3.2 **STRUCTURE AND FUNCTION OF AN ECOSYSTEM**

On the basis of structure, an ecosystem can be classified in the following two components:

- Biotic components Abiotic components

Biotic components:

- It include all type of living beings.
- They are further categorized into autotrophs and heterotrophs.
- Heterotrophes are further of two types:
- -consumers (herbivores and carnivores) and decomposers.
- Different biotic components are connected to each other through food and other relations.
- Food is synthesized by the plants only by chlorophyll in the presence of sunlight by the absorption of water from soil through their roots and carbon-di-oxide from atmosphere.
- Plants can prepare their food by themselves thats why; they are called autotrophes (producers).
- The abiotic components include non-living substances and other physical and chemical factors of the environment.

Producers (autotrophs) :

- These are the chlorophyll containing autotrophic organisms, which prepare their food from from the inorganic raw materials with the help of sunlight through the process of photosynthesis.
- In terrestrial ecosystem, the autotrophs are rooted plants (herbs, shrubs and trees).
- In the deep aquatic ecosystem floating plants called Phytoplankton's are the major producers.
- In shallow waters rooted plants are called macrophytes, are the dominant producers.
- When the environmental conditions are optimum, the phytoplanktons can produce as much food as produced by the larger shrubs and trees on unit area (land or surface water) basis.

$$H_2O + CO_2 + \text{Sunlight} + \text{Chlorophyll} \rightarrow \text{carbohydrates} + O_2$$

- During photosynthesis autotrophs convert solar energy into chemical energy of the organic compounds.
- Producers are called converters and transducers.

- Heterotrophs are dependant for their food and energy requirements on the producers.

Consumers:

- Consumers are the heterotrophic animals, which generally ingest and swallow their food.
- The food of consumers consist of organic compounds produced by autotrophes.
- Consumers are also known by name **phagotrophes**.

Consumers are of two types.

Herbivores:

- Herbivores are the animals which are dependant for their feed directly on the plants.
- They are called first order consumers.
- (grasshopper, deer, rabbits, goat, cattle) etc. are herbivores of terrestrial ecosystem.
- (Protozoa, Molluscs, crustaceans) etc. are some examples of aquatic ecosystem.
- ELTON (1927) called primary consumers as '**Key Industry Animals**', because they convert the plant material into the animal material.

Carnivores:

- these are the organisms which are dependant for their feed upon the flesh of other animals.
- The carnivores take their feed from the herbivores, so they are called primary carnivores or second order consumers.
- for example-frog, birds, fox, cat etc.
- The secondary consumers are preyed upon by any other larger carnivores; they are called tertiary consumers and so on.
- The larger carnivores such as lion tiger etc. which cannot be preyed upon further, they are called top carnivores and occupy top position in the food chain.

Decomposers:

- These are the micro- organisms such as bacteria, fungi etc. which take their food from the dead bodies of producers (plants) ,consumers (animals) and their organic wastes.

- Decomposers are also known by name micro-consumers or reducers because of their small size.
- They secret the digestive enzymes in the surrounding medium to digest the organic material (extracellular digestion).
- They consume a part of the decomposition product for their own nourishment.
- The remaining substances add materials and minerals to the substratum. This process is called **Mineralization.**
- The discharged minerals are utilized as nutrients by the producers.
- Decomposers are also known by name Saprophytes (sapro-to decompose).
- Decomposers are of two types-scavengers and parasites.
- Scavengers are the animals which take their feed from the dead bodies of the organisms.
- For example-termites, beetles, worms' etc. parasites the organisms which take their feed from the body of organisms called host.
- Parasites belong to all the category of organisms for example bacteria, fungi, viruses, protozoa, worms etc.

Abiotic Components:

- The abiotic components of an ecosystem include the non-living constitutes of an ecosystem i.e habitat.
- Habitat is a specific set of physical and chemical conditions that surrounds a species, a group of species or a larger community.
- Soil and water forms the important abiotic factors in an ecosystem.
- In addition to these there are a number of other abiotic factors which can be categorized into two categories.

Physical Factors:

Light:

- The natural source of light is solar radiations.
- The quality and intensity of light varies in the major habitats depending upon the cover, transparency and other factors.
- Green plants by utilizing solar energy convert the inorganic raw materials (nutrients, CO_2 and H_2O) into the complex carbohydrates, which is further passed through the food chain.

Temperature:

- It is a measure of intensity of heat.

- It controls the climate of a place in co-ordination with evaporation and precipitation.
- Consequently it has a direct control on the distribution of species in any geographical area.

Evaporation and precipitation:

- Evaporation and precipitation along with temperature are the main parameters which govern the climate in any geographical area and drive the water cycle.
- In terrestrial ecosystem they modulate the development of biomass in an ecosystem.

Pressure:

- It is an important parameter which governs the climate of an area.
- It decreases with altitude by a factor of 10 for every 15 km above the sea-level.
- It increases by 1 atmosphere for every 10 m depth in the water.
- Animals have undergone required adaptations to this change in the pressure.
- It limits the growth of population at the high altitudes and at different depths in the sea.

Humidity:

- It is defined by the moisture content in the air.
- It is controlled by the temperature and wind in an area.
- Transpiration by the plants and water absorption by the animals is influenced by atmospheric humidity.

Gravity:

- It determines the movement of matter to and from the system.
- It shows distinct effect on the structure, general orientation and distribution of animals.
- It controls the rock material and the hydrological cascade system.

Air and water currents:

- air and water currents are direct expression of pressure changes.
- In response to change in this parameter, organisms have undergone several changes.
- For example crabs in the beaches emerges with receding tide for feeding and return to their burrows as the waves sweep over the shore.

- Air currents are associated with the weathering of rocks which is linked with cycling of nutrients.
- Air and water currents are involved in the process of '**overturn**' of water which helps in enriching deeper water with oxygen.

Chemical Factors:

Carbon-dioxide:

- It is an important raw material for the process of photosynthesis.
- It controls the other chemical factors like pH, carbonate and bicarbonates of the medium in which the organisms live.

Oxygen:

- It governs the distribution of species in any geographical area.
- It is being continuously used in the respiration of organisms in an ecosystem and replenished through the process of photosynthesis by producers.

Minerals (nutrients):

- Nutrients are important to carry out and maintain life.
- Macronutrients are those which are required in large quantities.
- For example-carbon, hydrogen, nitrogen, sulphur, phosphorus, calcium, potassium, and sodium.
- They occur in the simple forms like carbon-di-oxide, water and nitrates in the nature.
- On the other hand micronutrients are the nutrients which are required in small quantities.
- For example- iron, manganese, magnesium, cobalt, zinc and molybdenum etc.
- The source of these nutrients in the terrestrial ecosystem is soil and in the aquatic ecosystem is water.

Organic matter:

- carbohydrates, proteins, fats constitute the living organisms.
- When organisms die their bodies decay and become organic detritus which is taken by the decomposers that help in the cycling of elements.