Announcements:
Next time: Population growth models – bring calculator (just in case)
This Friday (2/17): Next Paper discussion (paper posted today)
Report due
One week from Friday (2/24): Research Paper Topic selection due
Exam 1 – Review questions distributed Wednesday

Demographic ecology – the structure and dynamics of populations

Populations are “made of” individuals, but they have characteristics of their own Statistical properties of collections of individuals

The size of the population, which we can symbolize as $N(t)$ to indicate that it varies through time, is the main characteristic of interest.

How can $N$ change? Adding individuals (birth, immigration)
Losing individuals (death, emigration)

How do we observe, quantify, and understand potentially complex population dynamics

“Actuarial” approach – Life Tables and Fecundity Schedules
Detailing the average path through life taken by individual members of the population

Two components: survival (life table) and reproduction (fecundity schedule)

Age = $x$, units appropriate to the organism
Survivorship = $l(x)$, fraction of individuals that survive to age $x$.
Fecundity = $m(x)$, average number of offspring produced per individual at age $x$.

An aside on survivorship curves: Note that the Y-axis is a logarithmic scale, if data are not shown on a log scale, the diagnostic shapes for Type 1, 2, and 3 curves will be very different!

One these values are determined for members of a population, we can calculate other statistics that describe the dynamics of the population

$$R_0 = \sum l_x m_x$$

is the so-called “net reproductive rate” but it is not really a rate (Drew’s pet peeve)
This number is the average lifetime reproductive output per individual in the population

What can $R_0$ tell you: whether the population is growing ($R_0 > 1$) or shrinking ($R_0 < 1$), but not how fast in an absolute sense.
\[ T = \sum \frac{x_l m_x}{R_0} \]

is the appropriately named generation time, which describes the average time from birth-to-birth

What can limit generation time?

\[ r = \frac{\ln R_0}{T} \]

is the “per capita rate of increase” for the population, which describes the rate of growth of the population.

This rate tells you how fast the population is growing \((r > 0)\) or shrinking \((r < 0)\).

Based on these factors, what determines whether a population is growing, stable, or shrinking?

In a growing population, what factors can slow the rate of increase?