Chapter 16 Outline

- POPULATION ECOLOGY is the study of how populations interact with their environments.
  - POPULATION ECOLOGY is the study of the interactions between populations of organisms and their environments, particularly their patterns of growth and how they are influenced by other species and by environmental factors.
  - Populations tend to grow exponentially, but this growth is eventually limited.
  - As density increases, a population reaches the CARRYING CAPACITY of its environment, and limited resources put a ceiling on growth. Growth can also be reduced by density-independent factors such as natural or human-caused environmental calamities.
  - Some populations cycle- between periods of rapid shrinkage.
  - Based on models of population growth, it might seem easy to manage natural resources efficiently and sustainably. In practice, difficulties such as estimating population size and CARRYING CAPACITY complicate the implementation of such strategies.

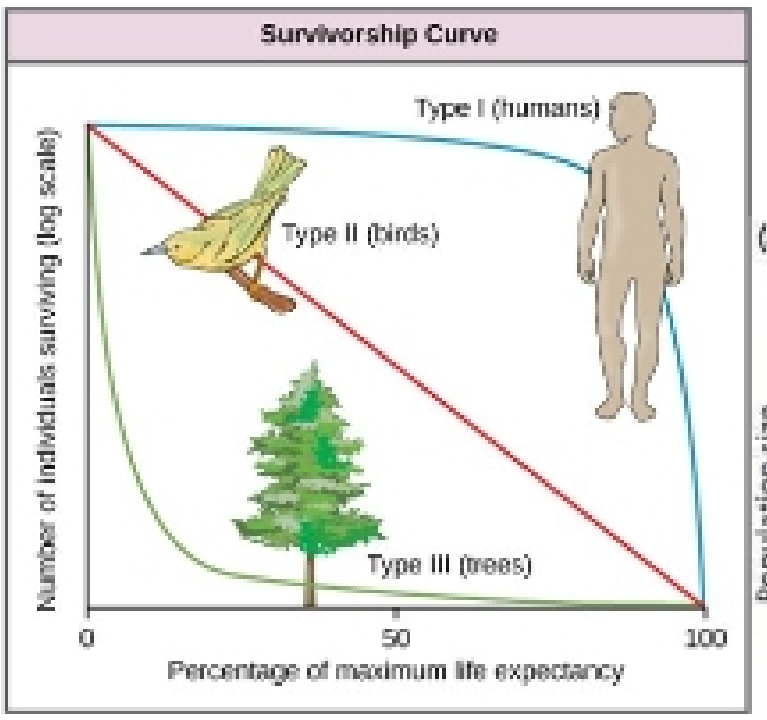
- A LIFE HISTORY is like a species summary.
  - An organism's investment pattern in growth, reproduction, and survival is described by its LIFE HISTORY. Very different strategies can achieve the same outcome in which a mating pair of individuals produces at least two surviving offspring.
  - Because constrains limit evolution, LIFE HISTORIES are characterized by trade-offs between investments in growth, reproduction, and survival.
  - Confounding factors can generate misleading results when you simply observe relationships between two variables. Randomizing subjects to treatment groups is an essential control, enabling the discernment of true cause-and-effect relationships.
  - LIFE tables and SURVIVORSHIP CURVES summarize the survival and reproduction patterns of the individuals in a population. Species vary greatly in these patterns: the highest risk of mortality may occur among the oldest individuals, or among juveniles, or death may strike evenly at all ages.

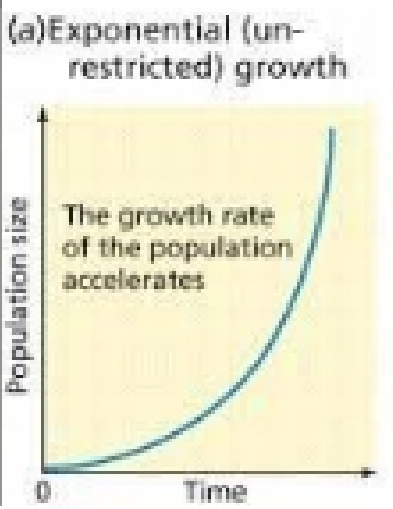
- ECOLOGY influences the evolution of AGING in a population.
  - Natural selection cannot weed out harmful alleles that do not diminish an individual's REPRODUCTIVE OUTPUT. Consequently, these mutant alleles accumulate in the genomes of individuals of nearly all species. This leads to the physiological breakdown that we experience as we age.
  - The rate of AGING and the pattern of mortality are determined by the of the organism's environment. In environments characterized by low mortality risks, populations of slowly AGING individuals with long life spans evolve. In environments characterized by high mortality risks, populations of early-aging, short-lived individuals evolve.

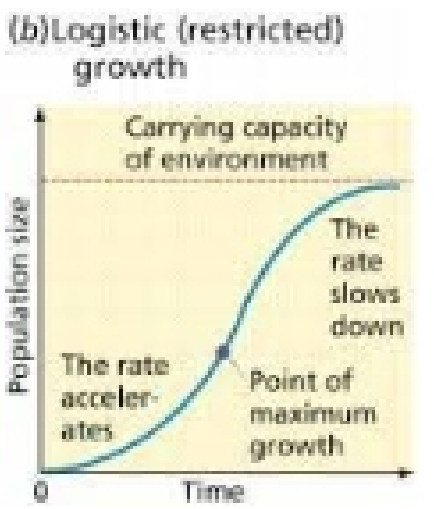
- By increasing the strength of natural selection later in life, it is possible to increase the mean and maximum longevity of individuals in a population. This occurs in controlled laboratory conditions.

- The human population is growing rapidly.
  - Age pyramids show the number of individuals in a population within any age group. They allow us to estimate birth and death rates over multi-year periods.
  - A DEMOGRAPHIC TRANSITION is characterized by an initial reduction in the death rate followed later by a reduction in the birth rate, and it tends to occur alongside industrialization.
  - The world's human population is currently growing at a very high rate, but limited resources will eventually limit this growth, most likely at a population size between 7 and 11 billion.

Visual Representations







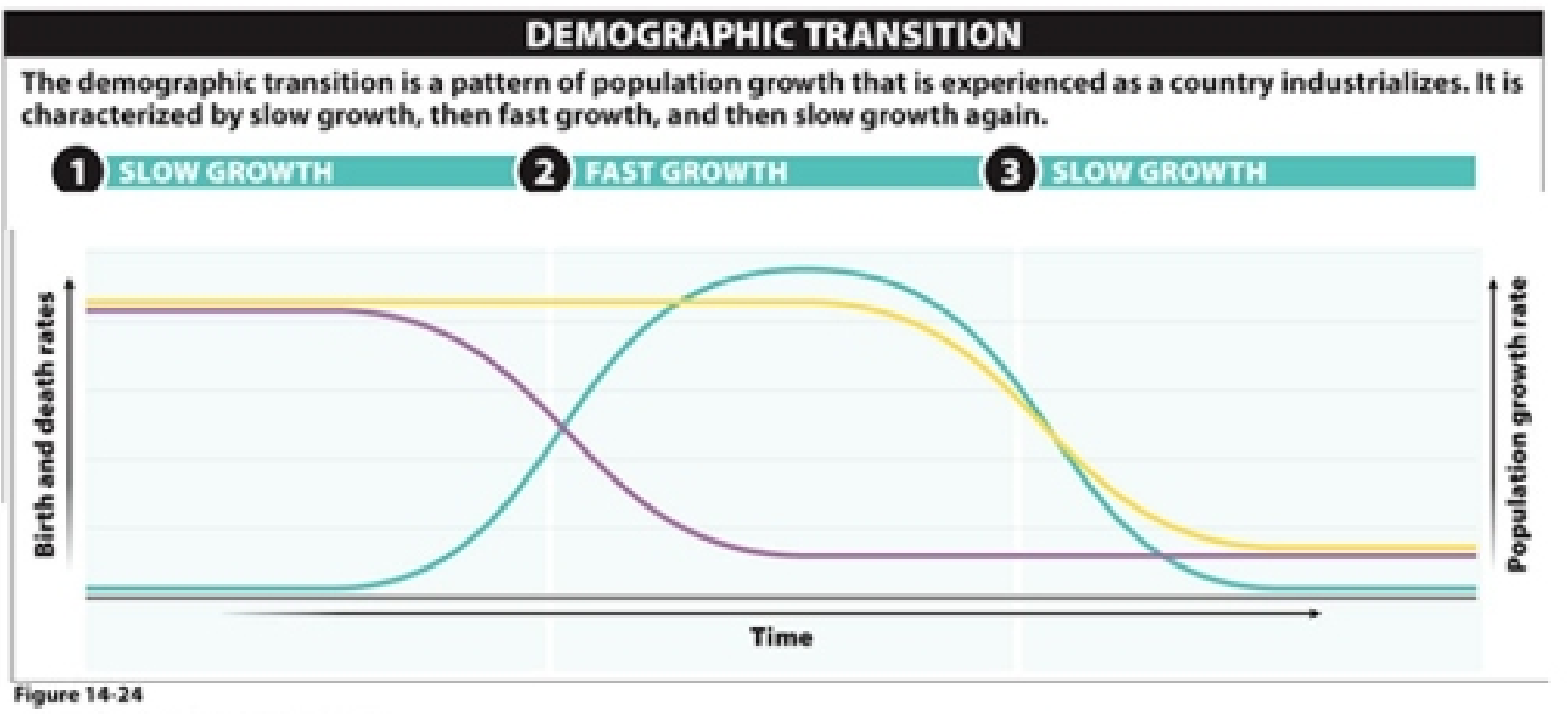


Figure 14-24
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