

Animal Diversity - I

Invertebrata

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Preface

A student who has just entered the portals of colleges finds it difficult to understand the subjects taught to him. This difficulty is mainly due to his poor standard of English. While preparing this Book the authors had in mind this particular difficulty of our students. This Book is written in a very simple and easy style. It is up-to-date and exhaustive in covering the syllabus.

We are immensely thankful to the authors for their kind co-operation in preparing the Book. We are immensely thankful to Saras Printers and Binders, Sivakasi for neatly printing the book. Suggestions for the improvement of the book are always welcome.

-Publisher

Why to Buy this Book

- *This Book is written solely for Examination going Students.*
- **Examination oriented.**
- **Easy to Answer the Questions.**
- **Very Simple.**
- *Point by point description.*
- *Points are arranged sequentially.*
- *Hence easy to remember.*
- **High matter content.**
- *Neat Diagrams.*
- **Helps in Practical Examination.**
- *Helps in writing Observation Note Book.*
- *Helps in preparing Competitive Exams.*
- *Important topics are given as Highlights.*

**Every Life Science Student
Must Buy and Keep One Copy
of this Book**

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1 Introduction to Invertebrates

Biology is an *important branch of science dealing with the study of life*.

Biology includes two branches, namely **Botany** and **Zoology**. Botany *deals with the study of plants* and **Zoology** deals with the *study of animals*.

Animals are **organisms** which *feed on other organisms, move* from one place to another, have breathing, *sense organs* and *nervous system*.

The word **animal** is derived from a Latin word *animale* meaning *breath*.

Animals are included in a large group called **Animal Kingdom**.

Whittaker (1969) classified living organisms into five kingdoms namely:

1. Monera - Prokaryotes
2. Protista - Unicellular eukaryotes
3. Fungi - Multicellular fungi
4. Plantae - Multicellular plants
5. Animalia - Multicellular animals

This is the **Five Kingdom concept**. According to this concept animals are included in two kingdoms namely

1. *Protista*
2. *Animalia*

Protista includes **Protozoa**, and **unicellular** eukaryotic algae.

Animalia includes all animals except Protozoa.

2 Five Kingdom Classification of life

Whittaker (1969) proposed a 5- kingdom concept for the classification of organisms. This classification is mainly based on **mode of**

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nutrition and **cellular organisation**. According to this concept, the organisms are classified into five kingdoms, namely-

1. *Monera*
2. *Protista*
3. *Fungi*
4. *Plantae*
5. *Animalia*

1. Monera

Kingdom Monera includes **prokaryotes** which lack ingestive mode of nutrition. Eg. *Bacteria*, *Cyanobacteria*, etc.

2. Protista

The kingdom Protista includes unicellular microbes such as, Protozoa, unicellular algae and unicellular fungi. They exhibit three types of nutrition, namely **autotrophic**, **holozoic** and **heterotrophic**.

3. Fungi

Kingdom Fungi includes eukaryotic fungi. They show absorptive nutrition and filamentous structure.

4. Plantae

Kingdom Plantae includes eukaryotic, multicellular plants. They show photosynthetic mode of nutrition.

5. Animalia

Kingdom Animalia includes eukaryotic, multicellular animals. They show ingestive mode of nutrition.

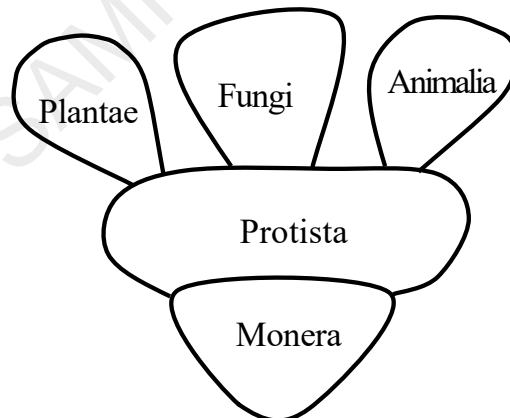


Fig.2.1: Five kingdom system of microbial classification.

The evolutionary relationships among the organisms within a kingdom are analysed with RNA sequence matching. Organisms having more RNA sequence similarity are brought close to each other.

3 Introduction to Protista

Protista is a **kingdom** proposed by *Whittaker* in 1969.

It includes **eukaryotic unicellular microorganisms** and some **multicellular** organisms.

It includes Protozoa, slime moulds, chrysophytes etc.

All the organisms included in Protista are called **protists**.

They exhibit three types of nutrition such as **autotrophic**, **heterotrophic** and **saprophytic**.

Protista is the **second kingdom**, the first being the **Monera**.

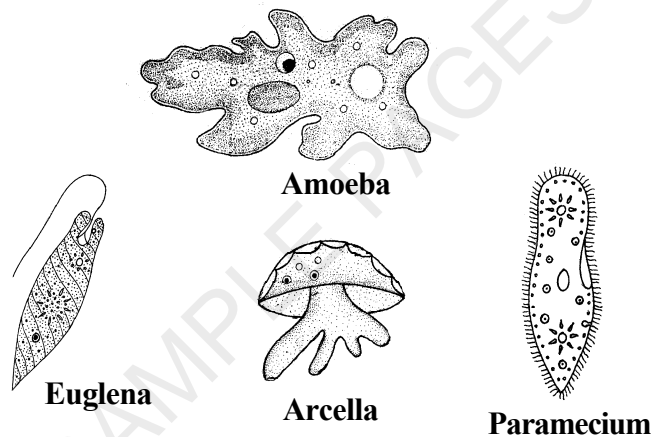


Fig.3.1: Protists.

The protists are **eukaryotic**. The eukaryotes contain a **nucleus** with **nuclear membrane**.

Salient Features of Protista

1. Eukaryotic
2. Aquatic
3. Unicellular rarely multicellular.
4. Autotrophic or heterotrophic.
5. Free living or symbiotic or parasitic.
6. Locomotion through pseudopodia or cilia or flagella.
7. Asexual reproduction. sexual reproduction rare.

Classification of Protista

Kingdom Protista is classified into the following groups:

1. Protozoa. Eg. *Amoeba*, *Plasmodium*, etc.
2. Slime moulds
3. Chrysophytes. Eg. Diatoms, Golden algae etc.



4 Animal Kingdom

All the animals of the Biosphere are included in a large group called **Animal Kingdom** or **Animalia**. The animal kingdom is subdivided into two sub-kingdoms, namely **Protista** and **Metazoa**.

Sub-kingdom 1. Protista

This sub-kingdom includes microscopic, unicellular animals. It contains a single phylum called **Protozoa**. Eg. *Euglena*, *Amoeba*, *Paramecium*, etc.

Sub-kingdom 2. Metazoa

This sub-kingdom includes multicellular animals. Eg. *Porifera* to *Chordata*.

The sub-kingdom Metazoa is divided into three branches, namely **Mesozoa**, **Parazoa** and **Eumetazoa**.

Branch 1. Mesozoa

It is intermediate between **Protozoa** and **Metazoa**. It includes endoparasitic animals. They are worm-like. The cells are differentiated into somatic cells and reproductive cells. Eg. *Dicyema*, *Rhopalura*, etc.

Branch 2. Parazoa

It includes sponges. They are multicellular with poorly defined tissues and without organs. Phylum **Porifera** is included in parazoa.

Branch 3. Eumetazoa

It includes true multicellular organisms. They have organ and organ system grade of organization. Eg. *Coelenterata* to *Chordata*.

Eumetazoa is further divided into two grades, namely **Radiata** and **Bilateria**.

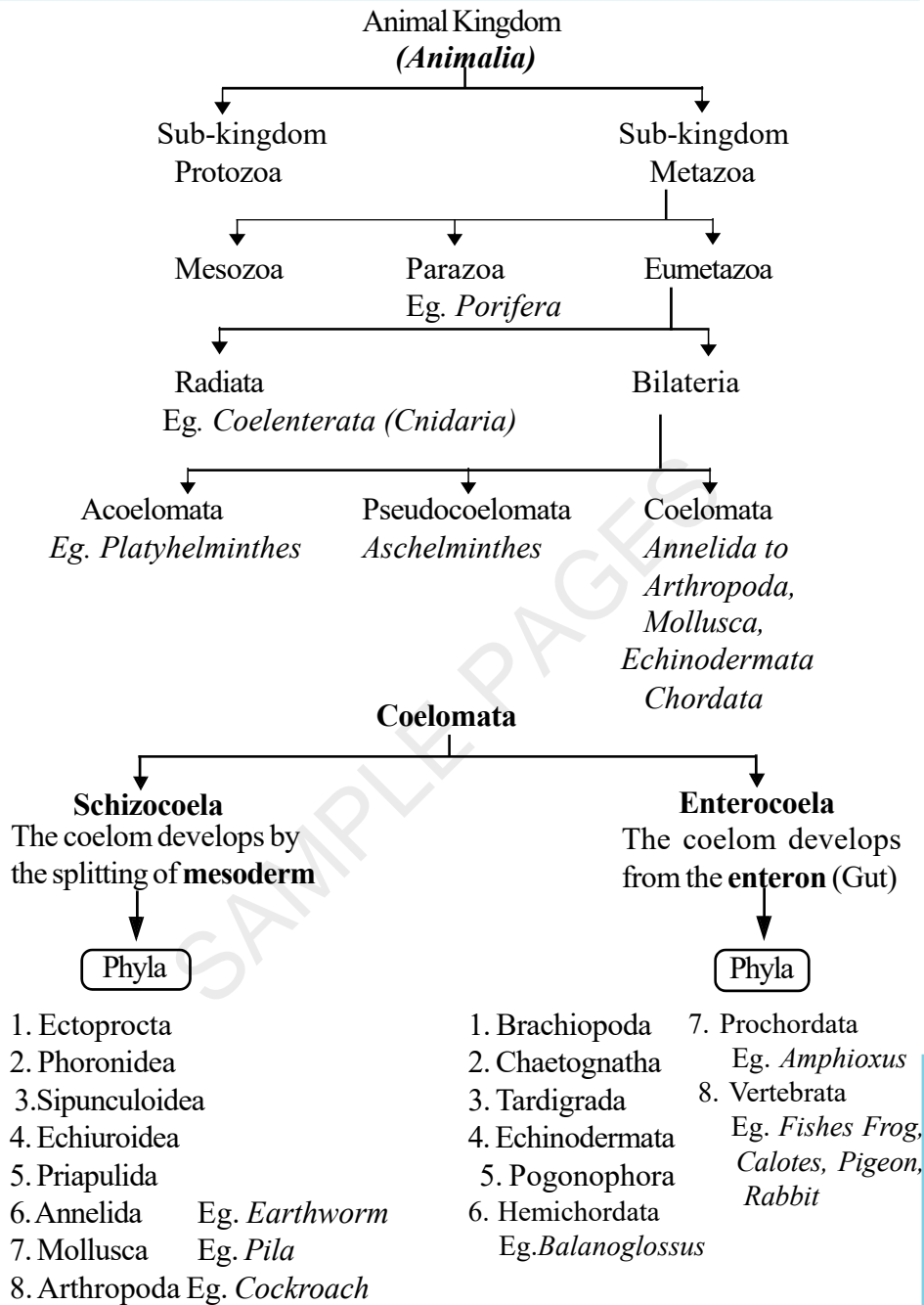


Fig.4.1: Outline classification of animals.

Grade I. Radiata

It includes radially symmetrical animals. Eg. *Coelenterata*.

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Grade II. Bilateria

It includes bilaterally symmetrical animals. Eg. *Platyhelminthes* to *Chordata*.

The grade Bilateria is further divided into three divisions, namely *acoelomata*, *pseudocoelomata* and *coelomata*.

1. Acoelomata

In this group of animals, a coelom (cavity lying between the gut and the body wall) is absent. Eg. *Platyhelminthes*.

2. Pseudocoelomata

In this group of animals, a false coelom (cavity not lined with coelomic epithelium) is present. Eg. *Aschelminthes*.

3. Coelomata

In this group, a true coelom is present. Eg. *Annelida* to *Chordata*.
Coelomata is divided into two groups, namely:

1. *Schizocoela*
2. *Enterocoela*

1. Schizocoela

The coelom develops by splitting of mesoderm. Eg. *Annelida*, *Mollusca*, *Arthropoda*.

2. Enterocoela

The coelom develops from gut. Eg. *Echinodermata*, *Hemichordata*, *Vertebrata*.

The Bilateria is further divided into two groups, namely *Proterostomia* and *Deuterostomia*.

1. Proterostomia

In this group of animals, the blastopore develops into the mouth. Eg. *Platyhelminthes* to *Mollusca*.

2. Deuterostomia

In this group of animals, the blastopore develops into the anus. Eg. *Echinodermata* and *Chordata*.



5 Systems of Classification

Biological Classification is arranging organisms into taxa (groups) based on the information such as structure, development, biochemistry, physiology and phylogeny.

*Aristotle (384 -322 BC) is the **Father of biological classification.***

The following theories are proposed on biological classification.

1. *Phylogenetic Classification*
2. *Phenetic Taxonomy*
3. *Cladistic Taxonomy*
4. *Numerical Taxonomy*
5. *Cytotaxonomy*
6. *Chemotaxonomy*
7. *Molecular Taxonomy*

1. Phylogenetic Classification

Grouping of organisms based on their phylogeny is called phylogenetic classification.

Phylogeny is the **evolutionary history** of a group.

All members of a group share a **common ancestor**.

It is a **natural classification**.

Phylogenetic classification is of 3 types namely:

1. *Monophyletic classification*
2. *Polyphyletic classification*
3. *Paraphyletic Classification.*

In **monophyletic** classification, all the members of a group has a single ancestor.

In **polyphyletic** classification, the members of group are derived from **two** or **more** ancestors.

The **paraphyletic** classification does not include all the descendants of the most recent common ancestor.

The history of the evolutionary history of a group of organisms can be diagrammatically represented as a **phylogenetic tree**.

2. Phenetic Taxonomy

*Phenetic taxonomy is a system of classification based on the **overall similarity** of organisms.*

Morphology and other observable traits are considered for classification.

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3. Cladistic Taxonomy

In cladistic taxonomy, organisms are grouped based on the most recent ancestor.

4. Numerical Taxonomy

Numerical taxonomy refers to the application of mathematical procedures to numerical evaluation of all the characters of the organisms for their classification.

It is also called *taximetrics*.

Mathematical and computerised methods are followed.

Similarities or affinities are numerically evolved for all the units for classification.

The numerical evolution of the similarity between groups of organisms is made and the organisms are then grouped based on their similarities.

5. Cytotaxonomy

Cytotaxonomy is the classification of organisms based on the comparative study of *chromosomes* during meiosis.

6. Chemotaxonomy

Chemotaxonomy is the method of biological classification based on the chemicals such as proteins, amino acids, nucleic acids, peptides etc.

7. Molecular Taxonomy

Molecular Taxonomy is the classification of organisms based on the informations such as amino acid sequence of proteins, nucleotide sequence of DNA, number of amino acids in proteins, number of nucleotides on DNA and other data derived from molecular techniques.

Methods of Classification

Plants and animals are classified in three ways

1. *Artificial Classification*
2. *Natural Classification*
3. *Phylogenetic Classification*

1. Artificial Classification

In artificial classification plants and animals are classified based on one or a few observable characters.

1. Organisms are grouped based on *habit* or *habitat*.