Chapter 14 Interactions in Ecosystems

Chapter 14.4 Population Growth Patterns

Key Concept: Populations grow in predictable patterns

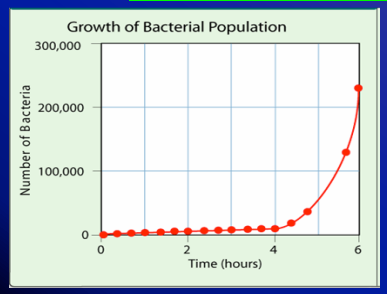
I. Changes in a population's size are determined by:
   - A. births
   - B. deaths
   - C. individuals who enter (immigration)
   - D. individuals who leave (emigration)

Population Change =
(births + immigrants) – (deaths + emigrants)

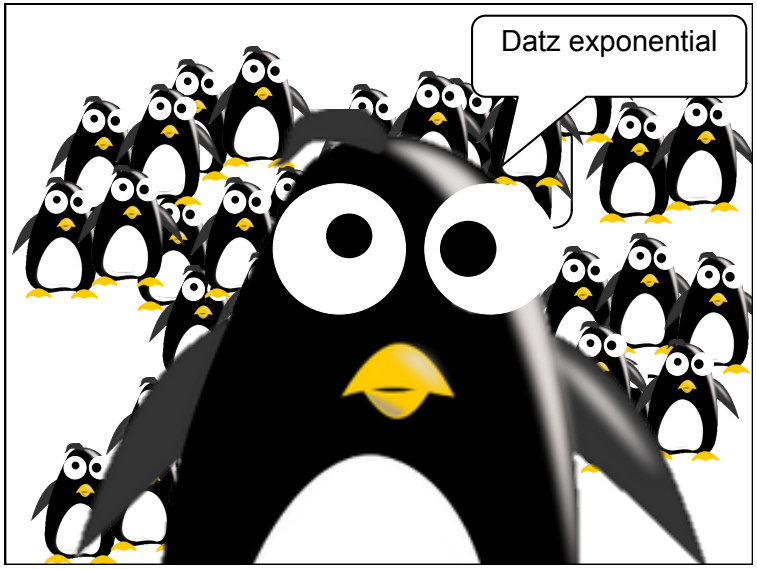
When would a population….

- …increase?
  - when there are more births than deaths
  - when immigration is greater than emigration
- …decrease?
  - when there are more deaths than births
  - when emigration is greater than immigration
- …stay the same?
  - when birth and death rates are equal
  - when immigration and emigration rates are equal

II. Population growth is available based on available resources
   - A. Exponential growth is when the individuals in a population reproduce at a constant rate.
     1. Exponential growth can only occur under ideal conditions with unlimited resources.

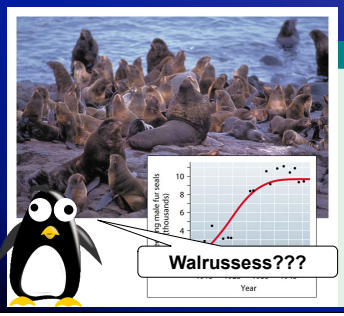


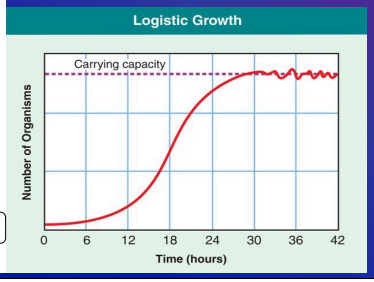
Time	Number of Cells	
0 minutes	1	$= 2^0$
20	2	$= 2^1$
40	4	$= 2^2$
60	8	$= 2^3$
80	16	$= 2^4$
100	32	$= 2^5$
120 (= 2 hours)	64	$= 2^6$
3 hours	512	$= 2^9$
4 hours	4,096	$= 2^{12}$
8 hours	16,777,216	$= 2^{24}$
12 hours	68,719,476,736	$= 2^{36}$



B. Logistic growth occurs when a population's growth slows or stops because resources become less available.

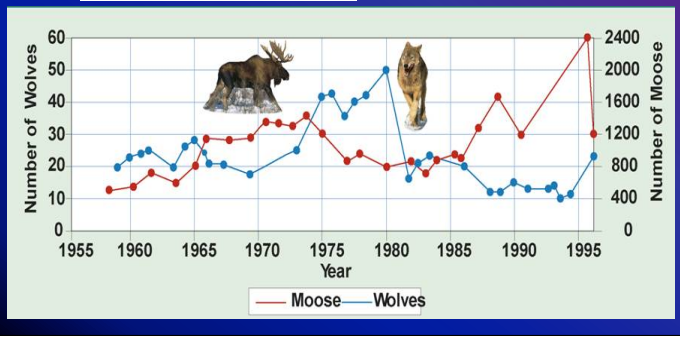
C. Carrying capacity is the number of individuals that a given environment can support.





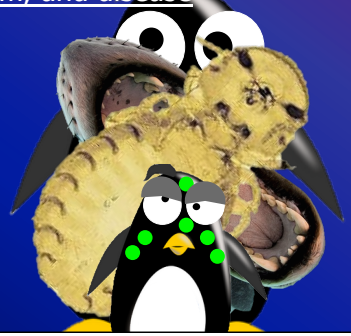
III. Ecological factors limit population growth

A. Limiting factors cause population growth to decrease, usually because a population reaches a certain size.



B. Density-dependant limiting factors limits population due to its size or density.

Examples: competition, predation, parasitism, and disease



C. Density-independent limiting factors affect all populations the same regardless of their size.

Examples: unusual weather, natural disasters, seasonal cycles, human activities, clear-cutting forests, damming rivers, etc.

Are the following limiting factors
density dependent or density independent?

1. Deer population drops because the wolf population that preys on them had increased.

   Density-Dependent (predation)

2. Orange trees frost over due to unusually cold temperatures.

   Density-Independent (seasonal cycles)

3. Small shrubs in the forest are continuously dying because sunlight is blocked by the population of larger trees.

   Density-Dependent (competition)

4. Polluted water is affecting the pH of a pond killing some fish eggs before they can hatch.

   Density-Independent (human activities)