

Assignment 6 – Aging / Reproduction

1. Estimation of population rate of increase

Consider a strain of *C. elegans* with the following life history:

1. First reproduction on day 3 of its life (20 progeny)
2. Reproduction on day 4: 100 progeny
3. Reproduction on day 5: 50 progeny
4. Death: Day 7

How fast does the number of individuals (population size) increase assuming unlimited availability of nutrients?

- a. What is the exponential rate of population increase?
- b. What is the population doubling time?

For simplicity, assume that all progeny of a given day are produced instantaneously at the same time (rather than being spread out throughout the day)

To calculate the solution, you can either simulate population dynamics in a programming language of your choice or use the Excel sheet available on the course website.

2. Early vs. late reproduction

Using the simulations from part 1, compare the rate of population increase of two different strains:

Strain 1:

10 progeny on days 3 and 4

➔ Total brood size of 20

Strain 2:

10 progeny on day 4 and 5

50 progeny on day 6

➔ Total brood size of 70

- a. Which of the two strain increases faster in the number of individuals?
- b. Run a simulation where the slower expanding strain starts with 100 times more individuals than the faster expanding strain. How long does it take for the faster strain to reach 50% of the population?
- c. Explain in words why early reproduction contributes more to the rate of population increase? What is the consequence for selection of reproductive timing during evolution, specifically for mutations that have positive effects on early, and negative effects on late reproduction?