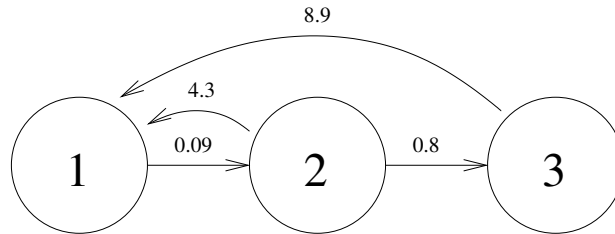


Mathematics 172 Homework

Here is more on what the stable age distribution means. Let us consider an organism, say a fish, with a life history that is summarized by the loop diagram



which has the Leslie matrix

$$L = \begin{bmatrix} 0 & 4.3 & 8.9 \\ .09 & 0 & 0 \\ 0 & .8 & 0 \end{bmatrix}$$

1. If release 100 stage one fish in a pond that has none of the fish to begin with, then

$$\vec{n}(0) = \begin{bmatrix} 100 \\ 0 \\ 0 \end{bmatrix}.$$

- (a) Compute $\vec{n}(50)$ (which gives the number of fish in each class in 50 years). *Answer:*

$$\vec{n}(50) = \begin{bmatrix} 64.36 \\ 5.73 \\ 4.54 \end{bmatrix}$$

- (b) What is the percent in each age group (i.e. the percent in each stage) in year 50? *Answer:* The vector of percents is

$$\begin{bmatrix} 86.24\% \\ 7.68\% \\ 6.08\% \end{bmatrix}$$

2. If release 100 stage 2 fish in a pond that has none of the fish to begin with, then

$$\vec{n}(0) = \begin{bmatrix} 0 \\ 100 \\ 0 \end{bmatrix}.$$

- (a) Compute $\vec{n}(50)$ (which gives the number of fish in each class in 50 years). *Answer:*

$$\vec{n}(50) = \begin{bmatrix} 722.60 \\ 64.36 \\ 50.95 \end{bmatrix}$$

(b) What is the percent in each age group (i.e. the percent in each stage) in year 50? *Answer:* The vector of percents is

$$\begin{bmatrix} 86.24\% \\ 7.68\% \\ 6.08\% \end{bmatrix}$$

which is just what we had in problem 1.

3. If release 100 stage 3 fish in a pond that has none of the fish to begin with, then

$$\vec{n}(0) = \begin{bmatrix} 0 \\ 0 \\ 100 \end{bmatrix}.$$

(a) Compute $\vec{n}(50)$. *Answer:*

$$\vec{n}(50) = \begin{bmatrix} 566.82 \\ 50.48 \\ 39.97 \end{bmatrix}$$

(b) What is the percent in each age group (i.e. the percent in each stage) in year 50? *Answer:* The vector of percents is

$$\begin{bmatrix} 86.24\% \\ 7.68\% \\ 6.08\% \end{bmatrix}$$

which is just what we had in problems 1 and 2.

Hopefully the last problems convince you that the percent in each stage eventually, becomes constant.