MODULE 2/3

CHAPTER 13
ORGANISMS AND POPULATIONS

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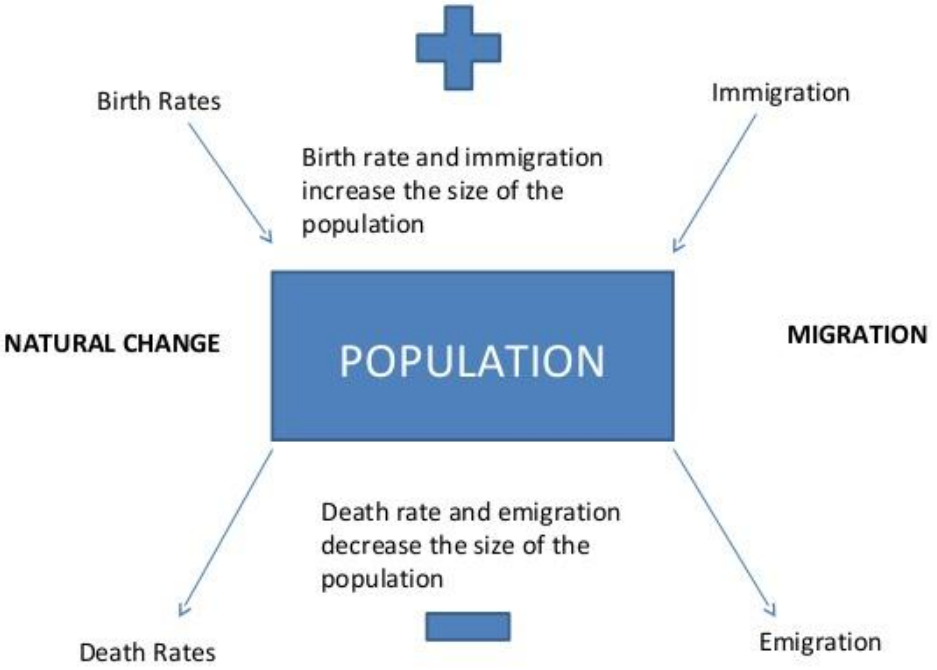
POPULATION

POPULATION ATTRIBUTES

Some significant attributes that populations possess are –

birth rate / natality, population density, death rate/ mortality, sex ratio, age distribution.



Age distribution :

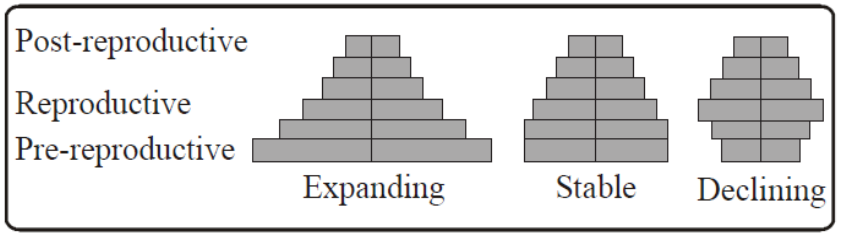
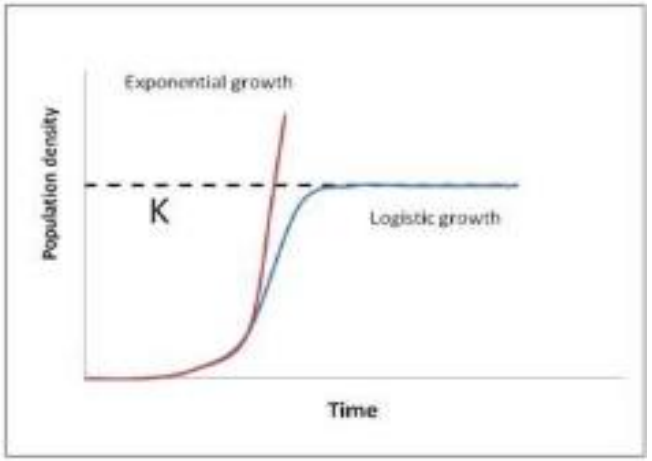


Fig. : Representation of age pyramids for human population

POPULATION GROWTH

- **Population Growth Models:**
- There are two models of population growth:
- **Exponential Growth Model:** When the resources availability is unlimited in the habitat, the population grows in an exponential or geometric fashion,
- The equation is: dN/dt= (b-d)*N
- Let (b-d)= r,
- then the equation is,



- $$\frac{dN}{dt} = rN$$
- When a population shows exponential growth, the curve plotted with N in relation to time assume J shape.

Equation for exponential growth can be

$$\frac{dN}{dt} = (b - d) \times N$$

Let $(b - d) = r$, then

$$\frac{dN}{dt} = rN \quad \text{or} \quad N_t = N_0 e^{rt}$$

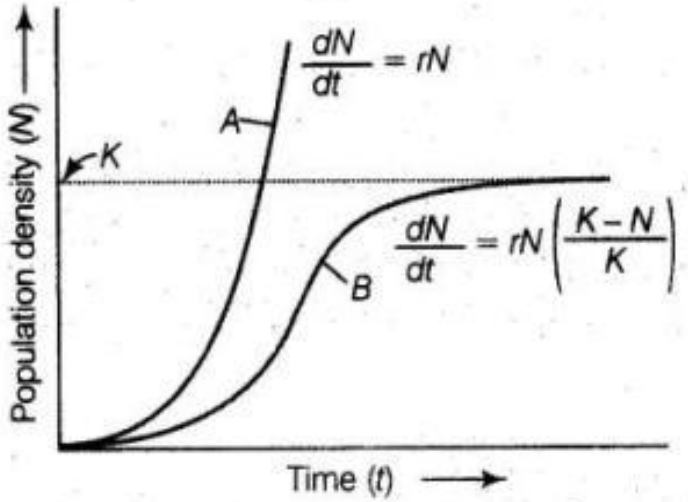
Where, N = Population size, N_t = Population density after time t

N_0 = Population density at time zero,

r = Intrinsic rate of natural increase

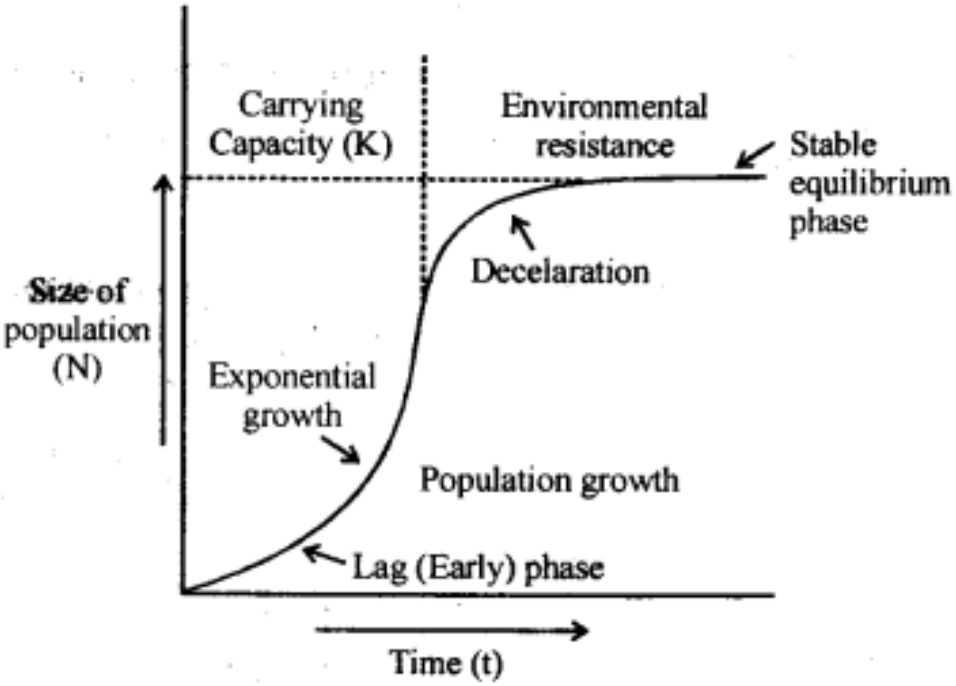
e = Base of natural logarithms (2.71828), b = Birth rate and

d = Death rate



Population growth curve *A* when responses are not limiting the growth, plot is exponential, *B* when responses are limiting the growth, plot is logistic, *K* is carrying capacity

GROWTH CURVES
(A) Sigmoid or S-shaped growth curve



Logistic population growth curve or S-shaped curve

Lag phase:
Positive acceleration phase:
Logarithmic or exponential phase :
Negative acceleration phase :
Stationary (Plateau) phase : **there is zero growth rate**.

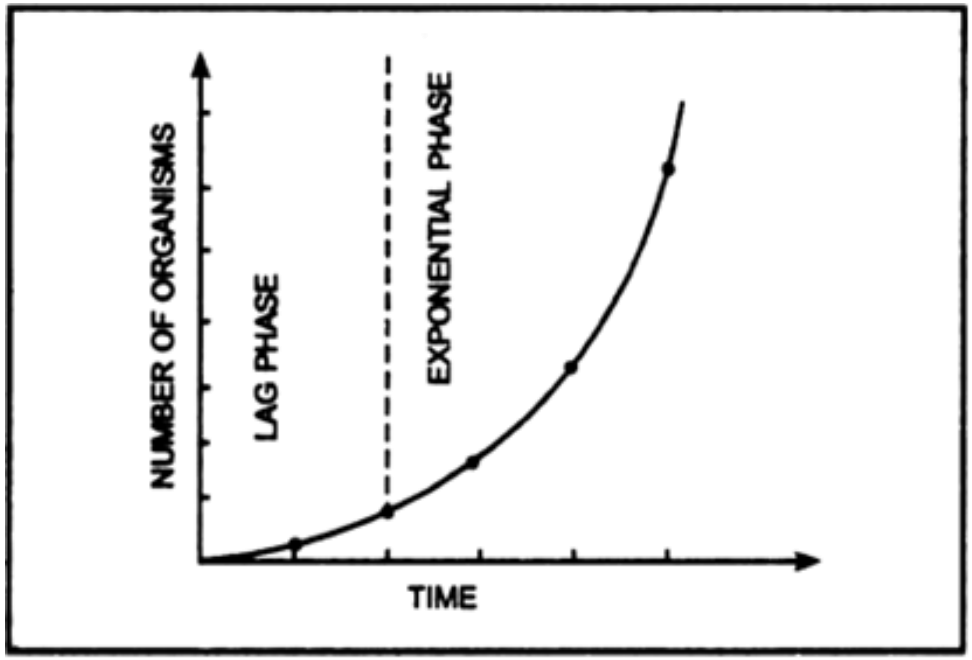
S-shaped curve is also called **logistic curve**. Sigmoid growth curve was described by **Verhulst, (1839).**

(B) J-shaped Growth curve

It has only **two phases :-**

Lag phase :

Logarithmic or Exponential phase :



Verhulst-Pearl Logistic Growth equation is given below–

Where, N = Population density at time t.

r = Intrinsic rate of natural increase.

K = Carrying capacity