A.P. Biology *Name* _____

CH. 53 - Population Ecology

How many ants (*shown below - 6 ants / cm²*) would there be in an ant colony that is flat and one meter long on each side? _____

Dispersion Patterns Matching

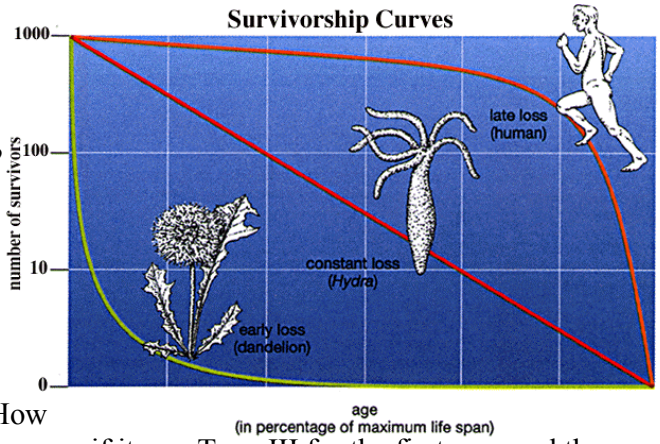
A - Clumped

B - Uniform

C - Random

_____ Trees of the same species in a tropical rainforest.
_____ King penguins on South Georgia Island in the South Atlantic Ocean.
_____ Butterfly fish.
_____ Mushrooms on a rotting log.
_____ Black walnut trees (Black walnut trees secrete toxins from their roots)
_____ Termites on the plains of the Serengeti.
_____ The *most common pattern* of organism distribution.

Survivorship Curve



_____ Which organism species produces the most offspring?
_____ Which organism species shows high early mortality?
_____ Which organism species shows a constant death rate over their life span?

In the natural world, many species show survivorship curves that are combinations of the standard curves. How would an open nesting songbird's survivorship curve appear if it was Type III for the first year and then Type II for the rest of its life span? Sketch this curve on the survivorship curve graph above

53.2 Exponential Population Growth

Expressed as an equation:

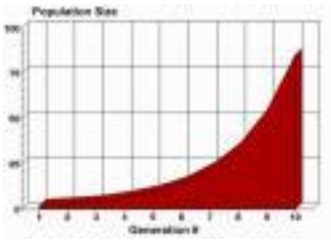
$$\frac{\Delta N}{\Delta t} = B + I - D - E$$

•Where: ΔN = the change in number of individuals
Δt = over a period of time
= = equals
B = births, I = Immigrants, D = Deaths, E = Emigrants

Using the formula D = dN, how many deaths would you expect per year is d = 0.010 annually in a population of:

500 _____ 700 _____ 1700 _____

If birth rates = death rates, the population is experiencing ZPG, or _____ _____ _____.

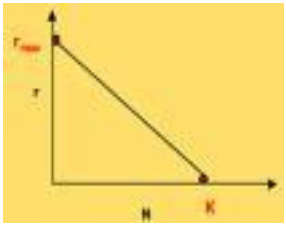


What type of population growth is shown by the graph to the left?

_____ _____ _____

•This type of growth only occurs in natural populations when they are exploiting a new habitat (with beaucoups resources!)

53.3 Logistic Growth

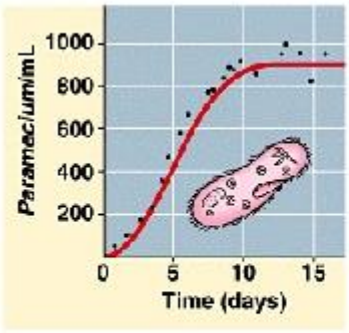


What type of population growth is shown by the graph to the left?

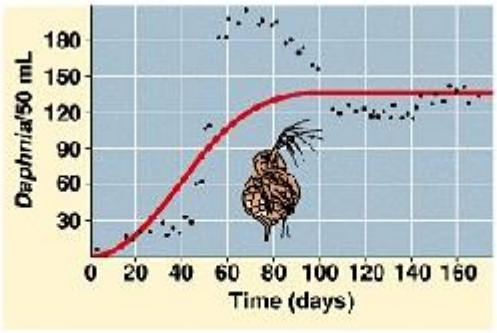
_____ _____ _____

What is Carrying Capacity (K)?

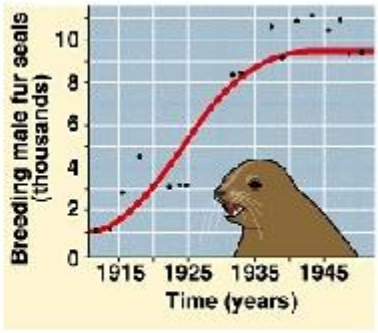
Is it static or dynamic?



(a) A *Paramecium* population in laboratory culture



(b) A *Daphnia* population in laboratory culture



(c) A fur seal (*Callorhinus ursinus*) population on St. Paul Island, Alaska

Concerning the diagram above:

_____ Which of the three populations most closely approximates logistic growth?

_____ Which of the three growth curves most dramatically overshoots its carrying capacity?

_____ Which of the three populations has the shortest reproductive period?

_____ Which of the three is a K-strategy species?

3

List 5 limiting factors that can influence carrying capacity.

1)

2)

3)

4)

5)

53.4 Life History Traits

_____ The proper name for this plant is the _____
_____ The plant is also called the _____ plant.
_____ This plant is an example of ____-_____ reproduction.
_____ After flowering, the plant produces seeds and then _____.
_____ The animal that the book uses to illustrate this point is the _____.
_____ This life history is the plant's response to an eratic _____.
_____ The proper term for this type of reproduction is _____.
_a._____ By contrast, the reproductive method utilized by an
_b._____ oak tree is called a. _____ _____ or b._____.

r and K Selection

•Two different ecological species categories (r and K) are distinguished by their strategies for success. *(Success being their long-term presence in an ecosystem.)*

r Strategy Species

•high intrinsic rate of increase (r)
•reproduce early and have many offspring
•offspring are small, mature early, and receive limited or no parental care, good offspring dispersal
•found to undergo wild swings in their population numbers.
•Examples: bacteria, ants, mosquitoes, mice, dandelions, oysters
• energy used to make each individual is low
•short life expectancy

K Strategy Species

•low intrinsic rate of increase (r)
•reproduce late and have few offspring
•long life expectancy
•offspring are large, mature slowly, and often receive intense parental care
•populations are stable and normally found at the carrying capacity (K)
•Examples: coconut palms, whales, redwoods, man
•Includes many of the species in danger of extinction.
•energy used to make each individual is high

53.5 Population Growth Regulation

Compare and contrast these two terms:

density-independent regulation

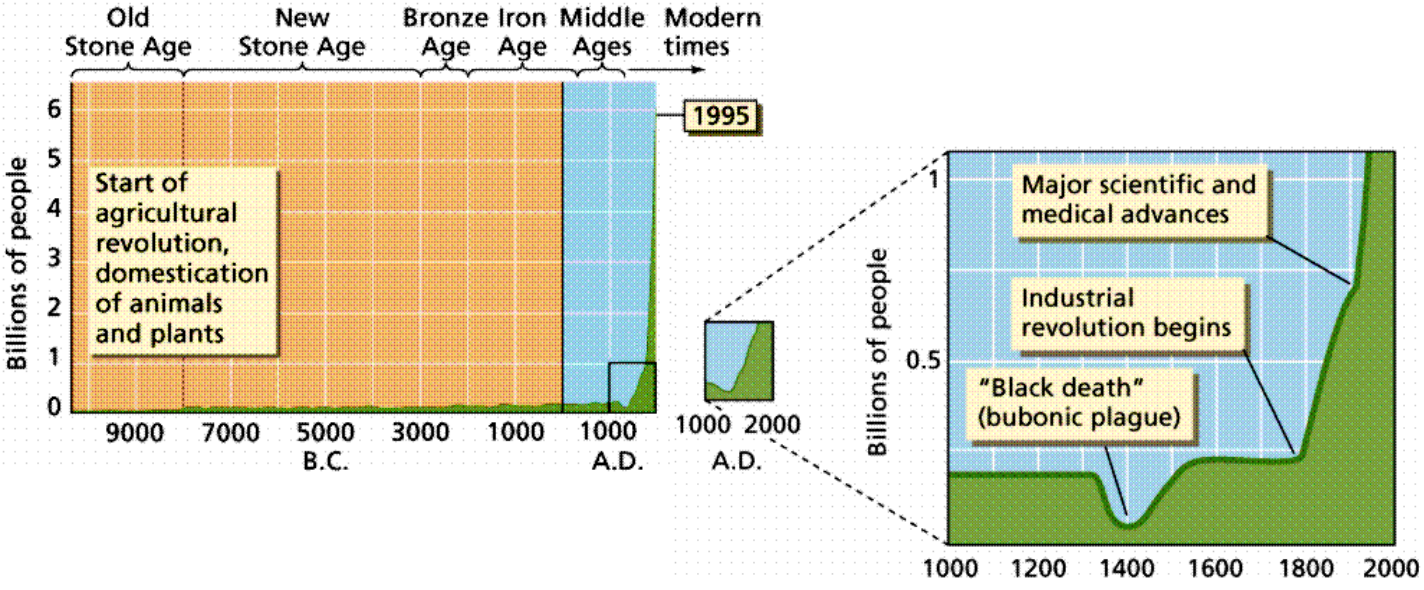
density-dependent regulation

Density-Dependent Population Regulation

Negative Feedback Mechanism	Explanation	Example
Competion for resources		
Territoriality		
Disease		
Predation		
Toxic wastes		
Intrinsic factors		

53.6 Human Population

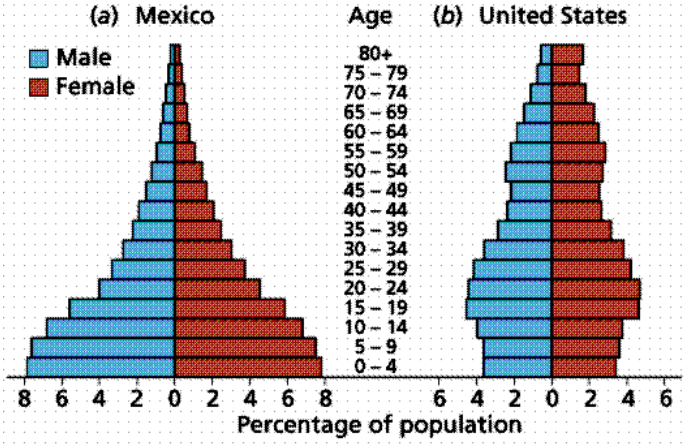
HUMAN POPULATION



Demography

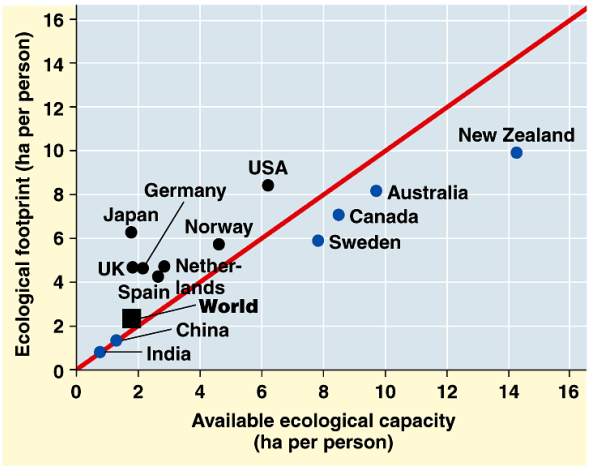
•The statistical study of populations.
•"demos" = people, "graphos" = measurement
•Helps us predict how populations will change in the future.

The characteristics of a population can be illustrated graphically by using a *population pyramid* - a bar graph using single year or five-year categories.
•Males enumerated to the left, females to the right.
•Shows population composition by age and sex.



The age distribution of human males and females in 1990 in the populations of Mexico (representing rapid growth) and the United States (showing slow growth).

Can the world's population sustain an *ecological footprint* that is currently the average American footprint? Explain.



What is the Earth's carrying capacity for our human population?