Formulas

discrete time growth:

- $N_T = N_0 \lambda^T$
- $\lambda = f + p$
- $\mathcal{R} = f/(1-p)$

continuous time growth:

- $N(t) = N(0)\exp(rt)$
- $r = b - d$
- $\mathcal{R} = b/d$

structured growth:

- $\ell_x = p_1 \times p_2 \times \ldots p_{x-1}$
- $\mathcal{R} = \sum \ell_x f_x$
- $\sum \ell_x f_x \lambda^{-x} = 1$
- $\mathrm{SAD}(x) \propto \ell_x \lambda^{-x}$

1. What happens in the long run to a structured, unregulated population with *non-interacting* cohorts?

A. It reaches a stable age distribution
B. It reaches a stable population size
C. The age distribution cycles while the total population size grows approximately exponentially
D. The age distribution grows approximately exponentially while the total population size cycles

Answer questions on this page *in pen*. *Briefly* show necessary work and equations. Points may be *deducted* for wrong information, even when the correct information is also there.

17. A species of plant produces 10 seeds on average in the first year after it is born, and 40 seeds on average in the second year after it is born, assuming it survives. Seeds survive the first year (and become adults) with probability 0.05, and first-year adults survive to become second-year adults with probability 0.8. Second-year adults always die.

a) (2 points). If we model this population by counting *after* reproduction, how many age classes do we have? How would you describe the individuals censused in each age class, and how would you number the age classes?

b) (1 points). How would this differ if we counted *before* reproduction?

c) (2 points). If a scientist constructs life tables for the two scenarios above, what factors would you expect to be the same, and which ones could differ?

d) (4 points). Construct a life table for the case where we count *after* reproduction (not the most common way). Show how you calculate the values of f_x, and then complete the life table below.

x	f_x	p_x	ℓ_x	$\ell_x f_x$
1				
2				
$\mathcal{R}$				