Chapter

7

Different Ecosystems

In "Habitat" chapter of class VI you have studied many things related to habitat. Try to recall some of them.

- The dwelling place for plants and animals is called habitat.
- Non living and living things are part of a habitat.

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Try to add more such points to your list.

- ……..
- ……..

Fig-1

Gayathri and Venkatesh are debating whether habitat and ecosystem are same? You may also ponder on that. Let us try to understand how the term ecosystem came into existence and in what way ecosystem is different from habitat.

What is Ecosystem

The word ecosystem was first used in 1935 by A.G. Tansley (a British Botanist and Ecologist) to describe a basic unit of nature. Tansley coined the word as reduction of the term "Ecological system" to "Ecosystem". According to him, nature works as a system in which organisms and their communities are influenced by many non living environmental factors and vice versa.

Till the use of the term ecosystem, people were studying inter-relationships in nature in separate units mainly of an individual and those live in the environment. Habitat is a place that fulfils the needs of such organisms.

Now you would be able to understand that Venkatesh and Gayathri both are correct in their own ways. The habitat that Gayathri talks about is a part of the larger ecosystem.

Lab Activity

Structure of the ecosystem

Aim : Let us study an Ecosystem. It may be your school/home garden. It will help you to understand the structure of an ecosystem.

Materials Required : Measuring tape string, small sticks, hand lens, hand towel, shovel.

Procedure : To know about Structure of the ecosystem you have to follow the following procedure

Form groups, each group with four students.

1. Use a tape to measure a square area that is one meter long and one meter wide. It can be on grass, bare dirt or sidewalk.
2. Mark the edges of the square with the help of string/small sticks as shown in figure 2. This is the area now we have to observe.
3. Observe the study area (that has been marked). Look for plants and animals that live there. Use the hand lens for keen observation.
4. Record all the living organisms you see. You can even dig to go deeper to find out other living organisms that may be present there.

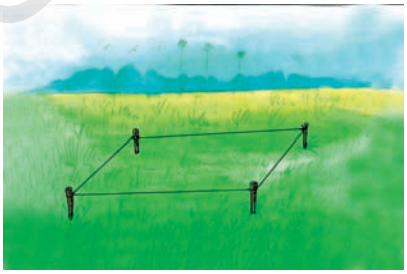


Fig-2 : Marked area of 1 meter square.

Write your observations in your notebook.

Discussion :

- *What living things did you find in your study area? Try to count them if possible.*
- *Which kind of living thing was most common in your study area?*
- *How was your study area different from those of other student groups?*
- *Other than the living organisms what other things could you record from your study area?*

From the above activity we see that an Ecosystem is made up of living things and their environments. The living things like plants, animals and micro organisms are known as biotic components of the ecosystem, whereas others like soil, water, air, sunlight etc are called as abiotic components of the ecosystem.

All these organisms live together and interact with one another in many ways.

Interdependence among the biotic components

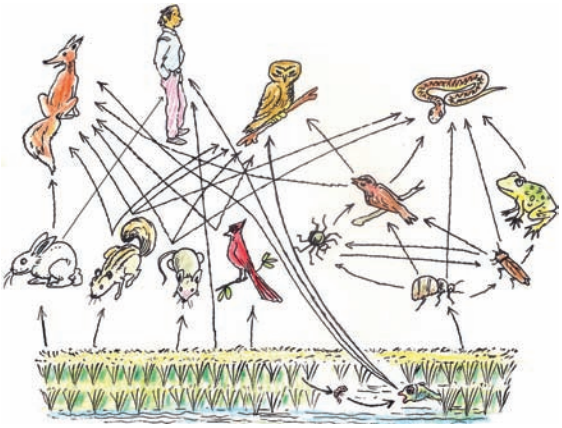


Fig-3 : Relationship between biotic components

- *What do the arrows in the figure indicate?*
- *Trace the path from grass to snake. (You may trace out other paths as well).*
- *On how many organisms fox is dependent for its food? Write their names.*
- *How many organisms depend on rabbit? Write their names.*

We know that there is a feeding relationship between plants and animals. Along with this we can see an interdependence between plants and animals for space, reproduction, shelter etc. as well.

- *Where do plants get their food from?*
- *Except food what other things do animals need for their survival?*

All the organisms in an ecosystem derive energy from food to live. The sun is the main source of energy for all living things. Plants trap this energy during photosynthesis. Animals do not get energy directly from the sun. Many animals eat plants, which use sunlight to make food. Animals that do not eat plants still indirectly depend on the energy of sunlight as they eat other plant eaters. So energy from sunlight is transmitted to all living things.

When scientists describe the way energy moves through ecosystems, they use the term food chains.

There are different feeding levels in a food chain. At first level several plants, algae etc use sunlight to make their food and are called **producers.** At second level some animals eat plants and are called **Herbivores**. At third level some other animals eat herbivores are called **Carnivores**. Herbivores and Carnivores are called as "Consumers".

At every level there are organisms called **Decomposers**. They feed on wastes, debris of plants and animals or on their remains after they die. They decompose remnants and return nutrients to the soil. Plants use these nutrients and the cycle goes on.

Now answer the following questions:

- *Make a list of producers in the food web?*
- *Which organisms are consumers?*
- *Where does the food web start from?*
- *Where does the food web end.*
- *What happens when plants die in a food web?*

Changes in the ecosystem

Organisms affect their environments to meet their needs.

Some changes affect other organisms. As animals eat plants or other animals, they reduce the number of organisms in their habitat.

For example, there are many insects in a bird's habitat. When a bird eats insects, it helps keep the number of insects from getting too large. This helps keep the bird's habitat and the whole ecosystem healthy and stable. But when there are too many birds eating insects, they reduce the insect's population quickly. In due course of time, there will not be enough food for the birds. In this situation some birds would leave the area. This would effect ecosystem, where they go away. It may restore balance to the ecosystem that they left (or) affect it adversely.

Powerful storms, earth quakes, fire accidents, tsunami, etc can destroy ecosystems very quickly.

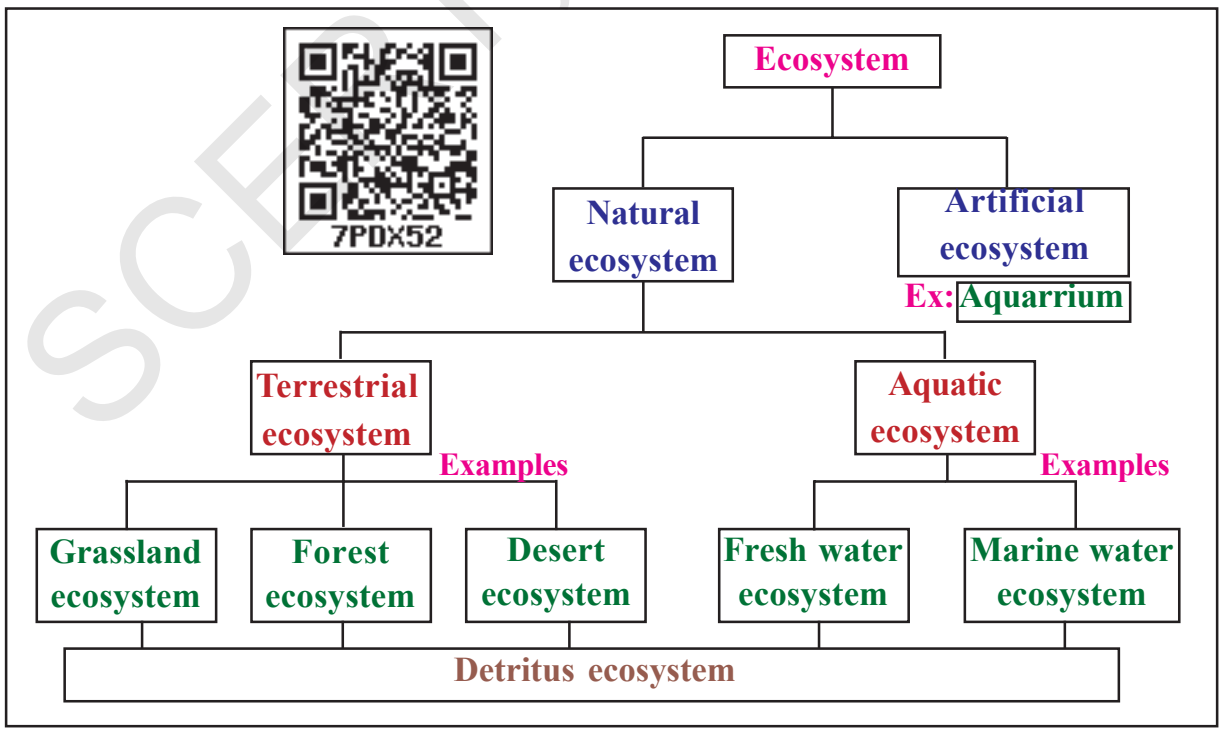
Humans are also instrumental in bringing about changes in ecosystem.

Ecosystem can vary from a small plant to a dense forest. The biosphere is the largest ecosystem present on earth. It would be very difficult to study biosphere as a whole, hence ecologists classified this biosphere into different ecosystems based on various aspects.

Types of Ecosystem

Due to the Abiotic and biotic factors, different ecosystems develop in different ways. These factors and their interaction between each other have resulted in the formation of different types of ecosystems.

On the basis of habitable areas, ecosystem may be classified as follows:



We have studied that a living community cannot live in isolation. It lives in an environment which supplies its material and energy requirements and provides other living conditions. The living community, together with the physical environment forms an interacting system called the Ecosystem. An ecosystem can be natural or artificial, temporary or permanent. A large grassland or a forest, a small tract in a forest or a single log, an edge of a pond, a village, an aquarium or a manned spaceship can all be regarded as ecosystems. An ecosystem can thus be defined as a functional unit of nature, where living organisms interact among themselves and also with the surrounding physical environment.

Now let us study some ecosystems.

Mangrove ecosystem

Mangroves are one of the most productive ecosystems on earth, deriving mineral nutrients from terrestrial fresh water and tidal salt waters. Mangroves are the forests that grow in back waters of low depth areas of sea shore. Mangrove serves as an important feeding, nourishing and breeding ground for a variety of commercial by important organisms and also serves as protected area for endangered species.

Coringa mangrove is situated south of Kakinada Bay and is about 150 km south of Visakhapatnam. Coringa is named after the river Corangi. Coringa mangroves receive fresh water from Corangi and Gaderu rivers, tributaries of Gautami and Godavari river and salt waters from Kakinada bay. Numerous creeks and canals travel in this ecosystem. Let us observe biotic and abiotic components of Coringa ecosystem.

Fig-4 : View of mangroves in Coringa

Biotic components

Producers - Mangrove, *Spirogyra, Oscilatoria, Ulothrix* (blue-green algae) etc.

Consumers - shrimp, crab, Hydra, protozoans, mussel, snail, turtle, daphnia, brittle worm, tube worm, etc.

Decomposers - Detritus feeding bacteria, etc.

Abiotic components - Marine and fresh water, air, temperature, sunlight, soil, etc.

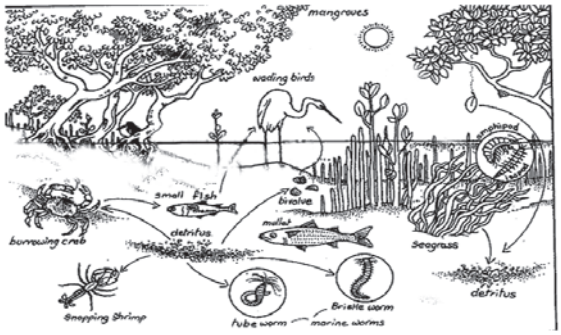


Fig-5 : Food web in Coringa Ecosystem

Do you know?

There are between 5,00,000 to 10 million marine species. Species diversity is as high as 1000 per square metre in the Indo-Pacific Ocean and new oceanic species are continuously being discovered.

The Desert Ecosystem

The deserts occupy about 17% of the land and occur in the regions with an average rainfall of less than 23mm per year. Due to extremes of temperature, the species composition of desert ecosystem is much varied and typical. They have so many adaptions according to surroundings. Desert areas look like those shown in Fig-6.

Fig-6 : Animals and plants in Desert Ecosystem

1. Producers – The shrubs, grasses and some trees are the main producers in deserts. The shrubs have extensive and much branched root system with the stems and leaves variously modified into thorns and spines. Some succulent plants like cactus (a type of cactus is *Brahma Jemudu*) are also found in desert. These store the water in their stems to be used during the time of water scarcity. Some lower plants such as lichens, xerophyte mosses and blue green algae etc. may also be present.

2. Consumers – Only a few animals are found in deserts, Comparaed to grass land and forest. Animals which are able to survive in Xeric conditions can only live in deserts. This includes some species of insects, reptiles, birds and mammals. Mammals are represented by a few species of nocturnal rodents. Some birds are also present in desert.

The camel, called the "ship of desert", feeds on tender shoots of the plants. It has the ability to conserve water in its body. The larger animals are scarce. The desert animals have various morphological and physiological adaptations which enable them to live in such extreme environment. How do long legs and large eyelids help the camel?

3. Decomposers – Due to poor dead organic matter and less amount of vegetation, decomposers are few. They are thermophilic fungi and bacteria.

Forest Ecosystem

Activity-2

Divide all of your classmates into four groups and collect the information on forests of Telangana. Write the flora and fauna and fill up the following table. Collect more information from internet or from school library.

Name of the forest :

Flora		Fauna	
Trees		Herbivores	
Shrubs		Carnivores	
Creepers		Rodents	
Moss and fungi		Birds	
Add other plants		Insects	

Display your observations on wall magazine of your class and compare with other groups.

Investigations:

1. *Do all forests have same type of vegetation?*
2. *Are producers of forest ecosystem higher than its consumers? Why?*
3. *Do all the forests have same type of animals? What are the different types of animals in each forest?*

Forest ecosystems have unique environment and are categorized based on the type and ages of trees, climate and soil. They impact the environment at scales ranging from local to regional by influencing climate, nutrients dynamics and water movement. Forests are found all over the world and they provide valuable economic and environmental services.

Producers (Flora): These are mainly plants that show much species diversity and greater degree of stratification. The trees

are of different kinds depending upon the kind of the forest formation. Besides trees there are also present shrubs and ground vegetation.

Consumers (Fauna): It includes insects like ants, flies, beetles, grass hoppers, bugs etc., and other animals like. Eg: Elephant, Nilgai deer, moles, squirrels, etc. Also carnivores like mongoose, snakes, birds, lizards, fox, mongoose, Lion, tiger also live in forest feeding on animals.

Decomposers: These include a wide variety of micro organisms which live on the dead bodies of flora and fauna (including) fungi and bacteria are decomposers.

Energy flow in an ecosystem

The existence of living world depends upon the flow of energy and circulation of materials through the ecosystem. Energy is required for the performance of all the life activities.

The main source of energy is sun. The space in the form of light rays. Approximately 57% of solar energy is absorbed in the atmosphere and scattered in space. About 36 percent is expended in heating water, land and in evaporating water. Nearly 8% of light energy reaches plants, of which 2% is utilized in photosynthesis.

The energy stored by plants is passed into the community or ecosystem through a food chain. A food chain consists of producers, herbivores and carnivores and omnivores or organims that feed both on animals and plants. Herbivores , carnivores and omnivores are consumers. The energy flows from the producers to consumers. At each transfer a large proportion (80 to 90 per cent) of potential energy is dissipated as heat produced during the process of respiration and other ways.

Key words

Habitat, Ecosystem, Food web, Producers, Consumers, Decomposers, Rodents, Flora and Fauna, Thermothilic fungi, Mangroves, Energy flow, Nocturnals, Biotic components, Abiotic components.

What we have learnt

- The word ecosystem was coined by A.G. Tansley.
- Interrelationship between biotic and abiotic factors can be studied as a part of an ecosystem.
- Living things like plants, animals and microorganisms are the biotic components of the ecosystem.
- Abiotic components of an ecosystem constitute soil, water, sunlight etc.
- Several ecosystems exist around us.
- Food chains/food web explain interdependence between biotic and abiotic components in the form of nutrient and energy.
- Food chains have three level- producers, herbivores and carnivores.
- Decomposers and integral part of every level in a food chain.
- The producers trap the sunlight to produce food.
- Consumers get energy by eating either producers or other plant eaters.
- Decomposers/recyclers feed on the wastes of plants and animals or remains of plants and animals after they die.

Improve your learning

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1. Define an ecosystem. Explain it with a suitable example. (AS 1)
2. Explain how diversity of living organisms helps in enriching any ecosystem. (AS 1
3. What happens when two animals having similar habits share one ecosystem? How could you conserve this type of bio-diversity? (AS 2)
4. What is the difference between habitat and ecosystem? (AS 1)
5. Who am I? (AS 1)
   - I am the base of food chain. .....
   - I depend on plants for food. .....
   - I break down the remains of dead plants and animals. .....
6. Which of the following is a producer? and why? (AS 1)

   (a) fox (b) fungus (c) hen (d) grass

7. What do you understand by food web?
   Describe your own food web with the help of a diagrammatic representation.(AS 1)
8. An ecosystem has mice. What happens if more cats are added to it? (AS 2)
9. List out producers (Plants, Bushes, Trees). Consumers (herbivores and carnivores) and Decomposers that you observed in your agriculture field or school garden. (AS 4)
10. In grassland ecosystem, rabbit eats only plants. They eat plants faster than the plants can grow back. What must happen to bring the ecosystem into balance? (AS 6)
11. Plant, Tiger, Rabbit, Fox, Eagle

    Did you find any connection among the above list of things. If we remove Rabbit from the list what will happen? (AS 6)
12. What do you understand by inter-dependency of animals and plants? How do you appreciate? (AS 6)
13. Collect the data of plants and animals from a park near by you and fill in the table in the page No. 109 and write a report on it.
14. Prepare a table on adaptations of the desert animals, collect the data from your school library?
15. Construct the food web with the following?
    Grass, Plants Grasshoper, Frog, Snake, Eagle, Goat, Fox, Tiger, Wolf, Rabit.

WHAT WE ARE DOING TO THE FORESTS OF THE WORLD IS BUT A MIRROR REFLECTION OF WHAT WE ARE DOING TO OUR-SELVES AND TO ONE ANOTHER

-Mahatma Gandhi

ANNEXURE

Energy flow in ecosystem

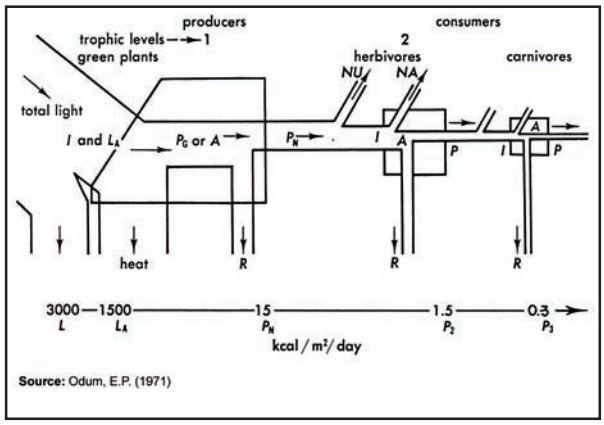

Fig of Energy flow in an ecosystem

Fig. Observe Diagrammatic representation of energy flow through a food chain of ecosystem. The boxes represent biomass or population mass and the pipes show the path of flow of energy between living units. The relative size of block suggests the quantity of energy flowing through each pipe.

L = Total energy input;

LA = Light absorbed by plants;

P_G = Primary gross production;

A = Total assimilation;

P_N = Net primary production;

P = Secondary production;

NU = Energy not used;

NA = Energy not assimilated by consumers;

R = Respiration.

The energy flow through an ecosystem can be represented diagrammatically in a simplified manner. In fig. the boxes and out at each level. Only about half the average light energy impinging upon the green plants is absorbed in the photo synthetic process, out of which 1 to 5 per-cent is converted into food energy and the rest of it passes out as heat into the atmosphere.

Energy accumulated by plants or the producers in an ecosystem is called primary production. The total energy produced during photo synthesis is the Gross primary production. And is represented by P_G or A and energy left after respiration and stored as organic matter in the producers is the Net primary production represented by P_N. Net primary production actually represent food potentially available to primary consumers which feed upon plants. The primary consumers, therefore, take in chemical potential energy in the form of plant food. Most of it dissipates in the form of heat (produced during the respiration) and is lost out of ecosystem. Only a small part of energy is fixed in the form of chemical potential energy in the protoplasm. The same process is repeated at the secondary consumers or primary carnivorous level and so on. Therefore at each step in the transfer of energy from one trophic level to another a large amount of energy is degraded in to heat and never returns to ecosystem.