Chapter 41: Population Ecology

I. What Are Populations?
   A. Definition: a group of [interbreeding] individuals, living in the same place at the same time.

   B. Characteristics
      1. Size
         - may estimate using statistical sampling

      2. Density: the number of individuals [of a species] per unit area

      3. Dispersion: the spacing of individuals
         a. Uniform dispersion
            - individuals are more evenly distributed than would be expected randomly.

         b. Random dispersion
            - results from a lack of interaction between individuals or a homogeneous environment.

         c. Clumped dispersion
            - can result from a patchy distribution of resources.

II. Populations Models

   A. What determines the number of individuals in a population?

      Birth rate (or natality rate) –
      Death rate (or mortality rate) –
      Immigration –
      Emigration –

      Density = (birth + immigration) - (death + emigration)

   B. Population Growth
      1. Exponential population growth – a J-shaped curve; represents an increasingly rapid addition of the number of individuals in a population over time.

      2. Logistic population growth – a population that begins to grow exponentially, then begins to level off as it approaches the carrying capacity (K); represented by an S-shaped curve.

         Carrying capacity = the maximal number of individuals in a population that can be sustained by the environment.
III. Patterns of Population Growth
   A. Rarely, cycles due to tight links between two populations of different species

   B. Irregular fluctuations due to environmental changes

   C. Patterns may differ for different populations of the same species

III. Factors Influencing Population Density

   A. Density-independent factors – their effect on individuals in a population does not vary with the degree of crowding.

       Density-independent population dynamics can result from:
       1. Fire
       2. Floods
       3. Ice-storms
       4. Other?

   B. Density dependent factors – their intensity of effect is directly related to the degree of crowding in the population.

       Density-dependent factors may be divided into two categories:
       1. Extrinsic
       2. Intrinsic

       Extrinsic – the population’s response to interaction with other members of the community.
       Intrinsic – the population’s own response to its density.

           Extrinsic factors:
           a. Predation
           b. Parasitism
           c. Disease
           d. Interspecific competition

           **Interspecific competition** – competition between members of different species for a limiting resource.

           Intrinsic factors:
           a. Territoriality
           b. Reproductive inhibition
           c. Dispersal
           d. Stress
           e. Intraspecific competition

           **Intraspecific competition** – competition between members of the same species for a limiting resource.
IV. Highlight: Human Population Growth

A. Currently, very rapid growth
   1. Increase of 1 billion people every 11 to 12 years
   2. Total of more than 6 billion reached in 1999

B. Reasons for growth
   1. Inhabit new habitats
   2. Ability to increase carrying capacity of habitats
   3. Decrease in mortality rates

C. Outlook for future
   1. Increasing human need and environmental deterioration
   2. Scarcity of resources due to nonsustainable uses
   3. Need to assess problems and make decisions