

Age-Based Predation

Populations exhibit age structures, where the population is segregated into different age groups. For example, immature animals are unable to reproduce but age into mature animals that are capable of reproducing. Additionally, predators prey more often upon the immature members of the population so predation can exhibit age based structures. In this project, you will develop an age-structured population model of immature and mature members subject to predation. How does the population evolve in the absence of predation? How does age based predation affect the stable population sizes?

Some Model Requirements

- The population is divided into two groups: Mature and Immature.
- Birth increase the number of immature members at a rate proportional to the size of the mature population.
- Immature members become mature members of the population at a rate proportional to the size of the immature population.
- The death rates in the immature population is proportional to the total population and the immature population.
- The death rates in the mature population is proportional to the total and immature populations and the mature population.
- Members of each population is removed by predation, which is proportional to the size of each population.

Some Questions to Answer

- How does the total population behave in the absence of predation? What is the stable steady-state population size?
- How does equal predation of both populations affect the total population size? Can equal predation cause the population to collapse?
- How does predation of only immature members and not mature members affect the stable population size? Does it make it easier or harder for the population to collapse?
- What are the effects of non-equal predation from both populations?