Orient BlackSwan

Inspired BIOLOGY

For the CISCE curriculum

8

NEP Compliant inside

WITH APP

Inspired BIOLOGY

8

Orient BlackSwan

Inspired Biology

has been developed in accordance with the CISCE Upper Primary Science (Biology) curriculum. Its aims are:

- to enable students to relate their daily life experiences and science by following a practical, thematic approach
- to focus on the development of scientific temper through skill and process development
- to encourage knowledge construction through information collection, organisation and reflection

Students' book

- complete syllabus coverage
- carefully graded text
- appropriate, well-labelled illustrations and photographs
- appropriate activities and exercises

Let's learn

Learning outcomes
encourage students to take responsibility for their learning

Get going
helps focus and direct students' attention to the lesson

Activities
help students learn through practical exercises

Stop and check
provides checkpoints for teachers and students to evaluate progress

Spotlight
focuses on important topics in greater detail

Go further
provides additional, interesting, relevant information

SciTech
links scientific concepts with real-life occurrences and applications

Eco corner
presents issues that are an environmental concern

Let's revise

In a nutshell
is a comprehensive revision corner

Concept map
is a graphic presentation of concepts linked logically

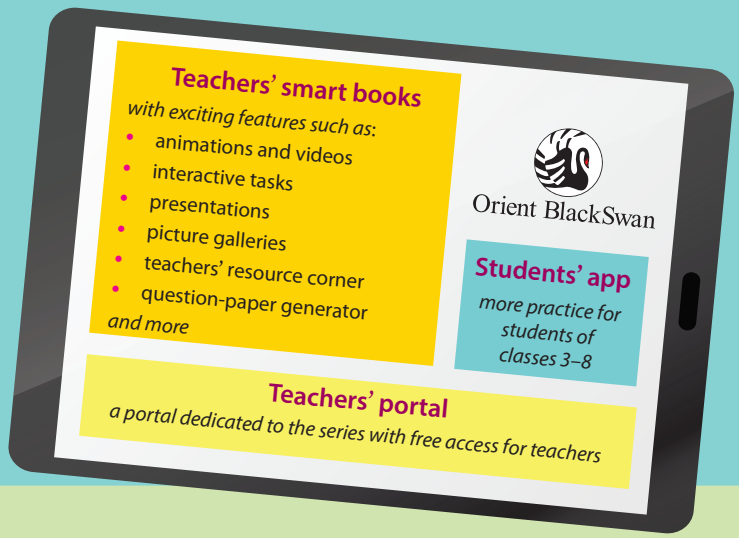
Summary
lists the main points of the lesson briefly

Keywords
lists important words and their definitions

Glossary
presents important words for quick revision at the end of the book

Teachers' resource packs

- lesson plans
- question bank with answers
- worksheets with answer key
- question papers with answer key
- answer key to the exercises in the students' book



Let's apply

Checkpoint
covers a variety of exercises (objective type, short answer and long answer)

Think and answer
encourages students to develop higher-order thinking skills necessary for the 21st century

Picture study
offers picture-based questions that encourage students to observe, identify and relate concepts to real life

Hands-on
offers a variety of projects that reinforce 21st century skills through experiments, model-making, discussion, role play, research work, report writing and so on

Subject integration
presents additional activities explicitly linking multiple subjects

Life skills and values
help children develop skills needed for everyday life and values needed to be well-adjusted members of society

Let's know more

Scientist in focus
describes the life and work of famous scientists to inspire students

Heritage corner
presents exciting and accurate information on India's scientific heritage

Internet links
provides sources for further study and research

Career watch
presents novel ideas for a career in science and technology

Let's work

- ***Worksheets*** a workbook corner with worksheets covering all lessons
- ***Test papers*** based on the ICSE pattern

CONTENTS

3 Ecosystems

Learning outcomes

By the end of this theme, you will be able to:

- explain what an ecosystem is
- describe the biotic and abiotic factors in an ecosystem and the interactions between them
- interpret the relationships between the biotic factors of an ecosystem (food chains and food webs)
- describe interdependence relationships between organisms
- describe the flora and fauna of a forest ecosystem

Get going

Visit a garden or park and look around you. You will see many plants and animals, big and small. Are all the organisms you see independent of each other? Does any organism affect the existence of another organism in that region?

ECOSYSTEM

Think of a lake. What comes to mind? You might think of reeds, lotuses, fish, frogs and ducks, all of which live in or near water. Now think of a desert. It is very different from a lake—full of sand and rocks, with little water. You might picture cactuses and camels living in a desert.

Fig. 3.1 A lake ecosystem is distinct from a desert ecosystem.

Lakes, deserts and forests are places that have their own distinctive physical characteristics, with different organisms adapted to living in them. Each of them is an example of an **ecosystem**. *An **ecosystem** consists of a community of organisms in a specific area interacting with each other and with the non-living components that surround them.* The word ecosystem comes from the Greek word *oikos*, which means 'home'. Therefore, an ecosystem includes everything found in the environment of an organism.

*The organisms found in an ecosystem form the **biotic components** or **biotic factors** of that ecosystem. All the non-living components of an ecosystem form the **abiotic components** or **abiotic factors**.*

Biotic Factors

The biotic factors of an ecosystem are all the organisms found there. They include plants, animals, fungi and

a. Rhinoceroses are primary consumers.

b. Wolves are secondary consumers.

c. Tigers are tertiary consumers.

d. Hyenas are tertiary consumers and scavengers.

Fig. 3.2 Some types of consumers

microorganisms. Biotic factors can be divided into three groups based on their mode of nutrition.

Producers

- **Producers** make their own food using substances that are available in their environment. Plants and some microorganisms (such as phytoplankton in the sea) make their own food.
- Since producers make their own food, they are called **autotrophs**. (*Autos* means 'self', and *trophos* means 'feeder' in Greek.)
- Since all animals depend directly or indirectly on producers for nutrition, the producers provide sustenance[1] for animals and other organisms like fungi.
- Producers link the biotic and abiotic factors in an ecosystem. They convert substances found in the environment, which cannot be used directly, into forms that can be used by other organisms.

Consumers

Consumers cannot make their own food. They depend directly or indirectly on producers for nutrition. They are called **heterotrophs**. (*Heteros* means 'other'.) Consumers can be grouped into the following groups.

- **Primary consumers** eat plants. **Herbivores** eat only plants; **omnivores** (which eat plants and animals) are considered primary consumers when they eat plants. Some examples of primary consumers are the deer, cow, rabbit, elephant and zebra.
- **Secondary consumers** eat primary consumers. Secondary consumers may be **carnivores**, or omnivores when they eat other animals. Some examples of secondary consumers are the frog, snake, cat, spider and shark.
- **Tertiary consumers** eat secondary consumers. Some examples of tertiary consumers are the tiger, owl and eagle.
- **Quaternary consumers**, such as eagle and hawk, eat tertiary consumers.
- **Scavengers** eat dead plants and animals. Some examples of scavengers are the hyena, vulture and termite. **Detritivores** eat small particles of dead plants and animals as well as animal dung. Examples include earthworms and dung beetles.

[1]**sustenance** (related to sustain) nourishment; commonly refers to food and drink

Decomposers

Decomposers break down the bodies of dead organisms into simple nutrients without directly eating them. They are called **saprotrophs**. (*Sapros* means 'rotten'.) Fungi and bacteria are examples of decomposers. Decomposition of organic matter helps to return nutrients to the environment.

SciTech

Just as cooked food is easier for us to digest than raw food, it is also easier for decomposers to break down. This is why cooked food goes bad faster than raw food items when left at room temperature.

Abiotic Factors

The abiotic factors in an ecosystem include all its non-living components such as water, air, soil, sunlight and temperature.

Sunlight

The Sun is the source of energy on Earth. Plants trap the energy in sunlight and use it to carry out photosynthesis. The behaviour of animals and the life cycles of plants and animals are influenced by the availability of sunlight, during the day and across the seasons.

Temperature or warmth

Most organisms on Earth need a temperature range of 25–35 °C to live comfortably. The types of organisms found in a region depend on the temperature.

Water

Water circulates through the water cycle. The kinds of organisms that live in a region depend on the amount of water available in that region. Water forms the major part of the bodies of organisms. All internal bodily functions of organisms need water. Plants need water to make food through photosynthesis.

Air

The atmosphere keeps our planet warm by trapping the Sun's heat. Air and wind help to regulate the temperature of the Earth.

Most organisms need oxygen present in air to get energy from food. Plants use carbon dioxide in air to make food. Wind is an agent of pollination and seed dispersal. Birds, insects and bats fly through the air.

Soil

Soil is formed by the breakdown of rocks. Soil is a source of water and minerals for plants. It contains microorganisms that convert atmospheric nitrogen into forms that can be utilised by plants. Burrowing animals such as rabbits and earthworms live in the soil.

Very few organisms are found in terrestrial habitats that do not have soil.

Thus, the biotic components of an ecosystem cannot live without the abiotic ones, and the abiotic components in turn are changed and replenished by the biotic components.

FOOD CHAINS AND FOOD WEBS

You know that plants trap energy from sunlight and store it in the food they make. Energy and nutrients are passed to herbivores when they eat the plants, and then to the carnivores when they eat the herbivores and so on. This is how energy and nutrients pass through different organisms in an ecosystem in a sequence called a **food chain**. *A food chain is a linear sequence of organisms through which energy and nutrients pass as one organism eats another.*

Spotlight

Energy is used by organisms for their life processes and is dissipated into the environment as heat. A food chain does not usually have more than four or five levels since there is not enough energy to be passed on. **The flow of energy is therefore linear** and a constant input of energy from the Sun is needed. However, nutrients are returned to the environment when organisms die and decompose. **The flow of nutrients is therefore cyclic.**

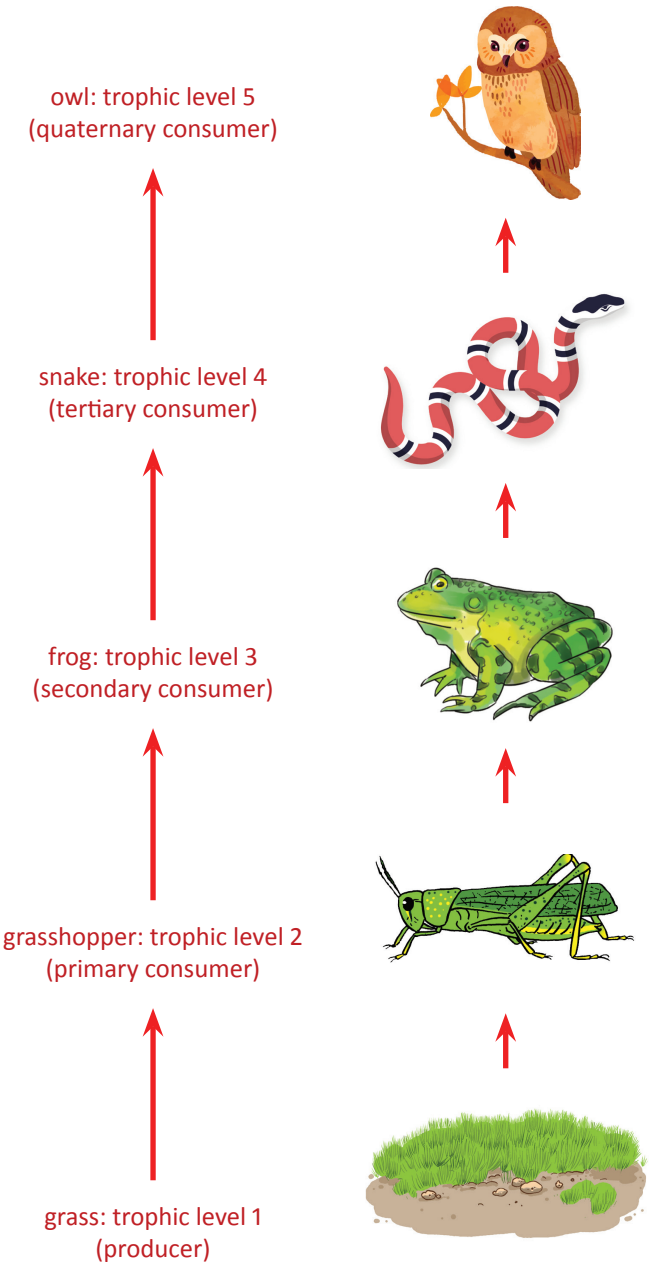


Fig. 3.3 An example of a food chain

Each step of a food chain is called a ***trophic level****.* In the food chain shown in Fig. 3.3, the grass (trophic level 1), grasshopper (trophic level 2), frog (trophic level 3), snake (trophic level 4) and owl (trophic level 5) form the trophic levels. The number of trophic levels in a food chain varies from 2 to 5, and rarely goes up to 6 or 7.

In an ecosystem, food chains do not exist alone. They are linked to each other to form **food webs**. *A food web consists of many interlinked food chains.*

In Fig. 3.4 given on the next page, note the following.

- The leaves and the grass are the producers.
- The producers are eaten by the grasshopper, deer or caterpillar, which are the primary consumers.
- The primary consumers may be eaten by the frog, sparrow, bear or tiger, which are the secondary consumers.

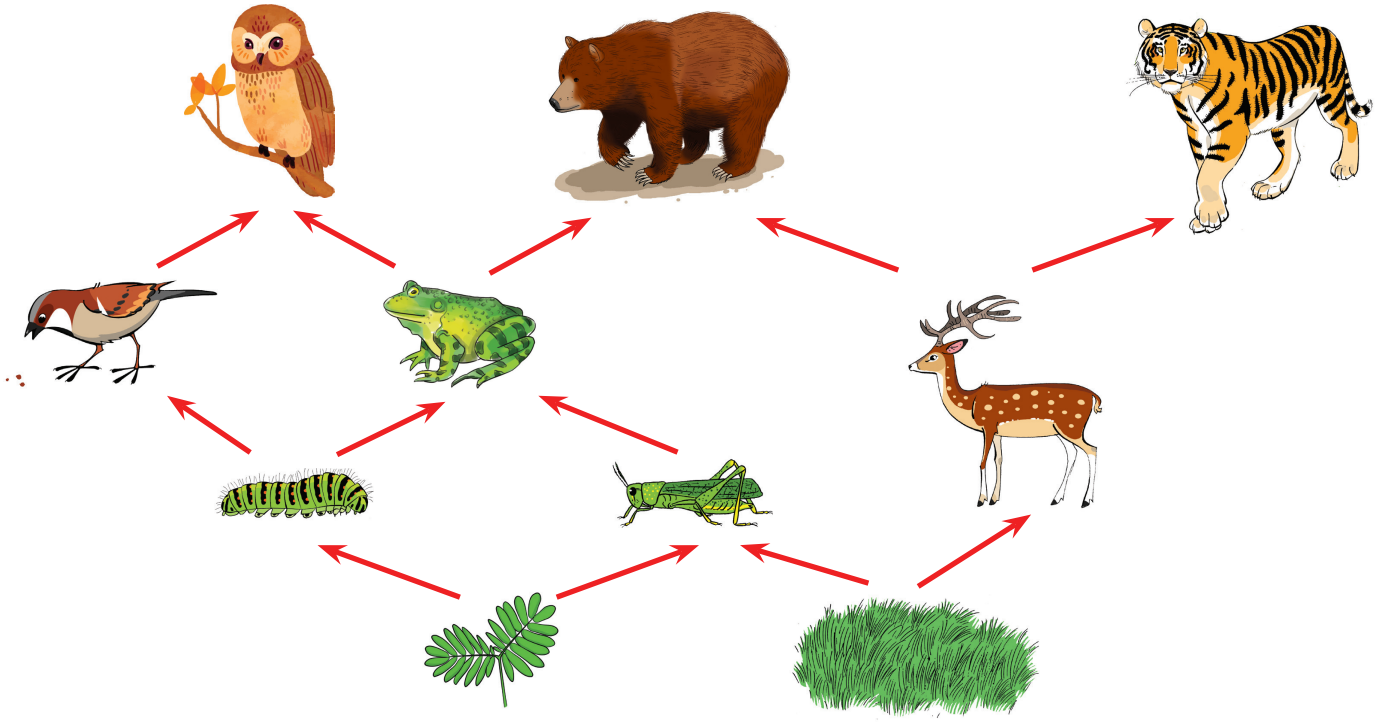


Fig. 3.4 A food web

- The frog and the sparrow (secondary consumers) may be eaten by the eagle or the bear, which are tertiary consumers.

A food web is complex. From the food web shown in Fig. 3.4 you can see that a prey may have multiple predators and a predator may have multiple preys. The removal of any one organism from the food web may have severe consequences. For example, if the frog is removed, the number of grasshoppers may increase. The grasshoppers will eat more leaves and grass, and may thus deprive other organisms in the food web of nutrition. Thus, each organism in a food web is important and cannot be removed without consequences.

The Significance of Food Webs

- An organism in a food web may have multiple sources of food. Thus, if one food source is scarce, the organism can still survive.
- Food webs provide an ecosystem with stability and also present alternate paths for energy flow and nutrient flow.
- Food webs play an important role in the cycling of nutrients in the living world. Nutrients and energy are passed from one trophic level to another.

FOOD PYRAMIDS

A pyramid can be used to show the number of organisms, the **biomass** (the total weight) of the organisms or the energy available at each trophic level in a food chain. Let us examine a simple food chain as an example.

plants → insects → frogs → snakes → eagles

- A herbivore may eat many plants.

For example, a few insects may eat thousands of blades of grass.

- A carnivore may eat many herbivores. Thus, many insects will be needed to sustain a few frogs in the ecosystem, which in turn will sustain fewer snakes.
- The snakes will provide nutrition for a very small number of eagles.

Thus, in this example, the number of organisms at each level decreases as we go higher. Similarly, the biomass of all the organisms at each level decreases as we go higher up. Therefore, the biomass of plants in the ecosystem will be higher than that of the insects. However, the biomass of the frogs will be less than that of the insects.

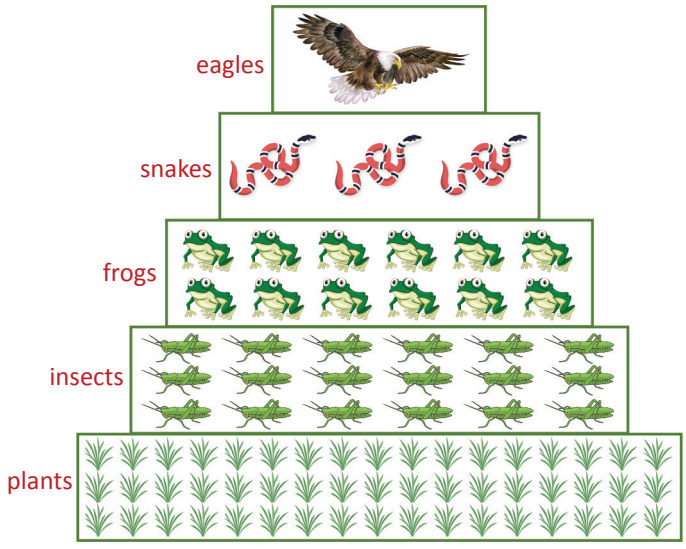


Fig. 3.5 Pyramid of numbers

Stop and check

Say if the statements are true or false.

1. Consumers are also called heterotrophs.
2. Herbivores are secondary consumers.
3. The Sun is the source of all energy on Earth.
4. The advantage of a food web is that even if one organism is removed, the food web is not affected.
5. A food pyramid can be used only to show the number of each type of organism in a food chain.

INTERDEPENDENCE BETWEEN ORGANISMS

You have learnt that no organism can live on its own. All organisms are dependent on each other for their survival. Some of these relationships may be beneficial while others may be harmful. Let us learn about some of these relationships between organisms.

Symbiosis

In a symbiotic relationship, two organisms live together such that one or both benefit. For example, **lichens** consist of a fungus and an alga. The fungus absorbs nutrients from its environment, while the alga, which contains chlorophyll, makes food.

Many microorganisms live in our intestines. They get food and shelter from us. At the same time they help us to digest our food and also synthesise vitamins such as vitamin K, which our body absorbs.

Parasitism

In a parasitic relationship, one organism lives with, in or on another organism and

Fig. 3.6 The relationship between algae and fungi in lichens is symbiotic.

Fig. 3.7 The relationship between mosquitoes and humans is that of a parasite and host.

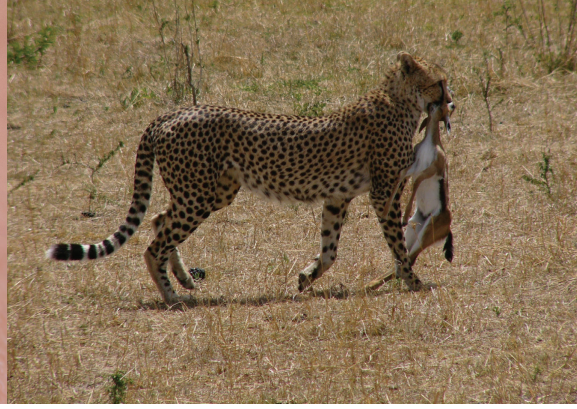


Fig. 3.8 The relationship between antelopes and cheetahs is that of prey and predator.

benefits from the interaction while the other is harmed. For example, the tapeworm lives in our intestines and absorbs the nutrients from digested food that our body needs. This could cause a nutrient deficiency in our body. The organism that benefits from the relationship is called the **parasite**, and the organism that is harmed is called the **host**. For example, mosquitoes are parasites that feed on the blood of hosts such as humans and other animals.

Predation

Predation involves one animal feeding on another. *A **predator** hunts and kills another organism for food. A **prey** is the organism that is hunted and killed by another organism to be its food.* Consumers get nutrition from the earlier trophic level by predation. The relationships between a tiger and a deer, between a snake and a frog and between an eagle and a mouse are examples of predator–prey relationships.

TYPES OF ECOSYSTEMS

There is a great variation in the ecosystems present on the Earth. Most of them are natural, for example, forests, deserts, grasslands, mountains, coral reefs and lakes. Some ecosystems are human-made, for example, crop fields, gardens, parks, aquariums, villages, towns and cities.

All ecosystems have biotic and abiotic components. The plants in an ecosystem are called its **flora** and animals are called the **fauna**. Every ecosystem is unique in its variety of flora and fauna.

Forest Ecosystems

A forest is a large area covered predominantly by trees and shrubs. Many kinds of forests are found in India.

Coniferous forests or montane forests

These forests are found in parts of above 1500 m, the Himalayas, and parts of northeastern India.

Flora Trees like the pine, deodar (cedar) and fir generally grow in these forests.

Fauna Black bears, wolves, red pandas, mountain goats, musk deer, barking deer, civets, brown squirrels, babblers, griffons and pheasants are found in these forests.

Fig. 3.9 Coniferous forest

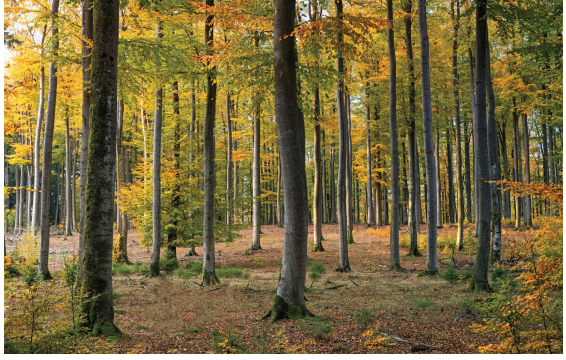


Fig. 3.10 Deciduous forest

Fig. 3.11 Evergreen forest

Deciduous forests

These forests are found in many parts of southern and central India and the lower parts of the Himalayas. Most trees that are found here have broad leaves. The trees shed all their leaves during one season of the year.

Flora Trees like the teak, *sal*, ebony, oak, sandalwood and neem grow in these forests.

Fauna Tigers, leopards, elephants, wild buffalo, *gaur*, *sambar*, blackbuck and the Malabar squirrel are found here.

Evergreen forests

These forests are found in parts of the Western Ghats, Eastern Himalayas and Andaman and Nicobar islands that receive heavy rain, even hundreds of centimetres a year. The trees in these forests shed leaves throughout the year rather than during a particular season.

Flora Plants like bamboos, and mahogany and ebony trees grow in these forests.

Fauna Tigers, leopards, elephants, wild dogs, Nilgiri tahrs, lion-tailed macaques, Nilgiri macaques, sloth bears, *gaur*, hornbills and king cobras are inhabitants of evergreen forests.

Thorn forests

Thorn forests are found in the dry areas of western, central and southern India.

Flora Acacia trees and cacti grow in these regions.

Fauna Camels, blackbuck, *chinkara*, rabbits, desert foxes and great Indian bustards are some animals found in these forests.

Mangrove or tidal forests

These forests are found in coastal areas, especially in the Sundarbans and Andaman and Nicobar islands.

Flora Mangrove trees and palm trees grow in these forests. Mangroves in particular are specially adapted to grow in the muddy and saline environments found in estuaries.

Fauna Tigers, crocodiles, monitor lizards, gharials, turtles, mudskippers, egrets, flamingos, pelicans, painted storks, ospreys, sea eagles and crabs are found here.

Go further...

Apart from forest ecosystems, some of the other terrestrial ecosystems in India include deserts, grasslands, *sholas* (mixed grassland and forest), alpine tundra (in the Himalayas) and marshlands.

Fig. 3.12 Thorn forest

Fig. 3.13 Mangrove forest

Fig. 3.14 Kaziranga National Park

Protected Areas

Some important forests in India are now protected and have been classified as **wildlife sanctuaries**, **national parks** or **biosphere reserves**. This has been done to protect or conserve the flora and fauna that are found in these forests.

Some protected areas and the important animals that they help conserve are:

- **Gir National Park** (lion)
- **Jim Corbett National Park** (tiger)
- **Ranthambore National Park** (tiger)
- **Bandipur National Park** (tiger)
- **Kaziranga National Park** (Indian rhinoceros)

Career watch

Forest officer

A forest officer in India is a member of the Indian Forest Service (IFS), which is one of the three All India Services, similar to the Indian Administrative Service (IAS). Officers are trained in subjects such as wildlife management, biodiversity, forest policy and law, remote sensing and forest tribes. They ensure that forests are conserved according to the law. To become a forest officer, you should study a subject such as zoology, botany, veterinary science, agriculture or engineering and be selected in the UPSC examination.

CHECKPOINT

A. Choose the correct option.

1. The word ecosystem comes from a word that means _____.
   a) food b) home c) soil d) water
2. The biotic components of an ecosystem consist of _____.
   a) only plants
   b) only animals
   c) plants, animals, fungi and microorganisms
   d) air, water and soil
3. _____ help to return nutrients to the soil.
   a) Producers b) Consumers
   c) Herbivores d) Decomposers
4. Which of these interactions is an example of a symbiotic relationship?
   a) the alga and the fungus in a lichen
   b) a tapeworm in the human intestine
   c) a deer eating grass
   d) an eagle eating a mouse

B. Fill in the blanks.

1. Each step in a food chain is called a _____ _____.
2. The relationship between organisms in which both organisms benefit is called _____.
3. The Indian rhinoceros is found in the _____ National Park.

C. Define the terms.

1. symbiosis 2. parasitism 3. predator
4. prey 5. flora 6. fauna

D. Differentiate between the terms.

1. Biotic factors and abiotic factors
2. Consumers and decomposers
3. Food chain and food web

E. Short-answer questions

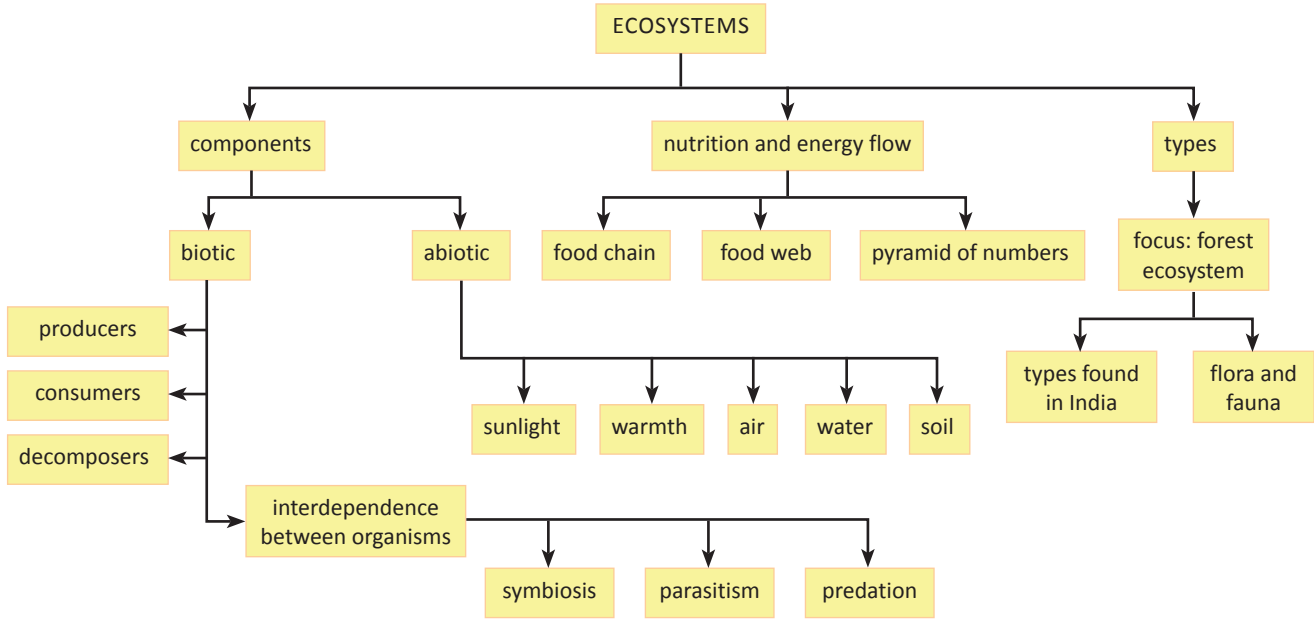
1. Which kinds of organisms are primary consumers? Give two examples of primary consumers.
2. What are decomposers? How are they useful?
3. Rearrange the components of the following food chains in the correct sequence.
   i. grasshopper, snake, grass, frog
   ii. deer, leaves, tiger
4. Identify the type of forest based on the flora and fauna.
   i. deodar, black bear, pheasant
   ii. teak, *sal*, tiger, *sambar*
   iii. acacia, *chinkara*, great Indian bustard
5. Name three national parks that protect tigers.

F. Long-answer questions

1. Briefly describe four abiotic factors found in an ecosystem.
2. Explain the flow of energy in a food chain with the help of a diagram.
3. Briefly describe the importance of food webs in the environment.
4. Explain what a food pyramid is.
5. Give examples of the flora and fauna that are found in the evergreen forests and mangrove forests of India.

In a nutshell

CONCEPT MAP



SUMMARY

- An ecosystem is a community of different organisms interacting with each other and with the non-living components that surround them.
- The living components of an ecosystem are called the biotic components or biotic factors. They include all the organisms in an ecosystem. Biotic factors can be divided into producers, consumers and decomposers.
- The non-living components of an ecosystem are called the abiotic components or abiotic factors. They include sunlight, warmth, air, water and soil.
- A food chain is a linear sequence of organisms through which energy and nutrients pass as one organism eats another.
- Each step of a food chain is called a trophic level.
- Food chains are linked to each other to form food webs.
- A food web shows that each organism has more than one source of food. Food webs also provide alternate paths for energy flow and nutrient flow.
- A food pyramid is used to show the number of organisms, biomass or amount of energy at each level of a food chain.
- Organisms in an ecosystem are dependent on each other. Symbiosis, parasitism and predation are three types of interdependent relationships between organisms.
- Many of the ecosystems on the Earth are natural, while some are made by humans.
- A forest is a large area covered predominantly by trees and shrubs. India has coniferous forests, deciduous forests, evergreen forests, thorn forests and mangrove or tidal forests.

KEYWORDS

ecosystem a community of organisms in an area that interact with each other and with the non-living components in their environment

food chain a linear sequence of organisms through which energy and nutrients pass

food web a representation of food relationships consisting of many interlinked food chains

decomposer an organism that breaks down dead organic matter to release nutrients back into the environment

trophic level a step in a food chain

Picture Study

Write the names of three animals that are found in each of the forests shown.

1. 

_____

_____

2. 

_____

_____

Think and Answer

1. Can you think of an organism that is both a producer and a consumer? (*Hint*: insectivorous plant)
2. Why does every food chain start with a producer?
3. Will animals that live on high mountains be able to live in the plains? Why, or why not?

Life Skills and Values

1. Suppose you are going on a camping trip to the Sundarbans. What will you take with you? Make a list along with your classmates. (Think of food, water, clothes, emergency supplies and so on.)
2. Insects like bees are essential for many flowers to be pollinated. But nowadays, the populations of bees and other insects have reduced greatly due to human activities. You can help bees and other pollinators by growing flowering plants in your garden, balcony or terrace. Also, if you see a beehive on a tree near your house, do not destroy it unless its presence is unsafe for people.

Hands-on

1. Observe the plants and animals around your house. (You may even choose a single tree for observation.) Note down what each animal eats and construct food chains, and if possible food webs. (For example, you may notice ants eating grass seeds, and lizards eating the ants.)
2. Visit a forest guided by a ranger. Observe the organisms there. Find out about their adaptations to their particular habitat.

Subject Integration

(Geography, Languages)

Have you read *The Jungle Book* by Rudyard Kipling? It is set in the forests of India. Find out which part of India the story takes place in. Note down which animals are characters in the story. Find out if they are still found in that part of India.
You might also like to read Jim Corbett's books, many of which are set in the forests of the Himalayas.

Scientist in Focus

'Billy' Arjan Singh

Arjan Singh (1917–2010) was an Indian conservationist who played an important role in banning the hunting of tigers in India. He was a hunter when he was young but became disgusted with hunting after killing a leopard. His first achievement was in saving the *barasinga* or swamp deer for which he was awarded the World Wildlife Fund's gold medal. Arjan Singh is most famous for reintroducing zoo-bred tigers and leopards into the wild.

Rachel Carson

Rachel Carson (1907–1964) was an American biologist who made people realise the effects of environmental pollution on organisms. Carson was deeply disturbed by the extensive use of pesticides and fertilisers. She wrote the book *Silent Spring*, in which she put down the effects of using pesticides over many years. The book had a direct and widespread impact; as a result, the use of DDT and many other pesticides in agriculture was banned in many countries.

Internet Links

https://www.conserve-energy-future.com/what-is-an-ecosystem.php
https://www.texasgateway.org/resource/food-chains-food-webs-and-energy-pyramids

Heritage Corner

Jim Corbett National Park

Jim Corbett National Park in Uttarakhand is India's first national park, established in 1936. It was originally named Hailey National Park but was renamed after the famous hunter-turned-conservationist Jim Corbett. The forest type is deciduous, with *sal*, *peepal* and mango trees. Tigers, leopards, elephants and many kinds of deer and monkeys are only some of the animals found here. This national park was the first one selected under Project Tiger, which was established to save India's national animal.

Inspired BIOLOGY

For the CISCE curriculum

CLASS 8

Orient BlackSwan

The National Education Policy (NEP) 2020 emphasises certain crucial parameters based on content and pedagogy. The Inspired Biology series provides a rich range of exercises and activities for each of the parameters. Here is a quick reference guide to some of the examples in this book.

The Inspired Biology series is mapped perfectly to the National Education Policy 2020.

21st Century Skills

A broad set of skills, knowledge, work habits and character traits that are important for success in the 21st century

Experiential/ Constructivist Approach

Learners construct their knowledge, based on what they already know, through experience or by doing and reflection

Integrated Approach

An approach to teaching and learning that works by connecting knowledge and skills across the curriculum, by bringing real life examples to the classroom

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Sustainable Development Goals

A framework of 17 global goals designed to be a blueprint to achieve a better and more sustainable future for all

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India Knowledge

A strong focus on ancient knowledge from India, traditional values, modern developments and future aspirations

Digital Integration

The use of digital tools to enhance and support the teaching–learning process

ICT/Digital resources

Orient BlackSwan Smart App - Interactive Tasks and Games for Practice and Revision

Teachers' Smart Book - Flipbook, Animations, Videos, Presentations, Picture Galleries, Interactive Tasks, Embedded Questions, Lesson Plans, Students' Book Answer Key, Worksheets with Answer Key, Question Paper Generator

Teacher Empowerment

Teachers' Resource Pack - Lesson Plans, Students' Book Answer Key, Question Bank with Answer Key, Worksheets with Answer Key, Test Papers

Teachers' Portal - Chapter e-Book, Presentations, Picture Galleries, Animations, Videos, Students' Book Answer Key, Worksheets with Answer Key, Interactive Tasks, Lesson Plans, Question Bank with Answer Key

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