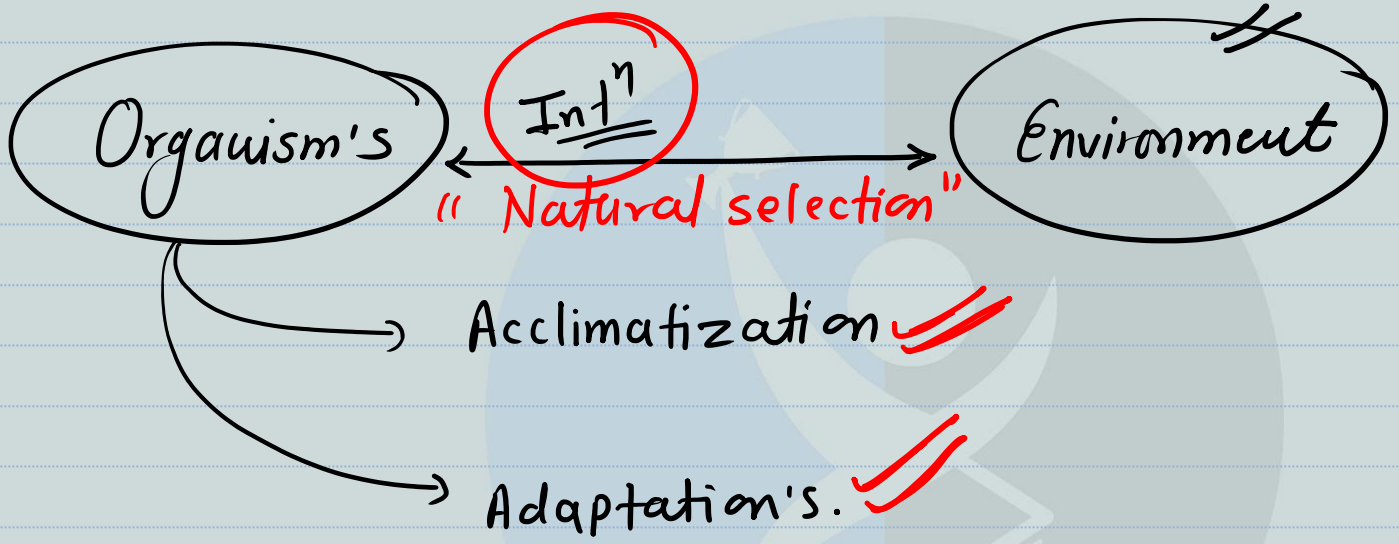
Adaptations, Hierarchy in ecology

IFAS

India's No **1** for NEET, IIT-JAM, GATE and NET Exams
www.ifasonline.com
9172266888


Orgauism's
Inⁿ
Environment
" Natural selection"
Acclimatization
Adaptation's.

- **Various Rules in Ecology**

Rule	Definition
Bergmann's Rule	Within a species of endothermic animals, individuals living in colder environments tend to have larger body sizes than those living in warmer environments.
Richards Hesse's Rule	Within a species of endothermic animals, populations living in more humid environments tend to have smaller heart sizes than those living in drier environments.
Allen's Rule	Within a species of endothermic animals, individuals living in colder environments tend to have shorter limbs and appendages than those living in warmer environments.
Gloger's Rule	Within a species, populations living in more humid environments tend to have darker skin or feathers than those living in drier environments.

Jordan's Rule	Within a species of fish, individuals living in colder waters tend to have larger gill surface areas than those living in warmer waters.
Bergmann's Rule (in reverse)	Within a species of ectothermic animals, individuals living in colder environments tend to have smaller body sizes than those living in warmer environments.
Rensch's Rule	Within a genus of animals, sexual size dimorphism (differences in body size between males and females) tends to be greater in larger species than in smaller species, with birds often cited as an example.
Cope's Rule	Within a lineage of animals, body size tends to increase over time.

1. Bergamann's Rule : Body size

	Equator	Poles
Body size :	Small	Large
Surface area : Volume ratio	High	Low

2. Richard Hesse's Rule : Heart size.

	Equator	Poles
Heart size :	Small	Large.

3. Allen's rule : Appendage (tail, limb, Ear pinnae)

Warm	Cold
→ Large size	– Small size.

4. Gloger's rule : Skin pigmentation

Warm + Humid	Cold + dry
– High pigmentation	– Less pigmentation.

5. Jordann's rule : fish.

Eq.	Pole
• Scale's thin	• Scale's thick.
• Number of vertebrae ↓	• No. of vertebrae ↑

6. Rensch's rule : Birds.

Wings :



7. Cope's rule : Evolutionary

" During the course of evolution Animals body size has increased. "

A general increase in the average body mass of animal population within a species with latitude is known as

(1) Allen's rule

(2) Allee effect

(3) Bergmann's rule

(4) Hamilton's rule

Individuals with greater mass have a smaller surface area to volume ratio, which helps to conserve heat. This is known as

(1) Liebig’s rule.

(2) Cope's rule.

(3) Gloger's rule

(4) Bergmann’s rule

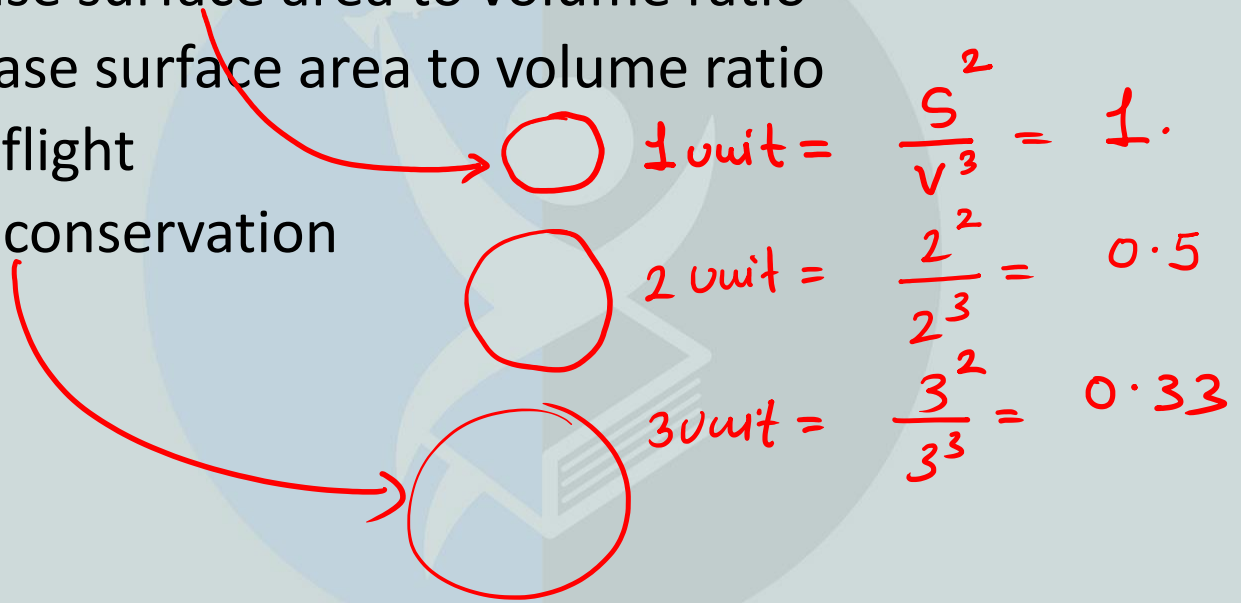
The birds in tropics are generally smaller in size because of-

(1) To increase surface area to volume ratio

(2) To decrease surface area to volume ratio

(3) For easy flight

(4) For heat conservation



- **How environment affect the organism ?**

1. Adaptation

" An adaptation is any heritable trait that helps an organism, such as a plant or animal, survive and reproduce in its environment "

- It is heritable

Adaptation it could be;

1. Morphological adaptation
2. Physiological adaptation
3. Behavioral adaptation

2. Acclimatization

" The process in which an individual organism adjusts to a change in its environment "

- It is non-heritable

Adaptations in Plants;

1. Environment with Water deficient conditions:

"Xeric" ⟶ Xerophyte's

"Cactus"



- Thick cuticle
- Reduced leaf
- Sunken stomata
- Spine
- Thick Succulant stem/leaf.
- Deep growing roots.

} Morphological

- Sckoto-opening stomata
- CAM-Pathway.

} Biochemical or Physiological.

2. Environment with Water conditions:

"Aquatic" → Hydrophytes

- Waxy coated leaves
- Mucilage coated leaves.
- Stem – Air Space (Aerenchyma)
- Root – Root packets.

etc.

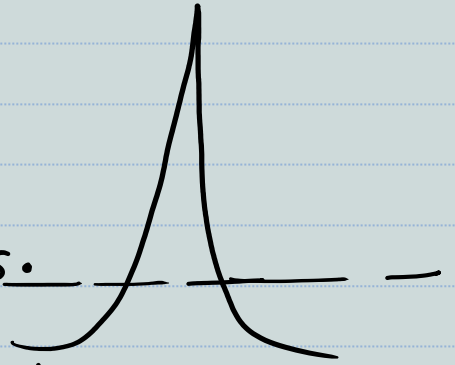
"Morphological"



"Pistia"

3. Environment with Saline conditions:

Mangroves → Halophytes



- Negatively geo-tropic roots & Pneumatophores.
- Thick cuticle
- Vivipary – Germination of seeds on parental plant.

4. Environment with Oligotrophic soil :

↓ Less Nutrient in soil.

e.g. Tropical rain forest

- Symbiosis – Mutualism imp.
- Decomposer's – play very imp. role.

Adaptations in Animals;

1. Environment with Water deficient conditions:

Xeric ⟶ Xerocole

- Kangaroo rat :
  - food ⟶ Moisture
  - fat-oxidation
  - Cont^{n} – Urination.

  } Physiological adaptation's.

- Desert lizard :
  - → Basking – "Sunbath"
  - → Burrowing – "Sand burried"

  } Behavioural adaptation's.

- Camel : "Long leg's, Hump, long-loop Henele"




BBC earth


4GIFs.com



2. Adaptations for extreme cold conditions:

- Salmon fish:
  - Anti-freezing protein ↑
  - Glycerol ↑
  - etc.

- Polar bear:
  - Fat storage → Insulator
  - Body size increase
  - Surface area to volume ratio ↓

- **Migration:** Moving from the stress environment to favourable environment.

- **Hibernation:** Winter sleep e.g. Polar bear, frog's, etc.

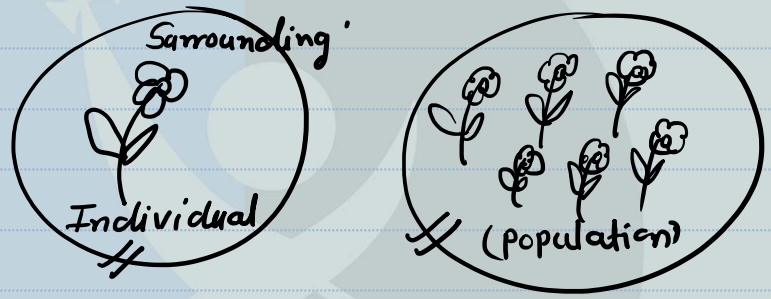
- **Aestivation:** Summer sleep e.g. "Cat fish"

- **Diapause:** Suspended development

- Ecology is divided into two branches, viz., **autecology** and **synecology**.

1. **Autecology :** Study of a single individual of a species or its population.

Single → Individual
→ Species
→ population.



2. **Synecology :** Study of communities is called synecology.

Multiple → Species

What is Ecological hierarchy / Levels in ecology ?

Autecology.

1. **Organism:** (any individual organism) One individual in it's environment.
   "Individualistic Ecology"
2. **Population:** Group of individuals of same species.
   "Population Ecology"

Synecology.

3. **Community:** Groups of indi. of diff. species. (Populations)
   "Commuuity ecology" (Commuuity)
4. **Ecosystem:** Basic Uuit - Abiotic + Biotic = Ecosystem.
   ↳"Basic Uuit of Ecology" (Biotope) (Biocenose)
5. **Landscape:** Diff. Ecosystem together form Landscape.
6. **Biomes:** "Large, Uuique climatic condition containing area.
7. **Biosphere:** "Globe"

1. **Organism:**
(any individual organism)
2. **Population:**
3. **Community:**
4. **Ecosystem:**
5. **Landscape:**
6. **Biomes:**
7. **Biosphere:**





1. Genecology: Study of genetic basis of variability among the individuals of a population with respect to the environmental complexity.



2. Ecological equivalent: Two different species that have similar adaptations and occupy similar ecological niches.

(Role)

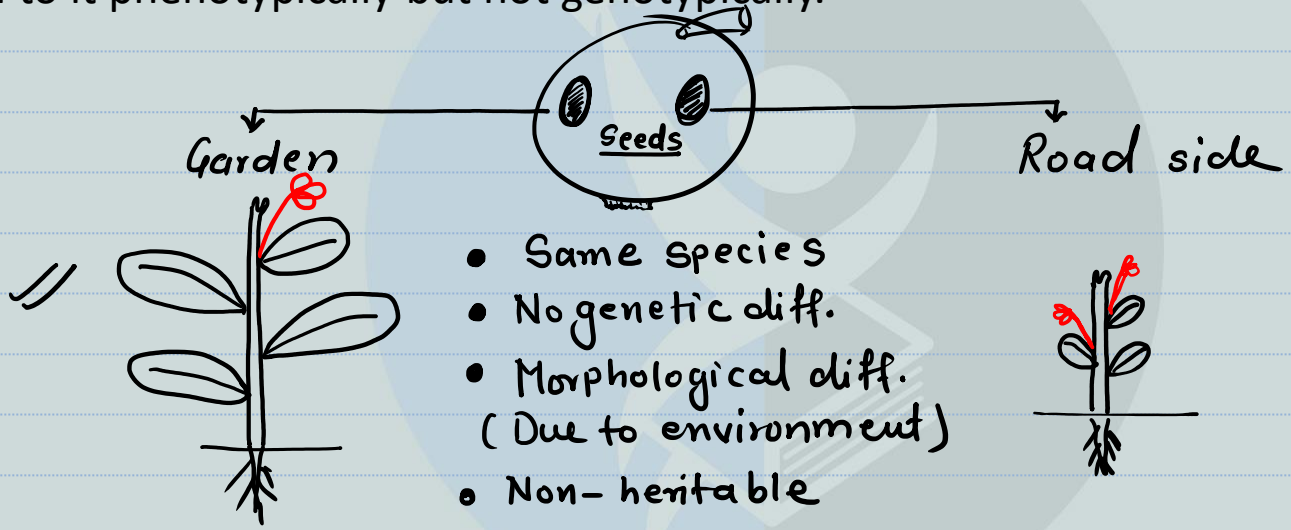


South America



Africa and Asia

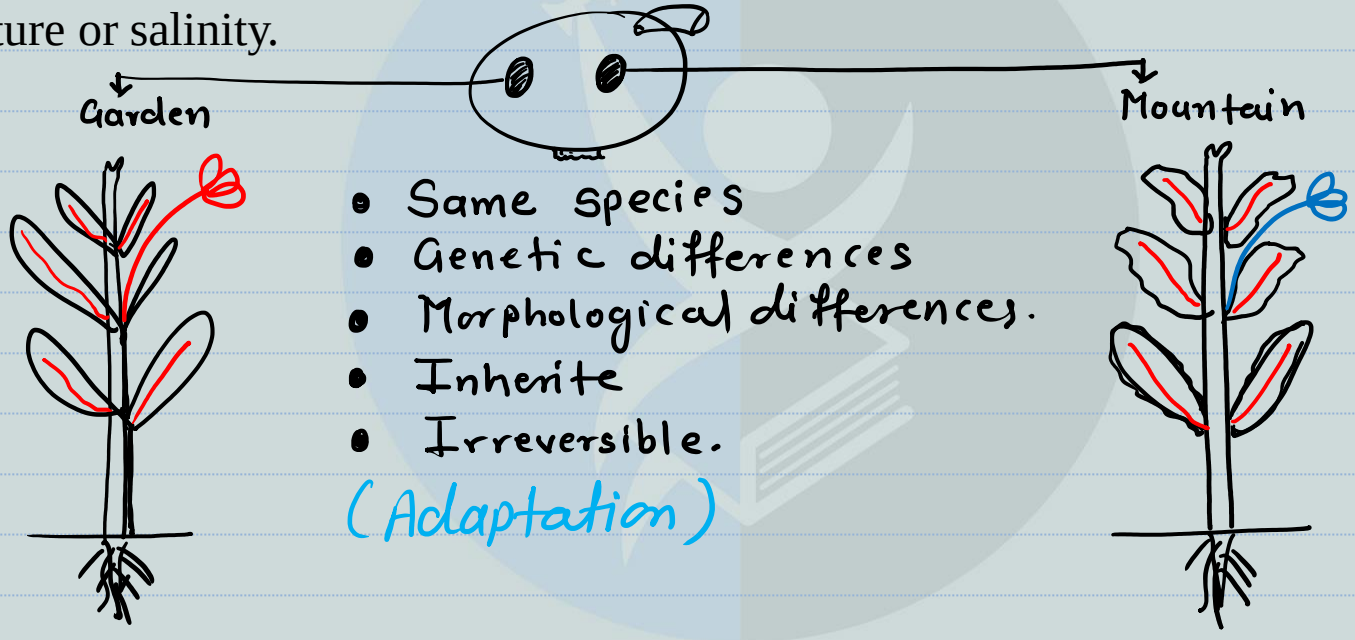
3. Ecophene/ Ecads : Plant or Animal Individuals occupying a particular habitat and adapted to it phenotypically but not genotypically.



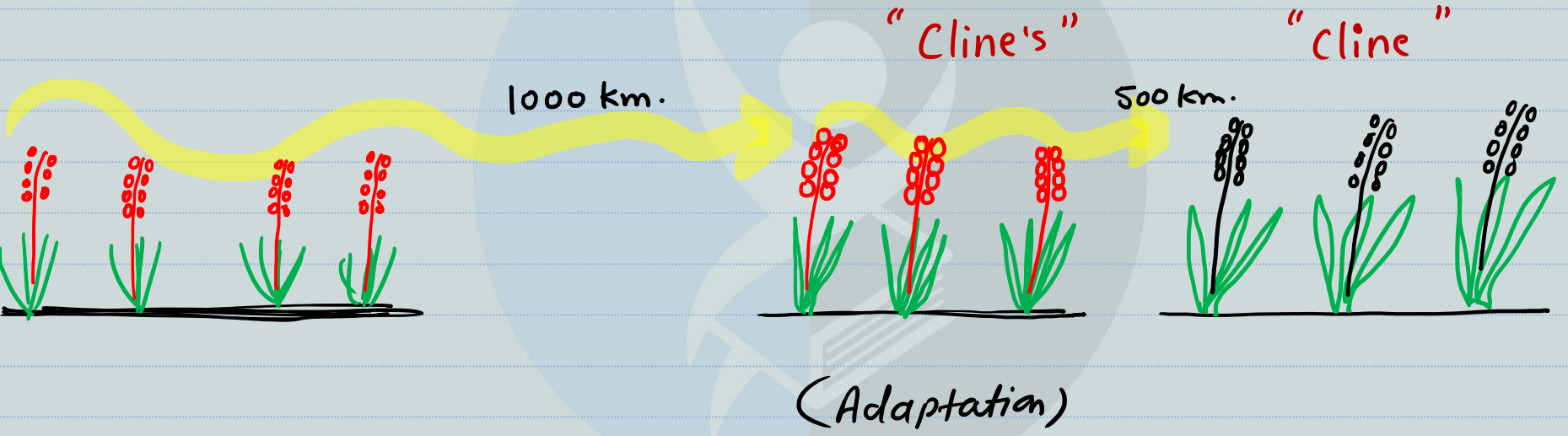
- Same species
- No genetic diff.
- Morphological diff. (Due to environment)
- Non-heritable
- Reversible

e.g. African Human's & Indian Human's.

4. Ecotype/ Ecological race / Ecospecies : a genetic subspecies or race of a plant or animal species that is adapted to a specific set of environmental conditions such as temperature or salinity.



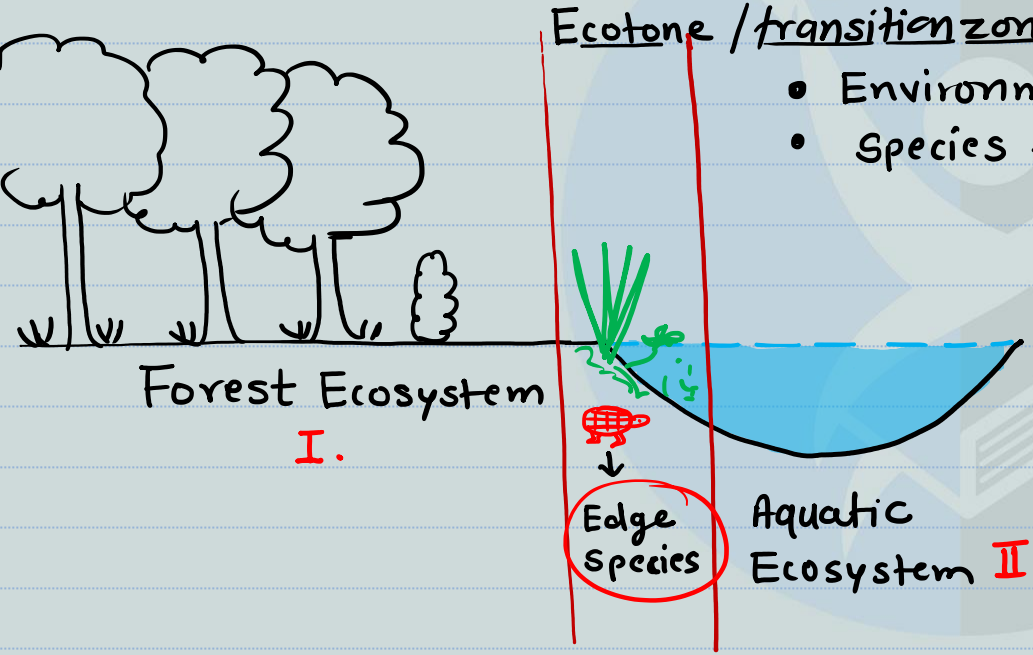
5. Ecocline : Series of plant populations which show a gradual change in the genetically determined environmental adaption.



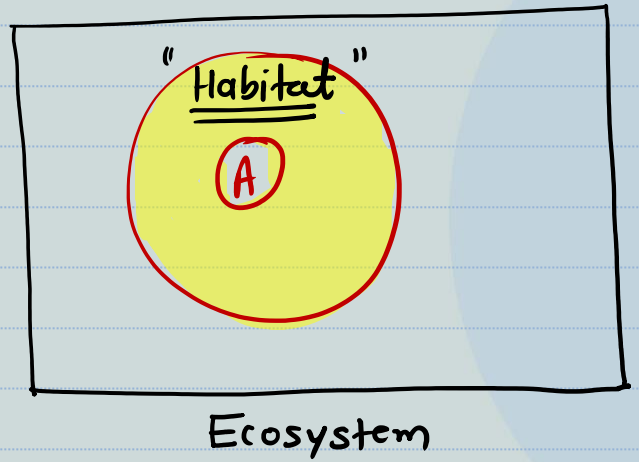
6. Guild : A guild is a group of species that exploit the same resources in similar ways, often within the same ecological community or habitat.



7. Ecotone : Ecotone refers to the transition zone between two or more different ecosystems or habitats, where they meet and blend into each other.

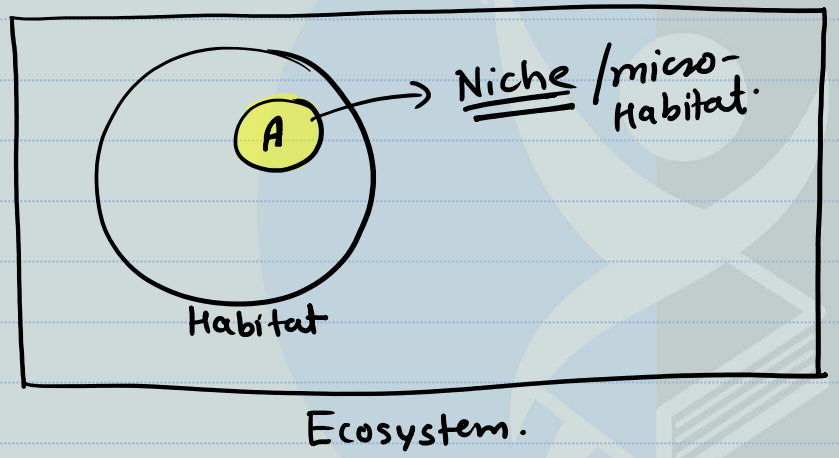


8. Habitat : The natural environment or physical place where a particular species of plant or animal lives and grows.



9. Territory : Defended area by an organism.

10. Ecological Niche : The range of physical and chemical conditions under which a species can persist (survive and reproduce) and the array of essential resources it utilizes.



Individuals occupying a particular habitat and adapted to it phenotypically but not genotypically are known as

(1) Ecophenes
(2) Ecotypes
(3) Ecospecies
(4) Coenospecies

Which of the following statements is TRUE for an ecotone?

(A) An ecotone is the synonym of an ecosystem

(B) An ecotone is an interface zone of two or more ecosystems

(C) An ecotone is a special feature of land biomes

(D) An ecotone is exclusively characterized by decreased biodiversity

HAPPY LEARNING

THANKS

IFAS

India's No **1** for NEET, IIT-JAM, GATE and NET Exams

www.ifasonline.com

9172266888