

UNIT

7

Living World of Animals - Diversity in Living Organism - Kingdom Animalia

Learning Objectives



At the end of this Unit the students will be able to understand,

- the classification of various types of animals
- makes it easier to observe, identify and study the different groups of animals on the basis of certain characteristics they have in common
- list out the general characteristics of animals based on grades of organization, types of symmetry, coelom and various body activity
- recognize that binomial classification has Latin and Greek words given to each animal and plant, the first name is genus and second as species
- recall the salient features of each phylum

Introduction

The enormous variety of living organisms surrounding us is incomprehensible. About 1.5 million species of animals are already described and named. Without suitable method of classification, the study of various organisms would be difficult.

For example, among the butterflies, it is difficult to identify their varieties. Because there are different colour of butterflies (blue, red, brown, yellow) and butterflies with spots (big and small).

Tigers and zebras have stripes. On the other hand tigers look more like cats and zebras are more like horses. Can we classify them based upon their

appearances? What factors are significant for their classification?

Long ago, when human civilization was confined to small place, the number and variety of animals and plants that they were aware was limited. However, when the European explorers went around the world during the 15th and 16th centuries, they could collect information on plants and animals from across the world. The immense diversity in shape, size and features baffled them.

The first systematic approach to the classification of living organisms was made by a Swedish botanist, Carolus Linnaeus. He generated the standard system for naming organisms in terms of genus, species and more extensive groupings using Latin terms.

For example, the tiger is a carnivore and the zebra is an herbivore, both are striped animals, but the tiger resemble a cat more than zebra. However all the three produce milk and feed their young ones.

Taxonomists realized that wide features are shared for the ranking of higher group in classification. Therefore characters that strike the eye, like the tiger's stripes, are often less significant than subtler ones, such as how many toes the animal possesses.

Different types of animals produce milk to feed their young ones. Therefore all of them could be grouped into one major category, known as mammals. Higher ranks are more comprehensive.

Human beings have a wonderful capacity to discriminate different animals. While walking through a field we may come across a jumping frog. Is it a frog or a toad? We may see a snake. Is it poisonous or not? We may hear a bird call but we are not familiar with it. Sometimes a fish may be seen in a temple tank. What kind is it?

In order to find an answer to such questions, we should know how to identify animals. For a biologist it is necessary to identify the organism, which have a name for identification and to know the group it belongs to.

Taxonomy

It is the theoretical study of classification including its basic principles, procedures and rules.

Classification

It is the ordering of organism into groups on the basis of their similarities, dissimilarities and relationship.

You are in a village, which is part of a taluk. Your taluk is part of district, which falls under a state- Tamilnadu. Tamilnadu is a state in India which is a country in South East Asia. Similarly, the Tiger is classified as **Kingdom:** Animalia; **Phylum:** Chordata; **Sub phylum:** Vertebrata; **Class:** Mammalia; **Subclass:** Eutheria; **Order:** Carnivora; **Family:** Felidae; **Subfamily:** Pantherinae; **Genus:** *Panthera*; **Species:** *tigris*. Find out the classification of cat and humans?

7.1

Classification of Living Organisms

Imagine a bacteria, neem tree and toad. All of them are living things and their basic unit is a cell. However, one major difference is that the cells in neem tree and toad have nucleus, whereas the bacterium has no nucleus. Thus all life can be divided into two major categories Prokaryotes and Eukaryotes. Among the eukaryotes like pond algae, fern and a rabbit, the pond algae is a single celled organism, whereas rest are multicellular organisms. On the basis of significant characteristic features like the presence or absence of cell wall and the photosynthetic activity, the organisms (living beings) are divided into major groups as shown in Figure 1 and 2.

7.2

Criteria for Classification of Animal Kingdom

Look at this list of animals: sponge, rotifer, jelly fish, flatworm, roundworm, snail, earthworm, grasshopper, star fish and peacock.

Among the above listed animals, sponge does not have any true tissues. We can divide the animalia into two major

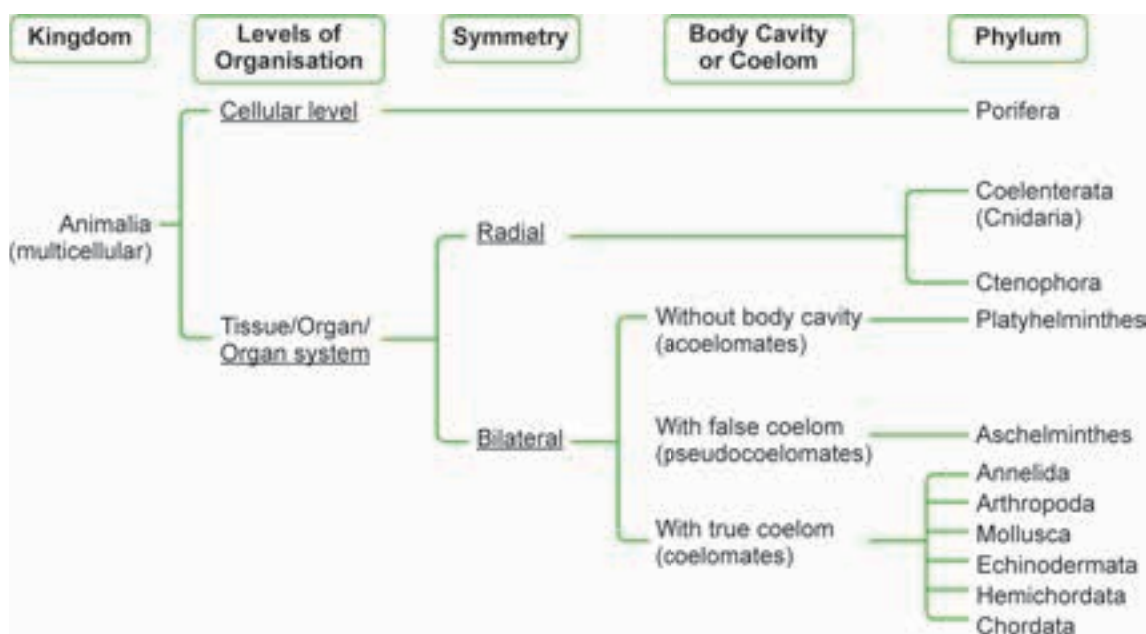


Figure 1 Classification of kingdom Animalia based on common features

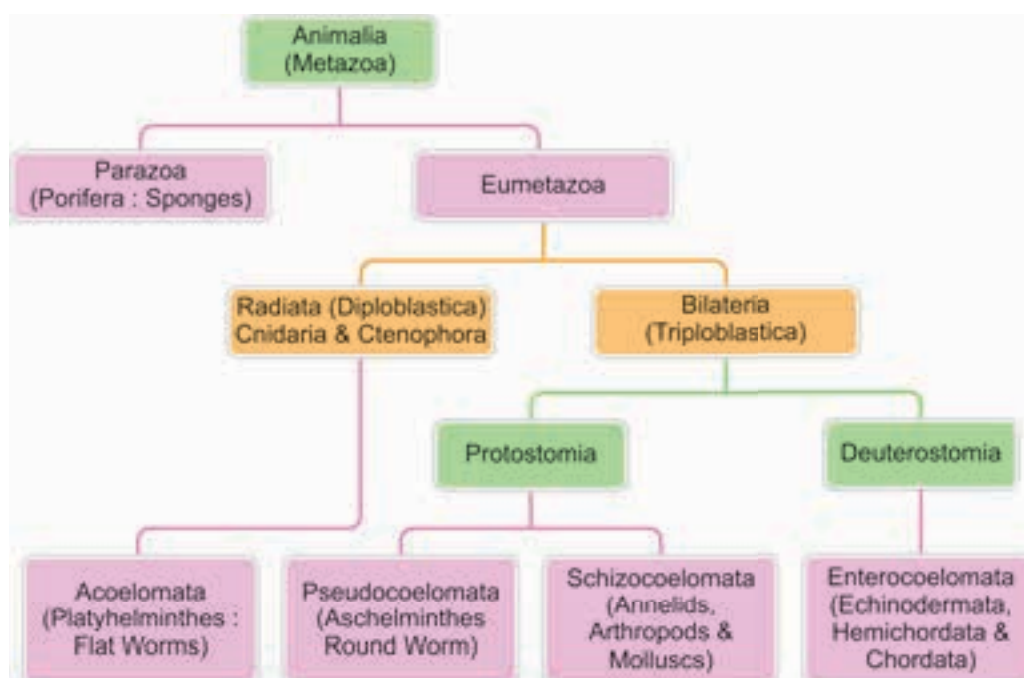


Figure 2 Classification of kingdom Animalia

divisions - those with true tissues and those without true tissues. The group of animals that lack true tissues are called as Porifera.

It is seen that the jelly fish and star fish have radial symmetry, while if we look at flatworm, roundworm, rotifer, snail, earthworm, grasshopper and peacock have bilateral symmetry.

- 1. Grade of organization** – Animals are grouped as unicellular or multicellular based on the number of cells.
- 2. Symmetry** – It is a plane of arrangement of body parts. Radial symmetry and bilateral symmetry are the two types of symmetry (Figure 3).

Radial Vs Bilateral symmetry

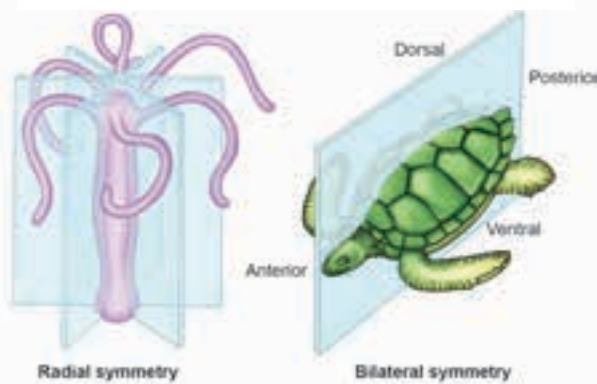


Figure 3 Radial and Bilateral Symmetry

In radial symmetry the body parts are arranged around the central axis, if we cut through the central axis in any direction, it can be divided into similar halves. E.g. Hydra, jelly fish and star fish. In bilateral symmetry, the body parts are arranged along a central axis, if we cut through the central axis, we get two identical halves E.g. Frog.

3. **Germ layers** – Germ layers are formed during the development of an embryo.

These layers give rise to different organs, as the embryo becomes an adult. If an organism has two germ layers, the ectoderm and the endoderm it is said to be diploblastic. If they have three germ layers, the ectoderm, the mesoderm and the endoderm they are triploblastic animals.

4. **Coelom** – Coelom refers to a fluid-filled cavity inside the body. It separates the digestive tract and other organs from the body wall. A true body cavity or coelom is one that is located within the mesoderm. Based on the nature of the coelom, animals are divided into 3 groups (Figure 4). Organisms like the earthworm are called coelomates or eucoelomates because they have true coelom. Tapeworm is an example of an acoelomate because it does not have a body cavity. Animals like the roundworm have a body cavity but it is located between the endoderm and the mesoderm.

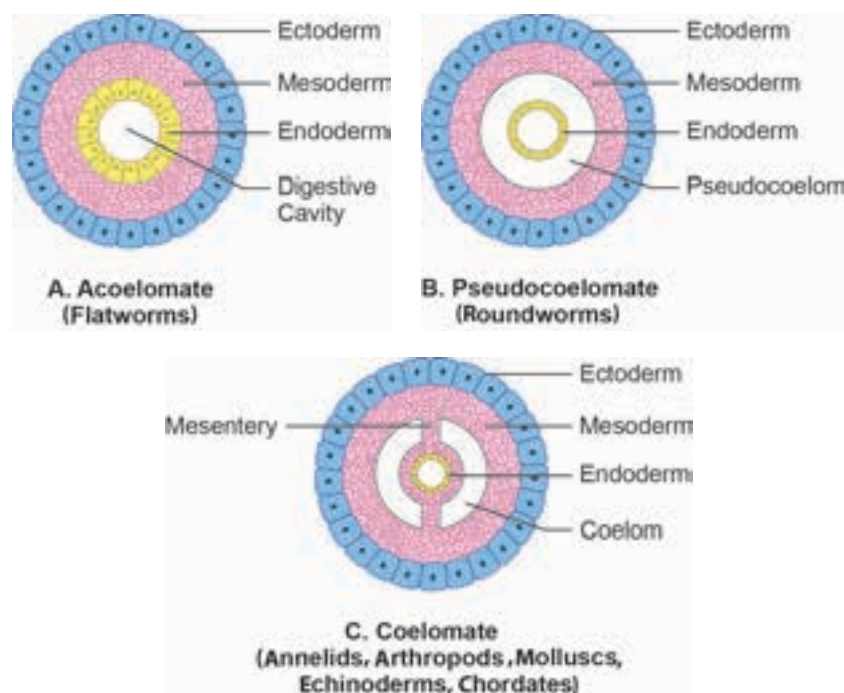


Figure 4 Types of Coelom

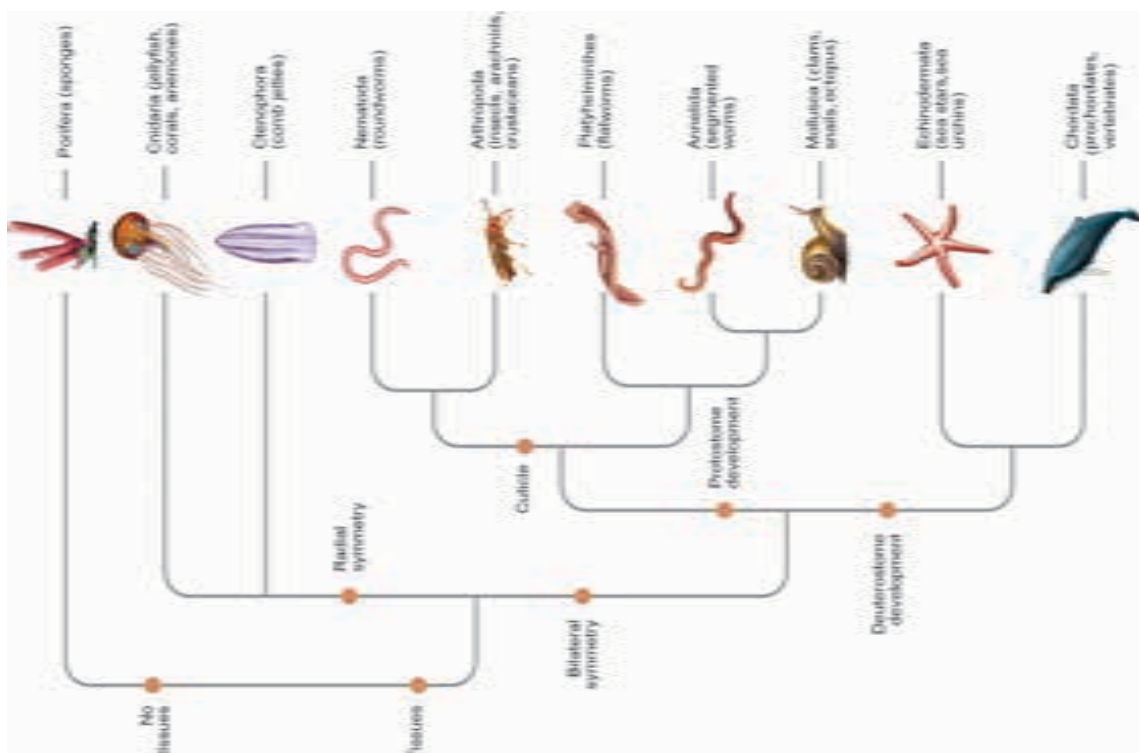


Figure 5 Classification of kingdom Animalia using different criteria

This is considered to be a false coelom and these organisms are called pseudocoelomates.

Characters like presence or absence of body cavity (coelom), segmentation, exoskeleton, jointed legs (appendages), notochord are used to classify the animalia into ten major Phyla (Figure 5).



More to Know

- **Deuterostome & Protostome :** In the development of embryo, deuterostomes, the first opening (the blastopore) becomes the anus, while in protostomes, it becomes the mouth.

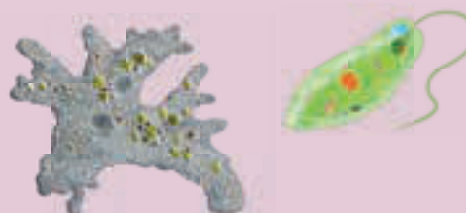
Kingdom Animalia is divided into two groups, based on the presence or absence of notochord **Invertebrata** and **Chordata** (Prochordata and Vertebrata). The groups invertebrata is classified as follows

7.3 Phylum - Protozoa

(*Proto-first; zoa-animals*) This phylum includes a great diversity of small, microscopic organisms. These are **single celled eukaryotes**. Their locomotion occur through **pseudopodia** (false feet), **cilia** or **flagella**. The nutrition is either **autotrophic** or **heterotrophic**. Respiration and excretion is carried out through general body surface or through **contractile vacuole**. They reproduce either asexually or sexually.

Activity 1

Both are protozoans. Identify their names and locomotor organ





More to Know

Parasitic Protozoans

- Amoebic dysentery is caused by protozoa called *Entamoeba histolytica* which spreads through contaminated food and water.
- Malaria is caused by *Plasmodium* sp. which spreads through female *Anopheles* mosquitoes.

7.4

Phylum - Porifera (Pore bearers)

These are multicellular, aquatic organisms. They are commonly called **sponges**. They have a **cellular grade** of organization without the occurrence of tissues. The body has many pores called **ostia** and **osculum** for circulation of water. The body wall contains **spicules** which form the skeletal framework. They can reproduce both by asexual and sexual methods.



7.5

Phylum - Coelenterata or Cnidaria

All coelenterates are aquatic animals, they are mostly marine in habitat. The body symmetry

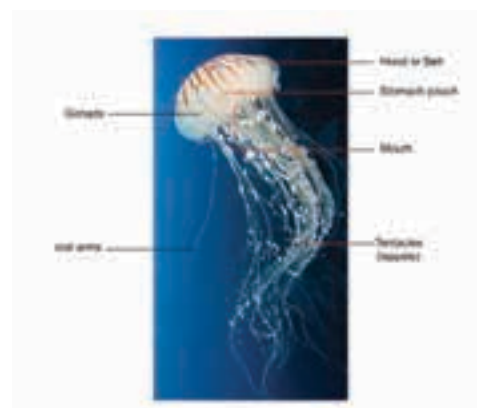
is radial. The body wall is of two layers of cells namely the outer **ectoderm** and the inner **endoderm**, which is separated from each other by a non-cellular jelly-like substance called **mesoglea**. Due to the presence of two layers in the body wall, they are said to be **diploblastic animals**. Many coelenterates exhibit **polymorphism**. In this phylum, organisms may exist in two different body forms namely, a **polyp** and a **medusa**. The tentacles bear stinging cells called **nematocysts** (**cnidoblasts**). Due to the presence of cnidocil, they are also called as **Cnidaria**. They reproduce both asexually and sexually.



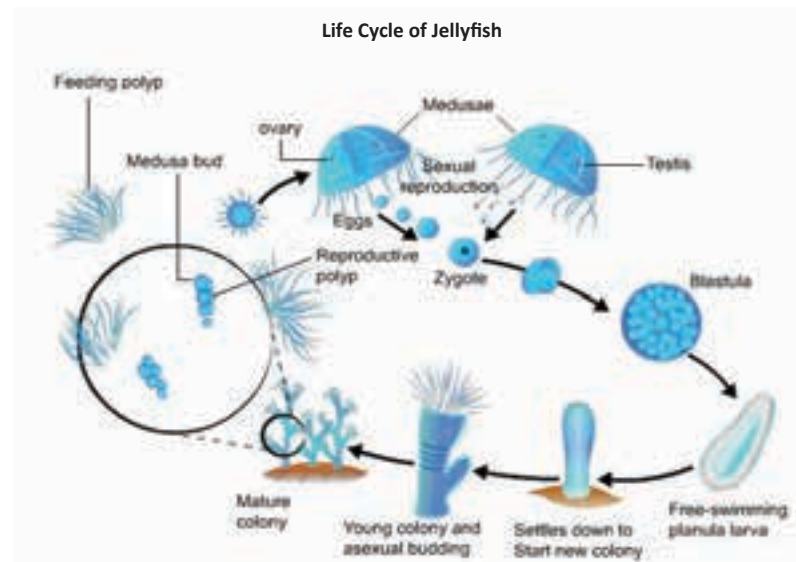
Hydra- a polyp

Info bits

If a moon jelly fish loses its limb, it rearranges the remaining limbs until they are symmetrically placed around its body so it can swim more efficiently.



Jelly fish- a medusa



7.6 Phylum: Platyhelminthes - (Flat worms)

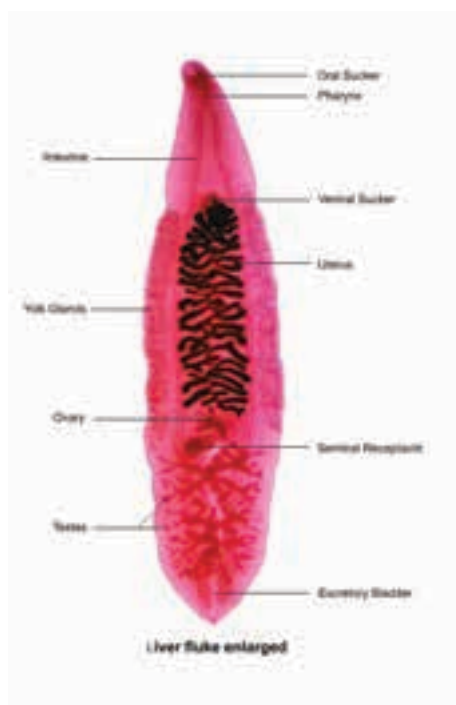
This phylum includes flatworms. The alimentary canal is either absent or very simple. Excretion and osmoregulation occur through **flame cells**. These worms are **hermaphrodites** having both male and female reproductive organs in a single individual. Most of the members are **parasitic** in nature.



Tape worm infection in Human intestine



Taenia solium (Tape worm) and Scolex (sucker) enlarged



7.7 Phylum - Nematoda Aschelminthes (Round worms)

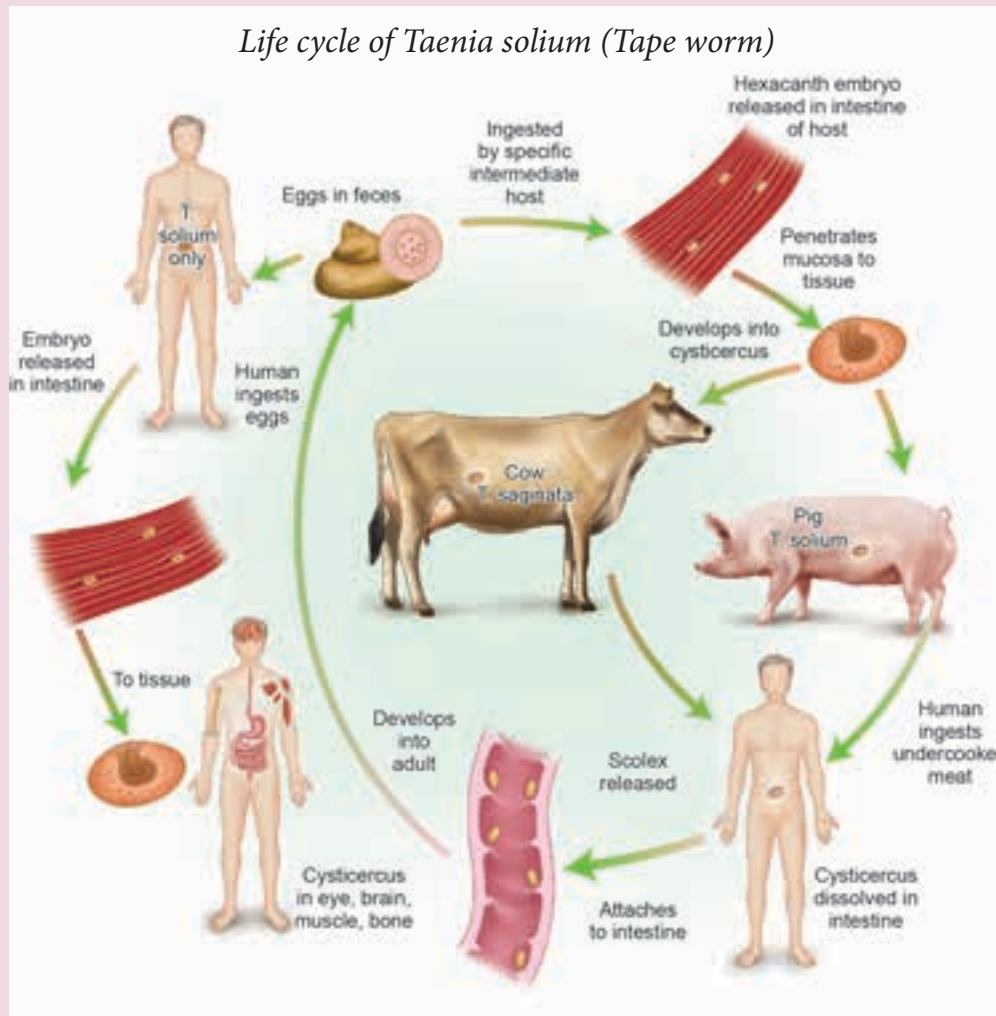
Aschelminthes comprises the **round worms**. The body is narrow and pointed at both the ends. There are no body segments. The body is covered by a **thin cuticle**. The body cavity is considered as a **pseudocoelom**. The alimentary canal is a straight tube. They reproduce sexually and the sexes are separate. They exist as free living soil nematodes or as parasites.



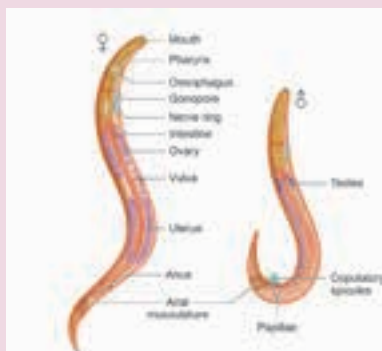


More to Know

Taeniasis is an intestinal infection in mammals caused by an adult tape worm. Due to intake of partially cooked pork meat.



Your class mate suffers from stomach pain. The teacher takes him to the doctor. The doctor advises that he is infected with round worms. Have you ever experienced such stomach pain?



Ascaris lumbricoides – Female and Male Worm

Ascaris lumbricoides (Round worms)

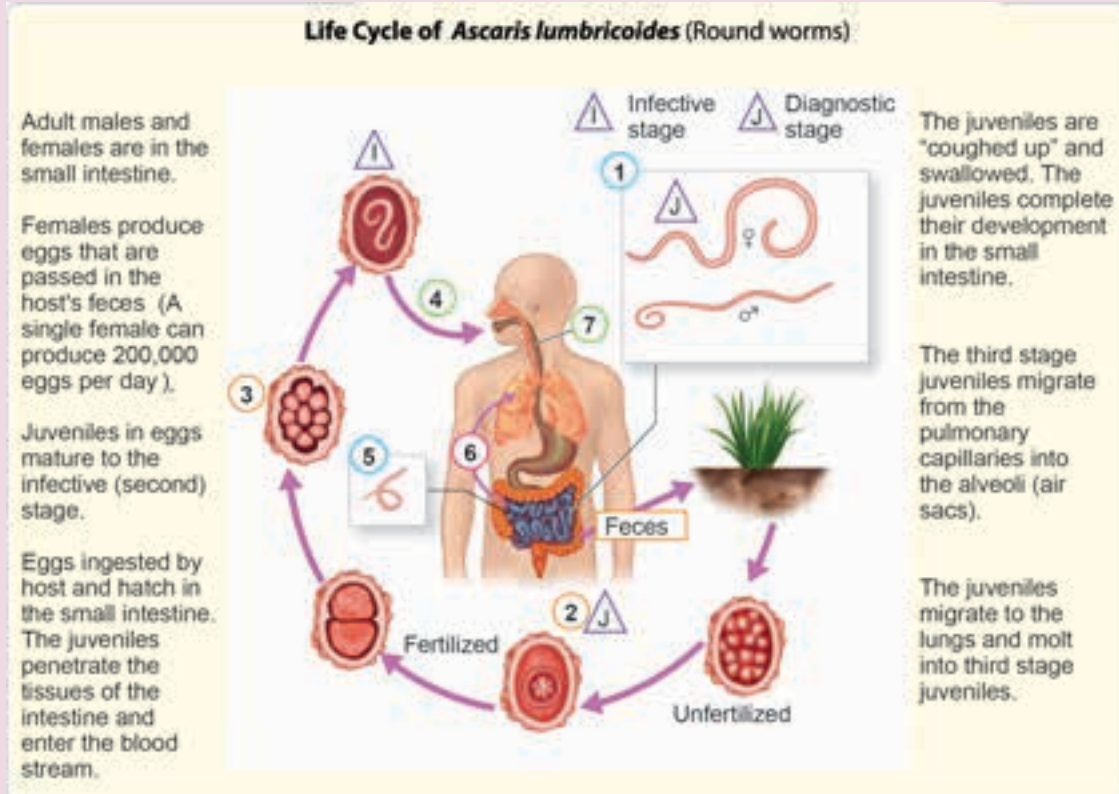
Adult worms	Male 15 to 30 cms Female 20 to 40 cms, oviparous
Eggs	60 μ , bile stained Albuminous coat with unsegmented ovum
Infective form	Embryonated eggs
Mode of transmission	Ingestion
Site of localization	Small intestine





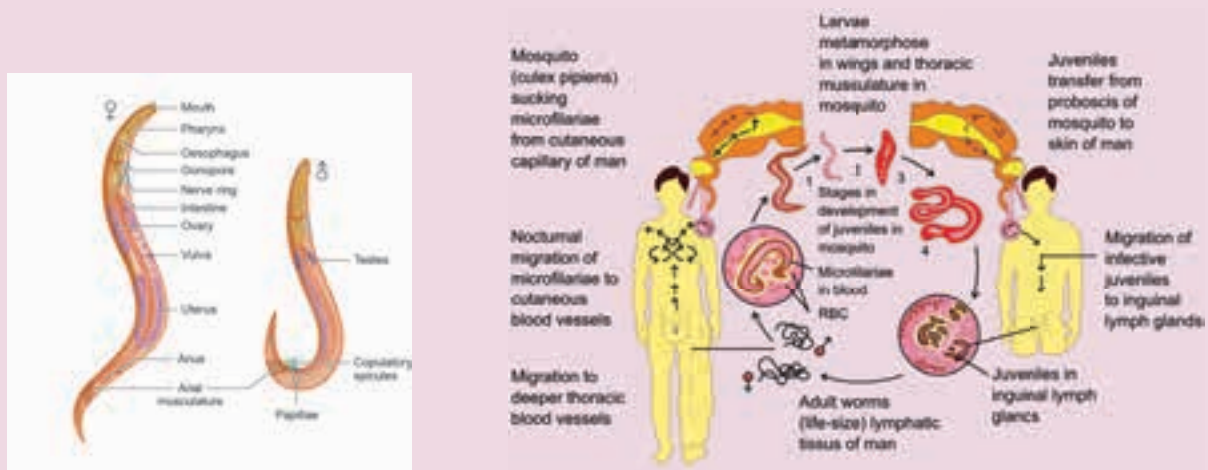
More to Know

Deworming is treatment for *Ascaris* infection. National Deworming day is observed on February 10th every year in India



More to Know

Filariasis or Elephantiasis is caused by *Wuchereria bancrofti*. It leads to the swelling of legs and groin due to the accumulation of excess of lymph.



***Wuchereria bancrofti*-
Female and Male worm**

Life cycle of *Wuchereria bancrofti*

7.8 Phylum - Annelida - (Segmented Worms)

Earthworms, leeches and a group of marine worms are included in this phylum. The name Annelida comes from the Greek word “**annulations**” which are ring like structures joined together. This is called **metamerism** which means the property of having repeated homologous organs in each segment functioning in coordination with each other. Further these animals are characterized by the possession of a body cavity called **coelom**. Some of them have movable bristles called **setae** involved in locomotion .

The body is covered by a moist outer cuticle, a thick multi-layered structure outside the epidermis providing protection. Nephridia are excretory structures and help to remove metabolic wastes. They have a nervous system with brain (**cerebral ganglia**). The most common larva is **trochophore**.

Think

- Annelida have no leg; yet they move.
- What is the role of setae in locomotion?



Earth worm (*Lampito mauritii*)

When you dig garden soil, you may come across earthworms which are often called- ‘**the friend of farmers**’. Why are they called so?



Leech (*Hirudinaria medicinalis*)

Have you heard about leeches? How are they different from earthworms in feeding habits?

7.9 Phylum - Arthropoda - (Organisms with Jointed Legs)

Arthropod is an ancient and largest phylum with more than 9,00,000 species. The word Arthropod means ‘**jointed legs**’. Insects, spiders, crabs, shrimps, butterflies, millipedes, centipedes and scorpions belongs to this phylum. The body plan is distinct with segmentation – **head, thorax** and **abdomen**. The exoskeleton is made up of **chitin**. As the size of exoskeleton cannot change during growth the animals has to shed it periodically by a process called **moulting**.

The coelomic cavity is filled with **haemolymph**(blood). The haemolymph circulates through the body cavity. They do not have well defined blood vessels. This is called **open circulatory** system wherein the tissues and cells of the animal body are bathed directly in blood.

Small arthropods directly absorb oxygen through their body surface. Many of the larger aquatic species breathe through feathery **book gills** and many land

arthropods breathe through a system of tiny body tubes called **tracheae**. Excretion occurs through **malpighian tubules** and **green glands**.

Think

Most agricultural pests are insects. Is there a harmful effect on respiratory system of insects, due to the application of chemicals as insecticides?

Activity 2

- Observe these figures.
- Have you seen any of them alive?
- Where have you seen them?
- What is the major difference you observe with reference to their legs?



Info bits

Copepods are tiny crustaceans (like shrimp) that live in the sea. They are the only creatures known to have only one eye.

Centipedes

They are fast hunters. They come out at night and feed on animals such as slugs, woodlice and earwigs. They grasp them with their fangs and kill them with poison. Female centipedes lay their eggs in the soil and guard them fiercely against predators. There are 2,800 species of centipedes and they are found all over the world. Giant centipedes over 30 cm (12 inches) long live in rain forests. Centipede means 'hundred legs' but most species have only 30 pairs.



Centipede

Millipedes

There are about 8,000 different species of millipedes. They live in the soil and feed mainly on rotting plants. The segments of their skin overlap to protect them and some can curl up into balls. Millipedes have two pairs of legs on each segment. This name means "thousand legs" but, most millipedes have only about a hundred. The longest have 750 pairs. Millipedes curl into tight balls when they are disturbed. Pilli millipedes look like woodlice but have more legs.



Millipede

Activity 3

Do you see honey bee visiting flowering plants of your garden. When do they visit? Why do they visit? What is the great service they render to us?

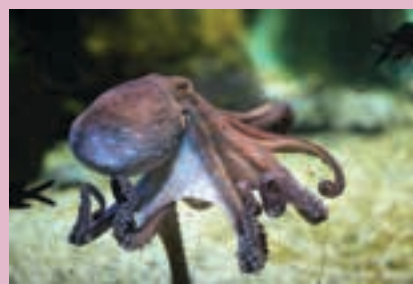


7.10 Phylum Mollusca - (Soft Bodied Animals)

It is the second largest phylum of animal kingdom. It is a very successful and diverse group of aquatic animals living in both marine and freshwater habitats. These are soft bodied animals without segmentation. The body is divided into **head, muscular foot** and **visceral mass**. The body is covered by a **mantle** enclosed by an **outer shell**. Respiration is carried through **gills (ctenidia)** or **lungs** or both. The most common larva is **trochophore**, and **veliger larva**.



Garden Snail



The Octopus is incredibly intelligent

It is the only invertebrate that is capable of emotion, empathy, cognitive function, self awareness, personality and even relationships with humans. Some speculate that without humans, octopus would eventually take our place as the dominate life form on earth.



The Giant squid

It has a donut-shaped brain that encircles the oesophagus.



More to Know

Pearl Culture

Pearl is synthesised by Pearl oyster. It is precious and used in jewellery making.



7.11

Phylum Echinodermata - (Spiny Skinned Animals)

They are exclusively marine organisms and the adults are radially symmetrical, but the larvae remain bilaterally symmetrical. They have an exoskeleton with **calcareous ossicles**, presence of external spines called **Pedicellaria**. The mouth is on the lower surface. **Water vascular system** is a unique feature of these animals. **Tube feet** is involved in locomotion. The most common larva is a **bipinnaria larva**.



Star Fish



Sea Urchin



Sea Lily



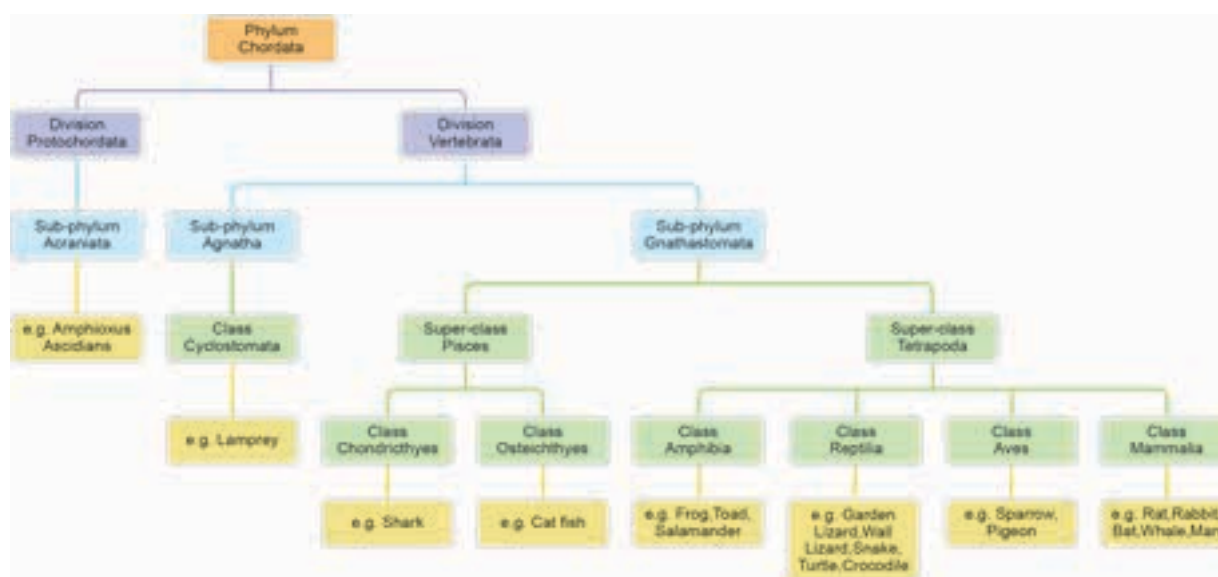
More to Know

Ornamental Echinoderms

Dried star fish and sea urchin are used as decorative items.



Sea Cucumber is a costly dish served in foreign countries.



Activity 4

Go on a field trip, record what you observe.

Activity 5

Prepare a report on diseases spread through pet animals.

7.12 Phylum Chordata

This phylum derives its name from one of the common characteristics of this group namely the **notochord** (Gr. *Noton* - back + L. *chorda* - cord). The animals belonging to all other phyla of the Animal Kingdom are often termed 'as non -chordates' or 'invertebrates' since they neither have notochord nor backbone in their body. The animals with backbones are chordates. Chordates are of primary interest because human beings are members of this group.

7.12.1 Sub-phylum Acraniata - Prochordata

The Prochordates are considered as the forerunner of vertebrata. Since they do not have a cranium or skull they are referred to as **Acrania**. The classification of the Prochordates is based on the nature of the notochord. The Phylum Prochordata is classified into three sub phyla namely Hemichordata, Cephalochordata and Urochordata.

7.12.2 Sub phylum Hemichordata

Hemichordates are marine organisms without backbone. They mostly remain as **tubicolous forms**. The body is soft, vermiform, unsegmented, bilaterally symmetrical and triploblastic. The **notochord is persistent as the stomochord**

in the anterior region of the animal.
Eg. Balanoglossus (Acon worms)

7.12.3 Sub phylum Cephalochordata

Cephalochordates are small fish like marine chordates with unpaired dorsal fins. The persistent **notochord extends forward beyond the brain**. Eg. Amphioxus.

7.12.4 Sub phylum Urochordata

In Urochordata the **notochord is confined to the tail region** of the larva. The adults are mostly degenerate, and are sessile forms. The body is enveloped by a tunic or test. Eg. Ascidian



Balanoglossus (Hemichordate)



Amphioxus (Cephalochordate)



Ascidian (Urochordate)

7.13

Division Vertebrata (Craniata)

This group is characterized by the presence of **brain case** or **cranium** and **vertebral column**. The notochord is an embryonic structure gets replaced by a **vertebral column** which forms the chief skeletal axis of the body. They have ventral muscular heart with two, three or four chambers. The **locomotor** organs may be fins or limbs. Excretion and osmoregulation are carried out by a pair of kidneys. They exhibit sexual dimorphism.

7.13.1 Super Class: Pisces (Fishes)

Fishes are **poikilothermic**, aquatic vertebrates with jaws. The body is streamlined. It is differentiated into head, trunk and tail. Locomotion is by **paired** and **median fins**. The body has a covering of **scales**. Body muscles are arranged into segments called **myotomes**. Respiration is performed by **gills**. Gill slits are 5-7 pairs. They are covered by an **operculum**. The heart is **two chambered** with an auricle and a ventricle. **Lateral line sense organs** are well developed.

Info bits

The cosmopolitan sailfish can swim faster than a cheetah can run! It can swim at least 109 kilometres (68 miles) per hour, while a cheetah can only manage 100 kilometres (62 miles) per hour.



More to Know

The smallest vertebrate, **Philippine goby/dwarf pygmy goby** is a tropical species fish found in brackish water and mangrove areas in south East Asia, measuring only 10 mm in length.



The gigantic **Blue whale** which is 35 meters long and 120 tons in weight is the biggest vertebrate animal.



- Have you seen an aquarium anywhere?
- Are you interested in maintaining an aquarium at home?



More to Know

Blue Revolution

The term blue revolution refers to remarkable emergence of aquaculture through fish and prawn production. Culturing of aquatic organisms is referred to as **Aquaculture**.



Flying fish: *Exocoetus*

7.14 Super Class Tetrapoda

Animals having four limbs or descended from four-limbed ancestors.

7.14.1 Class: Amphibia

The transition from aquatic to terrestrial living is clearly indicated in the Class Amphibia. They are the first vertebrates to live on land with **dual adaptation** to live in aquatic and land environments. This **double life** is expressed as **amphibious**. The body is divisible into head and trunk. In frogs, hind limbs have **webbed feet**. The skin is moist and glandular usually without scales. Respiration is effected by **gills, skin, bucco-pharynx** and **lungs**. The heart is **three chambered** with **two auricles** and a **single ventricle**. Sexes are separate. Fertilization is mostly external and the larva is a tadpole which metamorphoses into an adult.

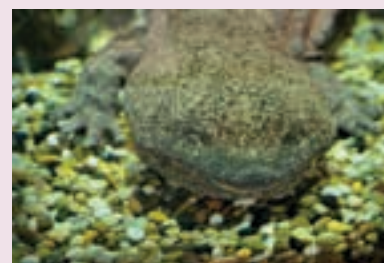


Tadpole - larva of frog

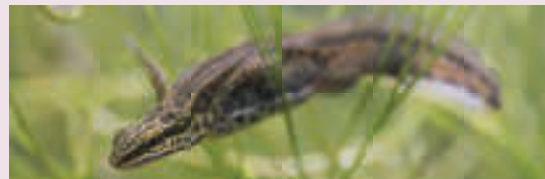
A boy was playing in the ground enjoying the shower of rain. Suddenly he was surprised to see an organism which was jumping like frog. He tried to catch with his hand, at once he was instructed by his mother not to touch as it is poisonous. Is it a toad? Is it not a frog?



The Chinese giant salamander *Andrias davidians* is the largest amphibian in the world. Its length is about five feet and eleven inches. It weighs about 65 kg, found in Central and South China.



The arrow poison frog, *Triturus helveticus* found in Cuba, is the smallest amphibian in the world. Its length varies from 8.5 – 12.5 mm.



7.14.2 Class: Reptilia

Reptilia represents the first class of vertebrates that is fully adapted for life on dry land. It is covered with an exoskeleton of horny imbricate **epidermal scales**. Skin glands are absent. Respiration is through **lungs**. The heart is **three chambered** with an exemption of **crocodiles** with **four chambered**. Sexes are separate. Fertilization is internal. Eggs are covered with an outer **shell**.

Have you seen wall lizard at home or in a common place?

Often it is found stuck to the wall. What enables it to do so?

Info bits

Dimetrodon was a mammal like reptile with a snail like structure on its back. This acted as a radiator to cool the body of the animal.



Can you imagine the size of Dinosaur and Home lizard which belong to the same class? Do you find both of them around us now? Give reasons. Which age is known as Golden age of reptiles?

7.14.3 Class: Aves

Birds (Aves) are the first **homeothermic** vertebrates with spindle shaped body which is divisible into four distinct regions namely head, neck, trunk and tail. They have two pairs of limbs, in that forelimbs are modified as **wings**. The hind limbs are adapted for walking and running. The **feet** are covered with **scales**, while the body is covered with feathers. A horny **beak** is present. Alimentary canal is provided with **crop** and **gizzard**. Respiration is through **spongy lungs**. **Air sacs** are present to make the bird light weight. The bones are filled with air, so they are called **pneumatic bones**. Their eggs are **yolk laden** and covered by hard **calcareous shell**.

Activity 6

- Often you wake up hearing the calls of birds. Have you even tried to identify the birds from their voices?
- Make a list of birds you often observe near your home or school?

Info bits

Archaeopteryx was the first bird. It was covered with feathers, but it had teeth, not a beak.



State bird of Tamil Nadu

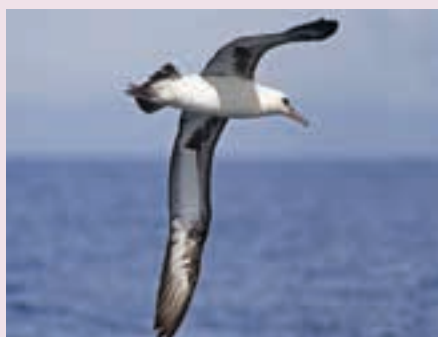


Common Emerald dove.
(*Chalcophaps indica*)

TYPES OF BEAK IN BIRDS



The bird with largest wing span



Length of wing span of Albatross is 3.5 m.
Which bird flies at the highest altitude?

Have you observed different shapes of bird's beak? Do you know the purpose of this modification?



American golden plover, *Pluvialis dominica*, covers long distance during migration, breeding in Alaska and Arctic. It flies to South America in autumn and then reaches New Zealand. It takes more than six months to cover 24,000 – 27,000 km.

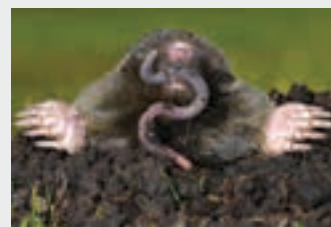


7.14.4 Class: Mammalia

This is a successful group of animals called mammals that adapt themselves readily to new situations and to new food habits. The integument is provided with **epidermal hairs, sweat, sebaceous and scent glands**. **Mammary glands** are the modified integumentary glands. The external ear or the **pinna** is present in most of the mammals. The heart is **four chambered**. **Testes** lie outside the body cavity, enclosed in **scrotal sacs**. Eggs are small with little or no yolk. Fertilization is always internal. They give birth to young ones and feed their young with milk. **Placenta** is a characteristic feature.

Info bits

A mole can dig a tunnel 300 feet long in just one night.



Can you identify these mammals? Do you see them near your home? If you wish to see many of them which place will you visit?



Info bits

Flying fox - The largest bat is the flying fox. Some are found on the island of Java and have a wing span of 1.7 m with a length of upto 42 cm. The smallest bat lives in Thailand. It weighs just 2 grams and is no longer than 3.3 cm



Activity 7

Make a list of animals having flight adaptations in major classes of invertebrates and vertebrates. Compare their adaptations and classify them and comment.

7.15 Binomial Names of Common Animals

As we find it difficult in identifying the required organism with their local names, we need a common name to be followed universally. To overcome this problem Carolus Linnaeus introduced the method of naming the animals with two names known as binomial names. The first name is called **genus** which is always written with the first letter capital and the second one is the **species** name always written in small letter. The binomial names of some of the common animals are as follows.

7.15.1 Invertebrates

Common name	Binomial name
Amoeba	<i>Amoeba proteus</i>
Hydra	<i>Hydra vulgaris</i>
Tape worm	<i>Taenia solium</i>
Round worm	<i>Ascaris lumbricoides</i>
Earthworm	<i>Lampito mauritii/Perionyx excavatus</i>
Leech	<i>Hirudinaria granulosa</i>
Cockroach	<i>Periplaneta americana</i>
Snail	<i>Pila globosa</i>
Star fish	<i>Asterias rubens</i>
Pearl oyster	<i>Pinctada fucata</i>

7.15.2 Vertebrates

Common name	Binomial name
Frog	<i>Rana hexadactyla</i>
Toad	<i>Bufo melanostictus</i>
Wall lizard	<i>Podarcis muralis</i>
Crow	<i>Corvus splendens</i>
Peacock	<i>Pavo cristatus</i>
Dog	<i>Canis familiaris</i>
Cat	<i>Felis felis</i>
Tiger	<i>Panthera tigris</i>
Man	<i>Homo sapiens</i>

A-Z GLOSSARY

1. **Amphibian** cold-blooded vertebrate animal of a class that comprises the frogs, toads, newts, salamanders and caecilians. They are distinguished by having an aquatic gill-breathing larval stage followed (typically) by a terrestrial lung-breathing adult stage.
2. **Annelida** a large phylum that comprises the segmented worms which include earthworms and leeches.
3. **Arthropods** Phylum Arthropoda; include the members of the Class Crustacea (prawn, shrimp, crabs), Arachnida (spiders, ticks, mites, scorpions) and Insecta (e.g., mosquitoes, flies, lice, fleas).
4. **Aves** a class of vertebrates which comprises the birds.
5. **Classification** is the arrangement of groups of animals, the members of which have one or more characteristics in common.
6. **Chordata** a large phylum of animals that includes the prochordates and vertebrates. They are distinguished by the possession of a notochord at some stage during their development.
7. **Coelom** body cavity located between the digestive tract and the body wall.
8. **Coelenterata** an aquatic invertebrate animal of a phylum that includes jellyfishes, corals, and sea anemones. They typically have a tube- or cup-shaped body with a single opening ringed with tentacles that bear stinging cells (nematocysts).
9. **Echinodermata** a phylum of marine invertebrates which includes starfishes, sea urchins, brittle stars, crinoids and sea cucumbers. They have five fold radial symmetry, a calcareous skeleton, and tube feet operated by fluid pressure.
10. **Invertebrates** animals lacking a vertebral column.
11. **Mammals** Warm-blooded vertebrate animals that possess hairs, mammary glands and feed their young ones.
12. **Mollusca** an invertebrate of a large phylum which includes snails, slugs, mussels and octopus. They have a soft unsegmented body and live in aquatic or damp habitats and most kinds have an external calcareous shell.
13. **Nematoda** a large phylum of worms with slender, unsegmented, cylindrical bodies, including the roundworms, threadworms and pinworms. They are found abundantly in soil and water, and many are parasites.
14. **Platyhelminthes** a phylum of invertebrates that comprises the flatworms.
15. **Porifera** a phylum of aquatic invertebrate animals that comprises the sponges.
16. **Protozoa** includes diverse minute acellular or unicellular organisms usually non photosynthetic.
17. **Pseudocoleomates** false body cavity it has a fluid filled body cavity which is not bounded by true epithelial layers
18. **Reptile** a vertebrate animal of a class that includes snakes, lizards, crocodiles, turtles, and tortoises. They are distinguished by having a dry scaly skin and typically laying soft-shelled eggs on land.
19. **Taxonomy** it is the theoretical study of classification including its basic principles, procedures and rules
20. **Toads** anurans with less smooth skin than that of frogs, exclusively terrestrial and hop rather than jump.



EXERCISE



I. Choose the correct answer

1. Which is not an insect?
(a) House fly (b) Bedbug
(c) Mosquito (d) Spider
2. Find the group having only marine members
(a) Mollusca
(b) Porifera
(c) Coelenterata
(d) Echinodermata
3. Mesoglea is present in
(a) Porifera
(b) Coelenterata
(c) Annelida
(d) Arthropoda
4. Dysentery is caused by
(a) Entamoeba (b) Euglena
(c) Plasmodium (d) Paramecium
5. Which one of the following pairs is not a poikilothermic animal
(a) Fishes and Amphibians
(b) Amphibians and Aves
(c) Aves and Mammals
(d) Reptiles and mammals
6. Identify the animal having four chambered heart
(a) Lizard (b) Snake
(c) Crocodile (d) Calotes
7. Which is not a feature of chordates
(a) Green glands
(b) Sweat glands
(c) Sebaceous gland
(d) Mammary gland
8. The bilaterally symmetrical larvae which transform into radially symmetrical adult is
(a) Bipinnaria (b) Trochophore
(c) Tadpole (d) Polyp
9. The animal without skull is
(a) Acrania (b) Acephalia
(c) Apterina (d) Acoelomate
10. Choose the correct terms related for Hemichordate
(a) Vermiform, unsegmented, triploblastic, ciliary feeders
(b) Vermiform, segmented, triploblastic, ciliary feeders
(c) Vermiform, unsegmented, diploblastic, ciliary feeders
(d) Vermiform, unsegmented, triploblastic, filter feeders
11. Hermaphrodite organisms are
(a) Hydra, Tape worm, Earthworm, Amphioxus
(b) Hydra, Tape worm, Earthworm, Ascidian
(c) Hydra, Tape worm, Earthworm, Balanoglossus
(d) Hydra, Tape worm, Ascaris, Earthworm
12. Poikilothermic organisms are
(a) Fish, Frog, lizard, man
(b) Fish, Frog, lizard, cow
(c) Fish, Frog, lizard, snake
(d) Fish, Frog, lizard, crow
13. Crop, gizzard and air sacs are seen in
(a) Fish (b) Frog
(c) Bird (d) Bat

14. Excretory organ of tape worm is
(a) Flame cells (b) Nephridia
(c) Body surface (d) Solenocytes
15. Tube like alimentary canal is found in
(a) Hydra (b) Earth worm
(c) Starfish (d) Ascaris
16. During ecdysis which of the following is shed off
(a) Chitin (b) Mantle
(c) Scales (d) Operculum
17. Cephalization is related to
(a) Head formation
(b) Gut formation
(c) Coelom formation
(d) Gonad formation

II. Fill in the blanks

1. The excretory opening of Porifera is _____
2. The second largest phylum of animal kingdom is _____
3. In India National deworming day is observed on _____
4. Myotomes are seen in _____
5. The larvae of an amphibian is _____
6. In birds the air sacs communicate with _____
7. Placenta is the unique characteristic feature of _____
8. The binomial name of our National Bird is _____
9. Blue revolution is the rearing of _____
10. In mammals testis are enclosed by _____

III. State whether true or false

1. Canal system is seen in coelenterates.
2. Hermaphrodite animals have both male and female sex organs.
3. Nephridia are the respiratory organ of Annelida.
4. Bipinnaria is the larva of Mollusca.
5. Balanoglossus is a ciliary feeder.
6. Fishes have two chambered heart.
7. Skin of reptilians are smooth and moist
8. Wings of birds are the modified forelimbs
9. Female mammals have scrotal sacs
10. Cloaca is present in all vertebrates

IV. Match the following

PHYLUM	EXAMPLES
(A) Coelenterata	(i) Snail
(B) Platyhelminthes	(ii) Starfish
(C) Echinodermata	(iii) Tapeworm
(D) Mollusca	(iv) Hydra

V. Understand the assertion statement. Justify the reason given and choose the correct choice

1. **Assertion:** The hydra is a diploblastic organism
Reason: They have two germ layers
(a) Assertion is correct and the reason is wrong
(b) Reason is correct and the Assertion is wrong
(c) Both assertion and reason is correct
(d) Both assertion and reason is wrong

2. Assertion :The prochordate are grouped under Acrania

Reason: They have well defined cranium

- Assertion is correct and the reason is wrong
- Reason is correct and the assertion is wrong
- Both assertion and reason is correct
- Both assertion and reason is wrong

VI. Give very short answers

- Define taxonomy?
- What is a nematocyst?
- Why coelenterates are called diploblastic animals?
- Which organism is called as Friend of farmers? Why?
- List the respiratory organs of amphibians
- Differentiate between tube feet and false feet
- Are Jelly fish and star fish similar to catfish? Give reasons
- What is acrania?
- What are the sub-phylum of prochordates?
- Why are frogs said to be amphibians?
- What is silver revolution?

VII. Give short answers

- Give an account on phylum Annelida
- List the excretory organs of invertebrates in relation to their habitats.
- How is the body wall of coelenterates arranged?
- Differentiate between flat worms and round worms?
- Outline the flow charts of Phylum Chordata
- List five characteristic features of fishes

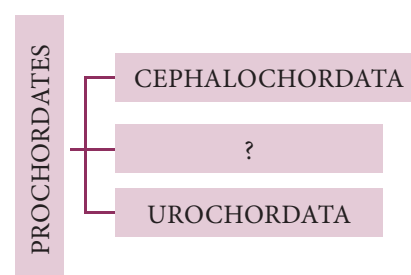
- Comment on the aquatic and terrestrial habits of amphibians
- How is the reproductive characters of mammals different from those of Aves
- On the basis of Position of notochord, classify the different Prochordates. Justify your answer
- How are the limbs of the birds adapted for avian life?
- List the integumentary glands of mammals

VIII. Give long answers

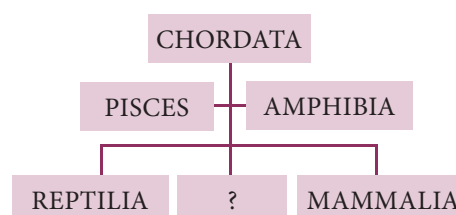
- Describe the characteristic features of different Prochordates with suitable diagrams
- Outline the flow chart of invertebrate phyla
- List the excretory organs of invertebrates in relation with the animals
- Give an account on phylum Arthropoda.

IX. Flow chart

- Find the missing group



- Find the missing group



3. Find the correct sequence

- (a) Frog » Fish » Snake » Dove » Lion
- (b) Fish » Snake » Frog » Lion » Dove
- (c) Fish » Snake » Frog » Lion » Crow
- (d) Fish » Frog » Snake » Dove » Lion

4. Visit to the near by garden of your school and give the answers for the following questions

- (1) List out the arthropods you have observed and give their binomial names
- (2) What are the harmful animals you have observed?

(3) Have you seen eggs of any animals? If yes, mention the name of its adult

(4) Name the birds that you could identify

5. Visit to a pond ecosystem and collect the names of animals observed. Give answer for the following questions.

- Prepare a list of aquatic and terrestrial animals found in the pond
- Arrange them under respective taxonomical group and submit your answer



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