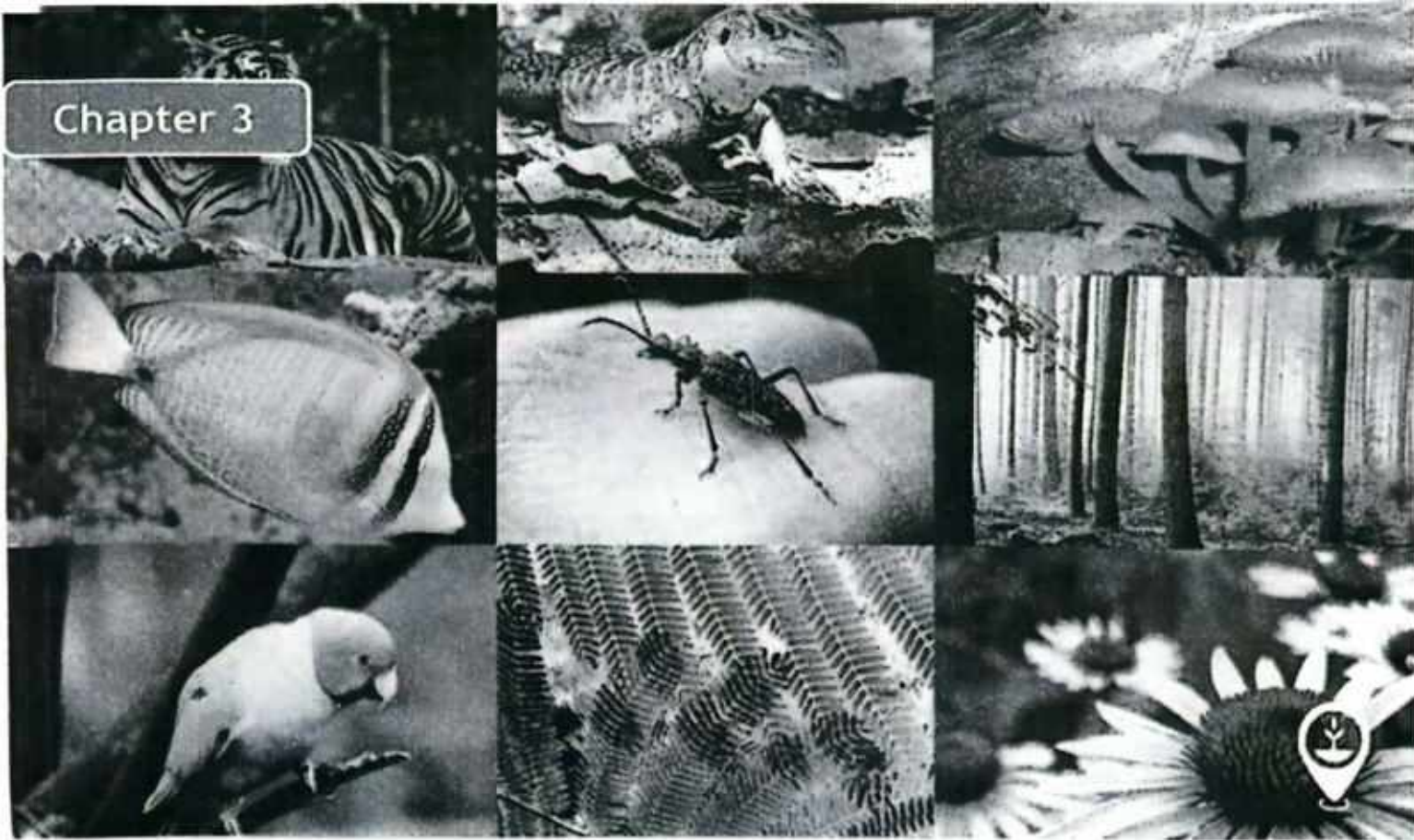


Chapter 3



BIODIVERSITY

SLOs: After completing this lesson, the student will be able to:

1. Define biodiversity.
2. Identify importance of biodiversity.
3. Discuss the impact of human beings on biodiversity.
4. Describe ways of conservation of biodiversity.
5. Discuss and describe the classification.
6. Compare the two kingdom system, three kingdom system and five kingdom system of classification.

3.1 DEFINITION AND INTRODUCTION TO BIODIVERSITY

The similarity among living organisms is that they share all the characteristics of life, i.e., movement, respiration, sensitivity, nutrition, excretion, reproduction and growth. At the same time these living things differ from one another and their variety is enormous.

Biodiversity

If you look around you will find variety of various kinds of organisms. The term biodiversity comes from 'biological diversity'. Biodiversity has ecological and economic importance. It provides us with nourishment, housing, fuel, clothing etc. Biodiversity is defined as "the variation in the species of plants, animals, and other organisms". The diversity of plants is called flora and the diversity of animals is called fauna.



Fig. 3.1: Biodiversity

STEAM ACTIVITY 3.1

Take a chart paper. Cut pictures of various plants and animals from old newspapers or magazines and paste on the chart paper. You have placed all the organisms together at one place. What is it? This is biodiversity.

3.2 IMPORTANCE OF BIODIVERSITY

The natural biodiversity provides us oxygen, clean water and air. They help carbon cycle and fix nutrients. They enable the plants to grow. Pests are controlled by organisms such as by insects, birds and fungi. They help protect against flooding and regulate climate. They help in pollination and crop production. Biodiversity provides our food stuff and medicines derived mainly from plants. The industrial materials such as building materials, fibres, dyes, resins, gums, adhesives, rubber and oil plants.

Do You Know?

Since it provides us with several economic and ethical benefits and adds aesthetic value, it is very important to conserve biodiversity.

3.3 IMPACT OF HUMAN BEINGS ON BIODIVERSITY

Humans are part of the natural environment. Population growth leads to the loss of natural habitat. Deforestation causes loss of plants and animals, oxygen production and carbon dioxide elimination. Ozone layer depletion, water pollution, global warming, desertification, increased erosion of land, is directly caused by human activities such as use of nuclear fuel, urbanization, transportation etc.

Let us see effect of human activities on biodiversity:

- Overpopulation:** The overpopulation of humans on earth has resulted in a huge loss of our biodiversity, it leads to increased resource consumption.
- Habitat destruction:** Excessive human interference leads to the destruction of the habitat in which animals live, which results in their extinction.
- Pollution:** The pollution caused by humans is drastically damaging our biodiversity and causing the species to die.
- Poor waste management:** It is the dumping of toxic chemicals dangerously on land.
- Global warming:** Increasing natural carbon dioxide and methane levels causing the sun to heat atmosphere more.
- Land:** Land is being damaged for construction of dams, buildings, airports etc., causing reduction of animals and plants.

Do You Know?

Human use land in various ways. Farms, towns and cities are located on land, Agricultural land quality is threatened by soil erosion, which can lead to desertification.



Habitat destruction: Deforestation



Water pollution



Air pollution



Land pollution



Global warming



Flood in Pakistan

Fig. 3.2: Effect of human activities on biodiversity

3.4 CONSERVATION OF BIODIVERSITY

Biodiversity conservation is the protection and management of biodiversity. Biodiversity refers to the variability of life on earth. It can be conserved in the following ways:

- a. In-situ Conservation
- b. Ex-situ Conservation

In-situ Conservation

In-situ conservation of biodiversity is the conservation of species within their natural habitat. In this method, the natural ecosystem is maintained and protected.

The in-situ conservation has several advantages. Following are the important advantages of in-situ conservation:

- a. It is a cost-effective and convenient method of conserving biodiversity.
- b. A large number of living organisms can be conserved simultaneously.
- c. Since the organisms are in a natural ecosystem, they can evolve better and can easily adjust to different environmental conditions.
- d. Certain protected areas where in-situ conservation takes place include national parks, wild life sanctuaries and biosphere reserves.

National Parks: These are small reserves maintained by the government. Its boundaries are well demarcated and human activities such as grazing, forestry, habitat and cultivation are prohibited. Pakistan has 36 national parks. The oldest national park is Lal Sunhanra in Bhawalpur district.

Wildlife Sanctuaries: These are the regions where only wild animals are found. Human activities are allowed here as long as they do not interfere with the conservation project.

Biosphere Reserves: Biosphere reserves are multi-purpose protected areas where the wildlife, traditional lifestyle of the inhabitants and domesticated plants and animals are protected.

Ex-situ Conservation

Ex-situ conservation of biodiversity involves the breeding and maintenance of endangered species in artificial ecosystems such as zoos, nurseries, botanical gardens, gene banks, etc.

Ex-situ conservation has the following advantages:

- a. The animals are provided with a longer time and breeding activity.
- b. The species bred in captivity can be reintroduced in the wild.
- c. Genetic techniques can be used for the preservation of endangered species.

Strategies for Biodiversity Conservation

Following are the important strategies for biodiversity conservation:

1. Poaching and hunting of wild animals should be prevented.
2. The reserves and protected areas should be developed carefully.
3. The levels of pollutants should be reduced in the environment.
4. Deforestation should be strictly prohibited.
5. Public awareness should be created regarding biodiversity conservation and its importance.

For Your Information?

Deosai National Park is a high-altitude alpine plain and National park in Gilgit-Baltistan. Deosai Plains are situated at an average elevation of 4,114 metres (13,497 ft) above sea level and considered as the second highest plateaus in the world.

3.5 CLASSIFICATION

Classification is the process of arranging things in groups or classes according to their resemblances and affinities and gives expression to the unity of attributes that may exist amongst a diversity of individuals.

STEAM ACTIVITY 3.2

Write the names of the organisms in their respective groups on the basis of having similar characteristics.

Rose, guava, fowl, pigeon, mango, sparrow, snake, crocodile, sunflower, lizard, cat, tiger, cow, tortoise, goat, dove. For example, rose, fowl, snake and goat have been placed in separate groups.

Group 1	Groups 2	Group 3	Group 4
Rose, ...	Fowl, ...	Snake, ...	Goat, ...

Why did you put rose and mango in one group whereas, fowl and pigeon in another group?

You placed the organisms of similar characteristics in groups. For example, you made a group of flowering plants with Rose, mango, guava and sunflower. You made another group of fowl, pigeon, dove, and sparrow. All of them have the similar characteristics in each group.

You have separated the organisms into groups on the basis of similarities and differences. Thus, you have classified the organisms.

To put organisms into separate groups on the basis of similarities and differences is called classification.

Biologists have designed ways of grouping organisms. The grouping of organisms is called **classification**. When we classify things, we put them into groups based on their characteristics.

Need of classification

Classification is needed to identify an organism correctly. It helps to know the origin and evolution of an organism. It helps to establish the relationship among different organisms. It provides the information about living things in different geographical regions. It helps in understanding how complex organisms must have evolved from simpler ones. Suppose you were asked to classify the living organism of your surroundings. What criteria would you use to classify the organism? **Taxonomy** is the branch of biology concerned with identification, naming and classification of organisms. The scientific study of diversity of organisms and their evolutionary relationship is called **systematics**.

Do You Know?

The Greek philosopher Aristotle was the first person who classified the living organisms. In 700s, Abu Usman Al Jahiz described 350 species of animals. In the end of 15th century many biologists worked classification method.

3.6 SYSTEMS OF CLASSIFICATION

According to earlier classification system, organisms were classified into two kingdoms, then three-kingdom and then five-kingdom system.

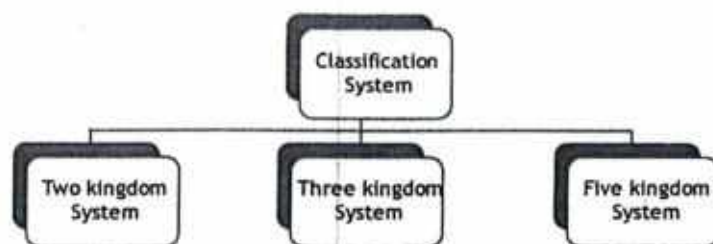


Fig. 3.3: Classification System

1. Two-kingdom classification system: It is the oldest system and classifies organisms into two kingdoms, the Plantae and Animalia. The **kingdom Plantae** includes the autotrophs. Bacteria, fungi and algae were also included in the kingdom. The organisms which depend on autotrophs or other heterotrophs are included in the **kingdom Animalia**.

Many unicellular organisms like *Euglena* have both plant like (presence of chlorophyll) and animal like (heterotrophic mode of nutrition in darkness and lack of cell wall) characteristics. So separate kingdom was introduced for such organisms.

2. Three-kingdom classification system: The German scientist Ernst Haeckel proposed a third kingdom Protista to accommodate *Euglena* like organisms and to separate unicellular microscopic organisms from multicellular ones.

3. Five-kingdom classification system: In 1937 E-Chatton suggested the terms 'Procariotique' to describe bacteria and 'Eucariotique' to describe plant and animal cells. In 1967 Robert Whittaker introduced five-kingdom classification system. The five kingdoms are: Monera, Protista, Fungi, Plantae and Animalia. In the five kingdom system bacteria and archaea were combined in a single kingdom Monera, because they shared the prokaryotic form of cell structure.

For Your Information

The organisms which lack nucleus in their cells are called **prokaryotes** while the organisms which have nucleus in their cells are called **eukaryotes**.

Prokaryote VS Eukaryote



Table 3. 1: Distinguish Characteristics of the Five Kingdom of Life

Kingdom	Cell Type	Nuclear Envelope	cell wall	Mode of Nutrition	Multi Cellularity
Monera	Prokaryotic	Absent	Non-cellulose	Autotrophs or heterotroph	Absent
Protista	Eukaryotic	Present	Present in some forms	Photosynthetic or heterotroph	Absent in most forms
Fungi	Eukaryotic	Present	Chitin	Absorptive heterotroph	Present in most forms
Plantae	Eukaryotic	Present	Cellulose and polysaccharides	Photosynthetic	Present in all forms
Animalia	Eukaryotic	Present	Absent	Ingestive heterotroph	Present in all forms

SUMMARY

1. The variation in the species of plants, animals, and other organisms is called biodiversity.
2. The natural biodiversity provides us oxygen, clean water and air.
3. Population growth leads to the destruction of natural habitat.
4. Deforestation causes loss of species plants and animals, oxygen production and carbon dioxide elimination.
5. Ozone layer depletion, water pollution, global warming, desertification, increased erosion of land, is directly caused by human activities such as use of nuclear fuel, urbanization, transportation etc.
6. Biodiversity conservation is the protection and management of biodiversity.
7. Biodiversity conservation can be conserved by In-situ conservation and ex-situ conservation.
8. In-situ conservation of biodiversity is the conservation of species within their natural habitat.
9. Ex-situ conservation of biodiversity involves the breeding and maintenance of endangered species in artificial ecosystems such as zoos, nurseries, botanical gardens, gene banks
10. National parks are small reserves maintained by the government. Its boundaries are well demarcated
11. Wildlife Sanctuaries are the regions where only wild animals are found.
12. Biosphere reserves are multi-purpose protected areas where the wildlife, traditional lifestyle of the inhabitants and domesticated plants and animals are protected.
13. Poaching and hunting of wild animals should be prevented.
14. The reserves and protected areas should be developed carefully.
15. The levels of pollutants should be reduced in the environment.
16. Deforestation should be strictly prohibited.
17. Public awareness should be created regarding biodiversity conservation and its importance.
18. Taxonomy is concerned with identification, naming and classification of organisms.
19. The scientific study of diversity of organisms and their evolutionary relationship is called systematics.
20. According to earlier classification systems organisms were classified into two kingdoms, three kingdoms and then five kingdom system.
21. Two-kingdom classification system classifies organisms into two kingdoms the Plantae and Animalia.
22. Three system classification system introduced the third kingdom Protista to separate unicellular microorganisms from multicellular ones.
23. Five-kingdom classification system includes the kingdoms Monera, Protista, fungi, Plantae and Animalia.

EXERCISE

Section I: Multiple Choice Questions

Select the correct answer:

1. Into which kingdom you place a multicellular land organism that performs photosynthesis:
A) monera B) protista C) plantae D) animalia
2. Which kingdom is mismatched with the characteristics?
A) fungi - usually saprotrophic B) animalia - rarely ingestive
C) protista - various modes of nutrition D) plantae - photosynthetic
3. The kingdom to which the Euglena belongs is:
A) animalia B) protista C) plantae D) fungi

4. The natural biodiversity help
 - A) Protect against flooding
 - B) Control pests
 - C) Regulate climate
 - D) All of these
5. _____ is an example of an ex-situ conservation.
 - A) sacred groves
 - B) wildlife sanctuary
 - C) seed bank
 - D) national park
6. Global warming can significantly be controlled by _____.
 - A) increasing solid waste
 - B) reducing water wastage
 - C) burning human-generated waste
 - D) reducing fossil fuel consumption
7. The most important cause of loss of biodiversity is:
 - A) habitat loss
 - B) over grazing
 - C) climate change
 - D) hunting
8. Major cause of extinction of different plants and animals is:
 - A) habitat loss
 - B) hunting
 - C) pollution
 - D) all of the above
9. The branch of biology that deals with the classification of organisms is called.....
 - A) systematics
 - B) taxonomy
 - C) taxa
 - D) ecology
10. Which kingdom includes prokaryotic organisms?
 - A) protista
 - B) animalia
 - C) monera
 - D) fungi

Section II: Short Response Questions

1. Why are the following scientists famous for?
 - a) Aristotle
 - b) Usman Al Jahiz
 - c) E-Chatton
 - d) Robert Whittaker
 - e) Ernst Haeckel
2. Define:
 - a) Biodiversity
 - b) Classification
 - c) Taxonomy
 - d) Systematics
 - e) Biodiversity conservation
3. Can you make the distinction between the following?
 - a) Bacteria and Protists
 - b) Fungi and Plants
 - c) Plants and Animals
 - d) In-situ conservation and Ex-situ conservation
4. Determine the advantages of ex-situ biodiversity conservation.
5. Give strategies for biodiversity conservation.
6. What is the need of classification?

Section III: Extensive Response Questions

1. Can you determine the importance of biodiversity?
2. What are the impacts of human activities on biodiversity?"
3. How biodiversity can be conserved?
4. Describe classification.
5. Compare the two-kingdom system, three kingdom system and five kingdom system of classification.