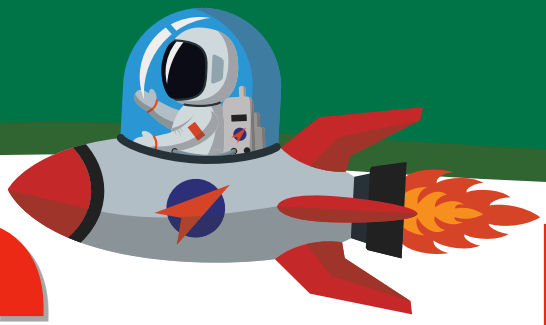
mentari
integrated solutions for education

ASTA



SCIENCE CHAMPION

Hazel T. Victoria • Fatmawaty Munte

6 Student Book

Builds conceptual understanding, reasoning skills, and critical thinking through science learning

Published in Indonesia by:
PT ASTA ILMU SUKSES (member of Mentari Group)
RUKAN Sentra Niaga Puri Indah Block T1-14
West Jakarta 11610

: (021) 310 2822/5890 1900
: (021) 5890 0818
: 0855 888 1948
: contact@astailmu.com
: www.mentarigroups.com

First published: 2022

Science Champion – Student Book 6

Preface

Science Champion is a science learning book specially designed to help pupils acquire scientific knowledge and understanding, develop skills, values, and attitudes. The scope of topics discussed at each level is arranged according to the science syllabus at the elementary level.

Science Champion uses a very systematic learning method through the Inquiry approach that has been tested and proven to be an effective approach at improving student's competences in mastering science. The inquiry approach is used by Singapore to improve students' competences which is proven through their consistency as the top rank at PISA (Program for International Student Assessment) and TIMSS (Trends in Mathematics & Science Studies). The development of material for each topic is arranged in stages, starting from the easiest material to more complex material (spiral progression).

Science Champion gives special emphasis on developing conceptual understanding and critical thinking skills to build a firm foundation in science. After the introduction of new concepts, students are invited to apply what they have learned in collaborative science activities. This book is equipped with a number of activities that will stimulate students' interest in the topic and consolidate their knowledge and understanding.

Science Champion makes science learning meaningful and fosters a love of science learning in children with the use of colorful and engaging visuals as well as age-appropriate language.

Be a science champion!

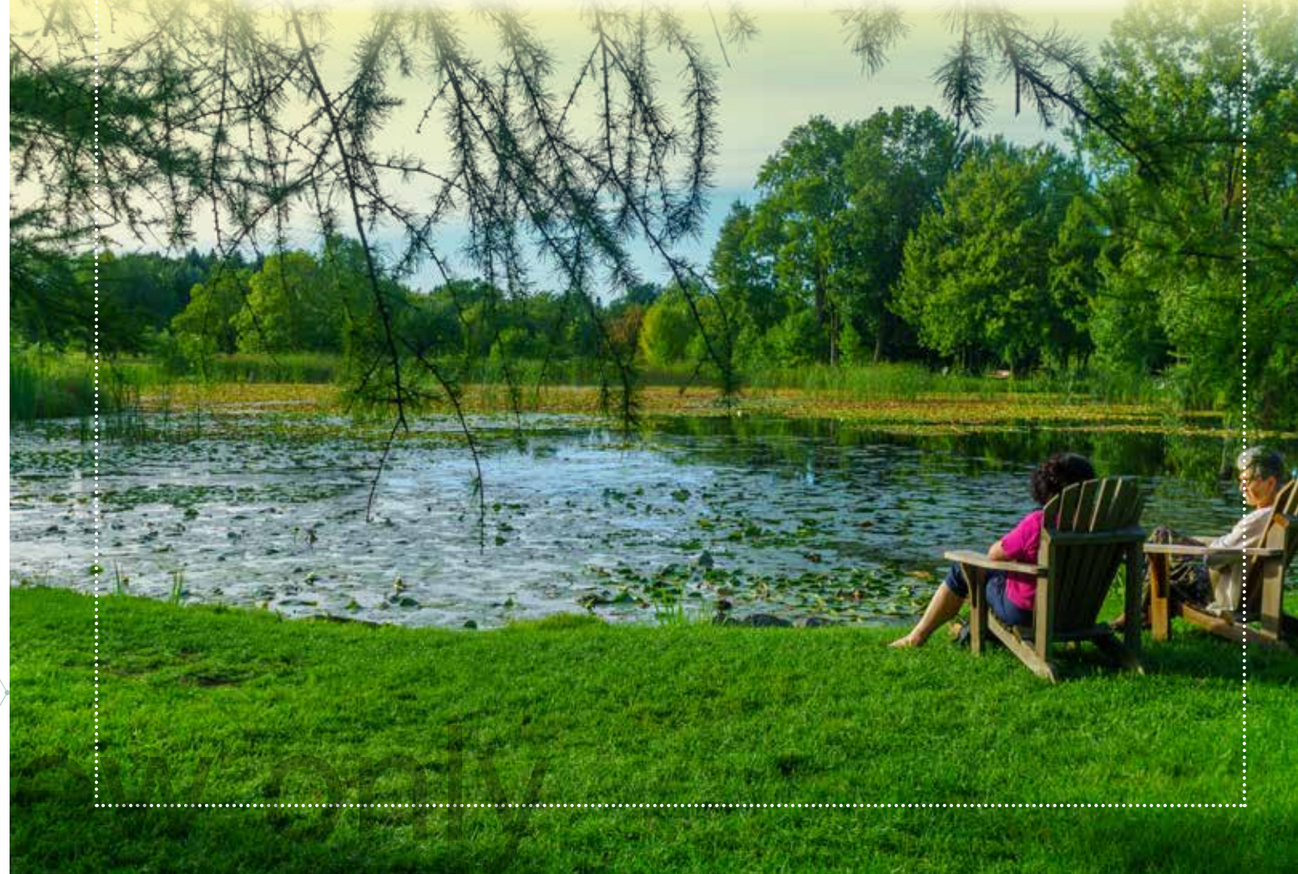
Table of Contents

CHAPTER 4

The Ecosystem

Everything around you is called the **environment**. People depend on the environment. We build houses and plant trees in the soil. We need air to breathe. We need animals to provide us food.

This chapter will help you explore our environment, its condition, and how humans interact with the environment.



Lesson 1

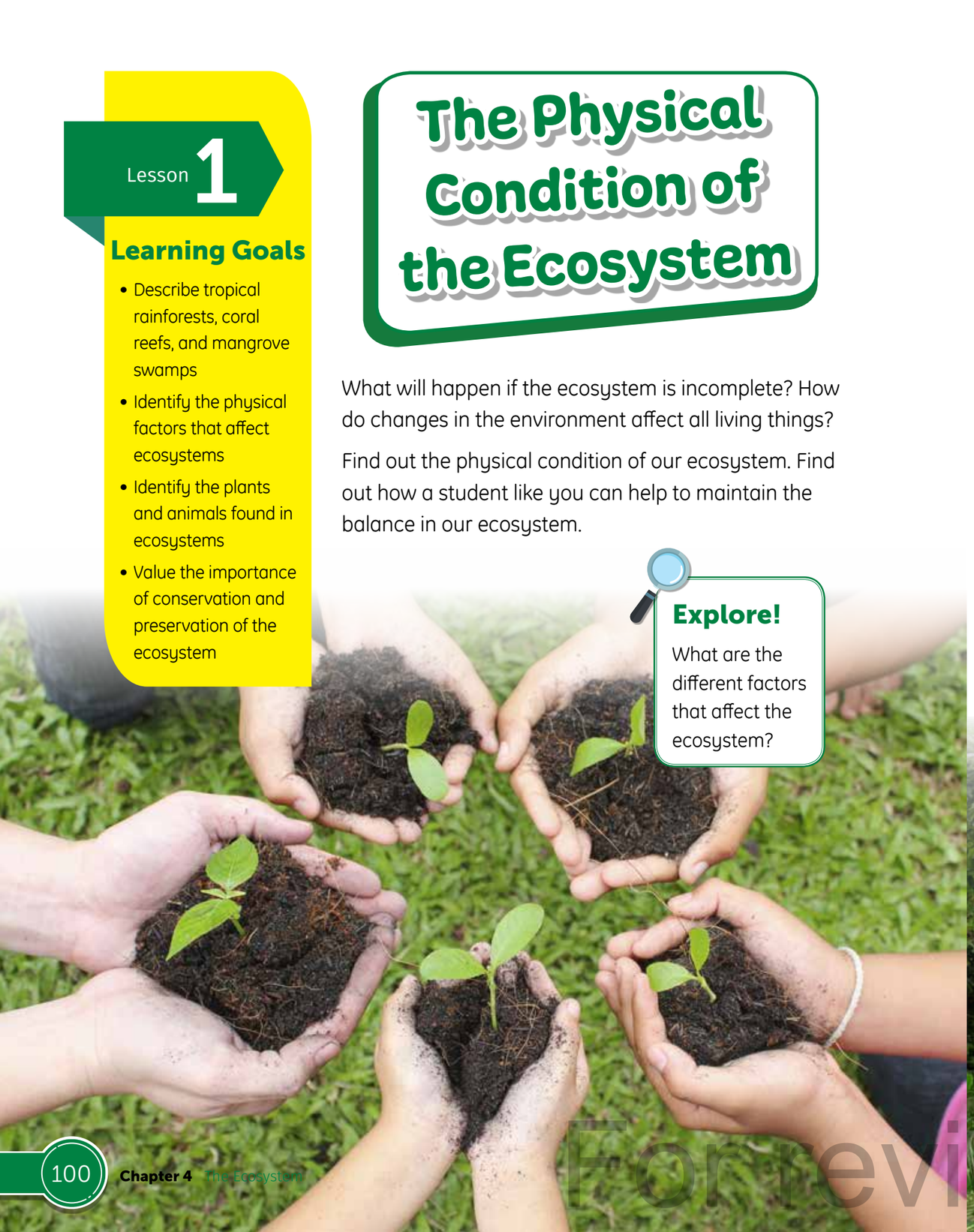
Learning Goals

- Describe tropical rainforests, coral reefs, and mangrove swamps
- Identify the physical factors that affect ecosystems
- Identify the plants and animals found in ecosystems
- Value the importance of conservation and preservation of the ecosystem

The Physical Condition of the Ecosystem

What will happen if the ecosystem is incomplete? How do changes in the environment affect all living things?

Find out the physical condition of our ecosystem. Find out how a student like you can help to maintain the balance in our ecosystem.



Explore!

What are the different factors that affect the ecosystem?

The Ecosystem and Its Components

The ecosystem is made up of two components interacting with each other. These are the biotic and abiotic components. The **biotic** components are the living things such as plants, animals, and microorganisms. The **abiotic** components are the nonliving things such as water, light, heat, and soil. The kinds of organisms living in an ecosystem depend on the abiotic components of that ecosystem.

A closer look at tropical rainforests

Tropical rainforests are found in countries near the **equator**, the imaginary circle around the middle of the Earth that divides it into two equal parts. Indonesia has many tropical rainforests. Organisms living in a tropical rainforest can survive its warm and rainy climate with a temperature that ranges between 20°C and 25°C on the average. Many kinds of vertebrates and invertebrates live in tropical rainforests. Also, different medicinal plants and spices are found in tropical rainforests.

Sunlight does not reach the tropical rainforest floor much because it is blocked by tall trees.

Science Bank

Do you know that Indonesia has the biggest rafflesia flower in the world? Rafflesia can weigh up to 10 kilograms. It smells like rotten flesh.

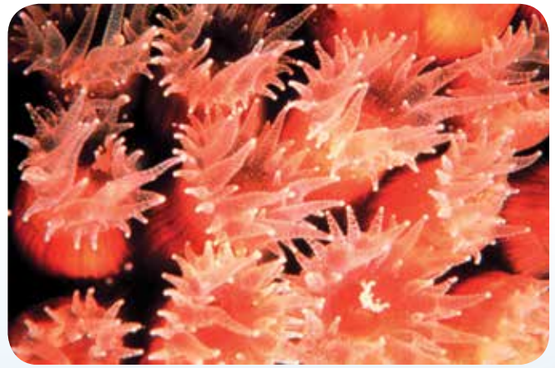
Corals make up a coral reef.

A closer look at coral reefs

Coral reefs serve as home to about 25 percent of sea organisms. They serve as home to many fishes, plants, and other organisms. Coral reefs are formed in shallow, clear, and moving water where sunlight can easily pass through. They need to grow in a temperature that ranges between 23°C and 29°C. Majority of the coral reefs are found in the Indian and Pacific Oceans.

Coral reefs can grow up to 4 inches tall. Coral reefs are made from calcium carbonate released by corals.

Corals are tiny animals that look like an upside down jellyfish. Corals come in different shapes and colors. They are used as decorations for aquariums. Corals have tiny animals called **polyps**. However, only the top layer of the reef has the living polyps.



Polyps, similar to jellyfish, have soft bodies and are sessile or fixed in one place.

A closer look at mangrove swamps

Mangrove swamps may be found in tropical and subtropical areas. **Mangrove swamps** are characterized by slow-moving waters that are surrounded by plants and trees, such as mangroves and some grasses. Plants and animals that can survive in salty environments are usually found in mangrove swamps.

Mangrove swamps are found along estuaries. **Estuaries** are regions where salt water and fresh water meet. Swamps have soil rich in nutrients which allow plants to grow. Animals like fish, freshwater shrimp, and clams live in swamps.

Which ecosystem would you like to explore?

Shrimps, unlike other marine organisms, swim backward.

How Do Human Activities Destroy the Ecosystem?

Unfortunately, there are many human activities that disrupt the balance in the ecosystem. Worldwide, only 20 percent of the tropical rainforests are left. Illegal logging, deforestation, and burning forest are causes of destruction of tropical rainforests.

Illegal logging is the harvesting, transporting, and trading of timber against national laws. It results in the degradation of forests.

Cleaning forests by burning trees and shrubs for farming totally destroys forests. It can kill old trees and even young plants. It also contributes to air pollution.

Humans destroy coral reefs directly through cyanide and dynamite fishing, in which divers shoot cyanide into reef crevices thus striking the fishes so they are easy to catch. Small organisms, especially corals, are killed.

Corals are often removed from their habitat to be sold as souvenirs. Careless divers destroy coral reefs by accidentally kicking them or dropping anchors from their boats.

How Can Humans Conserve and Preserve the Ecosystem?

Though human activities disrupt the ecosystem, humans can also conserve it. **Conservation** is an act to protect and keep the environment from harmful changes. There are many things we can do to reduce the impact of human activities on the environment.

1. Help rehabilitate damaged forests by planting trees.
2. Follow rules and regulations when visiting natural parks such as coral reefs, mangrove swamps, and rainforests.
3. Support organizations that protect the environment.
4. Do not throw your trash into bodies of water such as lakes, rivers, and sea.
5. Do not harvest animals and plants in a protected ecosystem.
6. Help promote the importance of the environment by increasing public awareness in the community.

Science at Work

Exploring the Ecosystem

What You Need

- meterstick
- string
- magnifying glass
- hand trowel
- weather or room thermometer

What You Need to Do

1. Choose an area to examine. The area should have soil with plants.
2. Mark out a 1 meter x 1 meter square using a string.
3. Use a magnifying glass to closely observe the area.
4. Use a hand trowel to dig into the soil. Write down your observations using the guide questions below.

Guide Questions

Living Things	Nonliving Things
What are the organisms living in the area?	What is the temperature of the area?
What do they eat?	Is the soil dry or moist?
Where do they live?	Is there a source of water?
What are the kinds of plants living in the area?	Does the area receive enough amount of sunlight?

Questions

1. How do abiotic components affect the life of the biotic components?

   _____

   _____

2. What characteristics do living things have in order for them to live in the area?

   _____

   _____

Looking Over

- An **ecosystem** is a community of animals, plants, and microorganisms interacting with the physical environment. It has biotic and abiotic components.
- The **biotic components** are the living things such as plants, animals, and microorganisms.
- The **abiotic components** are the nonliving things such as water, light, heat, and soil.
- The kinds of organisms living in an ecosystem depend on the abiotic components of that ecosystem.
- Some examples of ecosystems are tropical rainforests, coral reefs, and mangrove swamps.
- A **tropical rainforest** is characterized by warm and rainy climate.
- **Coral reefs** are made from calcium carbonate released by corals.
- **Mangrove swamps** are characterized by slow-moving water surrounded by plants.
- Some human activities that destroy the ecosystem are illegal logging, burning forest, and dynamite fishing.
- **Conservation** is an act to protect and keep the environment from harmful changes.

Enhance Your Skills

A. Circle the letter that corresponds to the correct answer.

1. Which of the following organisms can live in a swamp?
   a. an eagle
   b. a coral
   c. a dog
   d. a mangrove
2. An ecosystem is composed of biotic and _____ components.
   a. abiotic
   b. animal
   c. plant
   d. living
3. Which of the following ecosystems is characterized by slow-moving water surrounded by plants?
   a. a coral reef
   b. an ecosystem
   c. a tropical rainforest
   d. a mangrove swamp
4. What is an example of an abiotic component of the ecosystem?
   a. air
   b. bird
   c. grass
   d. worm
5. An example of a biotic component is _____.
   a. animal
   b. rain
   c. stone
   d. water

B. Read and analyze each statement carefully. Choose the best answer from the choices below.

A—If both statements are correct.

B—If both statements are incorrect.

C— If the first statement is correct and the second is incorrect.

D— If the first statement is incorrect and the second is correct.

____ 1. Tropical rainforests are found in countries near the equator.
Indonesia is a country with tropical rainforests.

____ 2. Coral reefs are not destroyed or harmed by simply touching them.
Coral reefs are a habitat for various kinds of living organisms in the sea.

____ 3. Illegal logging does not destroy the tropical rainforests.
Cyanide fishing destroys the coral reefs.

____ 4. Burning forest is the cause of damage of rainforests in the country.
Animals living in coral reefs are not affected by dynamite fishing.

____ 5. A mangrove swamp is surrounded by grass.
Its soil is rich in nutrients.

Everyday Science

How can a student like you protect the ecosystems that we have today?

Lesson 2

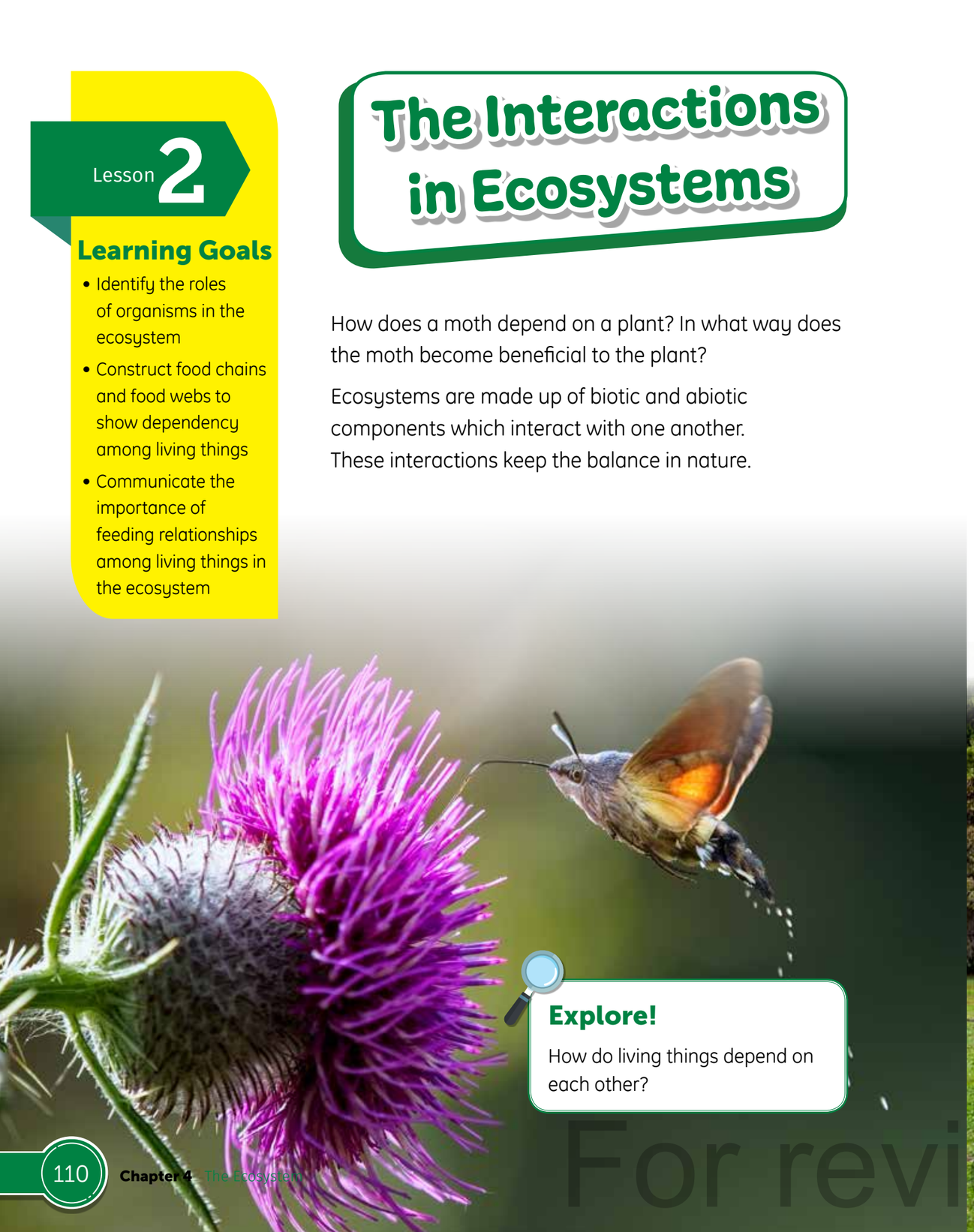
The Interactions in Ecosystems

Learning Goals

- Identify the roles of organisms in the ecosystem
- Construct food chains and food webs to show dependency among living things
- Communicate the importance of feeding relationships among living things in the ecosystem

How does a moth depend on a plant? In what way does the moth become beneficial to the plant?

Ecosystems are made up of biotic and abiotic components which interact with one another. These interactions keep the balance in nature.



Explore!

How do living things depend on each other?

How Important Is Energy in the Ecosystem?

The most common interaction in an ecosystem takes place when organisms get energy. Energy is needed by all living things to live. How an organism gets its energy is determined by its role. Each member of the ecosystem has its own role called **ecological niche**.

The Sun is the main source of energy in the ecosystem. Plants trap the light energy from the Sun to make their own food in the process called **photosynthesis**. The energy used by the plant is not gone. In fact, it is stored by plants. When an organism eats plants, the organism gets some of the stored energy in plants.

Organisms in the ecosystem can be classified as producers, consumers, scavengers, and decomposers. Each has an important role in the ecosystem.

Science Bank

Sunflowers are capable of tracking the Sun. This is called **heliotropism**. Water is collected on the shady part of the stem creating pressure which makes the flower face the Sun.

Other animals such as horses eat plants. Horses get energy from plants.

What are producers?

Producers are organisms that can make their own food. Plants are producers—they only need light energy, water, nutrients, and carbon dioxide gas released by animals to make their food.

Sunflowers face the Sun. Sunflower seeds are good sources of vitamin E.

Kelps are underwater producers. They are good sources of iodine and are used in making creams and jellies.

What are consumers?

Consumers are organisms that feed on producers or other consumers. They cannot make their own food. Consumers are classified by what they eat.

Herbivores are consumers that eat only plants.

A giraffe is an example of a herbivore.

Carnivores are consumers that feed only on animals.

Lions are carnivores. They feed only on flesh of other animals.

Omnivores are consumers that feed on both plants and animals.

Humans are omnivores. We can eat meat, fruits, and vegetables.

Chickens are omnivores, too. They eat worms and corn.

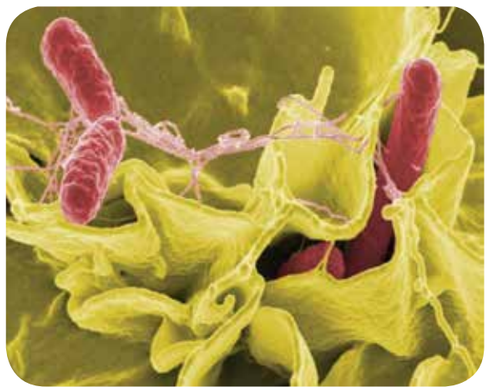
Scavengers are consumers that eat dead or injured organisms. They turn dead bodies of animals into smaller pieces.

A crow is a scavenger. It usually eats dead bodies of rodents such as rats and squirrels.

A hyena is a scavenger. It feeds on injured bodies of bigger animals like zebras.

Decomposers are organisms that feed on decaying matter. Because of them, nutrients are returned to the environment. Most of the decomposers are too small to be seen by unaided eyes.

Fungi, like mushrooms, are usually found in rotting logs. Some fungi are edible, while others are poisonous.



Bacteria are decomposers. Some bacteria live in human intestines and help in digestion.

Science Bank

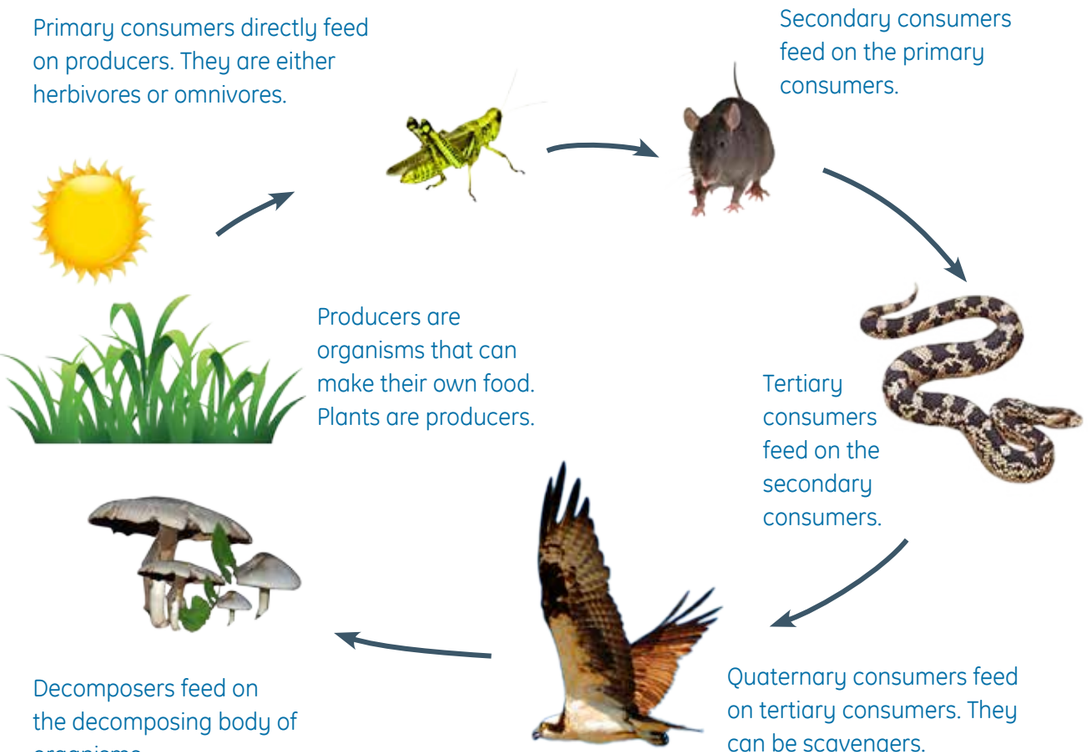
Penicillin is a drug discovered by Alexander Fleming from a fungus. It can kill harmful bacteria that cause diseases in our body.

Feeding Relationships of Organisms

Organisms are eaten by other organisms. Thus, organisms are interconnected with one another in feeding relationships.

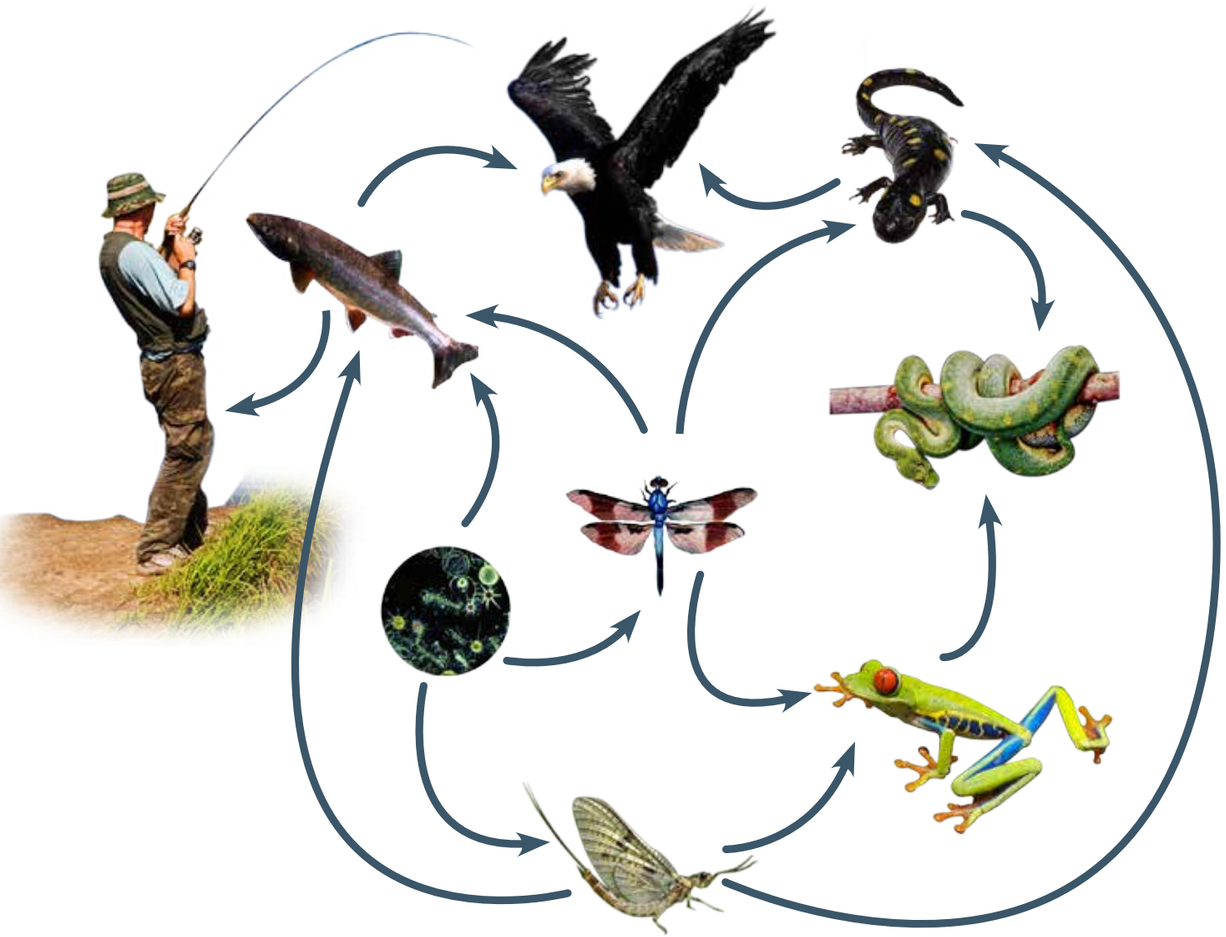
What is a food chain?

A **food chain** is a series of feeding relationships by which energy is transferred from one organism to another. It may be characterized by a linear path with arrows to show one-way direction of energy transfer from producer to consumers. Producers are always the first organisms in a food chain.



What is a food web?

Feeding relationships among organisms may be complex. A complex feeding relationship can be shown using a diagram of a food web. A **food web** is composed of interrelated food chains. Like a food chain, a food web uses arrows to show the direction of the transfer of energy.



How many food chains can you see in the given food web?

Science at Work

Let's Make Our Food Chain Model!

What You Need

- magazines
- paper
- glue
- pen

What You Need to Do

1. Choose among the three ecosystems discussed in the previous lesson.
2. Do further research on the organisms living in your chosen ecosystem.
3. Cut out from magazines pictures of plants and animals living in your chosen ecosystem. Make sure that the size of the pictures will fit on the paper.
4. Paste the pictures on a clean sheet of paper.
5. Create a diagram of at least two food chains using the pictures.
6. Label the pictures and show the flow of energy in the food chain.

Questions

1. How many consumers are there in each food chain?

   _____

   _____

2. What will happen if one organism will be removed from the food chain? Explain.

   _____

   _____

Looking Over

- The Sun is the main source of energy in an ecosystem.
- Light energy from the Sun is trapped by plants and is used in photosynthesis.
- Each member of the ecosystem has its own role called **ecological niche**.
- Producers like plants can make their own food.
- Consumers feed on producers or other consumers.
- **Herbivores** are consumers that feed only on plants.
- **Carnivores** are consumers that feed only on animals.
- **Omnivores** are consumers that feed on both plants and animals.
- **Scavengers** eat dead or injured bodies of organisms. They turn bodies into smaller pieces.
- **Decomposers** feed on the leftovers of scavengers. They return the nutrients to the environment.
- A **food chain** is a one-way transfer of energy in the ecosystem.
- A **food web** is made up of interrelated food chains.

Enhance Your Skills

A. Circle the letter that corresponds to the correct answer.

1. Which of the following is a producer?
   a. grass
   b. lion
   c. rabbit
   d. worm
2. What is the main source of energy in an ecosystem?
   a. animal
   b. plant
   c. Sun
   d. water
3. One example of a decomposer is _____.
   a. a bacteria
   b. a cat
   c. a caterpillar
   d. a dog
4. A feeding relationship includes _____.
   a. animals
   b. soil
   c. Sun
   d. water
5. Which of the following describes an omnivore?
   a. It feeds on plants.
   b. It feeds on animals.
   c. It feeds on both plants and animals.
   d. It feeds on dead and decaying organisms.

B. Answer the following questions.

1. What are the similarities and differences of a food web and a food chain?

   _____

2. What are the roles of the following organisms in the ecosystem?
   a. producer _____
   b. consumer _____
   c. decomposer _____

Everyday Science

What will happen to the ecosystem if there are no decomposers?

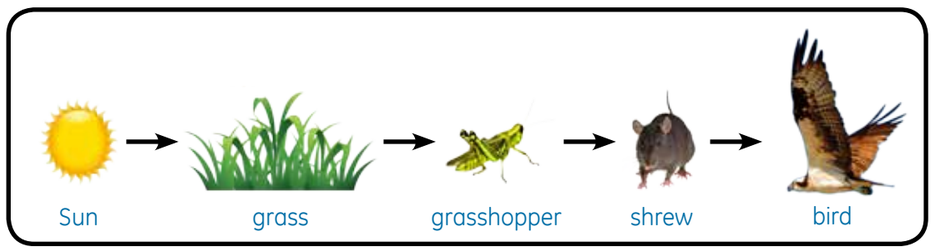
Linking Together

Chapter Test

A. Circle the letter that corresponds to the correct answer.

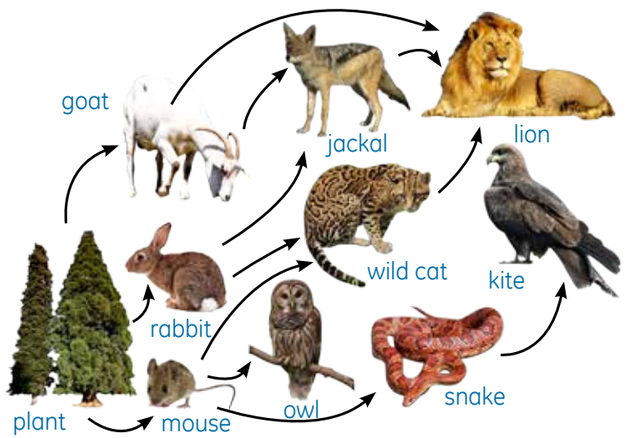
1. Which of the following is an omnivore?
   a. caterpillar
   b. cow
   c. rat
   d. tiger
2. In what kind of ecosystem do fruit trees belong?
   a. coral reef
   B. mangrove swamp
   c. tropical rainforest
   d. all of the above
3. Why is a cat categorized as a carnivore?
   a. because it feeds only on plants
   b. because it feeds only on animals
   c. because it feeds on decaying organisms
   d. because it feeds on both plants and animals
4. What human activity destroys the coral reefs using a poisonous material?
   a. diving
   b. illegal logging
   c. cyanide fishing
   d. burning forest

For items 5 and 6, refer to the diagram below.



5. Which is the herbivore?
   a. grass
   b. grasshopper
   c. bird
   d. shrew
6. Which is the omnivore?
   a. grass
   b. grasshopper
   c. bird
   d. shrew

For items 7–10, refer to the food web below.



7. How many food chains can you see in the given diagram?
   a. 5
   b. 6
   c. 7
   d. 8
8. Which of the following are the primary consumers?
   a. owl, snakes, kite
   b. rabbit, owl, mouse
   c. jackal, lion, wildcat
   d. rabbit, mouse, goat
9. How many consumers can you see in the picture?
   a. 7
   b. 8
   c. 9
   d. 10
10. How many decomposers are present in the picture?
    a. 0
    b. 1
    c. 2
    d. 3

B. Mark a check ☑ on the correct column to classify the given organisms.

Organism	Consumer				
	Herbivore	Carnivore	Omnivore	Scavenger	Decomposer
cat					
eagle					
grasshopper					
worm					
fungi					

C. Write True if the statement is correct. If false, change the underlined words to make the statement correct.

_____ 1. A carnivore is <u>always</u> a secondary consumer.
_____ 2. An <u>ecological</u> niche is the role of an organism in an ecosystem.
_____ 3. A <u>scavenger</u> feeds on decaying matter.
_____ 4. A worm is a <u>biotic</u> component of an ecosystem.
_____ 5. Bacteria are <u>decomposers</u>.
_____ 6. A <u>tropical rainforest</u> has a warm and rainy climate.
_____ 7. Cyanide is used in <u>burning forest</u>.
_____ 8. Mushrooms are <u>producers</u>.
_____ 9. <u>Mangrove swamps</u> are found along estuaries.
_____ 10. A food web has more than <u>one</u> food chain.

Making Connections

Friendly Bacteria

Bacteria are one of the decomposers in our ecosystem. They can only be seen using a microscope. Though these decomposers are feared because they may cause diseases, they are considered great workers in different fields.

Some bacteria are beneficial to our health. There are bacteria that live in our intestines that help in the process of digestion. The commercially available probiotic drinks, containing live, good bacteria, help improve our digestion.

Some bacteria help in the production of vitamin E, butter, cheese, yogurt, and soy sauce. In farming, some bacteria are used in making organic fertilizers and pesticides.