

Population Biology

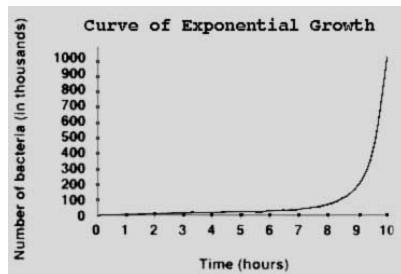
•A **population** is a group of individuals of a single species that simultaneously occupy the same general area.

Population Growth =

$$\text{Birth rate} + \text{Immigration} - \text{Death Rate} + \text{Emigration}$$

Exponential growth- growth pattern where a population grows faster as it increases in size

•Graph resembles a J-curve.



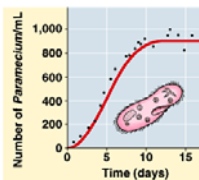
Limiting factors- environmental factors that restrict population growth.

i.e.-

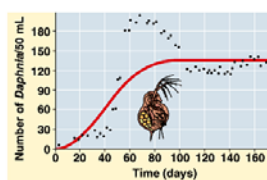
Carrying capacity- # of individuals in a population that an environment can just maintain ("carry").

Logistic growth- a description of idealized population growth that is slowed by limiting factors.

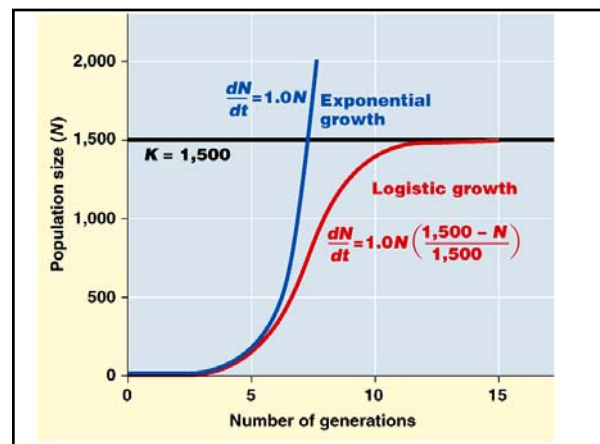
•Graph resembles an S-curve.



(a) A *Paramecium* population in the lab



(b) A *Daphnia* population in the lab



Life-History Patterns

r-strategists- populations of these organisms increase rapidly, then decline rapidly as conditions change.

- Live in unpredictable environments.
- Provide little or no parental care.
- Small body size, mature rapidly, reproduce early, and have short life spans.

i.e.- mosquitoes, spiders, bacteria

k-strategists- organisms that maintain population sizes at or near carrying capacity (k).

- Live in more stable environments
- Provide parental care
- Large, reproduce slowly, and are long-lived.

i.e.- elephants, humans, bears, and whales

Density-dependent factors increase their affect on a population as population density increases.

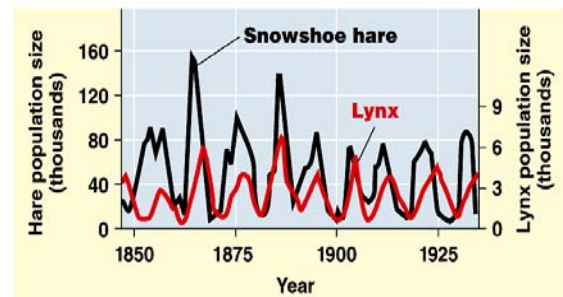
i.e.-competition, food, waste, disease

Density-independent factors are unrelated to population density, and there is no feedback to slow population growth.

i.e.- climate, weather, etc. (first frost)

Some populations have “boom-and-bust” cycles

- Populations of predator and prey often show periodic cycles, such as the 10-year cycle for the lynx and the snowshoe hare in the taiga of North America.



- For the lynx and many predators, the availability of prey often determines population changes.

- Notice that the hare population generally peaks before that of the lynx, and once the hare population falls, the lynx population follows.

