Ecosystem

The term ecosystem was first proposed by A.G. Tansley in 1935. It may be defined as a system formed by the community and the environment." The central theme of ecosystem concept is that the living organisms of a community not only interact among themselves but also have functional relationship with their non-living environment. "The structural and functional system of communities and their environment is called an ecosystem." Thus ecosystem is the basic structural and functional unit of ecology.

Functioning of Ecosystem

There are mechanisms for continuous absorption of materials by organisms for producing organic compounds and their release and conversion into inorganic form. The whole process is called the cycling of materials and the energy utilized to perform this act comes from the sun. However all living organisms are not capable of utilizing the solar energy and convert the same into chemical energy. The functional aspect of ecosystem including the trapping of energy by green plants and its passage into herbivorous and carnivorous animals and other organisms which are either parasitic or saprophytic. This process is called the flow of energy.

Types of Ecosystems

Some terrestrial ecosystems are named after the types of organisms and habitat conditions such as (i) grassland ecosystem, (ii) crop ecosystem (iii) forest ecosystem (iv) desert ecosystem & so on.

Similarly fresh water ecosystems are (i) pond ecosystem (ii) Lake ecosystem (iii) river ecosystem & so on. The largest and most uniform aquatic ecosystem is marine ecosystem. An v may be as small as drop of pond water. Such a small ecosystem is called micro- ecosystem. it may be as large as an ocean.

Human activities may modify or convert natural ecosystems into man- made or anthropogenic ecosystems.

Ecosystem Components

According to Odum, from the trophic (food) point of view, an ecosystem has two components

(i) Autotrophic component – In which the fixation of light energy, the use of simple inorganic substances and the manufacture of complex materials predominates.

(ii) Heterotrophic Components – The component which utilizes, rearranges and decomposes the complex materials synthesized by the autotrophs.

An ecosystem can be divided into the following four structural components –

1. Producers – Producers or autotrophic organisms are those living organisms of the ecosystem that utilize sunlight ad their energy source and simple inorganic materials like water, carbon dioxide and salts etc. to produce their own food. Producers are largely photosynthetic plants and their kind varies with the kind of ecosystem eq. in a dense forest the trees are the most important producers , in lakes and ponds, the producers are rooted or large

floating plants and microscopic plants (phytoplankton) usually the algae, in ocean the rooted and floating algae are the producers.

2. <u>Consumers</u> – Consumers are those living members that ingest other organisms and are therefore called heterotrophs. They derive their food directly or indirectly from the metabolized in the consumers body. The vast majority of consumers are the animals.

3. The Primary Consumers in an ecosystem are herbivores, which feed directly on the producers. However primary consumers also vary with the kind of the ecosystem. For example, a deer or giraffe is a primary consumer in a forest ecosystem, while a cow and goat are the primary consumer is a grassland or crop ecosystem.

4. The secondary consumers (carnivores) such as predaceous insets and game fish is a pond feed on the primary consumers. There are in most ecosystems, some organisms that eat other carnivores like a snake eat a frog on a bird eats all type of fishes including carnivores. These are called the tertiary carnivores like the lion and vulture, which are not killed or rarely killed and eaten by other animals.

5. <u>Decomposers</u> – Decomposers or the micro consumers are also called the saprobes or saprophytes. They are also the living components, chiefly the bacteria and fungi that break down the complex compounds of dead protoplasm of producers and consumers, absorb, some of the decomposition products and release simple decomposition usable by the producers molds and

mushrooms (Agaricus) of the forest floor are the largest of the decomposers that are visible to a naked eye.

6. Abiotic substances or components – The abiotic component consists of two things. The materials and the energy. The materials are like water, minerals, atmospheric gases and salts. They also include some organic matter, such as the amino acids and other products of decay of living things. The minerals and atmosphere gases keep on cycling. They enter into biotic system and after the death and decay of living things. The minerals and atmosphere gases keep on cycling. They enter into biotic system and after the death and decay of organisms return to soil and atmosphere. This is known as biogeochemical cycle. The circulation of materials involves trapping of the solar energy by the green plants, which is ultimately lost by the organisms is several ways. The amount of abiotic materials present in an ecosystem is called standing stage.

Food Chain

The series of organisms eating one and being eaten by the other is called the food chain. A simple food chain consists of three steps as follows – Plant --- Herbivore --- Carnivore, but it is obvious that more than three links may be involved in a food chain and therefore a generalized expression plant --- herbivore --- Carnivore is changed to plant --- Herbivore --- Carnivore ---- Carnivore ---- Carnivorer

Eg. In a pond bond ecosystem the food chain consists of phytoplankton, herbivorous zooplankton, small carnivorous fish, large carnivorous fish and finally the decomposers.

In grassland ecosystem, the food chain consists of – Grass ---

Grasshoppers --- Frog --- Snakes --- Vulture <u>Food Web/ Trophic</u>

<u>Web</u>

In nature, the food chains are not isolated sequences, but are rather interconnected with one another, "A network of food chains which are interconnected at various trophic levels, so as to form number of feeding connections amongst different organisms of a biotic community is called food web." Food web opens several alternate pathways for the flow of food energy. It also allows an organisms to obtain it also allows an organisms to obtain its food from more than one type of organisms of the lower trophic level. eg. a simple food web is fresh water as producers primary consumers secondary consumer, Tetiary consumer

<u>Ecological Pyramids</u>

There is some sort of relationship between the number, biomass and energy contents of the producers and consumers of different orders in any ecosystem. These relationship, when represented in diagrammatic ways are referred to as ecological pyramids which are of the following three types –

1. <u>Pyramids of Numbers</u>

    A graphic representation of number of individuals per unit area of various trophic level stepwise with producers forming the base and

top carnivores at the tip is called pyramid of number is straight or upright. For example : in a grassland ecosystem, a large number grass or herbs, support a lesser number of grasshoppers, the later support fewer number of frogs and the frog to still smaller number of snakes, the latter support to very few peacocks or falcons. Similarly in pond ecosystem, a large number of phytoplankton support a lesser number of zooplankton followed by carnivores – fishes and top carnivores like stork and king fisher.

In a tree ecosystem an inverted pyramid is obtained. A large tree provides food to several herbivores birds. The birds support still larger population of ectoparasites.

2. Pyramid of Biomass –

The amount of living or organic matter present in a particular environment is called biomass. " A graphic representation of biomass present sequences per unit are of different trophic levels, with producers at the base and top carnivores at the tip is called pyramid of biomass."

In a terrestrial ecosystem, the maximum biomass occurs is producers and there is progressive decrease in biomass from lower to higher trophic levels. In such terrestrial ecosystem the pyramid of upright.

In an aquatic habitat the pyramid of biomass is inverted. The biomass of phytoplanktons is less than that of zooplanktons. It is still more is primary consumers and so on.

3. Pyramid of Energy

A graphic representation of the amount of energy trapped per unit time and are in different trophic levels of a food chain with producer forming the base and the top carnivores at the tip is called pyramid of energy. The maximum energy content is present in the producers. The energy content decreases as it passes into higher trophic levels. The pyramid of energy is always upright.

Ecological Succession

Ecological succession means ecological development. It refers to the process of gradual change in conditions of environment and replacement of older species. This is an ever-containing phenomenon. The occurance of ecological succession has following characteristics.

1. It is a systematic process.

2. The changes are directional and take place as a function of time.

3. The succession occurs due to change in hysical environment and the population of species.

4. The changes are predictable. The process of succession is self- going, stable and biologically feasible.

According to ecological development the succession can be classified into two

1. Primary succession –

This is the initial stage of development of an ecosystem. It begins with the creation of community on such a location where there was no living organisms. such location may be a new island, newly created body of water, a new volcanic flows etc.

2. Secondary Succession

This is a re-establishment stage of the development of an ecosystem which existed earlier but was destroyed due to natural calamities or man-made reasons, Such reestablishment occurs due to the presence of seeds and organic matters of biological communities in the soil.

Some examples of secondary succession are as follows :-

a) Forests, which were destroyed due to fire take rebirth on abandoned land.

b) Vegitation, destroyed due to flood, grows once again.

c) Crops which were harvested grows again as some seeds of earlier crops remain buried under soil.

d) Bushes grow on an abandoned mining site