Population Ecology

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The characteristic of a population with low value of intrinsic growth (r = 0.2) is

(1) Late sexual maturity and small clutch size

(2) Early sexual maturity and small clutch size

(3) Late sexual maturity and large clutch size

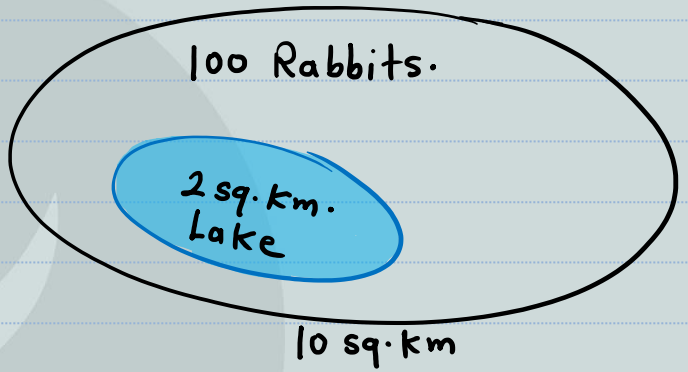
(4) Early sexual maturity and large clutch size

" $r = b - d$ "

8. Population Density (N): No. of individual per unit area.

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}}$$

$$\text{Pop. density} = \frac{\text{No. of individual}}{\text{Total area.}}$$



1. Crude density:

$$= \frac{100}{10}$$

$$= 10 \text{ Rabbit/sq. km.}$$

2. Specific density (Abundance): $= \frac{\text{No. of indi.}}{\text{Habitable}}$

$$= \frac{100}{8}$$

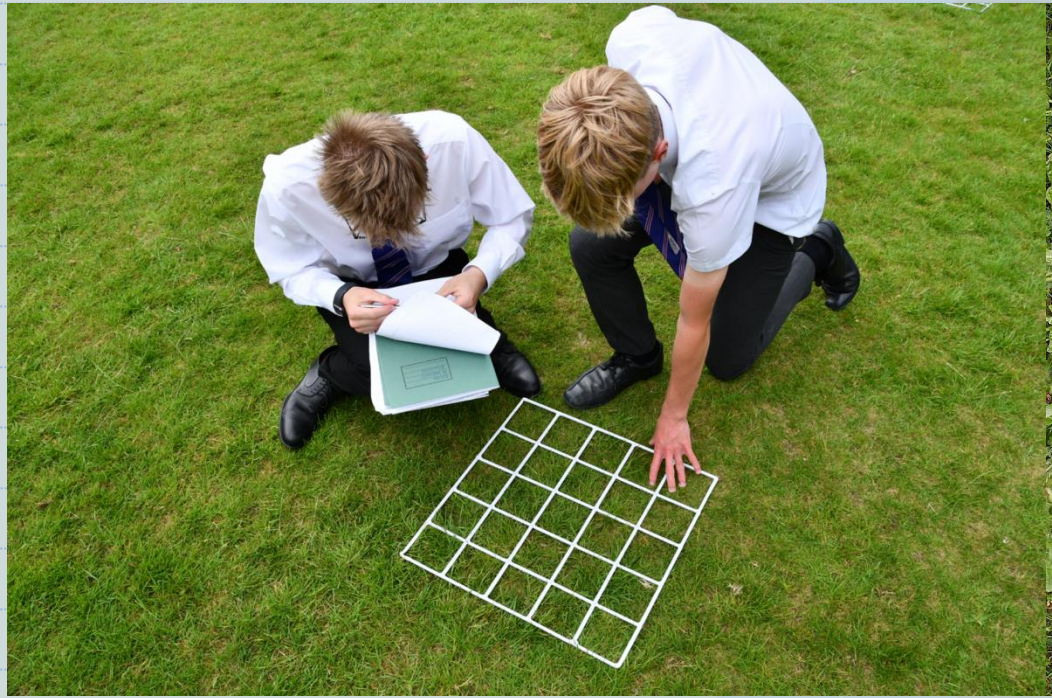
$$= 12.5 \text{ Rabbit/sq. km.}$$

Density calculate :

1. List quadrate method.
2. Line trasect method.
3. Belt transect method.
4. pit fall trap.
5. Sweep net method.
6. etc.

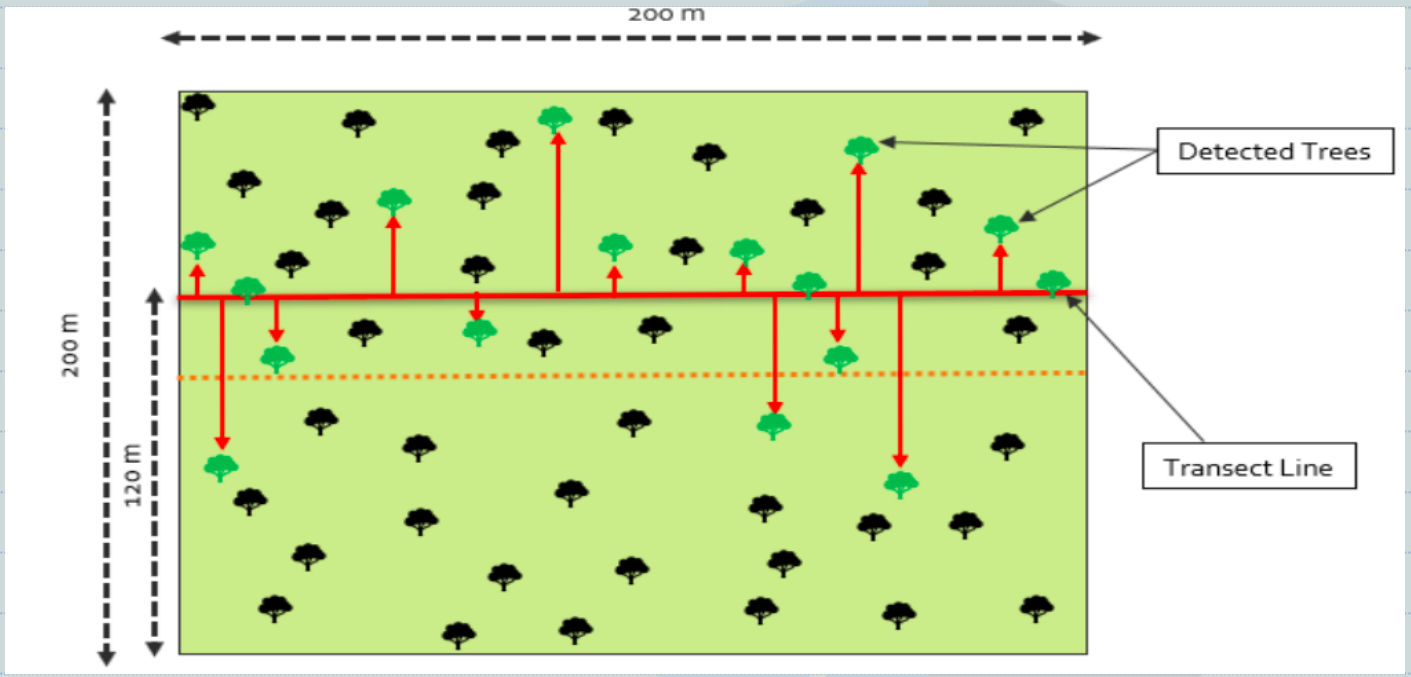
Mark-capture Recapture method.

1. List Quadrate Method





2. Line / Belt transect Method

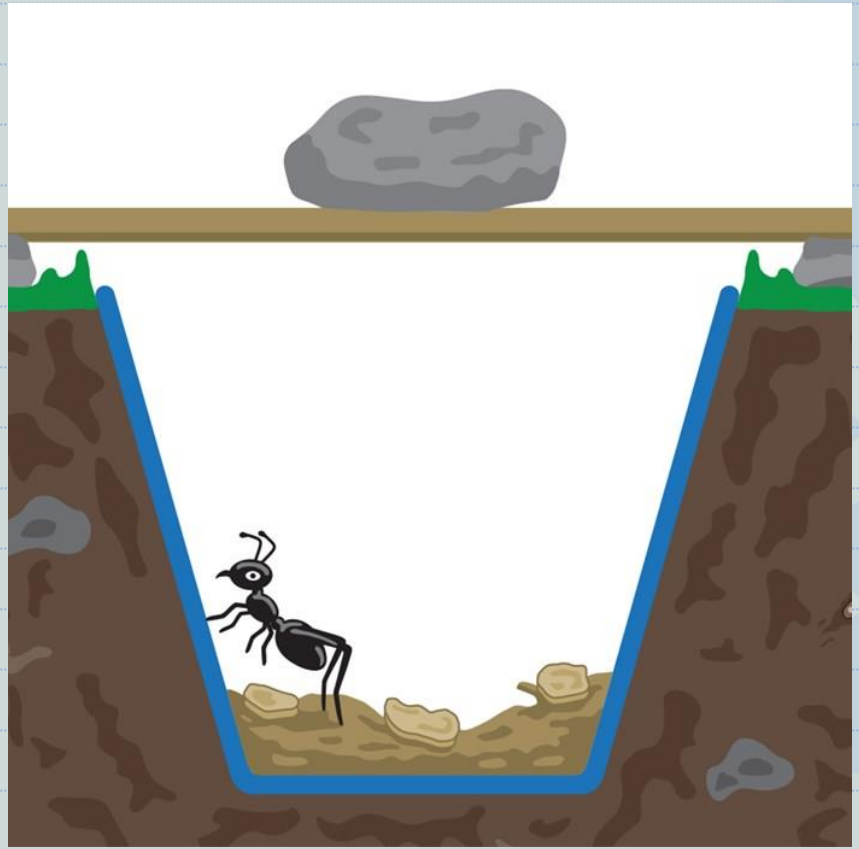


3. Suction traps





4. Pitfall traps



"Cursorial's"

5. Mark-Recapture technique :

Steps

1. Catch / trap
2. Mark
3. Release
4. 2nd catch
   - Marked
   - Unmarked.

C_1 : Catch 1

C_2 : Catch 2

M_1 : Marked one in catch 1.

M_2 : Marked one in catch 2.

$$N = \frac{C_1 \times C_2}{M_2} = \frac{100 \times 100}{10}$$

$$= \frac{10000}{10} = 1000 \text{ fish}$$

Fish density :



e.g. 1st catch = 100

2nd catch = 100

90 - Unmarked

10 - Marked.

10 marked ⟶ 100 fish.
1 marked ⟶ 10 fish.
100 marked ⟶ 10 X 100 = 1000 fishes

Example : Rabbit

1st ___ 30
2nd ___ 15
5 - marked
10 - Unmarked.

Rabbit density = ????

N = 90

Assumption:

1. Tag should not affect the mortality.
2. Unmarked and marked one should mixed properly.
3. Equal probability to being captured - marked & Unmarked.
4. No migration.

Pattern of Dispersion

Resources distribut^{n}.
Intra-specific int^{n}.

- Spatial position relative to each other in population.

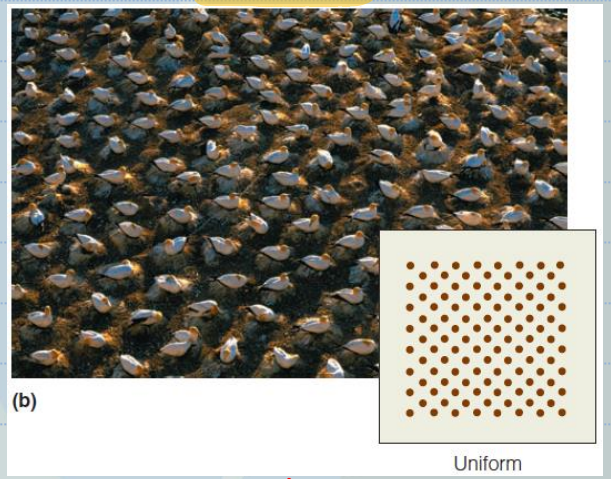
(Rare)

Random



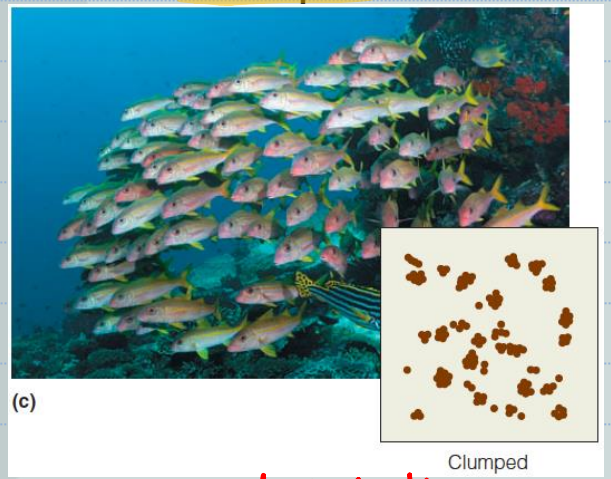
- Evenly distri.
- No interaction

Uniform



- Evenly distri.
- Competition, Social beha.
- Inhibition, Territorial.

Clumped



- Uneven distribution.
- positive int^{n}.

A tree species has leaves that contain an allelochemical compound that leaches into the soil and prevents the growth of its own seedlings. What kind of dispersion pattern is likely as a result of this process in the adult population of this species?

1. Random
2. Clumped
3. Uniform
4. Bimodal

1. Nearest neighbor methods

C	R	U
NNI = 0	NNI = 1	NNI = 2.15

2 .Variance / Mean methods

C	R	U
V/M = >1	V/M = 1	V/M = 1>

The following table shows the mean and variance of population densities of species A, B and C.

Statistic	Species A	Species B	Species C
Mean $\overline{x}$	5.3	7.05	5.30
Variance s^2	5.05	0.35	50.5

Based on the above, which of the following statements is correct?

(1) Species A and B show uniform distribution, whereas species C shows clumped distribution.

(2) Species A shows random distribution, species B shows uniform distribution, and species C shows clumped distribution.

(3) Species A and B show clumped distribution, whereas species C shows uniform distribution.

(4) Species A shows clumped distribution, species B shows random distribution, and species C shows uniform distribution.

Age Pyramid

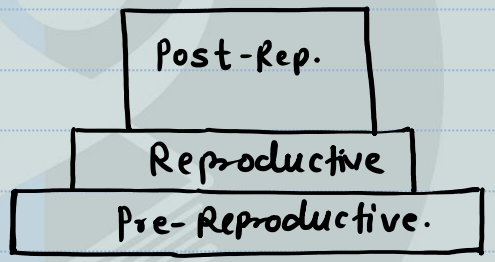
"Demographic" → Population graphical / statistic's Represent.

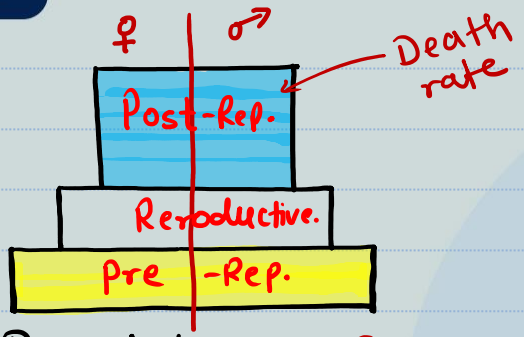
Age classes : or "Cohort" : Group of indi. with similar age.

✓ 1. Pre-reproductive :

✓ 2. Reproductive :

✓ 3. Post-reproductive :

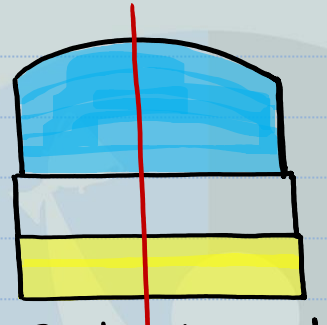




Broad base (1)

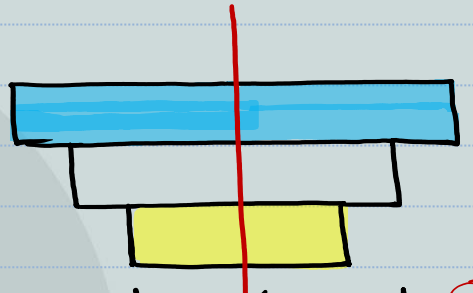
- Increasing

→ "Natural population"



Bell shaped (2)

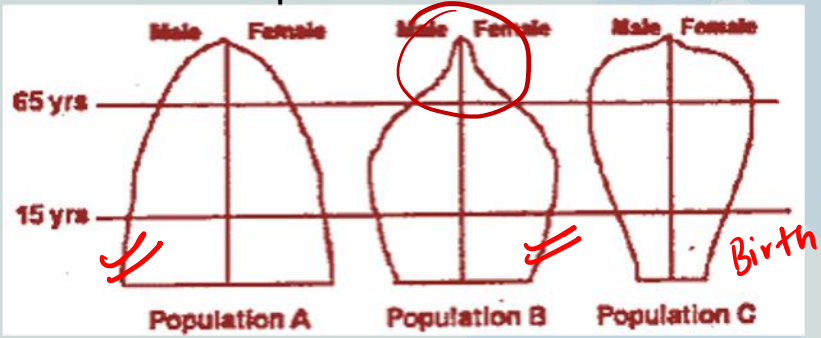
- Stable



Urn-shaped. (3)

- Decliwing.

Given below are the population pyramids of three different populations A, B and C depicting the relationship between birth and death rates in each.



Based on the population pyramids given above, which one of the following is **INCORRECT**?

(1) Population B has slower growth rate than population A.

(2) Population C has birth rate higher than its death rate.

(3) Population A represent a rapidly growing population.

(4) Population B has the highest death rate among the three populations.

Among the following which trend shows the decreasing population-

(1) More Individual in post reproductive stage

(2) More individual in Pre-reproductive stage and reproductive

(3) Less Individual in pre- reproductive stage & more in post reproductive stage

(4) Less individual in reproductive stage & more in pre-reproductive stage

Generation time / Doubling time

" Time gap bet^{n} birth and 1st age of Reproduction." $= \frac{\ln 2}{r}$

e.g. E.coli

1hr $\Rightarrow$ (8)

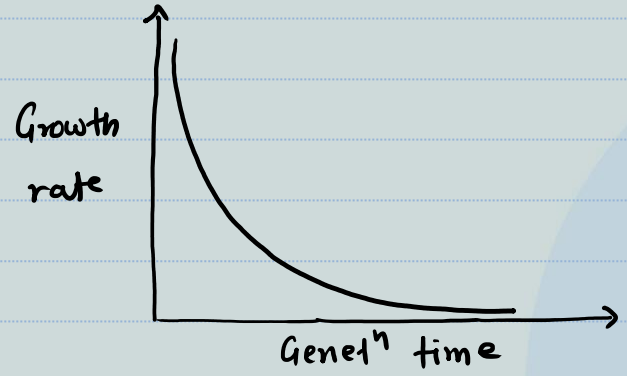
1 $\xrightarrow[\text{min.}]{20}$ 2 $\xrightarrow[\text{Min.}]{20}$ 4 $\xrightarrow[\text{min.}]{20}$ 8

$$\text{Generation time} = \frac{1}{\text{Growth rate.}}$$

e.g. Animal cell

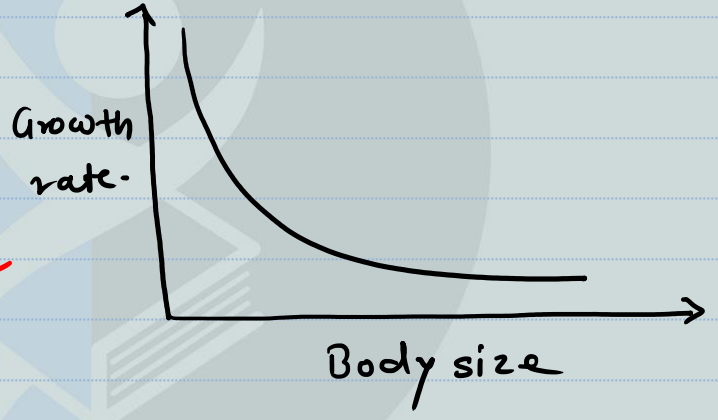
3day $\Rightarrow$ (8)

1 $\xrightarrow[\text{Hrs}]{24}$ 2 $\xrightarrow[\text{Hrs}]{24}$ 4 $\xrightarrow[\text{Hrs.}]{24}$ 8

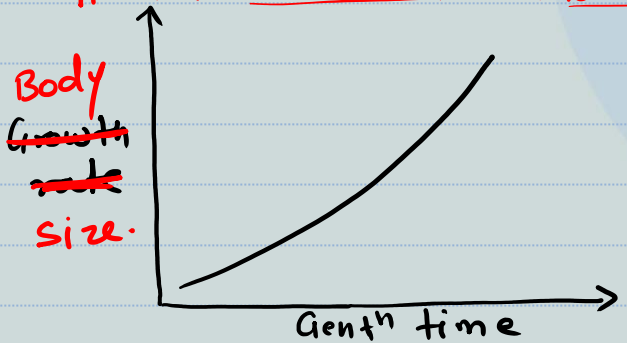


II. Growth rate of body size

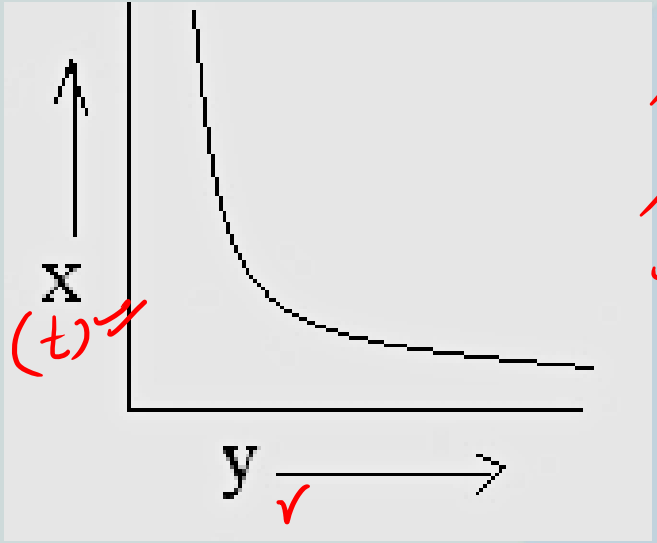
$$\text{Growth rate} = \frac{1}{\text{Body size}}$$



Generation time ∝ Body size.



The curve shown below shows a relationship between



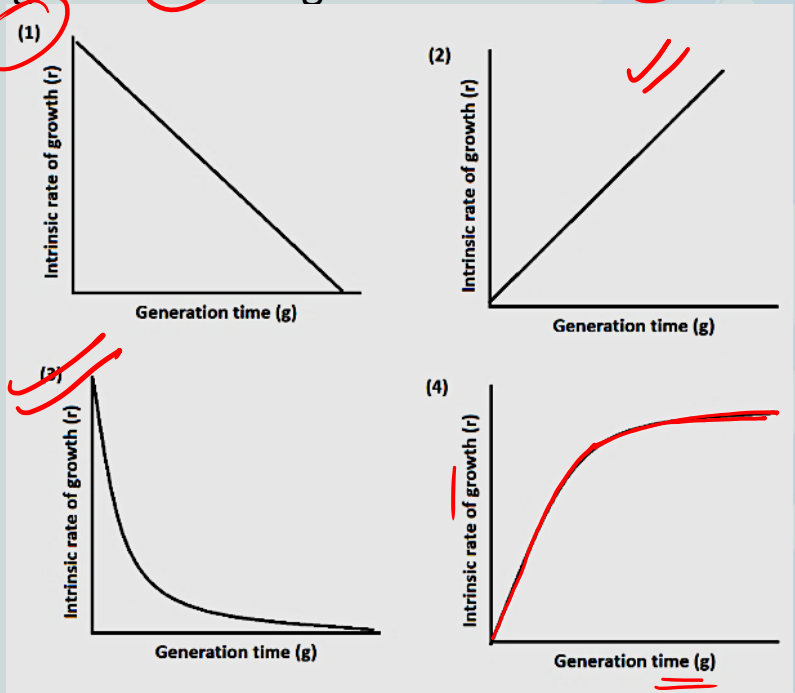
(1) Time (X) and Population density (Y)

(2) Body size (X) and generation time (Y)

(3) Generation time (X) and intrinsic rate of growth (Y)

(4) Fish length(X) and fish body weight(Y)

Among the following which graph best represent relationship between intrinsic rate of growth 'r' and generation time 't'



HAPPY LEARNING

THANKS

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