Population Growth

What is the population growth?

- The difference between the instantaneous birth rate and instantaneous death rate (it is the rate of population increase.
- The populations are dynamic.
- The nature of organisms, number of individuals which may change hourly, daily, yearly. Accordingly, the certain species becomes abundant by individual or decline or extinct.

To understand the population

- We need to know how to they grow?
- What are the natural factors which limit the population growth?

Population growth Models

- 1. The Exponential Growth Model:
- a) Population increase= *r* = the difference between the birth rate (b) and death rate (d)

b) Emigration (e) and Immigration (i) So,

r = (b-d) + (e-i)

- - individual movement may have a potential influence on population growth.
- The simplest model assumes that the population grows with out limits (biotic potential).
- In this growth the emigration = immigration is equal
- So the population of any species increase without any limits:

•
$$\frac{dN}{dt} = r_i N_i$$

 N= population size, t= time, r_i= intrinsic rate of natural increase for that population

The Logistic Growth Model

- Carrying Capacity *K*: defined as the maximum number of individual that the environment can support.
- When the population approaches its carrying capacity Growth rate decrease rapidly
- Because fewer resources is available for the new individual to use.
- So,
- The growth will be limited by one factor or more

The Logistic Growth Model

- $\frac{dN}{dt} = rN(\frac{K-N}{K})$
- In this model the $\frac{dN}{dt}$ is equal to the intrinsic rate of natural increase.
- r multiplied by N is the number of individual present at any time, (available resources)
- Sigmoidal growth curve.

Factors that regulate Population

1- Density-dependent effect

Negative feedback

a) carrying capacity, b) competition, c) predators, d) accumulation of wastes toxicity, e) behavioural changes

Positive feedback

Allee Effect:

growth rate increase with population size

• *Ex.* Be in group to deter the predators

• 2- Density-Independent effect

- Population growth is unrelated to the population size
- External environment (erratic or high fluctuation growth)

• 3- Population Cycle

- Cyclic pattern of increase and decrease
- Which depend on two drivers:
- 1) food plants
- 2) Predators