Previous Lecture

Populations Rarely Grow Exponentially Due to Limited Resources

Lecture 6

- Problem solving: Selecting the right equation
- Density dependence in nature
- ➡ 'r' and 'K' selection
- Density-dependence in species that vary greatly in size (e.g., plants, fish)
- Modifying the logistic to incorporate competition from other species.











Sample Problem 2012 Midterm

→ If the early phases of population growth in one defined stretch of the river showed no density-dependence and unconstrained population growth of the mud snail, which equation would best predict the instantaneous rate of change of the population size?







Limits on Population Growth in Nature **Density-dependent effects:**

- →A. Direct effects of resource depletion: decrease in birth rate,
 - increased starvation (increased death rate)



Limits on Population Growth (cont' d) B. Indirect effects

- ➡1. Increased foraging effort required at high N higher predation hazard for adults higher death rate of young in the 'nest'
 - (even deer predate bird nests!)





2. Increased time devoted to social interaction; territorial defense requires increased effort, at the expense of other activities

Elephant Seal Male























Density-dependence in plants There is a law that describes density-dependence in plants: it is NOT logistic. -3/2 thinning rule:









Review

- Exponential growth considers potential population growth rate
- →Logistic growth considers effects of intraspecific competition
- More advanced models consider effects of two-species or higher-order interactions

























Summary

- The two logistic growth equations are used to describe population growth and project future N when there is intraspecific competition
- Density-dependence in nature is manifested in many ways
- 'r' and 'K' selection are outdated concepts that contributed to life history theory for a short time*
- Density-dependence in size-plastic species tends to follow a 'thinning rule'
- Competition between species will be modeled in a manner similar to density-dependence.

*but should now be relegated to the dustbin of history.

Next Lecture

Interspecific competition
 Read Chapter 13, Smith & Smith