Population Growth Patterns

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CHAPTER 1 Population Growth Patterns

- Compare and contrast exponential and logistic growth.
- Define carrying capacity.
- Distinguish *K*-selected from *r*-selected species.

What starts out very small and has the potential to grow considerably larger?

Trees, of course. But also populations. Give a population everything it needs to survive, and the growth of that population will be tremendous.

Patterns of Population Growth

Populations may show different patterns of growth. The growth pattern depends partly on the conditions under which a population lives.

Exponential Growth

Under ideal conditions, populations of most species can grow at exponential rates. Curve A in **Figure** 1.1 represents **exponential growth**. The population starts out growing slowly. As population size increases, the growth rate also increases. The larger the population becomes, the faster it grows.

Logistic Growth

Most populations do not live under ideal conditions. Therefore, most do not grow exponentially. Certainly, no population can keep growing exponentially for very long. Many factors may limit growth. Often, the factors are density dependent (known as **density-dependent factors**). These are factors that are influential when the population

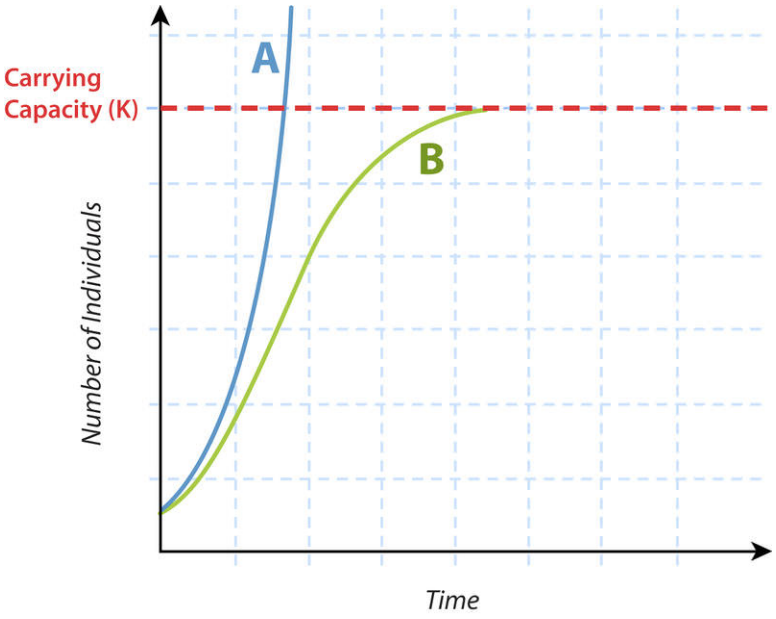


FIGURE 1.1

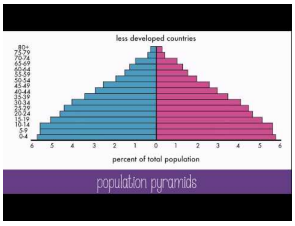
Exponential and Logistic Growth. Curve A shows exponential growth. Curve B shows logistic growth.

becomes too large and crowded. For example, the population may start to run out of food or be poisoned by its own wastes. As a result, population growth slows and population size levels off. Curve B in **Figure** 1.1 represents this pattern of growth, which is called **logistic growth**.

At what population size does growth start to slow in the logistic model of growth? That depends on the population's carrying capacity (see **Figure** 1.1). The **carrying capacity** (K) is the largest population size that can be supported in an area without harming the environment. Population growth hits a ceiling at that size in the logistic growth model.

Species can be divided into two basic types when it comes to how their populations grow.

- Species that live in stable environments are likely to be ***K*-selected**. Their population growth is controlled by density-dependent factors. Population size is generally at or near the carrying capacity. These species are represented by curve B in **Figure** 1.1.
- Species that live in unstable environments are likely to be ***r*-selected**. Their potential population growth is rapid. For example, they have large numbers of offspring. However, individuals are likely to die young. Thus, population size is usually well below the carrying capacity. These species are represented by the lower part of curve A in **Figure** 1.1. (*r* is the population growth rate. See the "Population Growth" concept.)



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Summary

- Under ideal conditions, populations can grow exponentially.
- The growth rate increases as the population gets larger.
- Most populations do not live under ideal conditions and grow logistically instead.
- Density-dependent factors slow population growth as population size nears the carrying capacity.

Review

1. Describe exponential population growth.
2. Describe logistic growth.
3. What are density-dependent factors?
4. What does the carrying capacity refer to?
5. What are *K*-selected and *r*-selected species?

References

1. Hana Zavadska. Graph of exponential versus logistic growth . CC BY-NC 3.0