

Population Growth: Factors that control population size.

Factors that increase population size:

Favorable environmental conditions (light, temp., nutrients)

High natality, generalized niche, sufficient food & habitat, few competitors, suitable predatory defense mechanisms, adequate resistance to disease & parasites, able to migrate, flexible

Factors that decrease population size:

Unfavorable environmental conditions, low natality, specialized niche, deficient food, habitat unsatisfactory or seriously impacted, too many competitors, unsuitable predatory defenses or defenses against disease or parasites, unable to migrate, inflexible (unable to adapt)

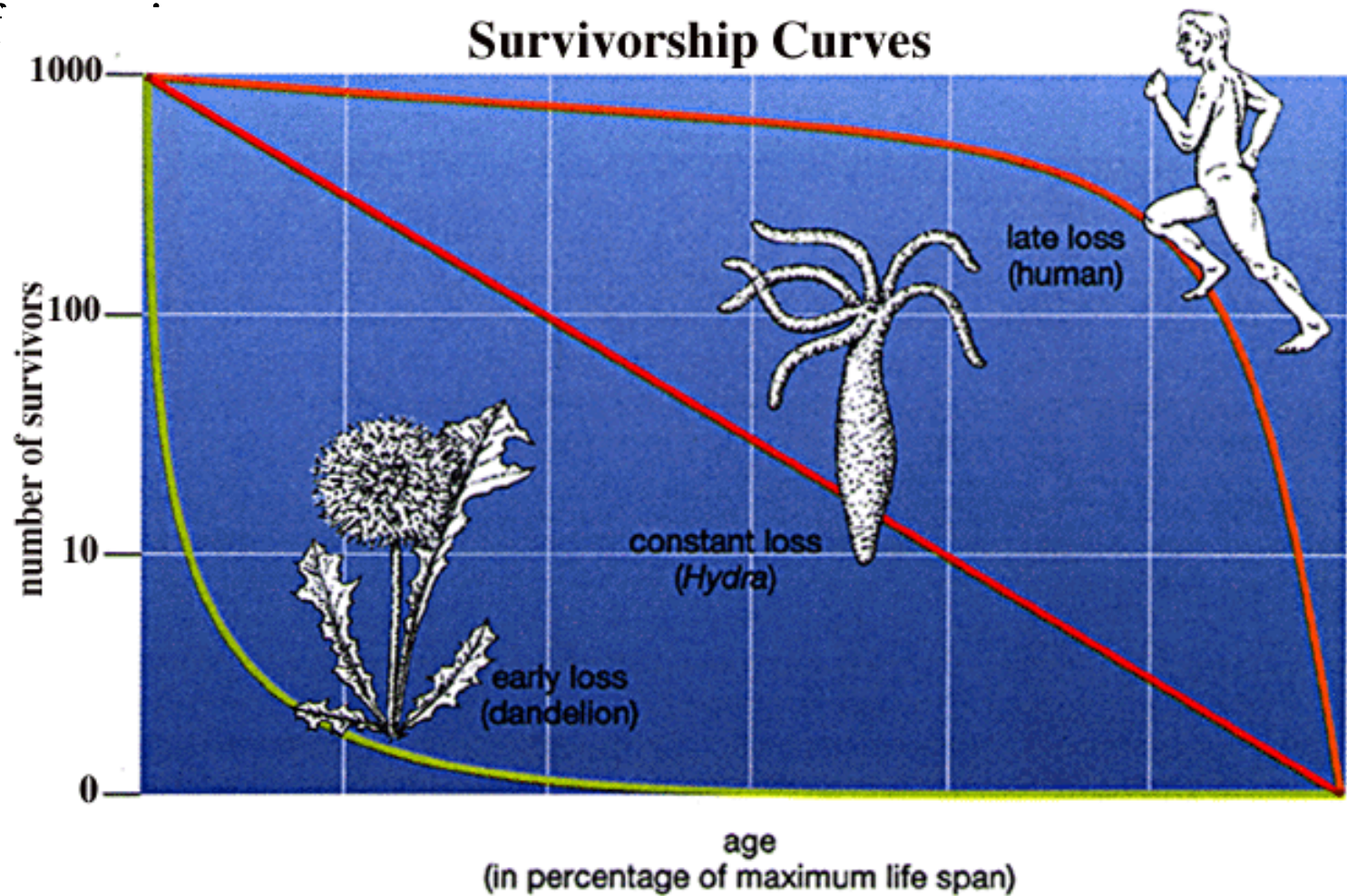
1. **Natality** – Production of new individuals by birth, hatching germination, or cloning. It is the main addition to populations. It is tied strongly to environmental conditions such as nutrition, climate, soil, water, & sometimes social.

1. **Fecundity** – Physical ability to reproduce.

1. **Fertility** – Actual number of offspring produced.

1. **Mortality (death rate)** = Number of organisms that die in a certain time period divided by the number alive at the beginning of that period.

1. Survivorship (life expectancy) – The % of a group that survives to a certain age. Life span – longest period of life reached by a given type of



http://www.biologycorner.com/resources/survivorship_1g.gif

1. Biotic potential – Maximum reproductive rate of an organism.

1. Calculating population growth: N_1 (Current Population) = N_0 (Original population) + B (births) – D (deaths) + I (immigration) – E (emigration)

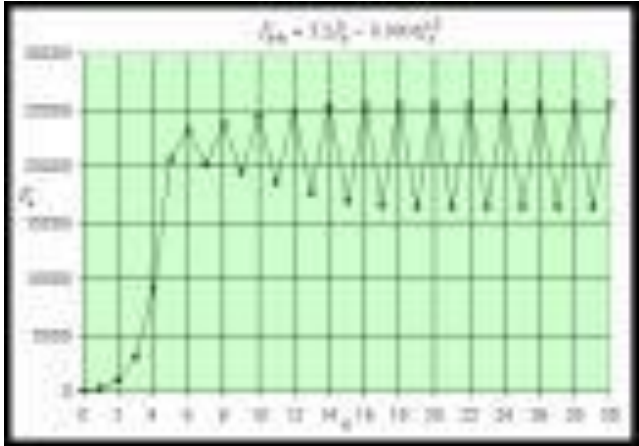
In 1995, the population of a small island in Malaysia was 40,000. The birth rate was measured at 35 per 1000 pop./yr. The death rate = 10 per 1000/yr., immigration = 100/yr. and emigration = 50/yr. Calculate the population after 1 year.

Doubling time – 70 divided by the annual % of growth (r) = doubling time of a population.

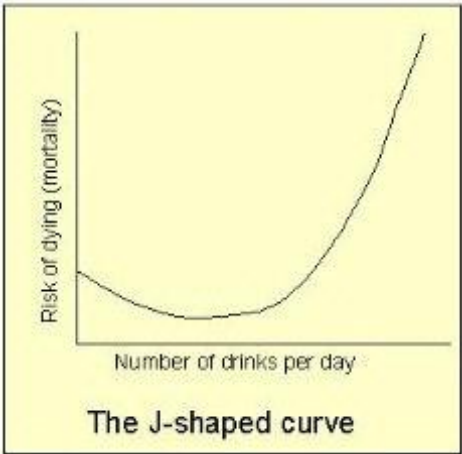
Population increase
in a year \div Population at the start of the year $\times 100$ = Annual
population growth rate (%)

Calculate the annual growth rate for Malaysia.

1. Malthusian growth (irruptive growth) population explosion (overshoots K) followed by a population crash or die back.



1. Exponential growth – “J” – growth at a constant rate of increase per unit of time. The existing population is multiplied.

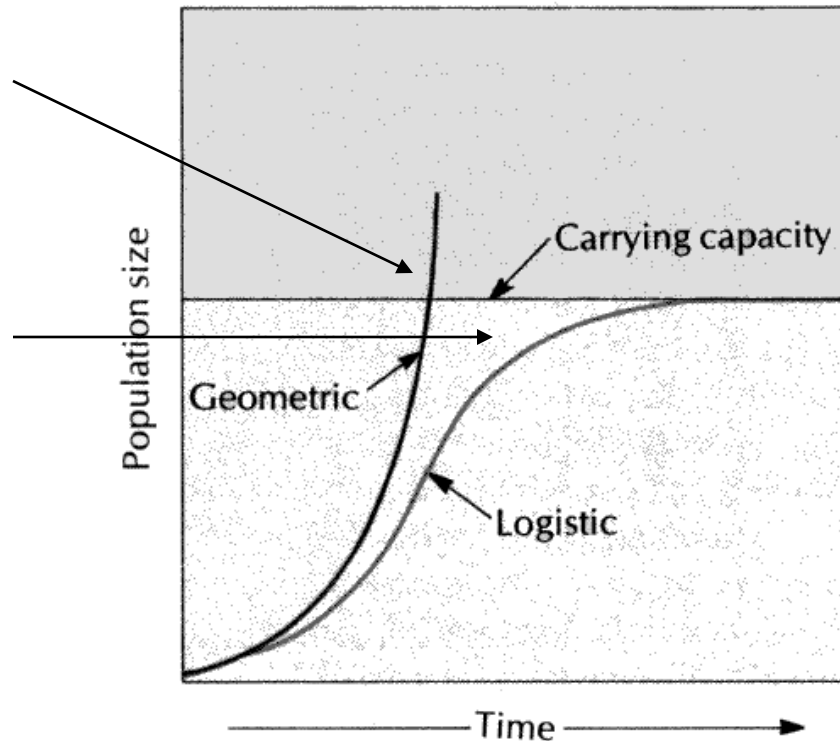


1. Arithmetic growth - growth that increases at a constant amount per unit of time. A constant amount is added to the population.

1. Logistic growth – “S” – A species grows logistically but slows as they approach the carrying capacity of the environment.

Biotic potential

Environmental
resistance



1. Limiting factors –

Intrinsic (between individuals of the same species or within the individual) vs Extrinsic (imposed from outside the population)

B. Biotic (caused by living organisms) or abiotic (caused by non-living components of the environment).

C. Density-dependent (effects are stronger as pop. Density increases. Includes: Interspecific and intraspecific interactions.

D. Density-independent (the effect is the same regardless of population density. Generally abiotic factors such as weather or climate, pH, temp.

1. Environmental resistance – factors that tend to reduce population growth.

1. Carrying capacity = K The limits imposed on population growth by finite space & resources.

Malthusian “strategies”: Organisms tend to have the following characteristics & are regulated by extrinsic factors (like predators):

1. Short life spans
2. Rapid growth
3. Early maturity
4. Many small offspring
5. Little parental care
6. Adapted to unstable environment
7. Pioneers
8. Niche generalists
9. Prey
10. Low trophic levels



Logistic “strategies” tend to be regulated by intrinsic factors:

1. Long life 2. Slower growth 3. Late maturity 4. Fewer large offspring 5. High parental care & protection 6. High investment in individual offspring 7. Adapted to a stable environment 8. Later stages of succession 9. Niche specialists 10. Predators 11. High trophic level.



Population assessment:

Mark re-capture

100 Monarch butterflies were captured, marked & released.

The next day, another 100 butterflies were captured, including 20 marked. Calculate the population of Monarch butterflies.

Originally marked/ P = # marked in 2nd capture/# captured 2nd time.

100/P = 20/100 Estimated population = 500