Lecture 2/13/02 – Population Ecology/ Population Growth

Lecture Outline
• What is population ecology?
• Models of population growth
• Regulation of growth
• Human population growth

What is a population?
• A group of individuals of the same species in a given area at a given time.
• Sometimes confused with all individuals
  – Species includes all capable of interbreeding
  – Population refers to those that do interbreed!
    • E.g., Remember the gall flies…; caribou

What is ecology?
• Study of organisms in relation to their environments

What is population ecology?

• Population ecology is study of factors that influence:
  1. Population size
  2. Population growth rate
  3. Density
  4. Population regulation
  5. Age structure

1. Population size:
   a. increases - decreases
   b. (Birth rate – death rate) + (immigration – emigration)
      (B-d) + (i-e)

2. Population growth – 2 types: exponential vs. logistic
   a. Exponential (Fig 18.6)
      i. Whole population multiplies by constant factor
      ii. 2,4,8,16,32,64,128…
      iii. Growth rate (G) = rN
           r = intrinsic rate of increase (natural growth rate under ideal conditions)
           N = number of individuals
           iv. “J” curve

   b. Logistic (Fig 18.8, 18.7)
      i. “S” curve
      ii. Most species have limits to growth (e.g., limited food, nesting sites, etc.)
      iii. Carrying capacity – number of individuals in an population that the environment can sustain
      iv. So- growth is exponential below carrying capacity and levels off below carrying capacity and levels off at carrying capacity

Food for thought: Why don’t humans have logistic growth?
3. Density – # individuals per unit area (e.g., 1 duck per square meter, 100 oak trees per square kilometer)

4. Population regulation
   a. Carrying capacity – as above
   b. Density dependent – population limiting factor that intensifies as density increases
      E.g., competition for food, nesting territory
      Reflected by – decreased birth rate or increased death rate
   c. Density independent – population limiting factor not related to density
      E.g., fire, fall freeze, hurricane
      Reflected by rapid death

5. Age structure- Proportion of individuals in different age groups
   (E.g., 10% population under 5 yrs old, 15% between 5-9, etc.)

Human population growth...

Facts about human population growth:
• Global population continues to rise
• Stabilization remains a challenge
• Number of poor continues to grow
• Despite Gains, Millions Go Hungry
• Low-Income Nations Are Especially Vulnerable to Water Scarcity

• The root of it all… OVERPOPULATION
• Now 6 billion people
• By 2050 could have 10 billion people
• Many estimate beyond Earth’s carrying capacity
• An socioeconomic problem