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COMMUNITY CHARACTERISTICS

BY

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Definition of Community:

In ecology, a community is a group or association of populations of two or more different species occupying the same geographical area at the same time, also known as a **biocoenosis**.

A biotic community, also known as a biota or 'biocoenosis', is the diverse group of organisms that live together and interact with each other within an environment or habitat. In other words, community represents the population of all species living and interacting in an



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area at a particular time. Community, in biology, refers to the assemblage of interacting organisms (either of the same or different species) coexisting in a particular area and time. For instance, a forest, inhabited by animals and various species of plants, as well as soil bacteria and fungi constitutes a biological community. Together, the biotic community and the physical landscape or abiotic factors make up an ecosystem.

There are many factors that contribute to a biological community. The factors include diversity (the number of species), abundance

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(number of each species), and the interactions among the various species. These interactions include predation, mutualism, parasitism, and competition. When these communities change over time, the phenomenon is called ecological succession.

In a community, except for autotrophs, most organisms rely on other organisms for food. This interdependence on other organisms can be represented by a food chain, with each organism occupying a particular place on the food chain called the trophic level.



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Types of Community:

There are two main types of community.

1. Major Community:

A major community is the smallest ecological unit which is able to sustain itself and is self-regulating. These communities are usually relatively independent of other communities, for example a pond, a forest, a grassland or lake. Long lasting and mature major communities contain only those organisms, which are successfully



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adapted to the environment and to the other species within the community.

A major community is an assemblage of a faunal community or 'zoonenosis', a floral community or 'phytocenosis', and a microbial community or 'microbiocenosis'.

2. Minor Community:

Minor communities, or merocenoses, which make up major communities, are smaller ecological units that are not individually



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self-sustaining and rely on interactions with other communities. An example of a minor community is the collection of organisms, which lives within a piece of deadwood on the forest floor.

Characteristics of Community:

Some of the major characteristics of community ecology are as follows:

- (a) Species Diversity
- (b) Growth Form and structure



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(c) Species abundance

(d) Dominance

(e) Self reliance

(f) Relative abundance

(g) Trophic structure

Community ecology deals with the group of various kinds of population in the areas. A group of several species (plants/ animals) living together with mutual tolerance in a natural area is called as a



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Community. A forest, a pond, and a desert are **natural communities**. A community has its own structure, development history, and behaviours.

The community has the following characteristics:

(a) **Species Diversity:** Each community consists of different organisms like plants, animals, microbes etc. They differ taxonomically from each other. This species diversity may be regional or local.



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(b) **Growth Form and structure:** Community can be analysed ' in terms of major growth forms like trees, shrubs, herbs etc. In each growth form as in trees, there may be different kinds of plants as- broad leaf trees, evergreen trees etc. These different growth forms determine the structural pattern of a community.

(c) **Species abundance:** Species abundance is the number of individuals per species, and relative abundance refers to the



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evenness of distribution of individuals among species in a community.

(d) **Dominance:** All species are not equally important in each community. The nature of the community is determined by a few species in a community. These limited species have control and dominating influence in the community. A dominant species is a plant, animal or functional group of different species most commonly or conspicuously found in a particular ecosystem. It is



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generally the most populous species or comprises the greatest biomass in an ecosystem. Examples: Tidal swamps in the tropics are usually dominated by species of mangrove.

(d) **Self reliance:** Each community has a group of autotrophic plants as well as heterotrophic animals. The autotrophic plants are self dependent.



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(e) **Relative abundance:** Different populations in a community exist in relative proportions and this idea is called as relative abundance.

(f) **Trophic structure:** Each community has a trophic structure that determines the flow of energy and material from plants to herbivores to carnivores.



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Species Diversity:

Species diversity is defined as the number of different species present in an ecosystem and relative abundance of each of those species. Diversity is greatest when all the species present are equally abundant in the area. There are two constituents of species diversity:

- **Species richness:** Species richness is the number of different species represented in an ecological community, landscape or region. Species richness is simply a count of species, and it



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does not take into account the abundances of the species or their relative abundance distributions. For example, if we have two plots of lands, A and B, and plot A has twenty four species of plants and plot B has eighty four species of plants, plot B has higher species richness. Tropical areas have greater species richness as the environment is conducive for a large number of species.



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- **Species evenness:** Relative abundance of individuals of each of those species. If the number of individuals within a species is fairly constant across communities, it is said to have a high evenness and if the number of individuals varies from species to species, it is said to have low evenness. High evenness leads to greater specific diversity.

It is possible in an ecosystem to have high species richness, but low species evenness.

For example:



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- In a forest, there may have a large number of different species (high species richness) but have only a few members of each species (low species evenness)
- In a forest, there may be only a few plant species (low species richness) but a large number of each species (high species evenness)

The species diversity varies in a different geographical location with tropics having highest and declines as we move towards poles. The



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most species-rich environments are tropical rainforests, coral reefs and ocean bottom zone.

Species richness increases with increasing explored area.

Importance of Species Diversity:

In a healthy ecosystem, diverse and balanced number of species exist to maintain the balance of an ecosystem. In an ecosystem, all the species depend on each other directly or indirectly. So to make a more efficient, productive and sustainable ecosystem, it is important to maintain high species diversity.

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- More diverse ecosystem tend to be more productive. E.g. the ecosystem with a great variety of producer species will produce large biomass to support a greater variety of consumer species
- Greater species richness and productivity makes an ecosystem more sustainable and stable
- More diverse the ecosystem, greater is the ability to withstand environmental stresses like drought or invasive infestations



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- Species richness makes an ecosystem able to respond to any catastrophe
- In Species-rich communities, each species can use a different portion of resources available as per their requirement. E.g. plants with smaller roots can absorb water and minerals from shallow soil and plants with deeper roots can tap deeper soil
- Rich diversity is important for the survival of mankind



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- Healthy biodiversity has innumerable benefits like nutrients storage and recycling, soil formation and protection from erosion, absorption of harmful gases, climate stability
- Humans get lots of product from nature like fruits, cereals, meat, wood, fibre, raisin, dyes, medicine, antibiotics, etc.
- Amazon forest is estimated to produce 20 percent of total oxygen in the earth's atmosphere through photosynthesis
- Pollinators, symbiotic relationships, decomposers, each species perform a unique role, which is irreplaceable

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- Diversity in large numbers help in large scale interaction among organisms such as in the food web
- In the nitrogen cycle, bacteria, plants have a crucial relationship, earthworms contribute to soil fertility
- Apart from these, there are other benefits such as recreation and tourism, education and research.

Each species plays an important role in an ecosystem. The role that a species plays in its ecosystem is known as its “**ecological**



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niche". Species can be broadly divided into generalist and specialist species.

- **Generalist species:** They have broad niches. These can live in many places and can eat a variety of foods. They can thrive in rapidly changing environmental conditions. E.g. cockroaches, rats, mice, flies, white-tailed deer, raccoons, humans, etc.
- **Specialist species:** They have a narrow niche, found in only one type of habitat and feed on a few types of food. They are



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more prone to disturbances in the environmental condition and cannot tolerate the change and environmental stress. In the tropical rain forests where environmental conditions are fairly constant, specialist species hold an advantage as they have fewer competitors for the resources. E.g. the giant panda of China is endangered because of low reproductive rate, disturbances in its habitat and specific diet mostly bamboo. Tiger salamanders breed in fishless ponds, shorebirds that feed on crustaceans tend to live on sandy beaches and adjoining coastal wetlands.

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- **Native species:** Species that normally live and thrive in a particular ecosystem.
- **Non-native species (invasive or alien species):** Species that migrate deliberately or accidentally to an ecosystem. They can spread rapidly if they find a favourable niche. Invasive species compete with other species for food and habitat. If the indigenous species are unable to compete, they are forced to leave or die.



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- **Indicator species:** These serve as biological smoke alarms. These species provide early warnings of damage to an ecosystem. E.g. presence of trout species is an indicator of the water quality as they need clean water with high levels of dissolved oxygen to thrive, birds are an excellent biological indicator of their habitat loss and fragmentation and use of chemical pesticides. Butterflies are also a good indicator species as their association with various plant species makes them vulnerable to their habitat loss and fragmentation. Coal



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miners used canaries as an indicator of the poisonous and explosive gases present in the mine.

- **Keystone species:** They play an important role in maintaining species diversity and integrity of an ecosystem. They have a high impact on the types and abundance of species in an ecosystem. These species play several critical roles in helping certain species (e.g. role in pollination like bees, butterflies) to sustain as well as check the overpopulation of other species to



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become overly dominant (e.g. top predators like a lion, shark, wolf, etc.). E.g. if predatory starfish was removed from an ecosystem, it resulted in different species of mussels to outcompete other species and reducing species diversity.

- **Foundation species:** They play an important role in creating and enhancing habitats. E.g. Elephants push over or uproot trees to open forest in grasslands and woodlands of Africa,



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promoting the growth of grass and other foliage required for small grazing species like an antelope.

Examples of the ecosystem with high Species Diversity

- **Tropical Rainforests:** They contain half of the world's species. There are about 5-10 million insect species present. 40% of the world's 2,75,000 species of flowering plants are present in the tropical regions. 30% of total bird species are present in tropical forests. The species richness of tropical



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forests is mostly due to relatively constant environmental conditions.

- **Coral Reefs:** Colonies of tiny coral animals build the large coral reefs ecosystem. The clarity of the water in the coral reef systems allow the sunlight to penetrate deep, resulting in the high level of photosynthesis in the algae present inside the coral. Adaptation to various disturbances and niche specialisation gives rise to species richness.



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The Great Barrier Reef of Australia is the world's largest coral reef with an area of 349,000Km². It contains about 400 species of coral, 1500 species of fish, 4000 species of molluscs and 6 species of turtles. It provides a breeding site for around 250 species of birds. It covers only 0.1% of the ocean but has about 8% of the world's fish species. There are thousands of species which are yet to be discovered and described.

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Threats to species diversity:

The world is facing an accelerated rate of extinction of species largely due to human activities. The four major causes of loss of diversity are known as “**The Evil Quartet**”.

These are:

- **Habitat Loss and Fragmentation:** Due to pollution, urbanisation and various other human activities, habitat loss and fragmentation is a major cause of loss in species diversity and driving plants and animals extinct. E.g:



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- Amazon rainforest (lungs of the planet), which is a house to millions of species are being cut and cleared for various purposes
- Tropical rainforest, which once covered 14 per cent of landmass, is no more than 6 percent now.

Over Exploitation: Over-exploitation of natural resources leads to the extinction of many species. E.g. Steller's sea cow, the passenger pigeon, many marine fishes are overharvested



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Alien species invasions: When alien species are introduced deliberately or unintentionally, some of them become invasive, leading to the extinction of indigenous species. E.g.

- . Extinction of cichlid fish in Lake Victoria due to the introduction of the Nile perch
- . Illegal introduction of the African catfish is a threat to indigenous catfishes in rivers

Co-extinctions: When a species becomes extinct, the species that are associated with it also becomes extinct. E.g.



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- . When a host fish goes extinct, the parasite also goes extinct
- . Mutualism like a plant-pollinator, where extinction of one species leads to the extinction of other species too.

Conservation of Species Diversity:

Each species has an important role to play in an ecosystem. It is important to conserve diversity because once extinct, we can not get it back. There are many ways to conserve biodiversity:



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- Biodiversity rich regions are protected as biosphere reserves, national parks and sanctuaries i.e. called **in-situ conservation**. Protecting Sunderbans for many endangered species like the royal Bengal tiger, olive ridley sea turtles, mangrove species etc.
- Biodiversity hotspots have been identified, which have high species richness. Total of 34 hotspots are identified globally



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e.g. Western ghats and Sri Lanka, Indo-Burma and Himalaya are rich biodiversity regions of our country.

- India has a tradition of protecting nature. In many cultures, trees and wildlife are given full protection e.g. sacred groves.
- **Ex-situ conservation**, where threatened and endangered species are identified, taken out and given full protection and



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kept in special reserves like botanical gardens, wildlife safari, etc.

- Gametes of threatened species are preserved by cryopreservation techniques.
- Seeds of commercially important plants are kept in the seed bank.



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