

BIO DIVERSITY

INTRODUCTION, CONCEPTS, TYPES



Lecture by :

SRINIVAS GAJJELA

ASST.PROFESSOR@RGUKT BASAR. TS

BIO DIVERSITY

- All *the variety of life present on the Earth-* Plants, Animals, fungi, micro organisms as well as communities that they form & the habitats in which they live is called **Biodiversity**.
- Biodiversity represents the variability within & among the ecosystems, species & genetic material
- The term Biodiversity was introduced by **‘Walter Rosen’**.

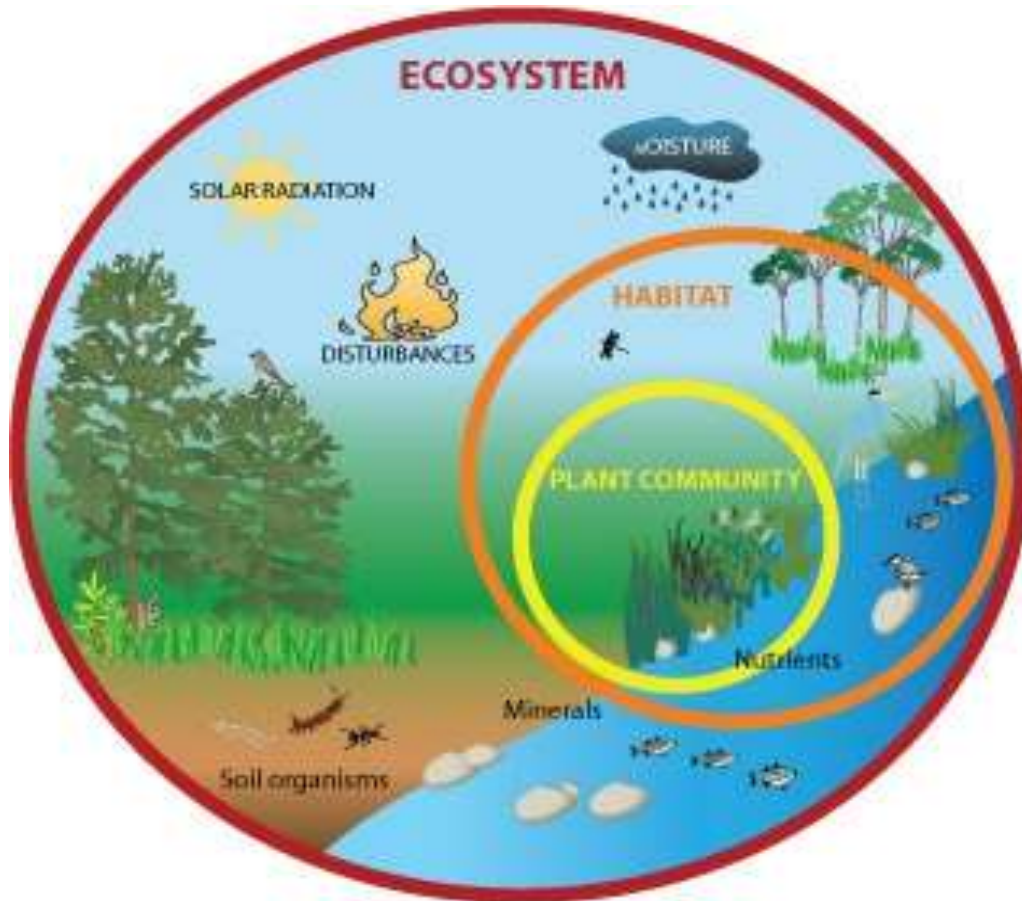
WHAT IS A SPECIES?

- A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
- The species is the principal natural taxonomic unit, ranking below a genus and denoted by a Latin binomial,
- e.g. ***Homo sapiens***.

- **An Ecosystem** includes all the living things – plants, animals, fungi & Microorganisms in a given area interacting with other & also with other non living components like weather, sun, soil.
- It is thus the *interaction of living & non living things* in a particular environment.
- **A biome** : is a specific *geographic area* notable for large community of plants & animals that live there.
 - Ex: Tropical rainforests, A Desert & A grassland.

- **ECOSYSTEM:**

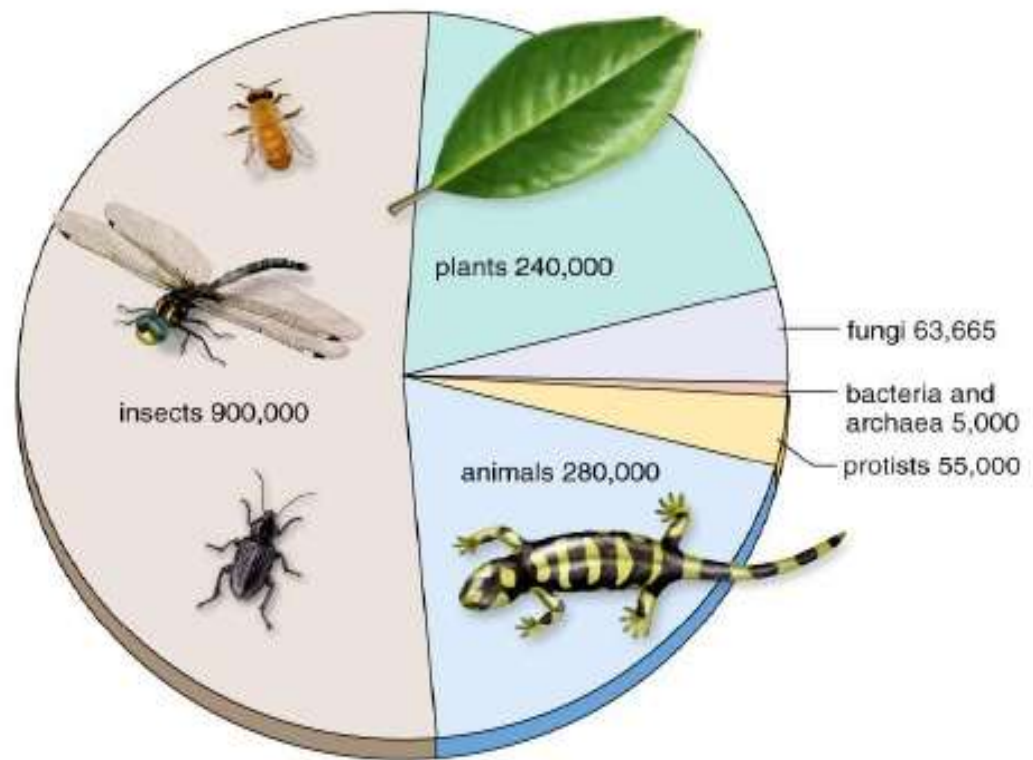
- An ecosystem is a community of living organisms in conjunction with the nonliving components of their environment, interacting as a system.
- These biotic and abiotic components are linked together through nutrient cycles and energy flows



- “Without biodiversity, there is no future for humanity” - Prof David Macdonald, at Oxford University.
- Biodiversity plays an integral role in the way ecosystems work and in the benefits they provide.
- Some of the benefits of biodiversity include:
 - **Regulating elements** *such as climate, water quality, disease, and pollination.*
 - Provisioning **resources such as food, clean water,** industrial raw materials, and genetic resources.
 - Cultural promotion such as **recreational, aesthetics, spiritual benefits**

- It has been estimated that ***more than 50million species*** of plants, animals,& microorganisms exist in the world.
- Out of these about ***1.4million species*** have been **identified** so far.
- **Each species is adapted well** to live in a specific environment.
 - Mountains peaks, depths of the seas, polar ice caps/ tropical rain forests & deserts.
- All this biodiversity of life is confined to a one kilometer thick layer of lithosphere, hydrosphere & atmosphere –which forms the **biosphere.**

Biodiversity of the Earth



Types of BIO DIVERSITY

- Biodiversity is a key measure of the health any ecosystem & of our entire planet.
- Every living organism is dependent on each other & also on the non living components.

Ex: Plants & animals need each other for food & depend on the nature for water, shelter etc.

- Biodiversity describes the how much variety there is in an ecosystem, species, & genetically within a species.

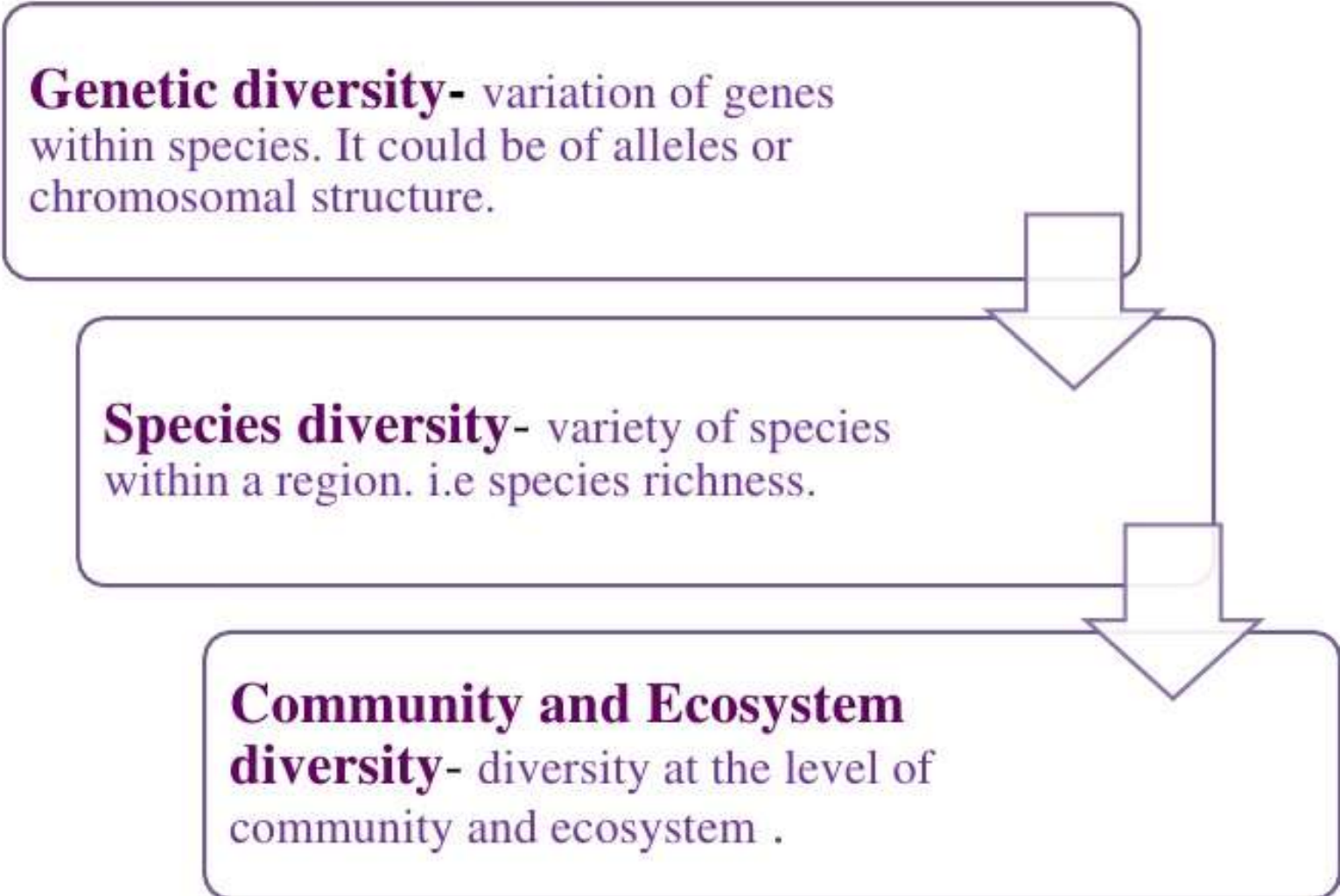
Types / Levels of BIO DIVERSITY

- There are 4 levels of Biodiversity :
 1. Species diversity
 2. Genetic Diversity
 3. Ecosystem / community diversity
 4. Functional diversity.

Levels of bio diversity

Includes three hierarchical levels;

Genetic diversity- variation of genes within species. It could be of alleles or chromosomal structure.



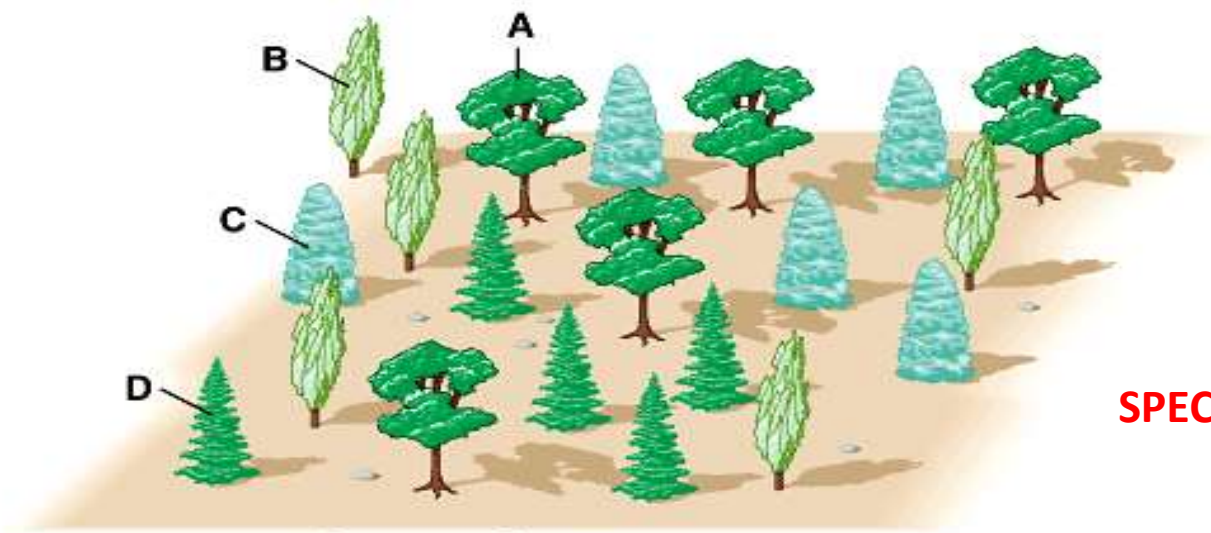
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graph TD; A[Genetic diversity] --> B[Species diversity]; B --> C[Community and Ecosystem diversity];
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Species diversity- variety of species within a region. i.e species richness.

Community and Ecosystem diversity- diversity at the level of community and ecosystem .

1. Species diversity

- *The no. of different species of plants, animals, fungi & microorganisms that are represented in a given community is called **Species diversity**.*
- **Ex: Palm trees, Elephants, or bacteria.**
- **The number of species that live in a particular location is called **species richness**.**
- **The no. of individuals in each species is called **species abundance**.**



SPECIES EVENNESS

Community 1

A: 25% B: 25% C: 25% D: 25%



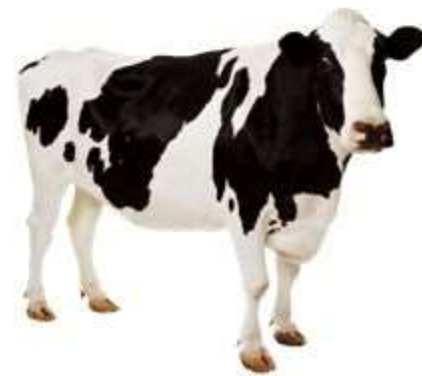
A - SPECIES is ABUNDANCE

Community 2

A: 80% B: 5% C: 5% D: 10%

Species Diversity

- The variety of species per unit area. This includes both the number of species present and their relative abundance.



2. Genetic Diversity

- Genetic diversity refers to ***the total number of genetic characters in the genetic makeup of a species.***
- The ***more genetic diversity*** a population has the more likelihood ***the population will be able to adapt & survive.***
- ***Ex: Poodles, German shepherds & golden retrievers are all dogs, but they look different as they have different genes.***

Genetic Diversity

1. ***Genetic Diversity-** the variety of genes or inheritable characteristics present in a population

Chihuahuas, beagles, and Rottweiler's are all dogs—but they're not the same because their genes are different.



Chihuahua



Beagle



Rottweilers

Genetic diversity



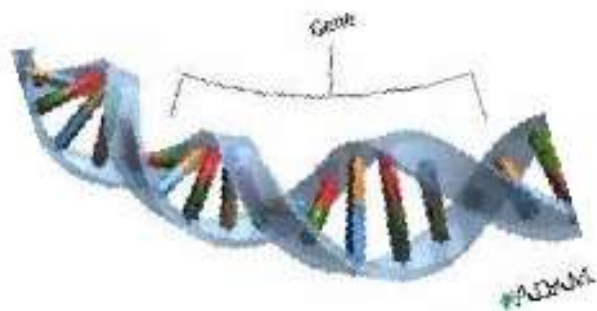
Genetic Diversity
within the humans



diversity found
in native
chickens



**Genetic
diversity** in the
bambara
groundnut



VARIATIONS IN BUTTERFLIES - GENETIC DIVERSITY



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BUTTER FLIES

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you know ?????

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3. Ecosystem or community diversity

- It refers to the biological community of interacting organisms and their physical environment.
- Each ecosystem corresponds to a series of complex relationships between
 - biotic components (living- plants, animals, fungi & microorganisms) and
 - abiotic (non living –sunlight, air, water, minerals, nutrients...).
- Ex: Tropical rain forest ecosystem, desert ecosystem, river ecosystem. etc

Ecosystem Diversity-

Desert



Coral Reef



Prairie

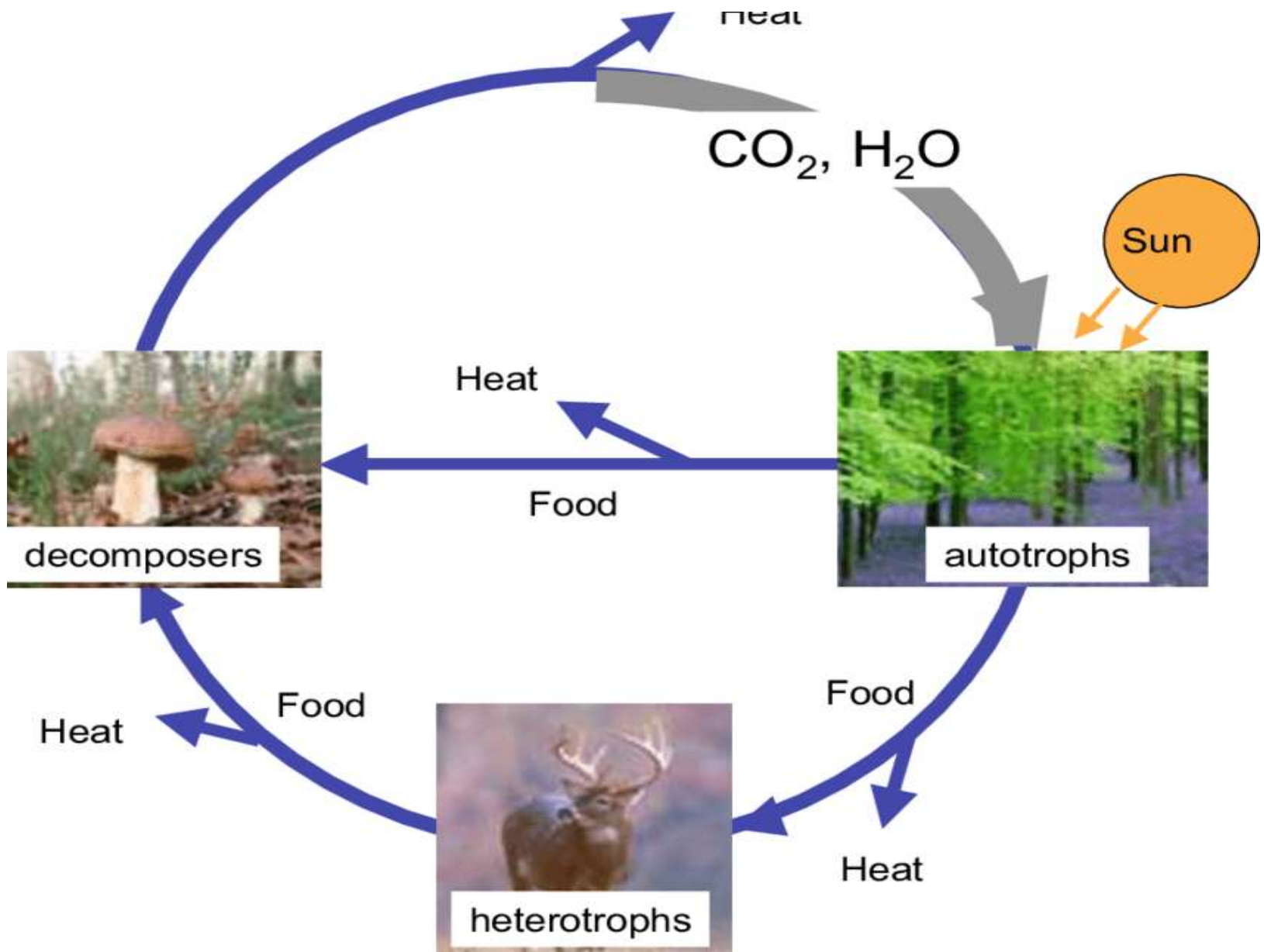


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4.Functional diversity

- It is the way species behave, obtain food and use natural resources of an ecosystem.
- In general a species rich ecosystem will have high functional diversity because there are many species with many different behaviors.
- *Functional diversity is useful to ecologists trying to conserve or restore it when it is damaged*, because knowing the behaviors and roles of *species can point to gaps in a food cycle or ecological niche* that lack species.



Microorganisms

Functional diversity

Nutrient's cycling

Energy flow

Waste degradation

Mineralization

Decomposing xenobiotics

Bioremediation

Enzymes

Polymers

Pharmaceuticals

Food and beverages

Bioactive compounds

Pathogenesis

Decomposing organic matter