2

"The beauty of the natural world lies in the details."

– Natalie Angier

Diversity in the Living World

The Big Question

Imagine exploring a rainforest teeming with unknown creatures, or discovering tiny organisms under a microscope. How do scientists make sense of this incredible variety of life? This chapter will introduce you to the fascinating world of biodiversity and how living things are grouped and understood.

Meet EeeBee.AI

Greetings, budding biologists! I'm EeeBee, your AI guide. Let's dive into the amazing variety of life, explore how living beings are classified, and discover what makes each group special!

Still curious? Talk to me by scanning the QR code.

Learning Outcomes

By the end of this chapter, students will be able to:

- Recognize the significance of each living organism and understand the concept of biodiversity.
- Comprehend the movement patterns in animals and the body structures involved in those movements.
- Discover and analyze examples of plants and animals, focusing on their adaptations to their environment.

From Last Year's Notebook

- Environment and Interdependence in Nature
- Adaptations in Different Habitats

Science Around You

The living world surrounds us, from towering trees to microscopic bacteria in your gut. Understanding this vast diversity is crucial for protecting endangered species, developing new medicines, and even understanding our own place in nature. It's the foundation of all biological study.

NCF Curricular Goals and Competencies

This chapter aligns with the following curricular goals and competencies:

CG-3 (C 3.1, 3.2, and 3.3): Investigates the living organisms around us and their relationship with non-living elements through scientific concepts

Mind Map

Diversity in the Living World

Diversity in Plants and Animals Around Us

❖ **Plant Diversity**

✓ **Categorization Based on Height**

• Herbs • Shrubs • Trees

✓ **Categorization Based on Stem Strength**

• Climbers • Creepers

✓ **Based on Leaf Venation**

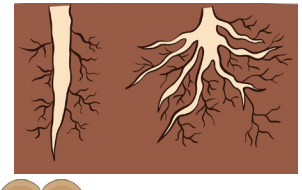
• Reticulate • Parallel

Reticulate Venation

Parallel Venation

✓ **Based on Root System**

• Taproot • Fibrous root



✓ **Based on Seeds and Seed Leaves**

• Monocot • Dicot

❖ **Animal Diversity**

✓ **Based on Movement**

• Walking • Jumping • Flying

• Swimming • Crawling • Climbing

✓ **Based on Food Habits**

• Herbivores • Carnivores • Omnivores

Plants and Animals in Different Surroundings

Habitat

✓ A habitat is the natural environment where an organism lives, providing everything it needs for survival.

❖ **Terrestrial Habitat**

✓ A terrestrial habitat is a land-based environment where organisms live, such as forests, deserts, and grasslands, adapting to conditions like temperature, rainfall, and terrain.

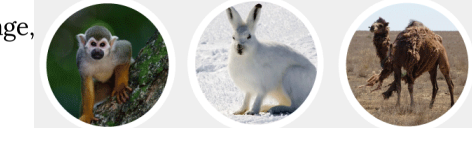
❖ **Aquatic Habitat**

✓ An aquatic habitat is a water-based environment like ponds, rivers, lakes, and oceans where organisms live and adapt to survive in water.

❖ **Adaptations**

✓ In Deserts

• Cactus, camels (water storage,



✓ In Mountains

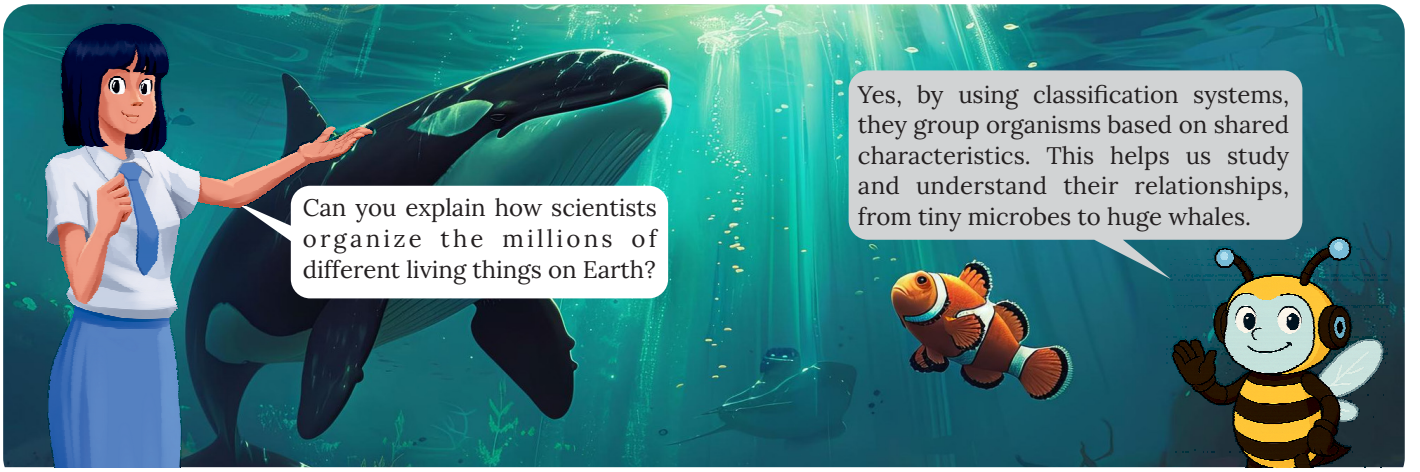
• Thick fur, broad leaves

✓ In Ponds, Lakes, and Rivers

• Gills, floating leaves, webbed feet

✓ In Oceans and Seas

• Streamlined bodies, fins, salt tolerance



In Focus

- Diversity in Plants and Animals Around Us
- Plants and Animals in Different Surroundings

Introduction

Diversity refers to the vast range of differences and variety that exist among living organisms in a particular area. It encompasses the numerous types of plants, animals, and other living things that inhabit the same region and how they differ from one another in terms of size, shape, color, habitat, behavior, and many other characteristics. This variety is not limited to a single place or ecosystem but extends across forests, oceans, grasslands, deserts, and even urban environments.

This diversity is crucial for the survival of life on Earth as it ensures the stability and functionality of ecosystems. It allows for interdependence between species, such as pollination by insects or seed dispersal by birds, and provides humans with resources like food, medicine, and clean air. Understanding the diversity of plants and animals helps us appreciate the intricate relationships that sustain life and highlights the importance of conserving these natural treasures for future generations.

From History's Pages

The concept of biodiversity has been recognized for centuries, with ancient civilizations like the Greeks and Indians observing and classifying plants and animals based on their unique traits. Aristotle, often referred to as the "Father of Biology," laid the foundation for the systematic study and classification of living organisms in the 4th century BC. Similarly, ancient Indian texts such as the Rigveda and Ayurveda emphasized the ecological and medicinal importance of various species. In the 18th century, Carl Linnaeus revolutionized the scientific world by introducing binomial nomenclature, a system that standardized the naming of species globally.

Diversity in Plants and Animals Around Us

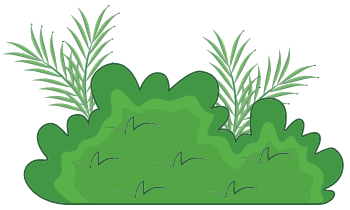
When we talk about diversity in plants and animals around us, we delve into understanding how many distinct types of living organisms coexist in a specific location. For instance, in a garden, we might find flowering plants, trees, shrubs, birds, insects, and small mammals, each playing its unique role in maintaining the ecosystem's balance. Each species is adapted to its environment in unique ways, which explains their differences in appearance and behavior. For example, plants in deserts have evolved to store water in their leaves, while animals in cold regions have thick fur to keep them warm.

Plant Diversity

Plants exhibit a wide range of characteristics that help us group and study them more effectively. These characteristics often relate to the stems, leaves, flowers, and more. For example, the thickness, height, and hardness of stems can vary greatly among different plants, while the shape, color, size, and arrangement of leaves can differ widely. This diversity allows plants to adapt to various environments and fulfill specific **ecological** roles. A practical way to study plants is by categorizing them based on their height and structural features, such as their stems and branching patterns.

Categorization of Plants Based on Their Height

Herbs are small plants with soft, green, and tender stems. They are usually short and lack branches. Examples include coriander, mustard, wheat, and paddy. Herbs are often used for food, medicine, and decoration.



Shrubs are medium-sized plants with woody stems. They have branches that grow close to the ground, giving them a bushy appearance. Examples include rose, china rose, lemon, and tomato. Shrubs are often grown for their fruits, flowers, or ornamental value.

Trees are tall plants with thick, hard, and woody stems called trunks. Their branches grow high above the ground, forming **canopies**. Examples include neem, mango, peepal, and jamun. Trees are vital for providing oxygen, shade, and habitats for various species.

Plants can be categorized based on their stem strength

Plants can be categorized based on their stem strength into creepers and climbers. These plants have weak stems and rely on external support or grow along the ground.

Creepers: Creepers grow horizontally along the ground because their stems are too weak to stand upright. They produce large fruits or flowers and spread to distribute their weight evenly. Examples include **Strawberry and Sweet Potato.**

Fig. 2.1 Strawberry

Fig. 2.2 Sweet Potato

Climbers: Climbers grow vertically with the help of nearby supports such as walls, fences, or branches. They use **tendrils** or twining stems to attach themselves and climb upwards. Examples include the **Cucumber and Pea Plant.**

Fig. 2.3 Cucumber

Fig. 2.4 Pea Plant

This classification helps us understand how plants adapt their growth to suit their environment.

Plants Based on Their Venation

The pattern of veins on leaves is called venation, and it plays a vital role in transporting water, nutrients, and food within the leaf. Based on the arrangement of veins, leaves can be categorized into two types: reticulate venation and parallel venation.

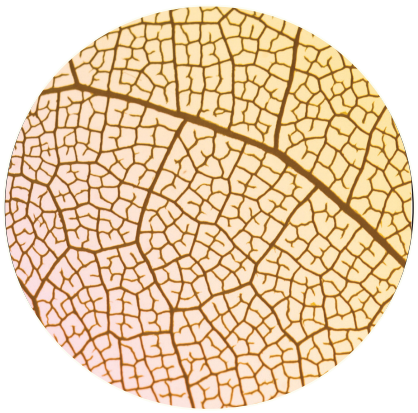


Fig. 2.5 Reticulate Venation

Reticulate Venation: Reticulate venation forms a net-like pattern of veins on both sides of the central vein, known as the midrib. The smaller veins branch out irregularly, creating a web-like structure. This type of venation is commonly seen in dicot plants. Examples include the leaves of rose and China rose.

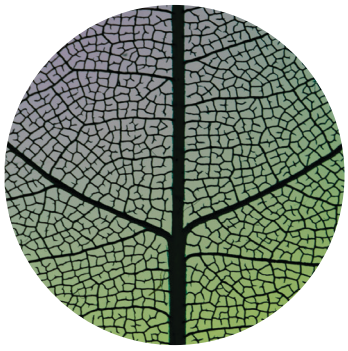


Fig. 2.6 Parallel Venation

Parallel Venation: In parallel venation, the veins run parallel to each other along the length of the leaf. Unlike reticulate venation, the veins do not branch out, and this pattern is typical in monocot plants. Examples include the leaves of banana and grasses.

These types of venation not only help in identifying plants but also reflect their **adaptations** to different environments. Reticulate venation provides structural support, while parallel venation ensures efficient nutrient transport in narrow leaves.

Plants classified based on their root systems

Plants can be classified based on their root systems into two types: Taproots and Fibrous roots. Each type plays a unique role in the plant's growth and adaptation to its environment.

Keywords

Ecological: Related to the relationships between living organisms and their environment.

Canopies: Overhead layers of leaves and branches in forests or gardens that offer shade and shelter to plants and animals below.

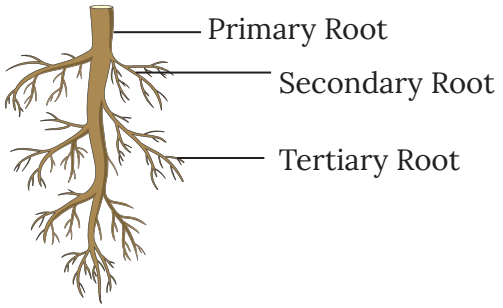


Fig. 2.7 Tap Root

Taproots: Taproots consist of a single, thick main root that grows deep into the soil, with smaller side roots branching off from it. This type of root is common in dicot plants and is excellent for anchoring the plant and accessing water and nutrients from deeper soil layers. Examples of plants with taproots include China rose and carrot.

Fibrous roots: They form a cluster of thin, thread-like roots of similar size that spread out from the base of the stem. These roots are typically found in monocot plants and are highly efficient in preventing soil erosion and quickly absorbing surface water. Examples include Sugarcane and Grass.

Fig. 2.8 Fibrous Root

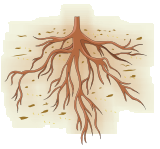
Understanding these root systems helps us appreciate how plants adapt to their environment. Taproots are suited for stability and deep water access, while fibrous roots are effective for holding soil together and thriving in areas with shallow water.

Plants categorized based on the seed leaves and seeds

Plants can also be categorized based on the number of cotyledons, or seed leaves, present in their seeds. This leads to two classifications: Monocotyledons (Monocots) and Dicotyledons (Dicots).


Seeds have one cotyledon

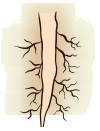

Leaves are narrow, with parallel veins


Fibrous roots

Monocotyledons (Monocots): Monocots are plants with seeds that contain a single cotyledon. These plants are characterized by having parallel venation in their leaves and a fibrous root system. Monocots are typically found in grasses and cereal crops, making them essential for agriculture. Examples of monocots include maize and rice.


Seeds have two cotyledons


Leaves are oval or palmate with net-like veins


Tap roots

Dicotyledons (Dicots): Dicots are plants with seeds that have two **cotyledons.** They are distinguished by reticulate venation in their leaves and a taproot system. Dicots include a wide variety of plants, many of which produce fruits, vegetables, or **legumes**. Examples of dicots include chickpea, pea and mango.

Keywords

Cotyledons: The seed leaves present in the embryo of a plant that store food for the developing seedling. They are the first leaves to appear when a seed germinates.

Legumes: Plants that belong to the pea family and produce seeds in pods. They enrich the soil by fixing nitrogen through their root nodules.

This classification not only highlights the structural differences in seeds but also helps in understanding the growth patterns and adaptations of plants. Monocots are ideal for quick water absorption with **shallow roots**, while dicots benefit from deeper anchorage and nutrient storage.

Animal Diversity

Animals exhibit remarkable diversity in their size, shape, movement, and behavior. This diversity allows them to adapt to different environments and perform specific roles in ecosystems. For example, some animals, like lions, are large and powerful, while others, like squirrels, are small and agile. Similarly, some animals fly through the air, like birds, while others swim in water, such as fish. This variety showcases the adaptability and uniqueness of the animal kingdom.

Understanding Local Names of Animals

Animals are often known by different names in various regions, reflecting cultural and linguistic differences. A local name refers to the commonly used term for an animal in a specific language or area. For example, a sparrow might be called by a unique name in one place and a different name elsewhere. Recognizing these names helps connect people with their local biodiversity and fosters a deeper understanding of the natural world.

Where Do Animals Usually Live?

Animals live in a variety of habitats, which are the specific environments that provide them with the resources they need to survive. Some animals live on land, such as forests, fields, or deserts, where they can find food, water, and shelter. Others reside in aquatic habitats, such as rivers, ponds, or oceans, where they are adapted to swim or float. Birds and certain insects inhabit the air, building nests in trees or flying vast distances. The habitat of an animal reflects its unique adaptations and survival needs.

What Kind of Food Does This Animal Need to Stay Healthy?

The diet of an animal is crucial for its growth, energy, and overall health. Different animals have different diets based on their species and habitat. Herbivores eat plants, such as grass or leaves, while carnivores feed on meat or insects. Omnivores consume a combination of plants and animals. Understanding an animal's diet helps in knowing how it interacts with its environment and maintains its role in the ecosystem. For example, a rabbit eats grass to stay healthy, while a lion relies on meat.

How to Group Animals Based on Movement

Animals use different types of movement to travel from one place to another, depending on their body structure and the environment they live in. Each mode of movement involves specific body parts that are adapted for the task. Here are some common types of movement in animals:

- **Walking:** Animals such as goats, humans, cows, and lions move by walking, using their legs for support and movement.
- **Jumping:** Animals like kangaroos, monkeys, and frogs use their strong legs to jump and cover distances.
- **Flying:** Birds, houseflies, and bees rely on their wings to fly, allowing them to navigate the air.
- **Swimming:** Aquatic animals such as fish, whales, and dolphins use fins to swim through water.

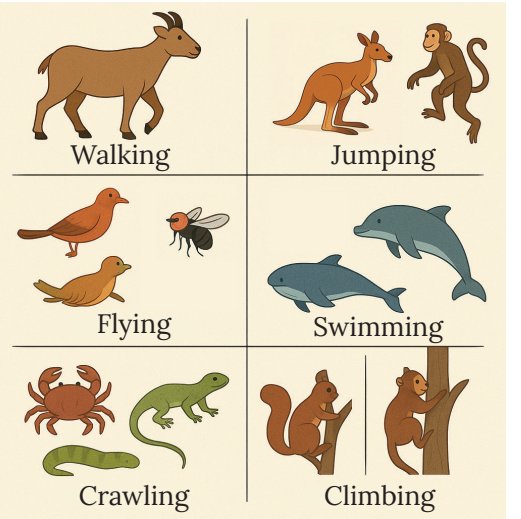


Fig. 2.9 Animals Based on movement

Keywords

Shallow Roots: Roots that grow close to the surface of the soil. They help plants quickly absorb water from light rains or surface moisture.

- **Crawling:** Creatures like crabs, lizards, and caterpillars move by crawling, often using their legs or body muscles.
- **Climbing:** Animals such as monkeys, squirrels, and koalas climb trees and surfaces using both their hands and legs.

Importance of Grouping Animals

In addition to movement, animals can also be classified based on features like size, shape, and color. Categorizing animals helps us understand their diversity and how they adapt to different habitats. It also highlights the unique roles they play in their ecosystems, emphasizing the importance of their survival and conservation. Understanding animal movement provides insight into their physical characteristics and how they interact with their environment.

Did You Know

Janaki Ammal (1897–1984)

Janaki Ammal

She was a renowned Indian botanist who made significant contributions to environmental conservation and biodiversity research. Her work focused on documenting and preserving India's rich plant diversity. She played a crucial role in the Save Silent Valley movement, which aimed to protect Kerala's Silent Valley forest from being destroyed by a hydroelectric project.

As the director of the Botanical Survey of India, Janaki Ammal spearheaded programs to classify and conserve the diverse plant species of the country. Her efforts in both scientific research and environmental activism have left a lasting impact on India's conservation history.

Fact Flash

Did you know that there are over 300,000 known species of beetles, making them the largest group of insects? Also, the tallest tree species, the Coast Redwood, can grow over 115 meters (380 feet) tall!

Common Misconceptions

× **Misconception:** All plants have flowers.

✓ **Correction:** Many plants, like ferns and mosses, reproduce using spores and do not produce flowers.

× **Misconception:** All insects have six legs.

✓ **Correction:** While most adult insects have six legs, some larval forms or other arthropods (like spiders, which are not insects) have different numbers.

Science Around You

Science helps us understand the incredible variety of life on Earth, from the smallest insects to the largest whales. This diversity, known as biodiversity, explains how different plants and animals exist and thrive in various environments. For example, the vibrant colors of a peacock's feathers are a result of complex light refraction, attracting mates and demonstrating evolutionary adaptations. The intricate web of life in a coral reef, teeming with fish, corals, and other organisms, showcases how different species interact and depend on each other for survival. Today, scientific efforts in conservation continue to transform our understanding and protection of endangered species and their habitats.

Activity

Observing Animal Adaptations: The Bird Beak Test

Objective: To understand how different bird beak shapes are adapted for specific food sources.

Materials: Various "food items" (e.g., dried pasta shapes, birdseed, small beads, water in a shallow dish), various "beaks" (e.g., tweezers, clothespins, spoons, droppers), paper plates or trays.

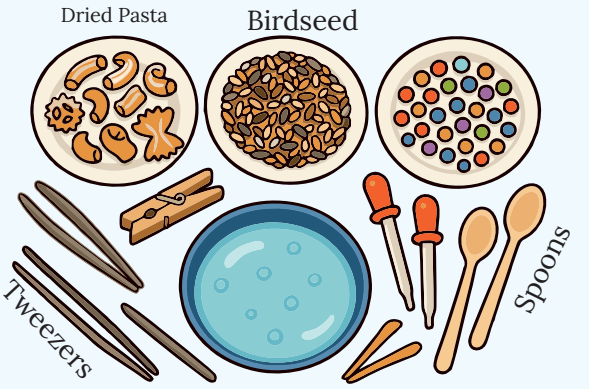


Fig. 2.10 Materials Required

- **Procedure:**

1. Setup: Place different "food items" on separate paper plates.
2. Testing Beaks: For each "beak" (tool), try to "eat" (pick up or collect) each type of "food item."
3. **Observation:** Note which "beak" is most effective for each "food item." For example, tweezers might be good for seeds, spoons for larger pasta.
4. Record your observations in a table.

- **Observation:** Note which "beak" allowed you to collect the most of a specific "food item" in a set time, demonstrating its adaptation.

Knowledge Checkpoint

Gap Analyzer™ Homework | Watch Remedial

Remembering

Multiple Choice Questions:

1. Which of these is a characteristic of all mammals?
   (a) Lay eggs ☐ (b) Have feathers ☐
   (c) Produce milk ☐ (d) Live in water ☐

Understanding

2. The process by which a caterpillar changes into a butterfly is called:
   (a) Germination ☐ (b) Photosynthesis ☐
   (c) Metamorphosis ☐ (d) Hibernation ☐
3. Which of the following is NOT a primary role of plants in an ecosystem?
   (a) Producing oxygen ☐ (b) Providing food ☐
   (c) Decomposing dead matter ☐ (d) Offering shelter ☐

Applying

Short Answer Question:

4. Explain two ways plants adapt to their environment and show two ways animals adapt to survive.
5. Explain the meaning of biodiversity with two examples of animal groups and state why insects are important.

Analyzing

Long Answer Question:

6. Explain why the diversity of plants and animals is essential for a healthy planet. Describe three different examples of how species interact within an ecosystem (e.g., predator-prey, symbiosis) and discuss the importance of conservation efforts in protecting this biodiversity.

Plants and Animals in Different Surroundings

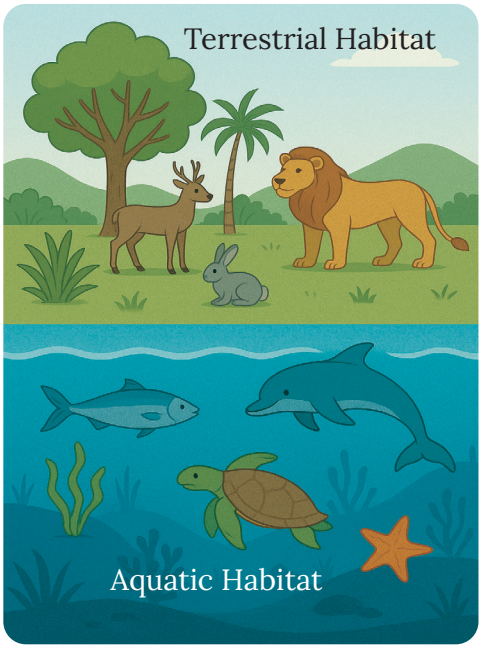


Fig. 2.11 Plants and Animals in Different Surroundings

All living organisms, including plants and animals, need food, shelter, and essential **resources** like oxygen and water from their surroundings to survive. A habitat is the natural **environment** where organisms live and thrive. It provides everything they need, including food, shelter, and suitable climatic conditions.

For example, sea turtles find their habitat in oceans, camels are adapted to survive in hot or cold deserts, and rhododendrons grow in mountainous regions. Many plants and animals can coexist within the same habitat by sharing resources. Habitats play a crucial role in shaping the biodiversity of a region, as they support the survival of diverse species.

Protecting biodiversity is essential to maintaining life on Earth. By preserving natural habitats and ensuring plants and animals can thrive, we can help safeguard the rich variety of life that our planet supports. This makes habitat conservation a critical step in sustaining biodiversity for future generations.

Plants and animals can be broadly classified into two types based on the habitat in which they live: **terrestrial habitats and aquatic habitats**. These habitats provide the necessary resources and conditions for the survival and growth of living organisms. Each type of habitat is unique and supports a variety of species that have adapted to thrive in those specific environments.

Terrestrial Habitat

Terrestrial habitats are land-based environments where living organisms interact with the land, air, and other elements of their surroundings. These habitats include forests, grasslands, deserts, and mountains, each presenting unique challenges such as fluctuating temperatures, limited water availability, and different soil types. Plants and animals living in these habitats have developed special adaptations for survival. For instance, desert plants like cacti store water in their stems and have spines to reduce water loss, while animals such as camels can survive without water for long periods and have broad, padded feet for walking on hot sand. In mountain regions, animals grow thick fur to withstand cold temperatures, and plants stay low to the ground to resist strong winds.

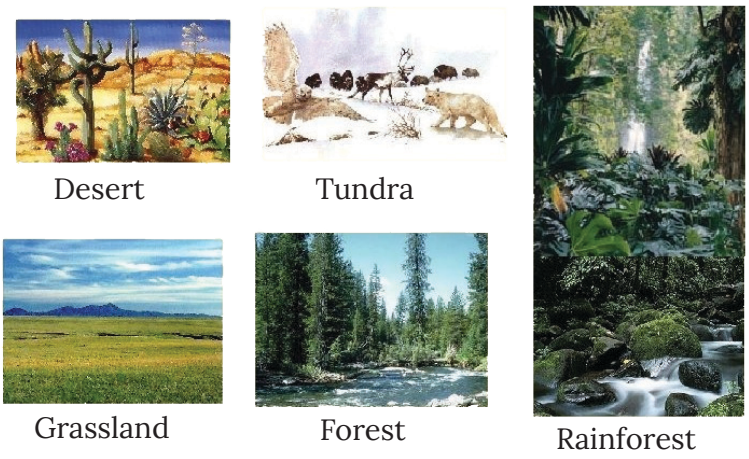


Fig. 2.12 Terrestrial Habitat

Forests provide dense plant cover where tall trees compete for sunlight, and animals like monkeys and birds adapt to life in the treetops. In grasslands, open spaces allow fast-running animals like deer and lions to survive through speed, whether hunting or escaping predators. Deserts push animals like snakes and lizards to become nocturnal, avoiding daytime heat, while mountain goats develop strong hooves to climb rocky slopes. Plants adapt to soil types; for example, deep roots help access underground water, while shallow roots spread wide to absorb surface moisture quickly. Seasonal changes also shape life in terrestrial habitats, prompting behaviors such as migration, hibernation, and leaf shedding. These adaptations help maintain the balance of life in these varied land environments, where organisms continuously adjust to survive changing conditions.

For Example

Lions and elephants in grasslands have adaptations like strong limbs and keen senses to hunt or protect themselves.

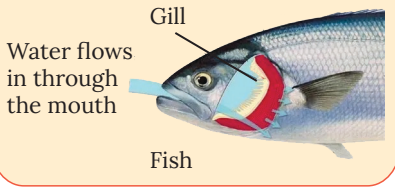
Pine trees and mountain goats are well-suited to cold, high-altitude mountain regions where temperatures are lower and the terrain is rugged.

Cactus are adapted to deserts with their thick stems to store water and spines to reduce water loss.

Aquatic Habitat

Aquatic habitats are water-based environments, including oceans, rivers, lakes, and ponds. These habitats are home to organisms that are specially adapted to live and move in water. For instance:

Fish have fins for swimming and gills for breathing underwater.



Sea turtles live in the ocean but come to land to lay eggs, showcasing their ability to adapt to both water and land.

Sea Turtle

Algae and seaweeds thrive in oceans and provide food and oxygen for aquatic animals.

Algae

Aquatic habitats also vary significantly, from the salty waters of oceans to the fresh waters of rivers and lakes. Each type of aquatic habitat supports its own unique biodiversity. For example, coral reefs in oceans are often referred to as the "rainforests of the sea" because of the incredible variety of species they host.

The Connection Between Habitat and Biodiversity

Both terrestrial and aquatic habitats play a vital role in supporting biodiversity. A habitat provides food, shelter, and proper climatic conditions essential for the survival of organisms. Many plants and animals share the same habitat and depend on each other for survival, forming complex ecosystems.

For example, in a forest (a terrestrial habitat), trees provide shelter and food for birds, while insects pollinate plants, and herbivores feed on leaves. Similarly, in a pond (an aquatic habitat), fish feed on smaller aquatic organisms, and plants like water lilies provide oxygen and shelter.

Fig. 2.13 Habitat and Biodiversity

Protecting Habitats to Preserve Biodiversity

Habitat loss due to human activities like deforestation, pollution, and urbanization is one of the biggest threats to biodiversity. Protecting terrestrial and aquatic habitats is crucial to ensure the survival of the wide variety of plants and animals that depend on them. Conservation efforts like creating wildlife reserves, protecting coral reefs, and reducing pollution help maintain the balance of ecosystems. By preserving habitats, we can ensure that the Earth remains rich in biodiversity for future generations.

Adaptation

Plants and animals living in different habitats have unique features and behaviors that help them survive. This ability to adjust and thrive in a specific environment is called adaptation. Adaptations involve physical features, behaviors, or movements that suit the organism to its surroundings, such as their shape, size, color, and structure.

Changes due to Adaptations

- **Changes in Body** → Many organisms develop special physical features to survive in their habitat. For example, camels have humps to store fat for energy in deserts.
- **Changes in Behavior** → Animals often change their behavior to adapt, such as hibernation in polar bears during winter to conserve energy.
- **Changes in Location** → Some animals, like birds, migrate to warmer regions during colder months in search of food and better living conditions.

Adaptations in Deserts

Deserts are harsh environments with extreme heat during the day, cold temperatures at night, and minimal rainfall. Organisms here have evolved specific adaptations to survive in these challenging conditions.

Adaptations in a Cactus

Cacti are excellent examples of plants adapted to desert life:

- **Spines instead of Leaves:** The leaves of cacti are modified into spines to minimize water loss through transpiration.
- **Green, Spongy Stems:** The stem is thick and spongy to store water and also performs photosynthesis.
- **Long Roots:** Cacti have long roots that grow deep into the soil to absorb water from underground sources.

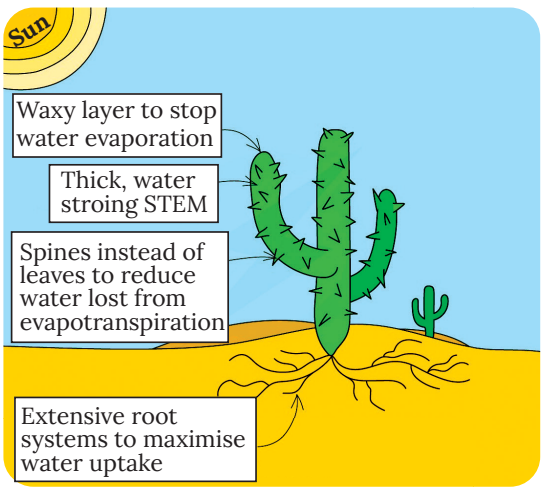


Fig. 2.14 Adaptation in Cactus

Adaptations in a Camel

Camels are well-adapted to survive in harsh desert conditions. Their physical features and behaviors enable them to endure extreme heat, scarce water, and sandy environments. Here are some key adaptations found in camels:

- **Body Color:** Camels have a brown-colored body that blends with the desert surroundings, helping them avoid predators.
- **Long Eyelashes and Closable Nostrils:** Their long eyelashes shield their eyes from sandstorms, and they can close their nostrils to prevent sand from entering their nasal cavity.
- **Hump for Fat Storage:** The camel's hump stores fat, which serves as a source of energy, allowing them to survive for months without food.
- **Long Legs:** Camels have long legs that keep their body elevated, protecting them from the hot sand.

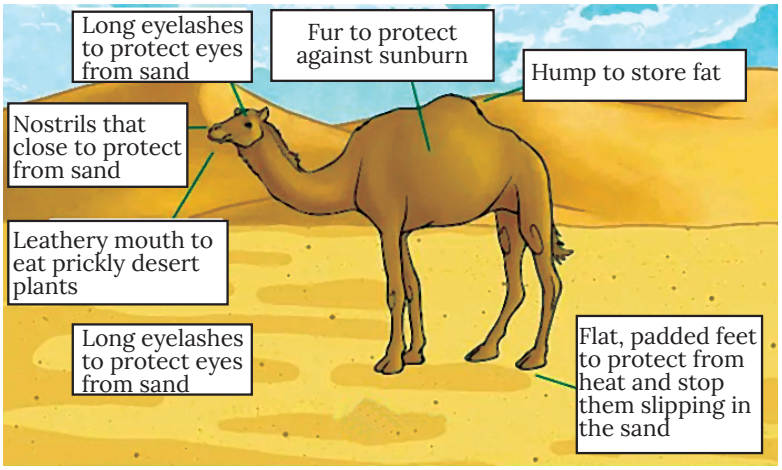


Fig. 2.15 Adaptation in Camel

- **Water Conservation:** Camels do not sweat and produce minimal urine and dung, conserving water for longer periods.
- **Low Breathing Rate:** They have a slow breathing rate, reducing water loss through exhalation.
- **Water Storage:** Camels can drink large amounts of water in one sitting and store it in their bodies for future use.
- **Thick Lips:** Their thick and tough lips enable them to eat thorny desert plants like cacti without injury.
- **Wide Padded Feet:** Their broad, well-padded feet and wide hooves help them walk on hot, soft sand without sinking.

Camels living in colder areas, such as Ladakh, have distinct adaptations. They have shorter legs to navigate mountainous terrain and two humps for better fat storage. During harsh winters, their body shrinks, and they rely on the stored fat for energy. Additionally, they grow long, thick hair to protect them from the extreme cold.

These adaptations enable camels to thrive in different environments, showcasing their remarkable ability to survive and flourish in both hot deserts and cold regions.

Adaptations in Mountain Plants

Mountain habitats pose extreme challenges with cold temperatures, strong winds, snow-covered ground, and limited food availability. Despite these conditions, plants and animals have evolved unique adaptations to thrive in these environments. Species such as mountain goats, yaks, snow leopards, and plants like pine, fir, and rhododendrons exhibit remarkable features that help them survive in harsh mountainous regions.

Mountain plants face challenges like freezing temperatures, heavy snowfall, and strong winds. Here are some adaptations that allow them to survive:

- **Conical Shape and Tall Growth:** Trees like pine and fir have a conical shape, enabling snow to slide off their branches easily. This minimizes the risk of branch breakage and reduces wind resistance.

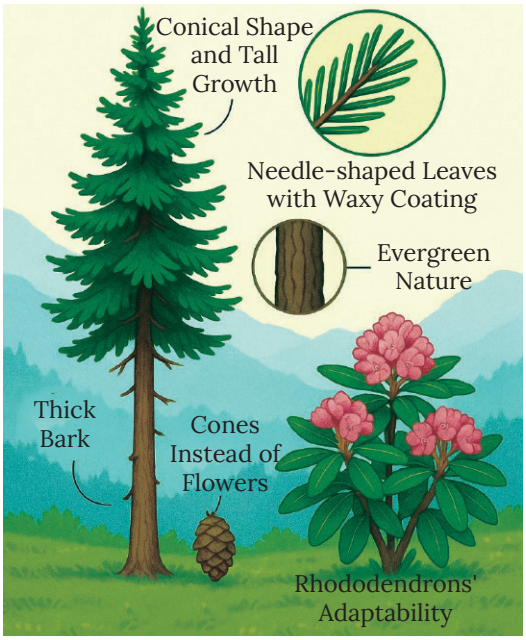


Fig. 2.16 Adaptation in Mountain Plants

- **Thick Bark:** The thick, sturdy bark of mountain trees provides insulation, protecting the plant's internal structures from the cold.
- **Needle-shaped Leaves with Waxy Coating:** Leaves of mountain trees are narrow and coated with wax to reduce water loss. Their shape also prevents snow from accumulating and allows wind to pass through.
- **Cones Instead of Flowers:** These trees produce cones that protect seeds from freezing temperatures, ensuring their reproduction.
- **Evergreen Nature:** Plants like fir and cedar remain green year-round, allowing them to perform photosynthesis even during winter.
- **Rhododendrons' Adaptability:** In the Shola Forests of Nilgiri, rhododendrons are short with small leaves to endure strong winds.
- In Sikkim, they grow taller in less windy conditions, showing regional adaptability.

Adaptations in Mountain Animals

Thick Fur and Fat Layers: Animals like yaks and polar bears have thick fur and fat layers to retain body heat and provide insulation against freezing temperatures.

Adapted Feet and Hooves:

- Mountain goats have strong hooves with rubbery pads for better grip on rocky slopes.
- Polar bears have padded feet to walk on snow and ice without slipping.

Feeding Adaptations: Herbivores like yaks use their horns to dig through snow and access grass.
Camouflage: Animals like snow leopards and mountain goats have white or patterned fur that blends with their snowy environment, helping them avoid predators.

Mountain Goat

Yak

Snow Leopard

Specific Animals:

- **Mountain Goats:** Strong hooves, thick white fur, and the ability to leap long distances help them navigate steep slopes and evade predators.
- **Yaks:** Dense fur and strong bodies enable them to survive freezing conditions. Their horns help them dig through snow for food.
- **Snow Leopards:** Thick, patterned fur provides warmth and camouflage, while their long, bushy tails help with balance and serve as blankets when resting.

Adaptations in Ponds, Lakes, and Rivers:

Freshwater ecosystems like ponds, lakes, and rivers provide vital resources but also present challenges such as fluctuating water levels, currents, and oxygen availability. Plants and animals in these habitats have developed specific adaptations to survive.

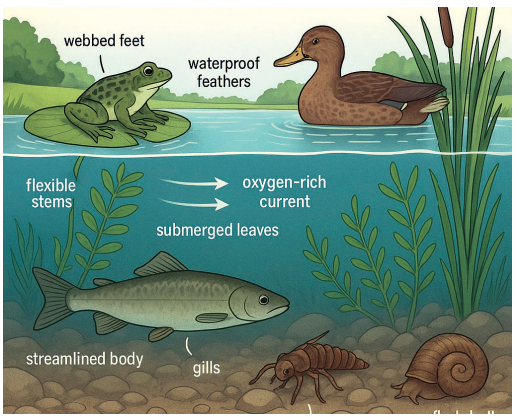


Fig. 2.17 Adaptation in Freshwater

Adaptations in Freshwater Plants

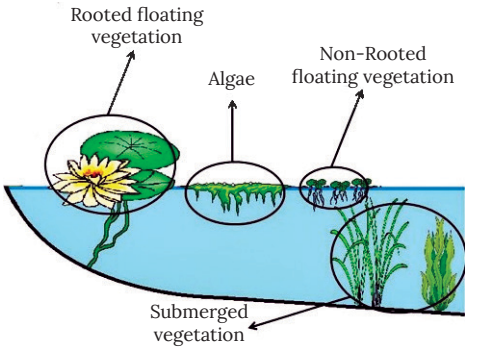


Fig. 2.18 Adaptations in Freshwater Plants

Reduced Roots:

Freshwater plants have small roots, as they don't need extensive systems to absorb water. Instead, their roots anchor them in place.

Long, Hollow, Flexible Stems:

Stems of freshwater plants are lightweight and flexible, allowing them to move with water currents without breaking.

Leaf Adaptations:

- **Submerged Plants:** Thin, ribbon-like leaves (e.g., Hydrilla) reduce resistance to water currents.
- **Floating Plants:** Broad, wax-coated leaves (e.g., water lilies) repel water and help plants float.

Air Spaces for Buoyancy:

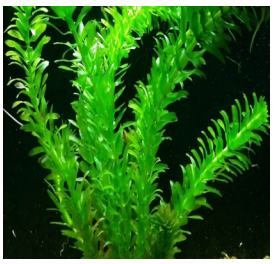
Floating plants like lotuses have air-filled spaces in their leaves and stems, enabling them to float.

Efficient Photosynthesis:

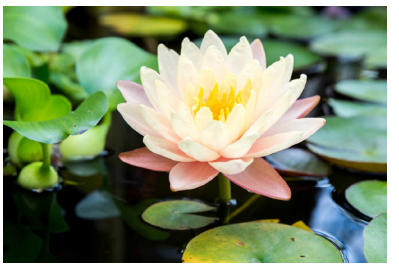
Floating plants have wide leaves to capture sunlight, while submerged plants absorb nutrients and gases directly from the water.

Examples of Freshwater Plants

- **Hydrilla:** Fully submerged with simple, narrow leaves.
- **Water Lily:** Floats on the surface with broad leaves.
- **Lotus:** Waxy leaves and stems help it thrive on water.



Hydrilla



Water Lily

Lotus

Adaptations in Freshwater Animals

Animals in freshwater habitats are equipped to navigate water, breathe, and feed effectively.

Fish

- **Streamlined Body:** Reduces water resistance.
- **Fins:** Help with **steering** and propulsion.
- **Gills:** Extract dissolved oxygen from water.
- **Scales and Mucus:** Protect against infections and reduce friction.

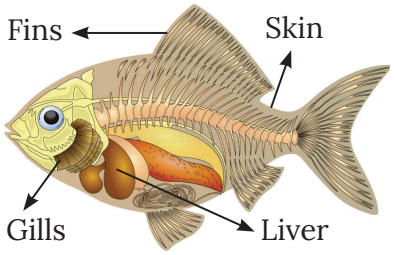


Fig. 2.19 Adaptation in Fish

Keywords

Steering in Fishes: Fishes steer by using their fins and tail to change direction while swimming. The pectoral and pelvic fins help them turn, stop, and maintain balance in water.

Frogs

- **Webbed Feet:** Aid in swimming.
- **Dual Respiration:** Frogs use lungs on land and moist skin underwater.
- **Strong Hind Legs:** Enable long jumps to catch prey.
- **Sticky Tongue:** Helps catch insects and small prey.

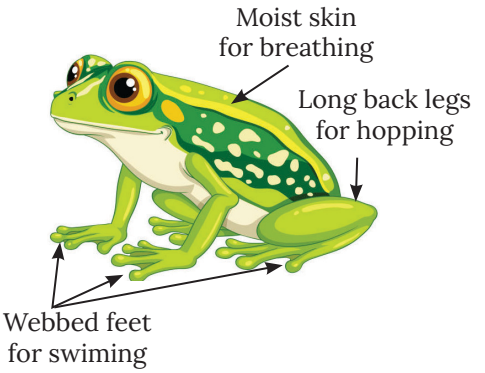


Fig. 2.20 Adaptation in Frogs

Examples of Freshwater Animals

- **Fish:** Carps, catfish, and trout are streamlined for swimming.
- **Frogs:** Adapted for both land and water.
- **Insects:** Water beetles and newts are adapted for swimming and extracting oxygen.

Adaptations in Oceans and Seas

Oceans and seas are saline water ecosystems with challenges like high salinity, immense depths, and limited oxygen. Marine plants and animals have evolved specialized features to survive.

Adaptations in Marine Plants

Algae (Phytoplankton and Seaweeds):

- **Phytoplankton:** Small, photosynthetic organisms that float near the surface and form the base of the marine food chain.
- **Seaweeds:** Larger algae that perform photosynthesis and thrive in saline water.

Holdfasts:

Seaweeds use root-like holdfasts to anchor themselves to rocks, preventing them from being swept away by waves.

Flexible Fronds:

Long, flexible structures move with water currents, reducing damage.

Air Sacs for Buoyancy:

Some marine plants have gas-filled sacs to float near the water's surface for sunlight exposure.

Salt Tolerance:

Marine plants cope with high salinity by storing or excreting excess salt.

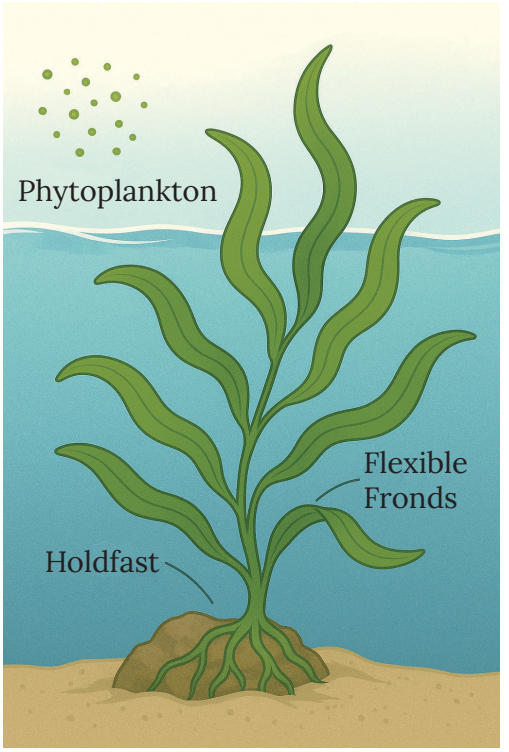


Fig. 2.21 Adaptations in Marine Plants

Adaptations in Marine Animals

Fish: Built for Water!

Fish are perfectly designed for life in the water! They have a streamlined body, which means it's smooth and pointed at the ends, helping them cut through the water easily, like a fast boat. Their fins act like paddles and rudders, helping them swim, steer, and stay balanced. And to breathe underwater, they use special parts called gills, which take oxygen right out of the water!

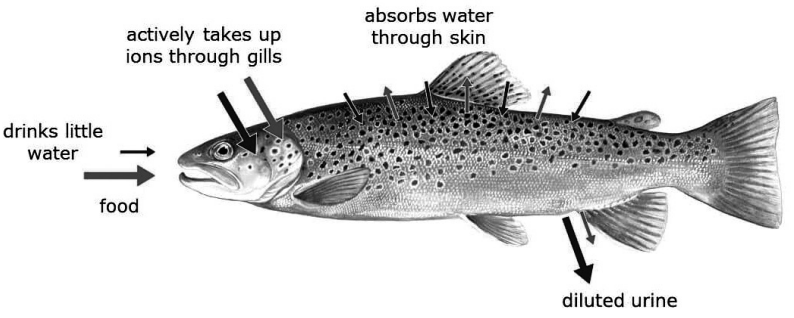


Fig. 2.22 Adaptations in Marine Animals

Marine Mammals:

Ocean Superheroes! (Dolphins and Whales)

Dolphins and whales are super cool mammals that live in the ocean. Even though they live in water, they still need to breathe air, so they have a blowhole on top of their heads – it's like a special nose for breathing when they pop up to the surface! To stay warm in the cold ocean, they have a thick layer of fat called **blubber**, which also stores energy. And just like fish, they have a streamlined body that helps them glide through the water super fast!

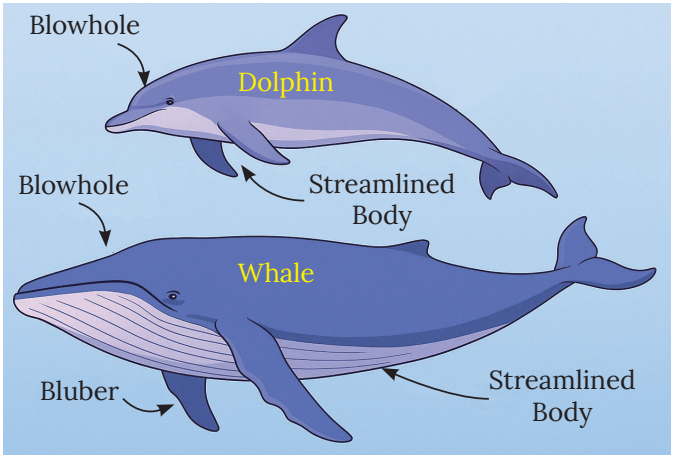


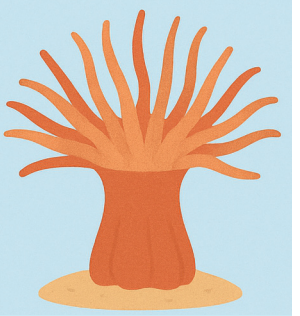
Fig. 2.23 Dolphin and Whale

Mollusks: Animals with Shells!

Mollusks
Shells protect them from predators and harsh conditions.

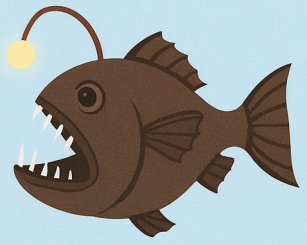
Mollusks are amazing sea creatures, and many of them have a special house called a shell. This shell is like their armor, protecting them from other animals that might want to eat them. It also keeps them safe from strong waves or when the water goes away at the beach. Think of snails and clams – they are mollusks with cool shells!

Sea Anemones: Flowery Hunters!



Sea Anemones
Use tentacles to capture prey like small fish and plankton

Sea anemones look like colorful flowers swaying in the ocean, but don't let that fool you – they are hunters! They have long, wiggly arms called tentacles. These tentacles have tiny stingers that help them catch small fish and other tiny sea creatures that swim by. Once they catch something, they pull it into their mouth in the middle.



Adaptations for Depth
Deep-sea animals often have bioluminescence to communicate or hunt in darkness

Deep-Sea Animals: Lights in the Dark!

Imagine a part of the ocean where it's always super dark, like permanent night! That's the deep sea. Animals living there have a special superpower: **bioluminescence.** This means they can make their own light, like little glow sticks! They use this light to find friends, attract food, and sometimes even to scare away bigger animals that want to eat them.

Examples of Marine Animals.

- **Dolphins and Whales:** Use blowholes for breathing and echolocation for navigation.
- **Fish:** Adapted with gills and fins for efficient swimming.
- **Crabs and Starfish:** Adapt to varying salinity and depth.

Keywords

Blubber: A thick layer of fat beneath the skin of marine animals like whales and seals that provides insulation and energy storage in cold water.
Bioluminescence: The natural ability of some organisms, like deep-sea fish and jellyfish, to produce light through chemical reactions inside their bodies.

Fact Flash

Did you know that some plants, like the Venus flytrap, are carnivores and eat insects? Also, the chameleon's tongue is twice as long as its body, allowing it to catch prey from a distance with incredible speed!

Common Misconceptions

× **Misconception:** Camels store water in their humps.

✓ **Correction:** Camel humps store fat, which can be metabolized for energy and water, but they don't hold liquid water directly.

× **Misconception:** All plants need direct sunlight to grow.

✓ **Correction:** Many plants, especially those from forest floors, thrive in shade or indirect light.

Science Around You

Science helps us understand how plants and animals adapt to their diverse surroundings, from scorching deserts to freezing poles. It explains how different environments shape life. For instance, cacti in deserts have specialized stems to store water and spines to reduce water loss, while polar bears in the Arctic have thick fur and blubber for insulation. These adaptations allow them to survive extreme conditions. Understanding these interactions, like how specific animals pollinate certain plants, reveals the intricate balance of ecosystems, highlighting the importance of biodiversity for a healthy planet.

Activity

Plant Adaptations: The Leaf Observation Test

Objective: To observe and compare different leaf structures and relate them to potential environmental adaptations.

- **Materials:**

  Various types of leaves (e.g., broad leaf from a common plant, a needle from a pine tree, a succulent leaf, a thorny rose leaf), a magnifying glass, a ruler.

- **Procedure:**

  1. **Collection:** Gather a few different types of leaves from your surroundings or a local park. Ensure they are clean.
  2. **Observation:** Examine each leaf closely using the magnifying glass. Note its shape, size, thickness, presence of hairs or thorns, and vein patterns.
  3. **Measurement:** Measure the length and width of each leaf.
  4. **Sketching:** Draw each leaf, highlighting its unique features.
  5. Record your observations in a table.

- **Observation:** Note how the different leaf characteristics vary (e.g., thick/thin, broad/narrow, smooth/hairy) and consider what environmental conditions these might be suited for.

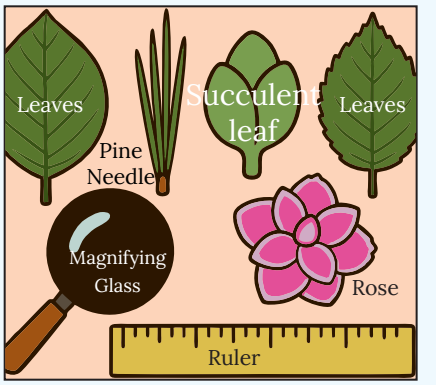


Fig. 2.24 Materials Required

Knowledge Checkpoint

Gap Analyzer™ Homework | Watch Remedial

Remembering

Multiple Choice Questions:

1. Which animal is known for its ability to change color to blend with its surroundings?
   (a) Elephant ☐ (b) Chameleon ☐
   (c) Dolphin ☐ (d) Penguin ☐

Understanding

2. What is the primary function of a cactus's spines?
   (a) To attract insects ☐ (b) To store water ☐
   (c) To reduce water loss ☐ (d) To provide shade ☐
3. Which of the following is NOT an adaptation for surviving in cold climates?
   (a) Thick fur ☐ (b) Blubber ☐
   (c) Large ears ☐ (d) Hibernation ☐

Short Answer Question:

Applying

4. Give two examples of how plants adapt to dry conditions and two ways animals adapt to cold conditions.
5. Show two animal adaptations for catching prey and explain why some plants have thorns to survive.

Long Answer Question:

Evaluating

6. Explain why plants and animals in different surroundings display unique adaptations. Describe three distinct adaptations found in animals for movement (e.g., flying, swimming, running) and discuss the importance of both physical and behavioral adaptations for survival in diverse habitats.

SUMMARY

The diversity in the living world highlights the vast variety of plants and animals found across different habitats. This diversity is essential for maintaining ecological balance and supporting life on Earth. The study of biodiversity focuses on the differences in size, structure, movement, and behavior of living organisms and how they adapt to their environments.

Diversity in Plants and Animals Around Us

Plants and animals vary significantly based on their traits and habitats:

- **Plants:** Classified based on characteristics like height (herbs, shrubs, and trees), stem strength (creepers and climbers), venation (reticulate and parallel), root systems (taproots and fibrous roots), and seed types (monocots and dicots). Examples include herbs like coriander, trees like neem, and monocots like rice.
- **Animals:** Display a wide range of movement patterns such as walking (goats), swimming (fish), flying (birds), and jumping (frogs). They adapt to their surroundings using traits like body size, camouflage, and diet.

Plants and Animals in Different Surroundings

Living organisms adapt to their surroundings, which include terrestrial and aquatic habitats:

Terrestrial Habitats: Found on land, including deserts, mountains, and forests. Examples include camels with adaptations like humps to survive in deserts and mountain goats with strong hooves for navigating rocky terrain.

Aquatic Habitats: Include freshwater (ponds, lakes, rivers) and marine environments (oceans and seas). Freshwater plants like Hydrilla have narrow leaves, while marine plants like seaweed use holdfasts for anchoring. Animals such as dolphins breathe through blowholes, and fish have gills and streamlined bodies for efficient swimming.

Adaptations

Adaptations allow organisms to survive and thrive in their specific environments:

Deserts: Camels and cacti conserve water through features like humps and spines.

Mountains: Plants like pine trees are conical to shed snow, and animals like snow leopards use thick fur for warmth.

Freshwater: Frogs use webbed feet and moist skin for dual respiration, while plants like water lilies float using air-filled stems.

Oceans: Marine animals like dolphins use streamlined bodies for swimming, and deep-sea creatures use bioluminescence for survival in dark depths.

Conservation of Biodiversity

The interdependence of plants and animals within ecosystems emphasizes the need to conserve habitats and protect biodiversity. Efforts like reducing deforestation, pollution, and habitat destruction ensure the survival of diverse species, which are vital for maintaining Earth's ecological balance.

Example Based Questions

Multiple Choice Questions

1. Which feature helps cactus plants survive in deserts?

   (a) Broad leaves to trap more sunlight

   (b) Fleshy stems to store water

   (c) Roots that float on water

   (d) Thin stems without chlorophyll

   Answer: (b) Fleshy stems to store water

   Explanation: Cactus plants adapt to dry surroundings by storing water in their thick green stems. Their leaves are reduced to spines, which prevent water loss and protect them from animals.

2. Why can polar bears live comfortably in the Arctic region?

   (a) They drink seawater to stay warm

   (b) They have thick fur and a fat layer for insulation

   (c) They eat plants growing under snow

   (d) They hibernate the whole year

   Answer: (b) They have thick fur and a fat layer for insulation

   Explanation: Polar bears survive extreme cold because their white fur camouflages them in snow and traps heat, while a thick fat layer (blubber) insulates their body from freezing temperatures.

Short Answer Questions

3. Why are animals in grasslands generally fast runners?

   Answer: Grasslands are open areas with very few trees. Animals like deer, cheetahs, and zebras depend on speed to escape predators and to catch prey. Being fast runners increases their chance of survival in such surroundings.

4. Why do plants in hilly regions usually have cone-shaped structures?

   Answer: Plants in hilly areas such as pine and fir are cone-shaped so that snow can easily slide off their leaves. This prevents the branches from breaking under the weight of snow. Their needle-like leaves also reduce water loss in the cold.

5. Why can't fish live outside water?

   Answer: Fish breathe through gills, which are specialized to take in oxygen dissolved in water. Outside water, gills cannot function properly, so fish are unable to breathe air directly and soon die.

Long Answer Questions

6. Explain with examples how animals show adaptation to their surroundings.

   Answer: Animals are found in different habitats such as deserts, polar regions, forests, and oceans. They survive by developing special features suited to their surroundings. For example, camels have long legs to walk on sand, store fat in their humps for energy, and can live without water for many days. Polar bears and penguins are adapted to icy regions with thick fur, fat layers, and small body parts to conserve heat. Monkeys in rainforests have long arms and tails to swing between trees, while lions in grasslands have strong legs and sharp claws to hunt prey. These adaptations ensure their survival in their unique surroundings.

7. Why is there so much diversity of plants and animals on Earth? Explain with examples.

   Answer: Earth has many different types of surroundings such as deserts, mountains, forests, rivers, seas, and polar regions. Each region has its own temperature, rainfall, soil, and living conditions. Plants and animals develop adaptations to live in these varied conditions, which leads to diversity. For example, cactus grows in deserts with very little water, lotus and water hyacinth float in ponds, pine and fir survive on snowy mountains, and mangroves grow in salty coastal areas. Similarly, camels live in deserts, fish in water bodies, lions in forests, and penguins in icy polar lands. This variety in surroundings creates an amazing diversity of life forms across the world.

Gap Analyzer™
Complete Chapter Test

EXERCISE

A. Choose the correct answer.

1. What is the reason for the great diversity in plants and animals?
   (a) Uniform climate ☐ (b) Varied habitats ☐
   (c) Limited resources ☐ (d) Lack of evolution ☐
2. Which of the following animals is best adapted to desert life?
   (a) Polar bear ☐ (b) Camel ☐
   (c) Frog ☐ (d) Penguin ☐
3. Mangrove trees are typically found in which type of environment?
   (a) Desert ☐ (b) Mountains ☐
   (c) Coastal wetlands ☐ (d) Grasslands ☐
4. Why do aquatic plants have thin and flexible stems?
   (a) To attract insects ☐ (b) To survive strong water currents
   (c) To store food ☐ (d) To grow faster
5. Which is an example of an adaptation in animals?
   (a) Trees shedding leaves ☐ (b) Camouflage in chameleons
   (c) Flowers blooming ☐ (d) Roots absorbing water

B. Fill in the blanks.

1. Animals like _____ use camouflage to protect themselves from predators.
2. Aquatic plants have _____ leaves to help them float.
3. Desert animals such as camels store water in their _____ to survive in harsh conditions.
4. The diversity in living organisms is largely influenced by their _____ surroundings.
5. Plants in hilly areas often have needle-shaped leaves to prevent _____ loss.

C. Write True or False.

1. Grassland animals have adaptations to hide from predators. _____
2. All plants and animals can survive in any environment. _____
3. Polar bears have thick fur and fat layers to stay warm in icy surroundings. _____
4. Cacti have deep roots to absorb water from the soil. _____
5. All aquatic animals have lungs for breathing. _____

D. Define the following terms.

1. Diversity
2. Adaptation
3. Habitat
4. Camouflage
5. Ecosystem

E. Match the columns.

	Column A		Column B
1.	Desert plants	(a)	Needle-like leaves
2.	Aquatic animals	(b)	Wetland habitats
3.	Mountain plants	(c)	Water storage in stems
4.	Mangrove trees	(d)	Gills for respiration
5.	Polar animals	(e)	Thick fur and fat

F. Assertion and Reason

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

(a) Both A and R are true and R is the correct explanation of A.

(b) Both A and R are true but R is NOT the correct explanation of A.

(c) A is true but R is false.

(d) A is false but R is true.

(e) Both A and R are false.

1. **Assertion (A):** Polar bears have thick fur and a layer of blubber.

   Reason (R): These features are adaptations that help them survive in cold Arctic environments.

2. **Assertion (A):** Cacti have broad leaves for photosynthesis.

   Reason (R): Cacti live in deserts and need to conserve water, so they have adapted with reduced leaves or spines.

3. **Assertion (A):** You can find the same variety of plants and animals in a desert and a rainforest.

   Reason (R): Different environments have unique conditions that support specific types of organisms.

G. Give reasons for the following statements.

1. Animals and plants develop unique adaptations based on their surroundings.
2. Camouflage is important for survival in some animals.
3. Aquatic plants have floating leaves and flexible stems.
4. Desert animals can survive with very little water.
5. Mountain plants grow close to the ground in harsh climates.

H. Answer in brief.

1. Why do animals in polar regions have thick fur and fat layers?
2. How do plants in deserts survive without much water?
3. What is the importance of diversity in plants and animals?
4. Describe how mangrove plants survive in waterlogged soil.
5. Why do grassland animals often have long legs or strong muscles?

I. Answer in detail.

1. Explain the importance of biodiversity and how it supports life on Earth.
2. Describe the adaptations found in desert plants and animals.
3. How do animals in aquatic environments survive and thrive?
4. Discuss the role of different habitats in creating plant and animal diversity.
5. Compare the characteristics of plants and animals in tropical rainforests and polar regions.

SKILL-BASED PRACTICE

Activity Time

STEM

"Build a Biome" Diorama

Materials Needed: Shoebox or small cardboard box, Construction paper, colored craft foam, clay, pipe cleaners, cotton balls, twigs, small pebbles, sand, felt, etc., Scissors, glue

Materials Required

Activity Steps:

1. **Choose a Biome:** Select a specific biome or surrounding (e.g., desert, rainforest, arctic tundra, ocean, grassland).
2. **Research Adaptations:** Research 2-3 specific plants and 2-3 specific animals that live in your chosen biome. Note down their unique adaptations to that environment.
3. **Design Diorama:** Plan how you will represent your biome inside the shoebox.
4. **Build Diorama:** Use the craft materials to create the landscape and represent the adapted plants and animals. Label them if possible.
5. **Present:** Share your diorama with others, explaining your chosen biome and the adaptations of the organisms you included.

Questions to Answer:

- What biome did you choose for your diorama?
- Name two plants and two animals from your diorama, and explain one adaptation for each that helps them survive in that biome.
- What was the most interesting adaptation you learned about while doing this activity?

Skills Covered: Research, Critical Thinking, Creative, Problem-Solving, Communication, Collaboration

Creativity

Art

"Animal Camouflage Design"

Task: Draw or paint an animal that is perfectly camouflaged in a specific environment. You will need two pieces of paper. On one, draw the animal in detail (e.g., a chameleon on a branch, a polar bear in snow). On the second, create a background that matches the animal's camouflage, then carefully cut out the animal from the first paper and place it onto the background. The goal is for the animal to almost "disappear" into its surroundings.

Materials to Use: Drawing paper, Colored pencils, markers, or paints, Scissors, Glue

Chameleon Camouflage

Questions to Answer:

- What animal did you choose, and what environment is it adapted to?
- How does the animal's coloring and pattern help it blend into its surroundings?
- How did you use your art materials to create the illusion of camouflage?

Skills Covered: Artistic Skills, Understanding Adaptation, Observation of Patterns, Creativity

Habitat Conditions Inquiry

Group Activity

Plant Growth in Varied Conditions

Activity Instructions: Work in a group of 3-4 students.

1. **Choose a Plant:** Select a common, fast-growing plant (e.g., bean sprouts, radish seeds).
2. **Set Up Different Conditions:**
   - **Pot A (Control):** Place seeds in soil with adequate water, normal room temperature, and moderate light.
   - **Pot B (Low Water):** Place seeds in soil with very little water.
   - **Pot C (Low Light):** Place seeds in soil with adequate water, but in a very dim or dark place.
   - **Pot D (Cold Temperature):** Place seeds in soil with adequate water, but in a cooler location (e.g., near a window in winter, or occasionally in a fridge for short periods if safe for plants).
3. **Observe and Record:** Over 7-10 days, observe the growth of plants in each pot. Record differences in height, leaf color, and overall health.
4. **Analyze:** Compare the growth in the different pots to the control.

Questions to Answer:

1. What type of plant did your group use?
2. Describe the differences in growth you observed between the control plant and the plants in the other conditions.
3. Which condition seemed to have the most negative impact on plant growth, and why do you think so?

Skills Covered: Research & Data Collection, Data Analysis, Critical Thinking, Teamwork

The Arctic Fox's Coat

Case Study

The Arctic fox lives in very cold, snowy regions. In winter, its fur is thick and white, allowing it to blend in with the snow. In summer, when the snow melts and the landscape becomes rocky and brown, the fox's fur changes to a brownish-grey color.

Arctic Fox's

Guiding Questions:

1. What is the purpose of the Arctic fox's white fur in winter?
2. Why does its fur change color in summer?
3. What do we call these features (thick fur, color change) that help an animal survive in its environment?
4. How does this adaptation help the Arctic fox find food or avoid danger?

Skills Covered: Observation, Understanding Animal Adaptations, Environmental Awareness

The Great Barrier Reef in Danger

Source Based Question

The Great Barrier Reef, located off the northeast coast of Australia, is the largest coral reef system in the world. Stretching over 2,300 kilometers, it is so large that it can even be seen from space! This natural wonder is home to thousands of species of marine life, including colorful corals, over 1,500 species of fish, sea turtles, mollusks, starfish, and even sharks.

The reef is a biodiversity hotspot because its warm, shallow, and clear waters provide the perfect habitat for so many organisms. Many reef fish have developed special adaptations, such as flat bodies to hide in narrow coral spaces, or bright colors to blend with corals and escape predators.

However, scientists reported in 2022 that the reef is under serious threat due to rising ocean temperatures and water pollution. When ocean waters become too warm, the corals lose their vibrant colors in a process called coral bleaching. This weakens them and affects all the marine life that depends on them. Global climate change and human activities are making the survival of this ecosystem more difficult. Protecting the reef has become an urgent task for the world.

The New York Times

U.N. Mission Joins Growing Calls to Label Great Barrier Reef 'In Danger'

The report's authors said current conservation efforts were not enough to address the "ongoing and increasingly serious challenge" presented by climate change.

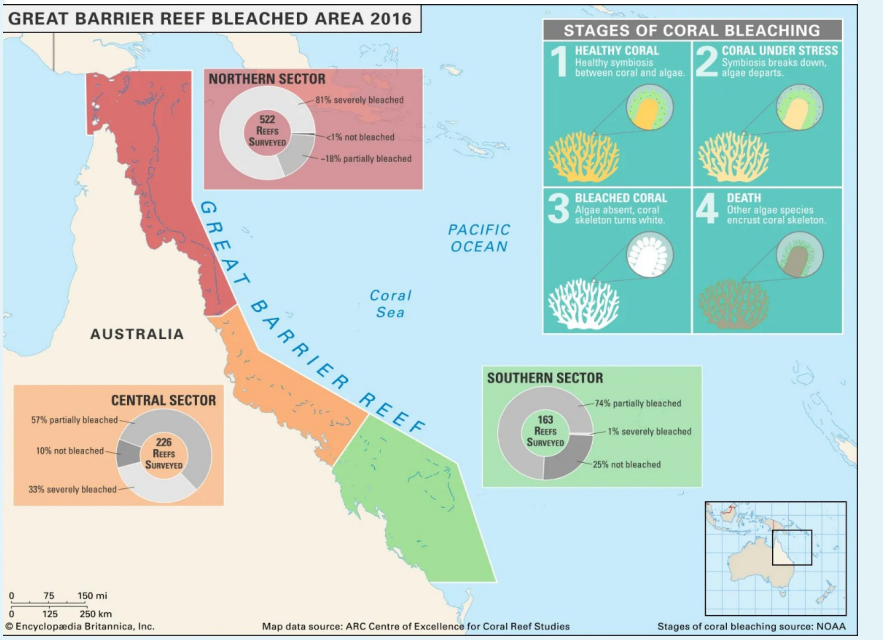


Image Credit: Encyclopedia Britannica

(Adapted from news and environmental reports, 2022)

Guiding Questions & Tasks

1. **Biodiversity Hotspot**
   a. Why is the Great Barrier Reef called a "biodiversity hotspot"?
   b. Give two examples of organisms found in the reef.
2. **Adaptations in the Reef**
   a. Describe one adaptation of reef fish that helps them survive.
   b. How does this adaptation protect them from predators?
3. **Threats to Diversity**
   a. What is coral bleaching?
   b. How does coral bleaching affect the survival of other marine animals in the reef?

Skills Covered: Remembering, Understanding, Analyzing, Research & Data Collection, Data Analysis