Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Life History of sifakas

Richard, A.F., R.E. Dewar, M. Schwartz, and J. Ratsirarson. 2002. Life in the slow lane? Demography and life histories of female sifaka (*Propithecus verreauxi verreauxi*). Journal of Zoology 256: 421-436.

Richard et al. (2002) reported on a 16-year observational study of sifakas in Madagascar.

We will use data presented in this paper for one point in time (1999) to create a **static** life history table for sifakas.

As we move through this case study you will fill in the missing values in the life table below. The values for Nx that are given were taken from an age pyramid (Fig. 6 in Richard et al. 2002) based on the number of individuals in the censused population in 1999. [N0-2 was estimated from survival data provided for newborns].

Static Life History Table: Nx = number of marked female sifakas in each of nine age classes present in the Beza Mahafaly Special Reserve in 1999.

Nx = the number of female sifakas in age class x (e.g., N0-2 = 37)

lx = the proportion of the original 37 female sifakas that survived to age class x

mx = the number of female baby sifakas born to **each female** sifaka in age class x

Fx (symbolized as bx in SimUText) = the total number of baby sifakas born to females in age class x.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | # of females | Survivorship | Female births per female | Total number of female births |
| **Age Range (years)** | **N x** | **lx** | **mx** | **Fx** |
| 0 to 2 | 37 |  |  |  |
| 3 to 5 | 19 |  |  |  |
| 6 to 8 | 14 |  |  |  |
| 9 to 11 | 9 |  |  |  |
| 12 to 14 | 14 |  |  |  |
| 15 to 17 | 4 |  |  |  |
| 18 to 20 | 6 |  |  |  |
| 21 to 23 | 6 |  |  |  |
| 24 or older | 1 |  |  |  |

Part I – Estimating per capita birth rate (**mx**) and fecundity (**Fx**)

Table 1 (below) was modified from Table 1 in Richard et al. (2002), which provided birthrates for each year of age for sifakas censused between 1984 and 1999. The values in the table below are medians (n=3) for 3-year age classes (e.g., the birthrate for the 3 – 5 age class is the median birthrate for 3-, 4-, and 5-year old sifakas). We will use the information here to find reasonable estimates for mx. Since females give birth to a single infant each time, the proportion of females giving birth is equal to the **number** **of infants born per female**.

1. To give birth, female sifakas had to have mated with a male. In addition, female sifakas give birth to both male and female babies. How could we modify the birth rate data in Table 1 to exclude males and calculate an **mx** that represents the number of females born per female?
2. Once you have entered your values for mx (number of female births/female) into the life table above, find Fx, the total number of **female** offspring produced by **female** sifakas in each age class. [These will not necessarily be whole numbers since your values for mx were based on birth rates recorded from 1984 – 1999. Nx was for a single year (1999)].

Table 1. Proportions of female sifakas (*Propithecus verreauxi verreauxi*) in each of nine age classes that gave birth.\*

|  |  |  |
| --- | --- | --- |
| **Age class** | **Nx** | **Birthrate** |
| 0 - 2 | 37 | 0.00 |
| 3 - 5 | 19 | 0.07 |
| 6 - 8 | 14 | 0.36 |
| 9 - 11 | 9 | 0.63 |
| 12 - 14 | 14 | 0.65 |
| 15 - 17 | 4 | 0.59 |
| 18 - 20 | 6 | 0.5 |
| 21 - 23 | 6 | 0.67 |
| 24 - 26 | 1 | 0.33 |

\*Data based on median values from Column B, Table 1 in Richard et al. (2002) which summarized birthrate data for the period 1984 – 1999).

Part 2 Estimating survivorship (**lx**)

Survivorship (lx) refers to the probability that an individual survives **from birth to age x**. Thus, if there were 37 females of age 0 (we are assuming no mortality of 1- or 2-year olds) and 19 of them made it to the age class of 3 – 5 years, then l3-5 = 19/37 = 0.51.

1. Calculate lx for females in each of the sifaka age groups and enter the values into your life history table.
2. Remember that to create this static life table we used census data from a single point in time (1999), and to calculate lx, we made the assumption that the age structure is stable, such that the proportion of individuals surviving to each age class doesn’t change over time. How does this differ from the calculation of lx in a cohort life table?
3. Looking carefully at the lx values you obtained, does it appear that the age structure is stable? Why or why not?
4. The age pyramid for the 1999 sifaka population doesn’t look much like a pyramid. If the age structure were stable, that shape would stay the same over time. Is that likely to happen? What are some factors that could change the shape of the pyramid over time?
5. The age pyramid also illustrates an uneven sex ratio in sifakas. Though the exact physiological mechanism is unknown, there is evidence that mammals can manipulate the sex ratios of their offspring. How is a female’s fitness affected by the sex of her offspring?

Part 3 Conclusions

1. Based on the data you have been presented from Richard et al. (2002) would you conclude that the population is increasing or decreasing? (Calculate R0). Explain how you came to this conclusion and how confident you are in your prediction.
2. In 2017, the Florida Fish and Wildlife Commission estimated that there are between 120 and 230 Florida panthers remaining in Florida. If you were charged with making a long-term population growth projection about Florida panthers, what **life history information** would you want to measure and how would you measure it?