



Figure 1: Example of aquatic algae.

2. Rotifers

Rotifers are microscopic multicellular animals commonly found in freshwater habitats. They play a key ecological role as consumers of algae, bacteria, and detritus.
Because they reproduce quickly and respond rapidly to environmental changes, rotifers are important indicators of water quality. Their feeding on algae establishes a dynamic predator-prey relationship.



Figure 2: Microscopic view of a rotifer.

3. The Predator-Prey Model

The predator-prey model describes how populations of two interacting species change over time: one as the predator and the other as the prey. A classical example is the Lotka-Volterra system, which explains cyclical population patterns. When prey populations increase, predator numbers grow due to the abundance of food. As predators consume prey, prey populations decline, which later causes a reduction in predator numbers. These natural oscillations illustrate how ecosystems can maintain dynamic equilibrium.

4. What We Will Do

Studying algae-rotifer interactions through mathematical models such as the Lotka-Volterra equations helps scientists analyze and predict ecological dynamics. These insights are valuable for aquatic ecology, aquaculture management, and environmental monitoring.