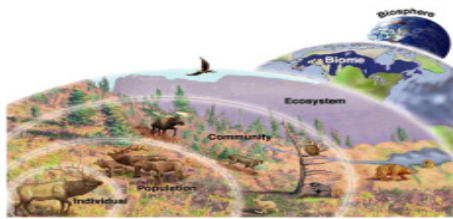
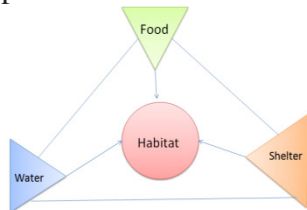


## 4. PRINCIPLES OF ECOLOGY

- Scientific study of the relationship of living organism with each other and with their environment.
- Ernst Hackel, a German biologist coined term ecology in 1869.
- 2 Greek words: Oikos means: home, estate and logos means: study
- Levels of organization
- Individual→Population→Community→Ecosystem→Biome→Biosphere



- Habitat is the physical environment in which an organism lives. A habitat may support many different species having similar requirement. Structural components are-

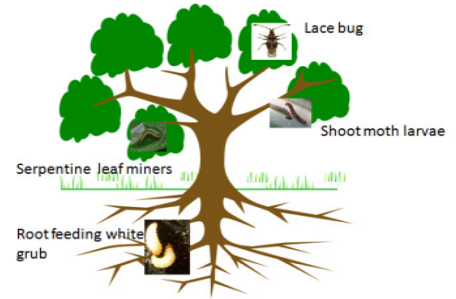


Four major habitats are-a. Terrestrial b. Fresh water c. estuarine d. Ocean

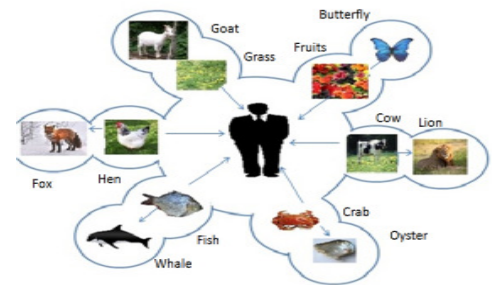
Types of Habitat



- Niche is the sum of all the activities and relationships of a species by which it uses the resources in its habitat for its survival and reproduction.



- Most important resources for animals are food and shelter and plants are moisture and nutrients in a niche.
- Example of Human Niche

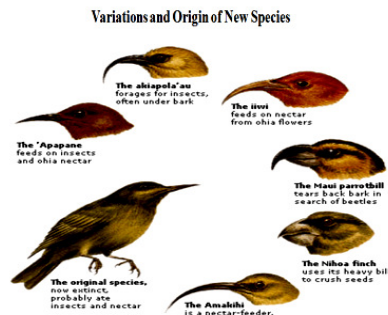


- The appearance or behavior or structure or mode of life of an organism that allows it to survive in a particular environment is known as adaption. Desert animals have raised their body above the ground by having long legs.

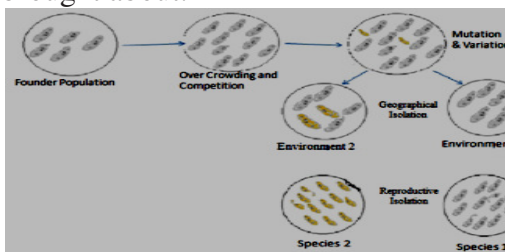


- Presence of gill and fins of fish and absence of wood formation and highly reduced root system of plants are the adaptation in aquatic life
- Adaptation have genetic basis and developed over many generations to help a species survive successfully in its environment.

- Species is a group of similar population of organisms whose members are capable of interbreeding and to produce fertile off springs.
- Variations are produced as a result of chance mutation. Variations are heritable.
- Evolution theory was propounded by Charles Darwin and Alfred Wallace in 1859. Later it extended in the light of progress in genetics, Neo –Darwinism.
- Organisms tend to produce more off springs that can be supported by the environment.



- Mutation (a change in genetic material that results from an error in replication of DNA) causes new genes to arise in population.
- Natural selection, Suitable adaptation for survival and Evolution results adaptation and diversity of the species.
- Speciation is the process by which new species are formed and evolution in the mechanism by which speciation is brought about.

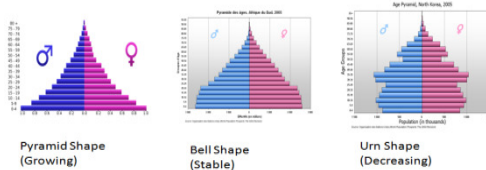


- Isolation is the factor which supports speciation. Major types of isolation are geographical isolation, ecological isolation and reproductive isolation.

- Extinction means the dying out of a variety or a species. Extinction takes place due to catastrophic natural phenomena or biological as well as human activities.
- Population is defined as a group of freely interbreeding individuals forming the population.
- A population has traits of its own which are different from those of the individual forming the population.
- The characteristics of a population become evidence through the density of the population, natality, mortality, dispersal, age distribution, dispersion and growth form.
- The number of individuals per unit area at a given time is termed as **population density**.
- Counting of human population is called **census**.
- The rate at which new individuals are born and added to a population under given environmental conditions is called natality.
- Loss of individuals from a population due to death under given environmental conditions is called mortality.
- The process by which groups of living organisms expand the space or range within which they live is dispersal of any population
- Density of a population basically depends upon natality, mortality, immigration and emigration.
- Age distribution refers to the proportions of individuals of different age groups in a population. The population may be broadly divided into three age groups:-

- pre-reproductive group: comprising of juvenile individuals or children,
- reproductive group: consisting of individuals capable of reproduction,
- post-reproductive group: contains aged individuals who are incapable of reproduction.

Age Structures of Populations



- Sex ratio is an important aspect of population. It refers to the ratio between female and male individuals in a population
- Two basic forms of population growth curves can be identified. (i) 'J'-shaped growth curve and the (ii) 'S'-shaped or sigmoid growth curve.
- 'Biotic community refers to the populations of different kinds of organisms living together and sharing the same habitat.

- Structure of the community is determined by:
  - The roles played by its various populations;
  - The range of its various populations;
  - The type of area that is inhabited by the ns of the community;
  - The diversity of species in the community;
  - Communities created by humans are known as manmade communities. Example is lawn and crop communities.
  - They are very unstable and require a great amount of care and constant manipulation and maintenance.
  - Stratification refers to the vertical layers of vegetation. Example: canopy of a tropical rain forest.

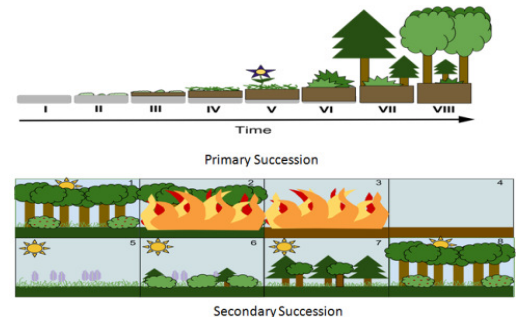
- Stratification is a practical strategy to minimize interspecific competition.
- Community characteristics – Species diversity also influences the stability of the community.

Community Diversity



A stable community is one which is able to return to its original condition after being disturbed in some way

- Ecological succession is process by which communities of plant and animal species in an area are replaced or changed into another over a period of time is known as ecological succession.
- There are two types of successions (i) Primary succession and (ii) Secondary succession.

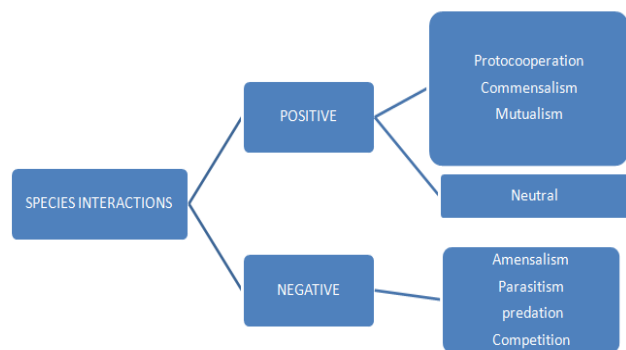


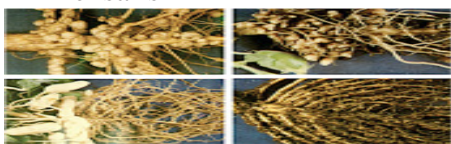


- Primary succession takes place over a bare or unoccupied areas where no community has existed previously. The plants that invade first bare land, where soil is initially absent are called pioneer species.
- A pioneer species generally show high growth rate but short life span.
- The community that initially inhabits a bare area is called pioneer community.

- Primary succession takes a very long time as compared to secondary succession. The pioneer community after some time gets replaced by another community with different species combination. This second community gets replaced by a third community.
- The terminal (final) stage of succession forms the community which is called as climax community.
- A climax community is stable, mature, more complex and long lasting.
- The entire sequence of communities in a given area, succeeding each other, during the course of succession is termed sere community.
- Succession that occurs on land where moisture content is low for e.g. on bare rock is known as xerarch.
- Succession that takes place in a water body, like ponds or lake is called hydrarch.
- Secondary succession is the development of a community which forms after the existing natural vegetation that constitutes a community is removed, disturbed or



destroyed by a natural or by human related events .

- The biological community of an area or ecosystem is a complex network of interaction is biotic interaction: The interaction that occurs among different individuals of the same species is called intraspecific interaction while the interaction among individuals of different species in a community is termed as interspecific interaction.



S. No	Type of interaction	Details
1.	Ammensalism 	is a negative association between two species in which one species harms or restricts the other species without itself being adversely affected or harmed by the presence of the other species. Ex. Fungus Penecillium and a variety of bacteria
2.	Predation 	Predator captures kills and eats an animal of another species called the prey. The predator naturally benefits from this relationship and Issues while the prey is harmed.
3.	Parasitism	One species is harmed and the other benefits. Example: animal, bacteria and viruses are parasites of plants dodder plant and mistletoe, tap worm and round worm.
4.	Competition 	An interaction between two populations in which both species are harmed to some extent.

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5.	Commensalism 	One of the species benefits while the other is neither harmed nor benefited. Example: relationship between sucker fish remora and shark; relationship between plants and epiphytes
6.	Mutualism 	Close association between two species in which both are benefitted. Example: Sea anemone and hermit crab. Any relationship between two dissimilar organism is known as symbiosis/example: termites and their intestinal flagellates; flowering plants and bees for pollination
7.	Neutralism	The relationship between two species which do interact but do not affect each other. True neutralism is rare or non-existent, its usage is often extended to situations where interaction are merely insignificant or negligible.



### Check Yourself

1. Who coined term ecology?
  - a. AG Tansley
  - b. Alexander Flemings
  - c. Louis Pasteur
  - d. Robert Brown
2. Human gut is the ----- of a tapeworm.
  - a. Niche
  - b. Habitat
  - c. Community
  - d. Biome
3. The appearance or behavior/structure/mode of life of an organism that allows it to survive in a particular environment is known as---.
  - a. Variation
  - b. Adaptation
  - c. Succession
  - d. Evolution
4. Theory of New Neo-Darwinism is proposed by---
  - a. GJ Mendel and Charles Darwin
  - b. Lamarck C and Charles Darwin
  - c. Charles Darwin and Alfred Wallace
  - d. Alfred Wallace and Lamarck C
5. When a physical barrier develops between two populations of a species is known as-----.
  - a. Reproductive isolation
  - b. Natural selection
  - c. Geographic isolation
  - d. ecological isolation

Ans: 1.a.      2.b    3.b.    4.c    5.a



### Stretch Yourself

1. Define the terms:
  - a. Census
  - b. Natality
  - c. Mortality
  - d. Density
2. What is the difference between habitat and niche?
3. How does Ammensalism differ from commensalism?



### Test Yourself

1. What is the basic adaptation of plants and animals to survive in their environment?
2. Discuss density independent population growth
3. Differentiate between primary and secondary succession
4. How does pioneer community differs from climax community?
5. Evolution leads to speciation. Explain in brief.