VulaLearn

# *Life Sciences, Grade 11, Biodiversity of Animals*

## Definitions

- **Symmetry**: The arrangement of parts around a central axis or plane.
- **Asymmetrical**: Having no symmetry.
- **Cephalisation**: The concentration of sensory organs and a brain at the anterior (head) end of an organism.
- **Diploblastic**: Having two primary germ layers (ectoderm and endoderm).
- **Triploblastic**: Having three primary germ layers (ectoderm, mesoderm, and endoderm).
- **Coelom**: A fluid-filled body cavity completely lined by mesoderm.
- **Acoelomate**: An organism without a body cavity.
- **Pseudocoelomate**: An organism with a body cavity not fully lined by mesoderm.
- **Coelomate**: An organism with a true coelom.
- **Protostome**: An animal in which the blastopore (first opening in embryo) develops into the mouth.
- **Deuterostome**: An animal in which the blastopore develops into the anus.
- **Through gut**: A digestive system with two openings, a mouth and an anus, allowing for continuous digestion and excretion.
- **Grazer niche**: A role in an ecosystem for organisms that feed on plants.
- **Biological parasitic wasp**: A type of wasp used in biological control to lay eggs in pests, controlling their population.
- **Pollination**: The transfer of pollen, essential for plant reproduction.

# Concepts:

General Animal Classification

- **Invertebrates**: Porifera, Cnidaria, Platyhelminthes, Annelida, Arthropoda
- **Vertebrates**: Chordata
- **Five Kingdom System**:
    1. Monera
    2. Protista
    3. Fungi
    4. Plantae
    5. Animalia
- **Human Classification**:
    - Kingdom: Animalia
    - Phylum: Chordata
    - Class: Mammalia
    - Order: Primates
    - Family: Hominidae
    - Genus: *Homo*
    - Species: *sapiens*

**Key Characteristics for Animal Classification**

- **Symmetry**:
    - Possibility of dividing an animal in one or more directions and getting two identical halves
    - **Radial Symmetry**: Body parts arranged around a central axis (e.g., Cnidaria). – more than one plane of symmetry

- **Bilateral Symmetry**: Body can be divided into two equal halves along a single plane (e.g., Platyhelminthes, Annelida, Arthropoda, Chordata).
- **Asymmetry**: No symmetry, permanently attached to a substrate  sessile (e.g., Porifera).

- **Cephalisation**:
  - Presence of a definite head containing sensory organs that face the direction the animal moves in (ability to respond to changes in environment)
  - The more complex an animal's body is, the greater need for nervous tissue to receive and interpret sensory information
  - Absent in Porifera, Cnidaria.
  - Present in others like Platyhelminthes, Annelida, Arthropoda, Chordata.
- **Tissue Layers (Germ Layers)**:
  - In early development of embryo, circular layers of cells develop
  - **Diploblastic**: 2 germ layers (Ectoderm and Endoderm). Only Cnidaria and Porifera.
  - **Triploblastic**: 3 germ layers (Ectoderm, Mesoderm, Endoderm). All other phylums.
    - Advantage: can develop organs  can grow larger and move to ore varied habitats
- **Coelom**:
  - Body cavity between endo- and mesoderm in all triploblastic organisms
  - Between body wall and internal organs – keeps them seperate
  - **Acoelomate**: No body cavity (e.g., Platyhelminthes).
  - **Pseudocoelomate**: False coelom (between endo and mesoderm), not fully lined by mesoderm (e.g., Nematoda).

- **Coelomate**: True coelom, fully lined by mesoderm (e.g., Annelida, Mollusca, Arthropoda, Chordata).

Functions of fluid in Coelom:

- May be hydrostatic skeleton
- Fluid used to circulate substances such as gases, nutrients, and wastes
- Space may be used to store excess fluids and waste
- Sperm and eggs can mature here

Advantages of a coelomate plan:

- Allows animals to become larger – more space for organs to develop
- Body wall and organs behave independently of each other (organs don't move with body walls)
- Provides hydrostatic skeleton in soe phyla (helps animals move and burrow in liquid)
- Fluid helps transport food, oxygen and wastes

- **Presence or Absence of a Through Gut**:
  - **Through gut:** Two openings, one for ingestions, the other for egestion
  - **Absent**: Cnidaria, Porifera, Platyhelminthes (have a blind gut – one opening for ingestion and egestion).
  - **Present (first seen in Annelids)**: Arthropoda, Annelida, Chordata.
  - **Advantages of a through gut**: Allows digestion and excretion of more complex molecules, animals can grow larger and move to more varied environments.

  - Surface area to volume ratio
    - The ratio of Total Surface Area : Volume is very important for land mammals
      - They need to exchange gases between the air and their blood and between blood and tissues

        - A high TSA:V ratio is most effective gaseous exchange surface for diffusion
    - Gaseous exchange takes place by diffusion and needs surface with:
        - Large SA:V ratio
        - Transport system close by
        - Thin for gases to diffuse across

**Phylum Porifera: The Sponges**

- **Characteristics**:
    - Cannot move (no muscles), sessile.
    - Filter feeders: capture suspended food particles by circulating water through their body cavity.
    - Asymmetrical.
    - Diploblastic.
    - No coelom or gut.
    - No cephalisation.

**Phylum Cnidaria: Jellyfish, Bluebottles, Corals & Sea Anemones**

- **Characteristics**:
    - Have stinging cells (nematocysts) for defense and capturing prey.
    - Radial symmetry.
    - Diploblastic.
    - No cephalisation.
    - No through gut.

**Phylum Platyhelminthes: Flatworms**

- **Characteristics**:
    - Often parasitic
    - Bilateral symmetry.
    - Triploblastic.
    - Cephalisation: definite head with eyes.
    - Blind ending gut.

**Phylum Annelida: Segmented Worms**

- **Characteristics**:
    - E.g. Earth worms
    - Have segmented body parts (helpful for burrowing)
    - Coelomate with coelomic fluid acting as hydroskeleton (pseudocoel)
    - Bilateral symmetry.
    - Triploblastic.
    - Cephalisation.
    - Through gut (take in soil, extract food and pass soil out anus – NB for soil systems – aerate soil and return calcium to soil through calciferous glands).

**Phylum Arthropoda: Insects, Spiders, Crabs**

- **Characteristics**:
    - Have many jointed legs, a segmented body, exoskeleton made of chitin, waterproof cuticle, coelom
    - Bilateral symmetry.
    - Triploblastic.
    - Cephalisation.

- Through gut.

**Invertebrates in Agriculture**

- Invertebrates play major roles in ecosystems and agriculture.

1. **The Grazer Niche**: Dominant grazers that control plant growth (e.g., locusts, harvester termites).
2. **Decomposition and Recycling**:
    - Fly larvae eat carcasses.
    - Earthworms recycle faeces, acting as fertilizer.
    - Fungi recycle dead organic matter.
3. **Soil Fertilisation**: Dung beetles move dung underground, fertilizing the soil.
4. **Soil Aeration**: Termites, ants, and earthworms dig tunnels, allowing air to enter the soil, making it more fertile for crops.
5. **Pest Control**:
    - Farmers use biological control methods (e.g., parasitic wasps lay eggs in cabbage moth pests to destroy crops).
    - Predatory arthropods (e.g., spiders, ladybugs) feed on other arthropods, controlling prey population size.
6. **Plant Pollination**:
    - Allow plants to reproduce; some plants depend on a single species for pollination.
    - Examples: bees, butterflies, flying beetles.
7. **Marketable Products**:
    - Mopane worms: edible larvae harvested for food.
    - Honey: produced by bees; beekeepers farm bees.