



coursavy

Environment & Ecology

Fundamentals of Ecology

Most Important Session



youtube.com/coursavy

t.me/coursavy

tests.coursavy.com

Ecology

- Study of interaction or inter-relationship of organism with their environment is called Ecology
- Organism and environment are always interdependent, inter related or mutually reactive

Ecological Hierarchy

1. Organism
2. Population (Species)
3. Community

4. Ecosystem
5. Biome
6. Biosphere

Ecology

Species

- The basic unit of classification, defined as the group of living organism similar in structure, function and behaviour and produced by similar parents, have common gene pool, can inter breed under natural conditions and reproductively isolated from other group of organisms.

Population

- A group of freely interbreeding individuals of the same species present in a specific area at a given time.
- Local population of a given is called Demes.

Important Concepts in Ecology

Endemic Species – A species which is found only in a particular area is known as endemic species.

- Kangaroo in Australia

Keystone species – The species which have greater influence on the community's characteristics relative to their low abundance or biomass are called Key-stone species.

- Lion in forest

Critical Link Species - The species which establishes an essential link with other species to help the latter in some vital activity are called link species.

- Mycorrhizal fungi, Insect species which works as pollinators of flowers.

Ecology, Environment, Ecosystem, Biome

Ecology - Interactions organisms have with each other and with their abiotic environment.

Environment - the physical and biological factors along with their chemical interactions that affect an organism.

Ecosystem is a community of living organisms (plants, animals and microbes) in conjunction with the non-living components of their environment (things like air, water and mineral soil), interacting as a system.

Ecology, Environment, Ecosystem, Biome

Quite similar in use

Ecology means all living species and their interactions, from biological perspective.

Environment means everything around you and is seen as resources that are required for organism living.

Ecosystem is about the systems of transformation, energy flow and interchangeability of living species, on the basis of natural resource cycles.

Biomes - large geographic area defined by characteristic climate features and dominant plant life. Biomes are generally found in bands of latitude around the planet.

1. Organism

- An organism is the smallest unit of ecological hierarchy and basic unit of ecological study.
- It may be small, large, unicellular or multicellular.
- Fixed lifespan and organized life cycle (birth to death)

2. Species

The **basic unit** of classification, defined as the group of living organism, similar in structure, function and behaviour and produced by similar parents, have **common gene pool**, can **inter breed** under natural conditions, and **reproductively isolated from other group of organism**.

2. Population

A group of individual (members) of the same species living at one place (specific geographical area) constitute a population.

Local Population / Demes - Population of an organism inhabiting a particular area.

- Home sapiens inhabiting in hills and plains.

Sister Population - different population of the same kind of organism

Natality - Rate at which new individuals are born and added to a population under given environmental conditions.

2. Population

Biotic Potential (Reproductive Potential, Potential Ability) - Under most favourable environmental conditions, the maximum reproductive capacity of an organism is known as BP. It can never be realised actually, due to various limiting factors.

3. Community

- Groups of organisms of different species that live in common area at a certain time, which are interlinked and interdependent for nutrition, food or other resources.
- Natural aggregation of plants and animals in the same environment.
- **Biotic Community = Animal + Plants + Microbial Community**
- Such interactions may involve life-death struggle among various organisms, as well as nutrient cycles manifested through various kinds of food webs and food chains.

3. Community

How diversity of populations affects stability in community?

- A complex community (i.e. that has a high diversity of populations) is more stable in comparison to community having low diversity.
- Food webs - more interconnected, and the greater inter-connectivity makes it more resilient to disturbance.

3. Community

Producers, Consumers and Decomposers

- In terms of nutrition, that all organisms within a community are either producers, or consumers or decomposers.
- The producers or ***autotrophs*** are the plants - make their own food from inorganic raw material via photosynthesis or chemosynthesis.
- Consumers or ***heterotrophs*** get their nutrition / energy from the things they consume.
- *Decomposers*, which break down organic matter into simple products.
- Fungi and bacteria are the common decomposers. They serve as the “garbage collectors” or “recyclers” in our environment.

Home Range and Territory

Home Range - Several Members of a species may cover a definite area for searching food, mates and shelter.

- HR of different group can overlap.
- HR is larger in size and natural, and has many breeding groups.
- HR is usually not defended.
- Its size may vary from few meters (Ants) to many kms (African Hunting Dog)

Home Range and Territory

- **Territory** - When in home range, a particular geographic area is marked by an individual or a group of breeding individuals for breeding and raising family, it is known as territory. It is an area which is a **family habitat**.
- A HR is formed by many territory, territory is **defended against member of same species** except the mating partner.
- **Boundaries** of the territory are marked by Urine eg. Dogs, Tiger, Secretions like pheromones
 - eg. Rabbit
- Territory of different groups **can not overlap**.
- **PS** - Territory reduce the competition for the basic needs (shelter, food)

Ecotone, Edge Effect, Ecological Niche

- **Ecotone** - The transition zone between the two communities is called Ecotone or Tension zone. It has greater number of species and density.
- It may also be the transition zone between two communities where one type of community is getting modified into the other type.
- **Edge Effect** - Species which occur most abundantly and spend their time in ecotone area is called Edge Species. The tendency to increase the variety and density of some organism at the community border is known as Edge Effect.
- The density of song birds is greater in the mixed habitat of the ecotone between the forest and the desert.

Characteristics of Ecotone

- Very narrow or quite wide
- Conditions intermediate to the adjacent ecosystems.
- A well developed Ecotone contains species which are entirely different from the adjoining Ecosystems/Community
- Diversity and Density increases - Edge Effect

Ecosystem

Abiotic Components \longleftrightarrow Biotic Comp

- + Soil
- + Air
- + Water
- + Light
- + Temperature

Input
↓

Transfer of Energy

↓
Output / Degradation

4. Ecosystem

Ecosystem is a community of living organisms (plants, animals and microbes) in conjunction with the non-living components of their environment (things like air, water and mineral soil), interacting as a system.

Ecosystem is about the systems of transformation, energy flow and interchangeability of living species, on the basis of natural resource cycles.

Concepts

Ecological Niche - It is the **functional role** of any species in ecosystem or the community.

Occupational Address, Profession, Status - in an ecosystem

Gau's Principle - Two species can not have same Niche in the same ecosystem. If they have same niche, one will die, due to the principle of competitive exclusion.

Ecological Equivalents - Organism that occupy same of similar ecological niche if different geographical regions.

Arctic Fox and African Jackal - both are scavengers

Grazers of North America and Kangaroo's of Australia

Difference between Niche and Habitat

A niche describes how an organism ***makes its living and responds to the distribution of resources and competitors***. The ecological niche involves both the place where an organism lives as well as the roles that an organism does in its habitat.

For example, various *habitats* of *house sparrow* include woodlands, grasslands, and deserts; houses, factories, warehouses, zoos etc. However, when we talk about its *niche*, it would include – eating insects, grains, seeds etc.; making nests in houses, trees and shrubs etc.

Niche is a broader concept than habitat and its focus is on ***functional role*** played by the species rather than only the place it needs to live.

Speciation

- Process of creation of new species by separation of population of plants and animals, originally able to interbreed into independent evolutionary units which can no longer interbreed to produce fertile offspring, due to accumulated genetic differences.

5. Biomes

- Biomes are *groups of ecosystems that share similar climatic conditions and same kind of abiotic and biotic factors* **spread over a large area.**
- The biomes are either **terrestrial or aquatic.**
- There are several systems of classification of biomes. The main types of biomes include Deserts (Hot, Cold, Semi Arid and Coastal), Aquatic Biomes (marine or freshwater), Forest (Tropical, Temperate, Taiga , Montane etc.), Grassland (Savannah etc.) and Tundra (Arctic Tundra, Alpine Tundra)

5. Biomes

Importance of Biomes

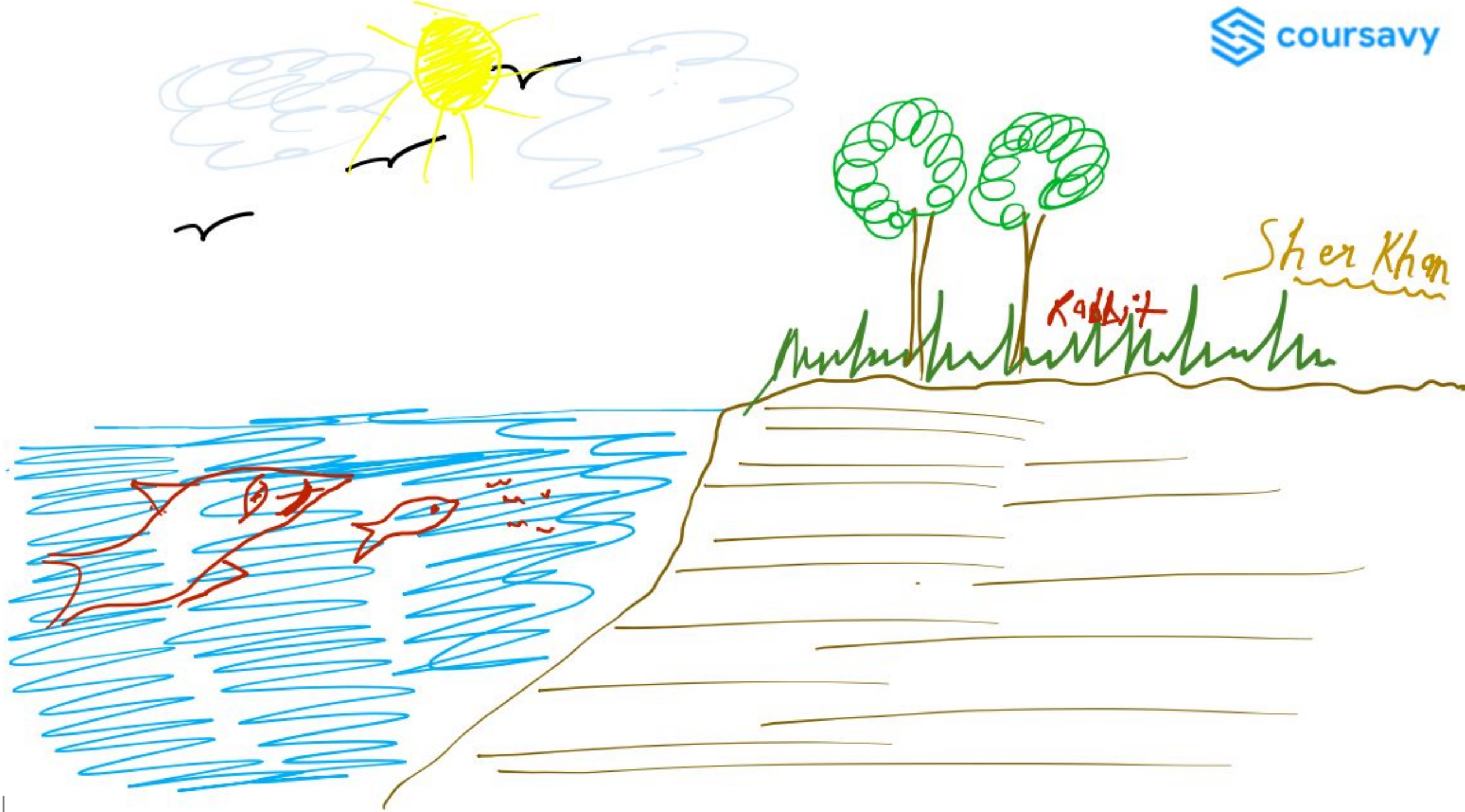
- Biomes play a crucial role in sustaining life on earth.
- For example, the Aquatic biome - home to millions of fish species and the source of the water cycle.
- Role in climate formation, regulation
- The terrestrial biomes provide foods, enrich the air with oxygen and absorb carbon dioxide and other bad gases from the air.

Similarities / Differences between Biomes and Ecozones

- *Both biomes and Ecozones are groups of ecosystems, but an Ecozone comprises only land parts of Earth surface, while the biomes comprise both aquatic and land parts.*

6. Biosphere

- All the biomes together make up the biosphere.
- Biosphere is the entire part of the earth where living things exist. This includes soil, water, light, and air.
- The word Biosphere includes sum total of life and life-support systems ie. atmosphere, hydrosphere, lithosphere, and pedosphere.
- Largest ecological unit



Final Notes