Ecological Niche

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- Definition's about Niche
- fundamental Niche
- Realised Niche
- Connell's experiment
- Gause exclusion principles.

Gause's 'Competitive exclusion' principle states that two species with identical niches cannot coexist indefinitely. Which of the following statements is the most appropriate regarding the validity of the principle?

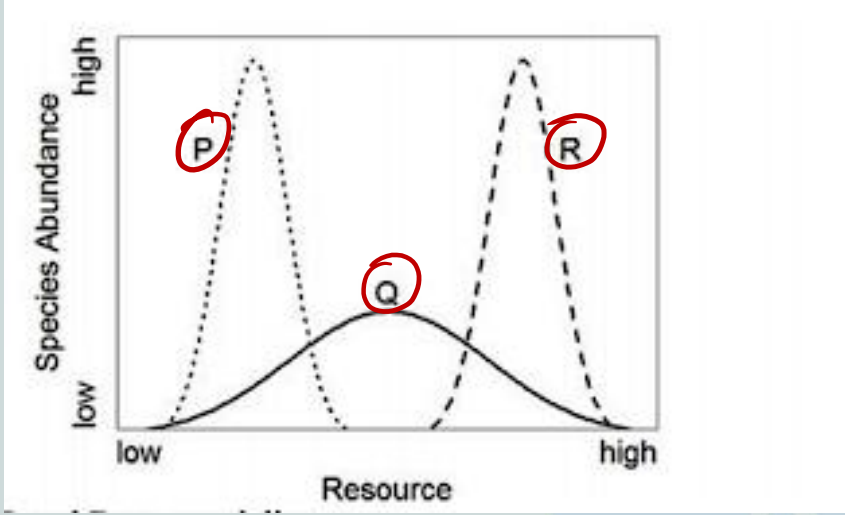
(1) It depends on how one defines niche.

(2) There are in nature many instances of continued coexistence of closely related species.

(3) The principle is universally true.

(4) It does not predict the outcome where, both the species are equally strong competitors

The abundances of three species (P, Q, and R) were measured along a resource gradient. The resultant pattern is summarized in the figure. Which of the following statements can be inferred from niche theory?



(A)P is a generalist; Q and R are specialists.
(B)Q is a generalist; P and R are specialists.
(C)P and Q are generalists; R is a specialist.
(D)P and Rare generalists; Q is a specialist.

Three bird species with similar habitat and diet preferences co-exist in a habitat. For these species, which one of the following statements is most likely to be correct?

(1) The fundamental and realised niches of these species are same. X

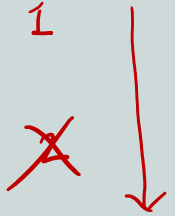
F > R

(2) Their fundamental niches are greater than their realised niches.

(3) Their realised niches are greater than their fundamental niches.

(4) The fundamental and realised niches both will expand.

You observed the two species of barnacles, species 1 and species 2, occupy upper and lower strata of intertidal rocks, respectively. Only when species 2 was removed by you from the lowers strata, species 1 could occupy both the upper and lower strata. From the choice given below what would be your inference from these observations.



(1) Upper strata of intertidal rocks is the realised niche of the species1

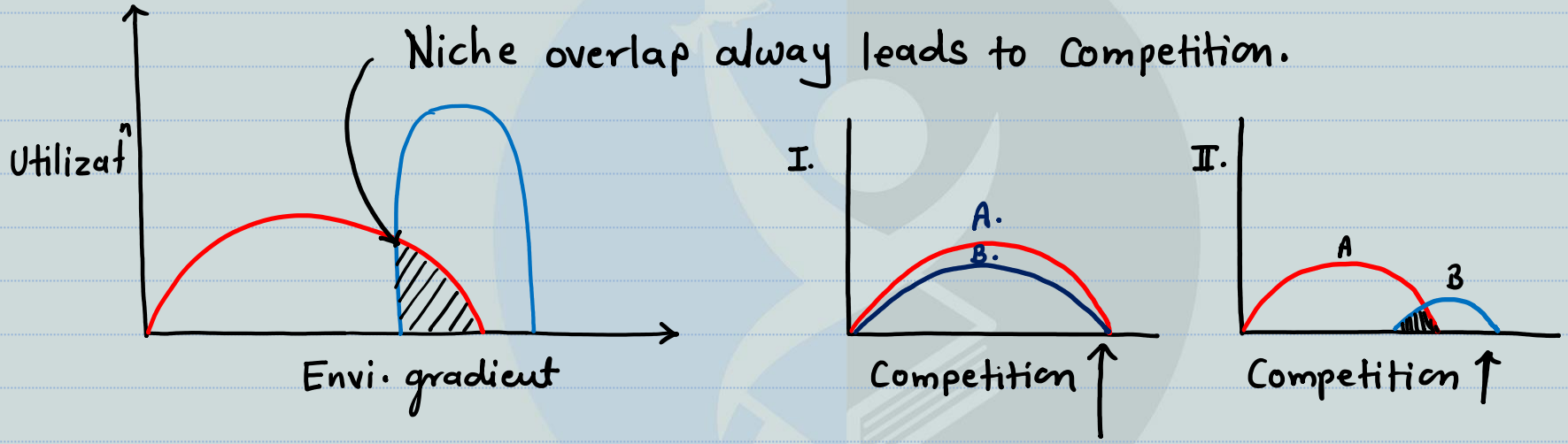
(2) Upper strata of intertidal rocks is the fundamental niche of the species1

(3) Species 1 and species 2 exhibit mutualism

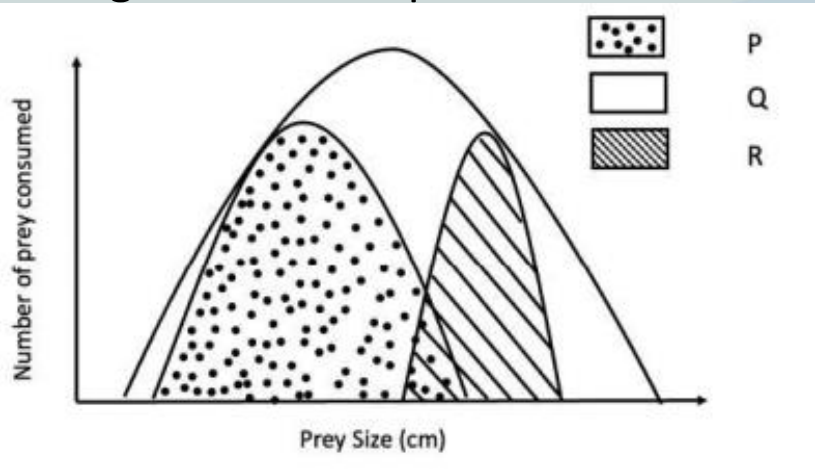
(4) Species 1 can compete out species 2

	Generalist	Specialist
Niche Width:	Broad	Narrow
Ability Competition:	Weak	Strong
Range of tolerance :	Broad	Narrow
	r- Selection Species	K- Selection Species

Niche overlap / Similarity : Two diff. species require same niche.



The figure below represents the fundamental and realised niche of two species.

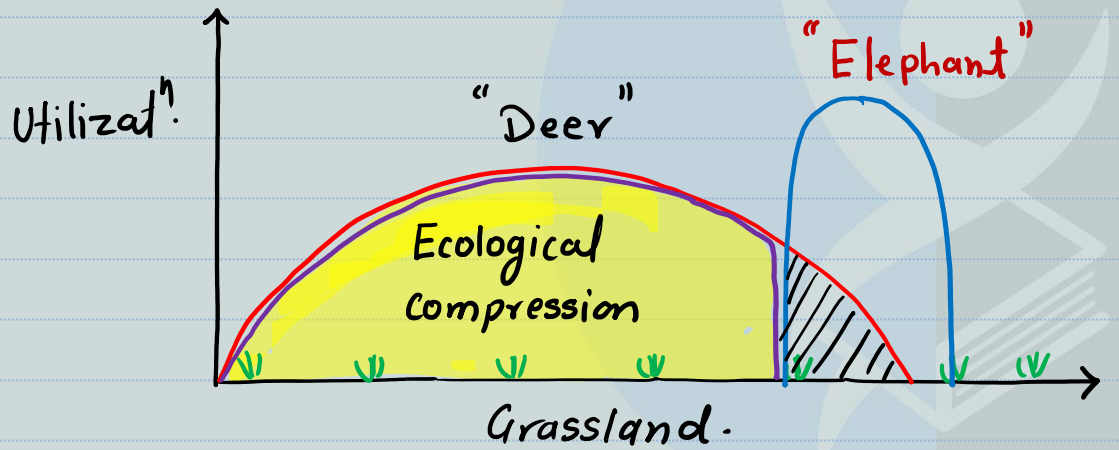


Which one of the following options correctly identifies the fundamental niche and realised niche of any one of the species?

1. Fundamental niche - P; Realised niche - Q
2. Fundamental niche - Q: Realised niche - P
3. Fundamental niche - P; Realised niche - R
4. Fundamental niche - R; Realised niche – P

Ecological Compression:

- Short term condition.
- Niche compress due to competitor.
- Not heritable.

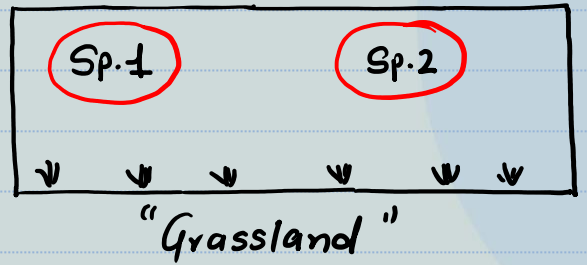


Niche Differentiation

"Co-existance"

Resources partitioning :

1. Temporal partitioning : e.g. Bird species in grassland.
   (Time)

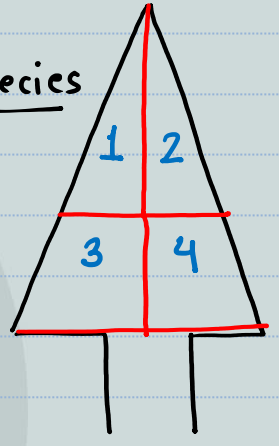


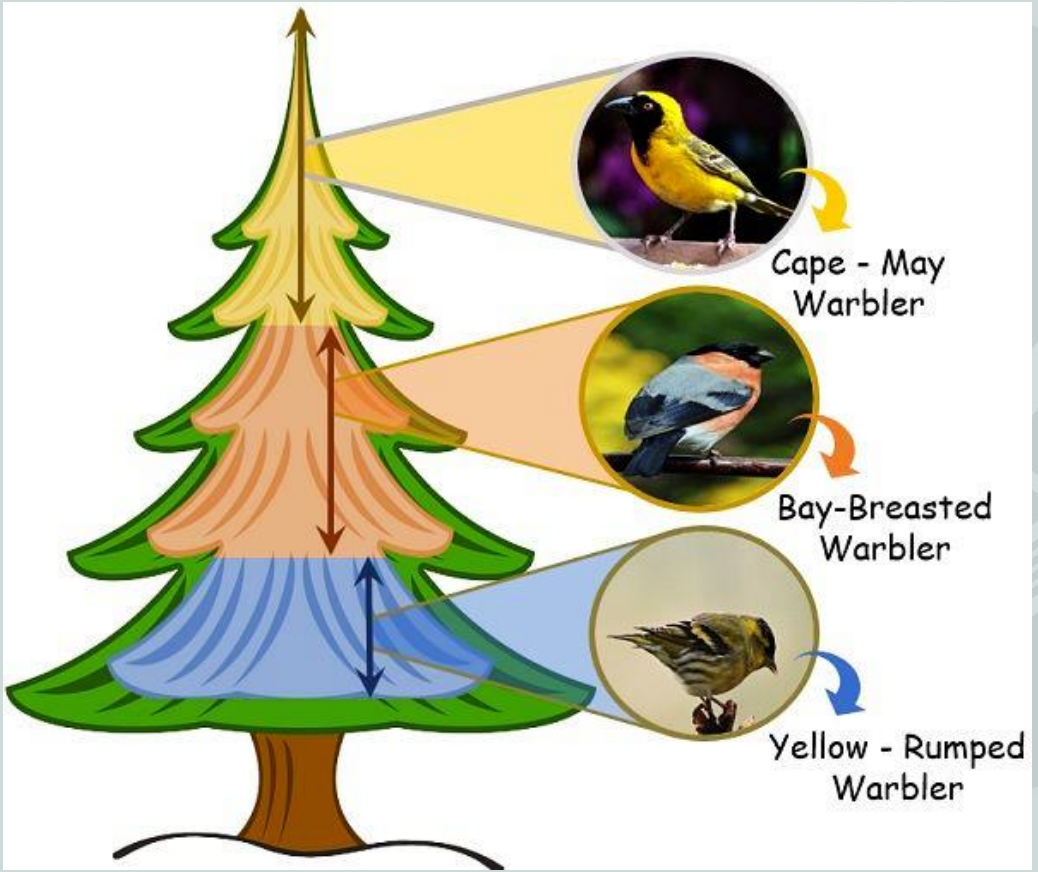
"Grassland"

Sp 1 : 9:00 am to 12:00 pm.
Sp. 2 : 12:00 pm to 3:00 pm.

2. Spatial partitioning: e.g. Warbler bird's. – Four species

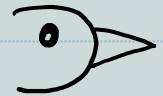
"space"




Cape - May
Warbler
Bay-Breasted
Warbler
Yellow - Rumped
Warbler

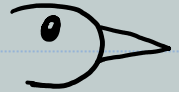
3. Morphological partitioning :

Habitat-1



"Seed's"

Habitat-2



"Seed's"

: Allopatric

Habitat-3



↓ Small size Seed

↓ Large size Seed.

: Sympatric

} Character displacement

- Conditional partitioning : Seasonal differentiation



Hypothetical condition's :

- Resources Unlimited.
- Space Unlimited.

Natural condition's :

- Disease pressure present.
- Predator pressure present.

Which of the following statements is the most appropriate example of character displacement?

(1) Two related species depending on the same prey species avoid competition by feeding at different times of the day. Temporal.

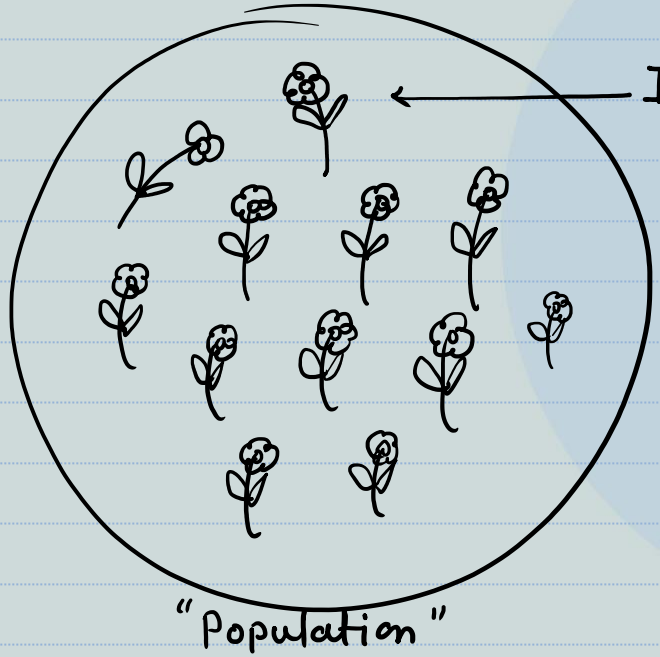
(2) The body sizes of two related species are very similar when they are allopatric, but in geographical areas of sympatry, one species is significantly smaller than the other.

(3) The food niche of a species is generally wider in the absence of competing species than in their presence.

(4) Closely related species can coexist if their densities are regulated by a predator.

Population Ecology

Population: Group of individuals of same species.

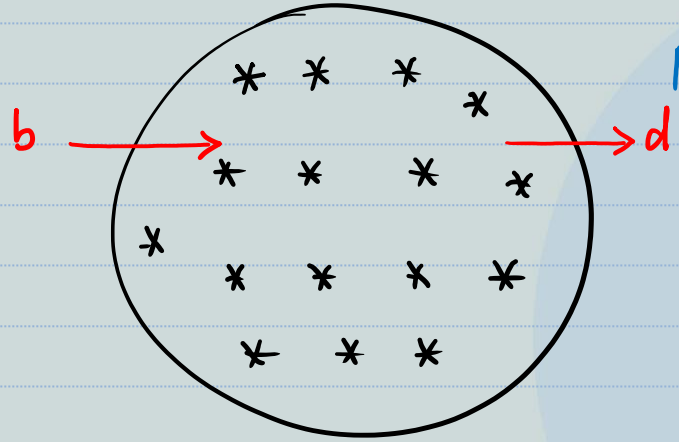


Population attributes:

- Population size ✓
- Birth rate ✓
- Death rate ✓
- Growth rate ✓
- per capita Birth rate ✓
- per capita death rate ✓
- per capita growth rate. ✓

- Population density
- Population Abundance
- Life table
- Survivorship curve
- Life history strategies
- Growth model.

1. Population size: (N) Total no. of individuals present in population.



$N_0 = 16$

"Endemic population"

Pop. size after 1 year ?????

- Birth rate (b) = 10
- Death rate (d) = 5

$$N_{t+n} = b - d + N_0$$

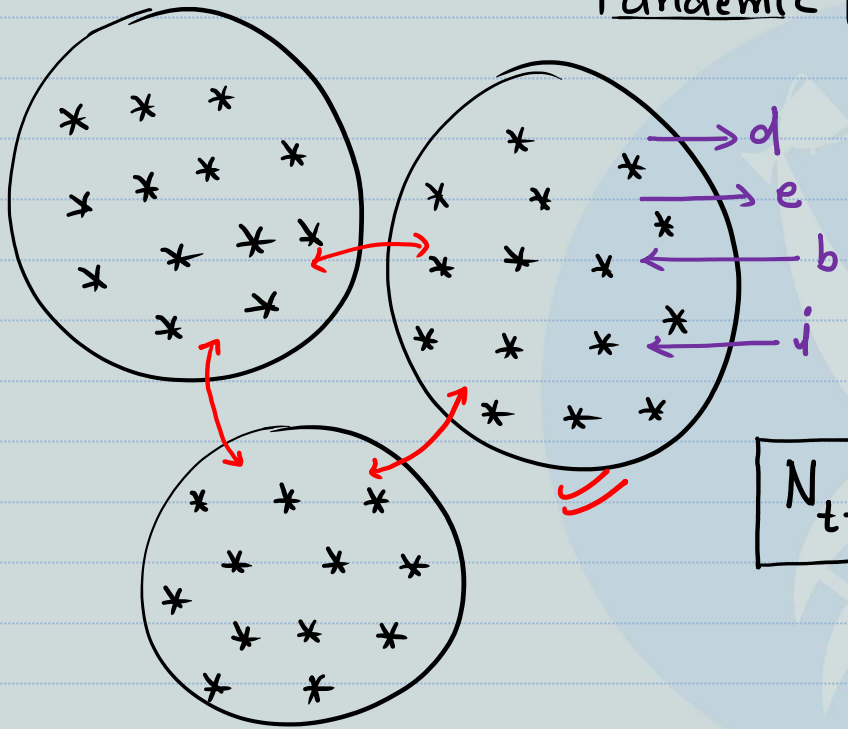
$$= 10 - 5 + 16$$

$$N_{t+n} = 21$$

t = time

n = Number.

Pandemic population



- Birth rate
- Death rate
- Migration
  - Immigration (i)
  - Emigration (e)

$$N_{t+n} = (b+i) - (d+e) + N_0$$

2. Birth rate : Total no. of indi. are added in pop. via birth.

$N_0 = 16$ indi. ⟶ 10 indi / year.

3. Per capita birth rate : (b)

↳ per person

$$b = \frac{10}{16} = 0.6$$

$r = b - d$

$= 0.6 - 0.3$

$r = 0.3$

4. Death rate : Total no. of indi. eliminated from pop. due to death.

$N_0 = 16$ indi ⟶ 5 indi / year.

5. Per capita death rate (d) $\frac{5}{16} = 0.3$

6. Growth rate : Change in population size .

$$G.R = \frac{\Delta N}{t}$$

$N_o = 16$

$N_{t+n} = 21$

$\Delta N = \underline{05}$

Example : Rabbit = 100

After 1 year = 900

Growth rate = $\underline{800}$

per capita growth rate = $\frac{800}{100} = 8$ indi.

7. Per capita Growth rate (r) :

$$\frac{05}{16} = \underline{0.3}$$

$r = 0.3$

$r = b - d$

r = per capita Growth rate
b = per capita birth rate
d = per capita death rate

$r = +ve$ ∴ Pop. increase

$r = 0$ ∴ Pop. stable

$r = -ve$ ∴ Pop. decrease.

HAPPY LEARNING

THANKS

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