ECOSYSTEM : POND ECOSYSTEM

Dr Poonam kumari
Associate Professor
Dept Of Zoology
Maharaja college, Ara
(B.Sc Part I Zoology Hons)

Ecosystem, the complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space.

An ecosystem can be categorized into its abiotic constituents, including minerals, climate, soil, water, sunlight, and all other nonliving elements, and its biotic constituents, consisting of all its living members. Linking these constituents together are two major forces: the flow of energy through the ecosystem, and the cycling of nutrients within the ecosystem.

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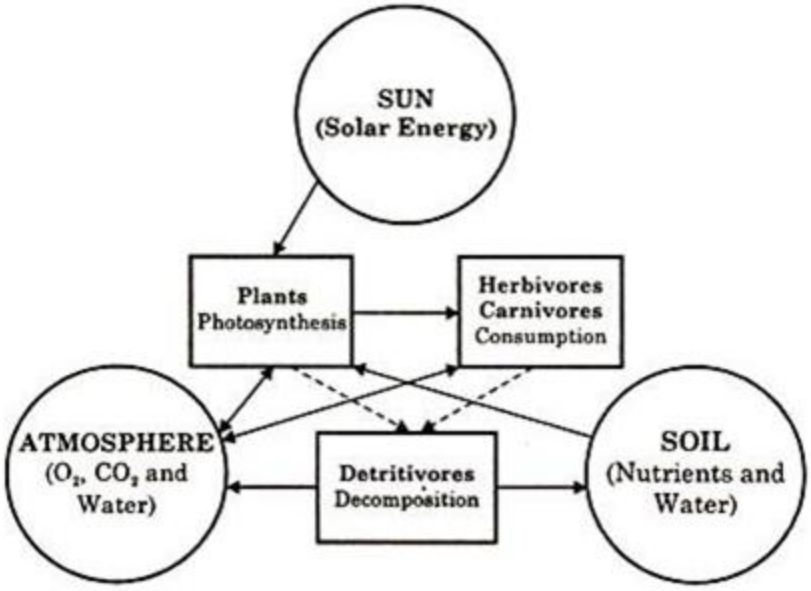

Relationship within an Ecosystem.

Structure of Ecosystem:

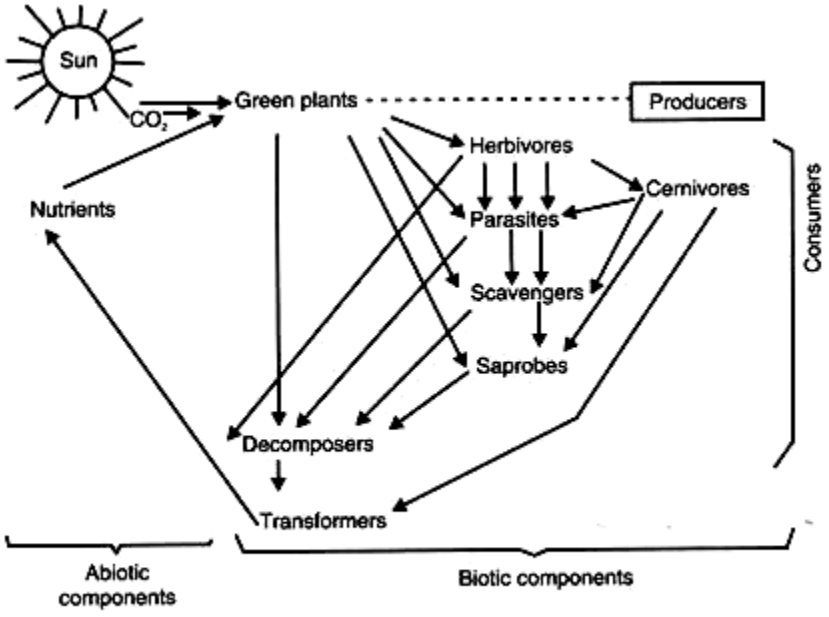

Fig. 3.1. Different components of ecosystem.

The structure of an ecosystem is basically a description of the organisms and physical features of environment including the amount and distribution of nutrients in a particular habitat. It also provides information regarding the range of climatic conditions prevailing in the area.

From the structure point of view, all ecosystems consist of the following basic components:

1. Abiotic components

2. Biotic components

1. Abiotic Components:

Ecological relationships are manifested in physicochemical environment. Abiotic component of ecosystem includes basic inorganic elements and compounds, such as soil, water, oxygen, calcium carbonates, phosphates and a variety of organic compounds (by-products of organic activities or death).

It also includes such physical factors and ingredients as moisture, wind currents and solar radiation. Radiant energy of sun is the only significant energy source for any ecosystem. The amount of non-living components, such as carbon, phosphorus, nitrogen, etc. that are present at any given time is known as standing state or standing quantity.

2. Biotic Components:

The biotic components include all living organisms present in the environmental system.

From nutrition point of view, the biotic components can be grouped into two basic components:

(i) Autotrophic components, and

(ii) Heterotrophic components

The autotrophic components include all green plants which fix the radiant energy of sun and manufacture food from inorganic substances. The heterotrophic components include non-green plants and all animals which take food from autotrophs.

So biotic components of an ecosystem can be described under the following three heads:

1. Producers (Autotrophic components),

2. Consumers, and

3. Decomposers or reducers and transformers

The amount of biomass at any time in an ecosystem is known as standing crop which is usually expressed as fresh weight, dry weight or as free energy in terms of calories/metre.

Producers (Autotrophic elements):

The producers are the autotrophic elements—chiefly green plants. They use radiant energy of sun in photosynthetic process whereby carbon dioxide is assimilated and the light energy is converted into chemical energy. The chemical energy is actually locked up in the energy rich carbon compounds. Oxygen is evolved as by-product in the photosynthesis.

This is used in respiration by all living things. Algae and other hydrophytes of a pond, grasses of the field, trees of the forests are examples of producers.

Chemosynthetic bacteria and carotenoid bearing purple bacteria that also assimilate CO_2 with the energy of sunlight but only in the presence of organic compounds also belong to this category.

Consumers:

Those living members of ecosystem which consume the food synthesized by producers are called consumers. Under this category are included all kinds of animals that are found in an ecosystem.

There are different classes or categories of consumers, such as:

(a) Consumers of the first order or primary consumers,

(b) Consumers of the second order or secondary consumers,

(c) Consumers of the third order or tertiary consumers, and

(d) Parasites, scavengers and saprobes.

(a) Primary consumers:

These are purely herbivorous animals that are dependent for their food on producers or green plants. Insects, rodents, rabbit, deer, cow, buffalo, goat are some of the common herbivores in the terrestrial ecosystem, and small crustaceans, molluscs, etc. in the aquatic habitat. Elton (1939) named herbivores of ecosystem as "key industry animals". The herbivores serve as the chief food source for carnivores.

(b) Secondary consumers:

These are carnivores and omnivores. Carnivores are flesh eating animals and the omnivores are the animals that are adapted to consume herbivores as well as plants

as their food. Examples of secondary consumers are sparrow, crow, fox, wolves, dogs, cats, snakes, etc.

(c) Tertiary consumers:

These are the top carnivores which prey upon other carnivores, omnivores and herbivores. Lions, tigers, hawk, vulture, etc. are considered as tertiary or top consumers.

Besides different classes of consumers, the parasites, scavengers and saprobes are also included in the consumers. The parasitic plants and animals utilize the living tissues of different plants and animals. The scavengers and saprobes utilize dead remains of animals and plants as their food.

(d) **Decomposers and transformers:**

Decomposers and transformers are the living components of the ecosystem and they are fungi and bacteria. Decomposers attack the dead remains of producers and consumers and degrade the complex organic substances into simpler compounds. The simple organic matters are then attacked by another kind of bacteria, the transformers which change these organic compounds into the inorganic forms that are suitable for reuse by producers or green plants. The decomposers and transformers play very important role in maintaining the dynamic nature of ecosystems.

Function of Ecosystem:

An ecosystem is a discrete structural, functional and life sustaining environmental system. The environmental system consists of biotic and abiotic components in a habitat. Biotic component of the ecosystem includes the living organisms; plants,

animals and microbes whereas the abiotic component includes inorganic matter and energy.

Abiotic components provide the matrix for the synthesis and perpetuation of organic components (protoplasm). The synthesis and perpetuation processes involve energy exchange and this energy comes from the sun in the form of light or solar energy.

Thus, in any ecosystem we have the following functional components:

(i) Inorganic constituents (air, water and mineral salts)

(ii) Organisms (plants, animals and microbes), and

(iii) Energy input which enters from outside (the sun).

These three interact and form an environmental system. Inorganic constituents are synthesized into organic structures by the green plants (primary producers) through photosynthesis and the solar energy is utilized in the process. Green plants become the source of energy for renewals (herbivores) which, in turn become source of energy for the flesh eating animals (carnivores). Animals of all types grow and add organic matter to their body weight and their source of energy is complex organic compound taken as food.

They are known as secondary producers. All the living organisms whether plants or animals in an ecosystem have a definite life span after which they die. The dead organic remains of plants and animals provide food for saprophytic microbes, such as bacteria, fungi and many other animals. The saprobes ultimately decompose the organic structure and break the complex molecules and liberate the inorganic components into their environment.

These organisms are known as decomposers. During the process of decomposition of organic molecules, the energy which kept the inorganic components bound together in the form of organic molecules gets liberated and dissipated into the environment as heat energy. Thus in an ecosystem energy from the sun, the input is fixed by plants and transferred to animal components.

Nutrients are withdrawn from the substrate, deposited in the tissues of the plants and animals, cycled from one feeding group to another, released by decomposition to the soil, water and air and then recycled. The ecosystems operating in different habitats, such as deserts, forests, grasslands and seas are interdependent on one another. The energy and nutrients of one ecosystem may find their way into another so that ultimately all parts of the earth are interrelated, each comprising a part of the total system that keeps the biosphere functioning.

Thus the principal steps in the operation of ecosystem are as follows:

(1) Reception of radiant energy of sun,

(2) Manufacture of organic materials from inorganic ones by producers,

(3) Consumption of producers by consumers and further elaboration of consumed materials; and.

(4) After the death of producers and consumers, complex organic compounds are degraded and finally converted by decomposers and converters into such forms as are suitable for reutilization by producers.

The principal steps in the operation of ecosystem not only involve the production, growth and death of living components but also influence the abiotic aspects of habitat. It is now clear that there is transfer of both energy and nutrients from

producers to consumers and finally to decomposers and transformers levels. In this transfer there is a progressive decrease of energy but nutrient component is not diminished and it shows cycling from abiotic to biotic and vice versa.

POND ECOSYSTEM

A pond is either a natural or an artificial body of water that is enclosed. Ponds can occur naturally in the world or they can be human made (such as a garden pond).

An ecosystem is the technical term for a community of organisms. For such a community to form an ecosystem, it needs to be a distinct system where the organisms live and interact.

Pond Ecosystem is differs from other water ecosystems. Unlike the river ecosystem, which is categorized under the Lotic systems, pond ecosystem falls under the Lentic ecosystem for the reason that the water remains stagnant in ponds for a relatively longer period time.

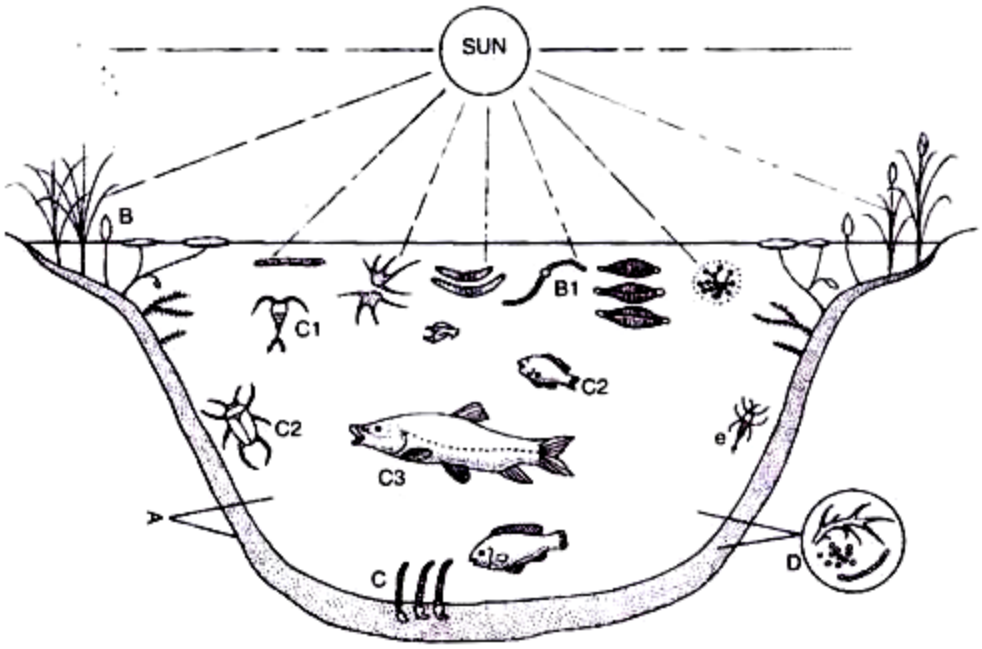

Fig. 3.4 A pond ecosystem.
A—Abiotic component; B and B1—Producers; C1—Primary consumers (herbivores); C2—Secondary consumers; C3—Tertiary consumers; D—Decomposers—saprophytic bacteria and fungi.

MEANING OF POND ECOSYSTEM

A pond ecosystem is a system of organisms that live together in a pond. A pond ecosystem can be defined in three ways:

1. A closed community of organisms in a body of water.
2. An enclosed body of water that houses numerous different creatures.
3. A biological system that includes water and plant and animal life interacting with each other.

So, to summarize, a pond ecosystem is:

- A community of organisms living together…
- Within a body of water that can be either…

- Artificially enclosed or….
- Naturally enclosed.
- A distinct community with its own ecology.

Types of pond ecosystem.

Ponds can come in many different forms, and they all have their own differentiating characteristics. Below, you will find a discussion of some of the key types of pond ecosystem.

1. Salt ponds.

Salt ponds contain brackish (i.e. salty) water and can occur close to the sea side where waterlogged ground creates natural pools. Salt ponds can also occur in rocky areas on the beach, though here they are called rock pools. It is also possible to find salt ponds inland, thanks to the presence of brackish streams created through streams flowing through salty rocks.

2. Garden ponds.

These artificially created ponds can contain ornamental plant and animal species that come from all over the world (i.e. non native species).

3. Freshwater pools.

Freshwater pools can form anywhere inland, either from rainfall or from the presence of water saturating the soil. They can also be created by rivers flowing in to a depression in the ground. They can be home to fish, birds, amphibians, crustaceans and many other kinds of wildlife.

4. Vernal pools.

Vernal pools are seasonal ponds. They form in depressions in the ground, but only during certain types of the year when the rainfall is heaviest. As a result, they will attract certain types of animals and birds that are in need of a drink whenever they appear and at other times of the year will be relatively deserted – one example for instance is a seasonal oasis in the desert. These types of pond ecosystems are sometimes referred to as ephemeral pools as well, to reflect the fact that they only exist at certain times of year.

5. Underground ponds.

Ponds can also form underground, in the rocky environment of caves. Here, a surprising amount of life can be found, including fish, different bacteria, lichens and so on.

Characteristics of pond ecosystems.

There are several things that mark pond ecosystems out from other types of ecosystems. Below, you will find a list of some of the main features of these ecosystems.

1. Still waters: pond ecosystems are lentic ecosystems – i.e. they involve stagnant or standing water.

2. Surrounded by banks: by definition, pond ecosystems are surrounded by either artificial or natural banks.

3. Wet: these ecosystems are wet and humid ones.

4. Different levels: distinct communities of creatures will live at different levels of a pond. Crustaceans and deep water fish may live at the lower level, for example, whilst birds and blooming plants may live towards the surface.

5. Variable in size: some pond ecosystems can be very small (such as a rockpool) whilst others can be almost as large as a lake.

Importance of pond ecosystems.

Pond ecosystems are very important, and for this reason it is vital that we take steps to protect and nurture them.

1. Biodiversity.

Pond ecosystems are very important habitats for so many different types of fish, birds, plants and crustaceans as well as insects such as dragonflies, damsel flies and pond skaters.

2. Ubiquity.

Pond ecosystems can be found on every continent on the planet. That makes them very important for the life of organisms all over the world.

3. Abundance.

Pond ecosystems are very abundant. Not only can they be found almost everywhere, they can be found plentifully. That, again, makes them a key habitat for many different species.

4. Source of hydration.

Even if they do not actually live in the pond ecosystem, many species of animals will come to pond ecosystems whenever they need a drink. A key example is a watering hole in a prairie or desert. Humans can also use these ecosystems as a source of water.

5. Beauty.

Pond ecosystems are very beautiful as well. As we watch the sunlight reflecting off the surface of a pond we can feel inspired, calm and in touch with nature.