Chapter-wide learning goals:

1. Discuss the role of evolution in producing the variety of life history strategies exhibited by populations.
2. Compare and contrast some of the fundamental life-history trade-offs that resource limitation places on populations.
3. Show how the information summarized in a life-history table can be used to describe different life history strategies.
4. Demonstrate how demographic data can be used to inform management decisions for populations of threatened species.

Section 1: Life Cycles and Life Histories

1. Explain why the existence of complex multi-cellular organisms is an evolutionary mystery.
2. Draw a life cycle diagram to illustrate a complex life history.
3. Suggest hypotheses that could explain why some species have relatively simple life cycles while the life cycles of other species are more complex.
4. Describe how fitness drives species' life history strategies using examples.
5. Summarize how data on clutch size in birds has been used to explore the evolutionary basis for different life history strategies.
6. Summarize Boyce and Perrins's explanation for why the mean clutch size of great tits does not maximize the number of chicks surviving per clutch.
7. Provide examples that illustrate variation in life cycles.

Section 2: Life History Parameters

1. Determine whether or not a population is stable, shrinking, or growing.
2. Estimate the per capita population growth rate, r, as the difference between the average per capita birth rate and death rate over a time period, t, so that $r = b - d$.
3. Approximate the per capita birth rate, b, as Births / ($t N_{avg}$).
4. Approximate the per capita death rate, d, as Deaths / ($t N_{avg}$).
5. State the assumptions associated with estimating per capita growth rate from simple approximations of b and d.
6. Determine from a population's age pyramid whether the population is likely to be growing, shrinking or stable.
7. Draw the qualitative shape of the age structure graph predicted for several different populations with different demographics.
8. Describe a population in terms of its age structure.
9. Generate hypotheses about demographic parameters and/or recent history of a species from the age structure of a population.

Section 3: Life Tables and Survivorship Curves

1. Describe the principle of allocation as it relates to life history strategies.
2. Use life table data to make predictions about how a population will change in the future.
3. Illustrate how life history data can be used to inform management decisions.
4. Predict how changes in stage specific rates will affect the growth of a population using life tables.
5. Construct a life table from estimates of age specific birth and death rates, making sure to calculate survivorship (l_x) and fecundity (m_x).
6. Describe the meaning of the values in each column of a simple life table.
7. Distinguish between static and dynamic life history data.
8. Calculate a population's net reproductive rate, R_0, as $R_0 = \Sigma(l_x m_x)$ using the data in a life table.
9. Calculate a population's generation time, T, as $T = \Sigma(x\, l_x m_x)/R_0$ using the data in a life table.

10. Calculate the population growth rate, *r*, from estimates of its net reproductive rate, R_0, and its generation time, *T*.
11. Infer aspects of a species' life history strategy from a survivorship curve for one of its populations.
12. Plot a survivorship curve using life table data.
13. Explain the demographic transition that tends to occur as nations develop, industrialize and become more urban.

Section 4: Trade-Offs

1. Contrast how different species' life histories may be successful in different environments using examples of one or more trade-offs.
2. Discuss the selective pressures that favor semelparity in agave and iteroparity in yucca.
3. Describe the conditions that are expected to favor *r*-selected vs. *K*-selected life history strategies.
4. Explain when plants with ruderal, stress-tolerant, or competitive life history strategies should be favored using Grime's life history classification scheme.
5. Explain when fish with opportunistic, equilibrium, and periodic life history strategies should be favored using Winemiller and Rose's life history classification scheme.
6. Generate hypotheses about trade-offs that may enable the coexistence of two species.
7. Draw a graph illustrating an example of a trade-off between fecundity and some other life history trait.
8. Provide examples of species that exhibit different strategies in different environments (i.e., species with plastic life history strategies).