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Diversity of Organisms

Diversity of Organisms-introduction

Every organism whether plant or animal is unique in itself. There is a wide diversity in the flora (plants) and fauna (animals) in the world. The diversity we see today is the result of 3.5 billion years of organic evolution. During the course of this evolution several species vanished from the surface of the Earth and became extinct. It is estimated that more than fifty times the existing species have become extinct. With such a vast number of organisms - both living and extinct, it becomes impossible to study every one of them at individual level. This task of studying the diversity of living organisms can be made easier and more effective if the various organisms are arranged in an orderly manner.

By making a comparative study and assorting the similarities and differences amongst the various varieties of species, organisms can be classified into groups or sets. Taxonomy is a regular branch of science that is involved with the purpose of arranging or grouping organisms.

Importance of classification:

- It makes the study of such a wide variety of organisms easy.
- It projects before us a good picture of all life forms at a glance.
- It helps us understand the interrelationship among different groups of organisms.
- It serves as a base for the development of other biological sciences such as biogeography etc.
- Various fields of applied biology such as agriculture, public health and environmental biology depends on classification of pests, disease vectors, pathogens and components of an ecosystem.

Classification of Plants and Animals

Plants	Animals
Cellulose cell wall surrounds the cell membrane	Cell wall is absent in animal cells
Plastids are present-especially a green pigment called chlorophyll.	Chlorophyll is absent in animal cells.
large vacuoles containing cell sap are present in plant cells.	vacuoles are usually absent.
Most plants do not exhibit movement of locomotion.	Most animals exhibit movement of locomotion.

Plants	Animals
Keep growing through out their life and are localised in the apical meristem	Growth stops after maturation but body cells are replaced periodically. growth is uniform and proportionate.
Manufacture there own food by photosynthesis.	cannot make their own food. They depend directly or indirectly on plants for their food
Sense organs and nervous system absent.	Well-developed nervous system.

Nomenclature

Carl Linnaeus, father of modern botany, was a Swedish naturalist who laid the foundation of modern classification and nomenclature in 1758. He devised a binomial system of nomenclature (naming system) in which an organism is given two names:

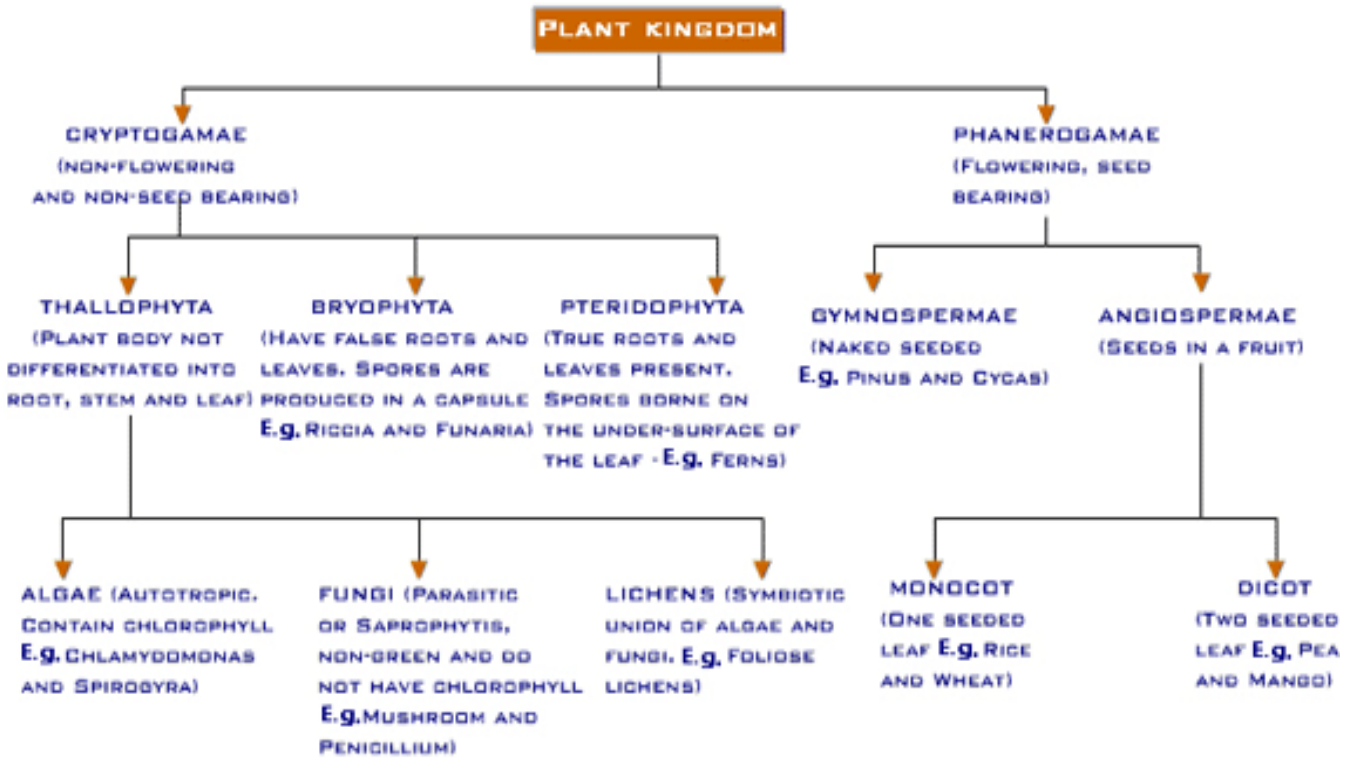
- A generic name (name of genus) which it shares with other closely related organisms which has features similar enough to place them in the same group.
- A specific name (name of species) which distinguishes the organism from all other species. No other organism can have the same combination of genus and species.

The scientific name derived by using the system of nomenclature is followed all over the world as they are guided by a set of rules stated in the International Code of Nomenclature.

Plant Kingdom:

The classification telescope for the plant kingdom

The chart given below briefly outlines the classification of the plant kingdom.



Eichler in 1883 suggested a system to classify the plant kingdom which is well accepted. He said that the plant kingdom is subdivided into two subkingdoms: Cryptogamae and Phanergamae

Sub Kingdom Cryptogamae

(crypto-hidden, gammous-marriage)

These are lower plants that do not bear flowers or seeds. They form three divisions.

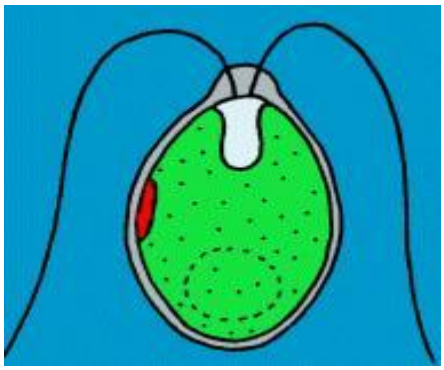
Division Thallophyta

(thallus-undifferentiated, phyta-plant)

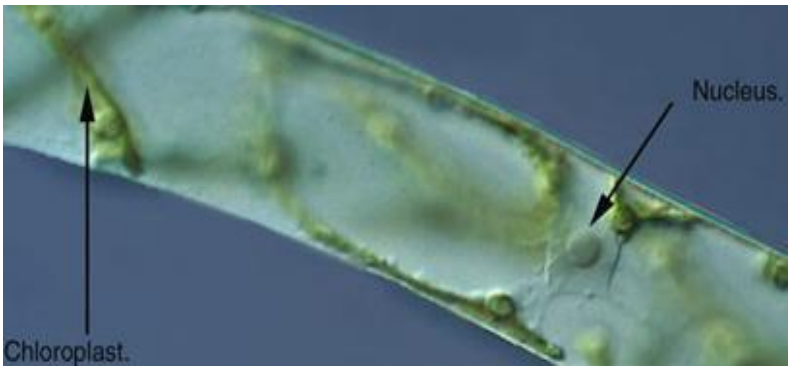
- The plant body is not differentiated into stem, root and leaves but is in the form of an undivided thallus.
- Vascular tissues are absent.
- The reproductive organs are single-celled and there is no embryo formation after fertilization.

This division includes three sub-divisions: algae, fungi and lichens.

Algae



Chlamydomonas



Spirogyra

Cladophora

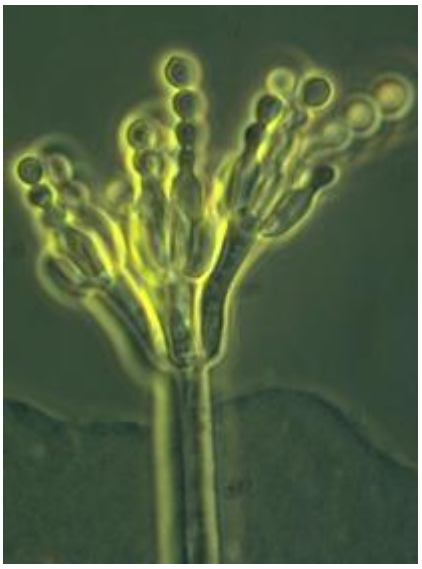
- Occur in ponds, lakes and fresh water bodies. Sea weeds are found in marine waters.
- May be single celled, colonial or filamentous.
- Are autotropic i.e., they can prepare their own food with the help of the green pigment i.e., chlorophyll present in the plant. Sometimes red, blue, yellow and brown pigments are found.
- Blue-green bacteria (cyanobacteria) are included in this group of plants.

Examples: Spirogyra, Volvox, Eurodivia, Ulothrix, Cladophora, Ulva, Chlamydomonas.

Fungi Kingdom

Reproduction in Fungi

Mushroom



Penicillium

These do not contain chlorophyll and hence are heterotropic and have diverse modes of nutrition. They may be saprophytic i.e., depending on dead or decaying organic matter for their food, or may be parasitic i.e., depending on living organism for their food.

Example: Mushrooms (Agaricus), Penicillium and Aspergillus.

Lichens

Foliose lichen

Fruticose lichen

This is a group which has two varieties of plants, an alga and a fungus living in perfect harmony. They co-exist for mutual benefit. This relationship is known as symbiosis. The fungus absorbs water and mineral salts and supplies it to the alga. The alga prepares food and supplies it to the fungus.

Example: Foliose lichens, Fruticose lichens.

Division Bryophyta

Riccia

Marchantia

- Moss and Liverwort belong to this variety of plants. There are the simplest form of land plants. The plant body is flat and lack true leaves and roots. The upper surface of the plant body produces a stalk which bears a capsule. The capsule contains spores.

Example: Riccia, Marchantia, Funaria

Division Pteridophyta

Fern

- The plant body is differentiated into stem, leaves and roots.
- Vascular system is present.
- Leaves usually have leaflets. Spores are borne on the undersurface of the leaf.
- They grow in damp cool shady places.

Example: Ferns Watch video on Life cycle of fern

http://www.youtube.com/watch?v=V81eh5hcJsc

Sub Kingdom Phanerogamae

This division is made up of plants that bear flowers and seeds and make up the majority of the larger plants. The body is differentiated into true stem, leaves and roots. Propagation of the plant takes place with the help of seeds. Seeds are formed as a result of sexual reproduction. The male and female gametes (sex cells) fuse together inside the ovary (female part of the flower) and develop into the seed. In some plants seed is not produced inside an ovary. Phanerogamae is made into two further divisions.

- Gymnosperms (naked seeded plants)
- Angiosperms (Seed borne within a fruit)

Division Gymnospermae

Pinus

Gymnosperms are intermediate between cryptogams and angiosperms. The male flower is a cone which produces pollen. The female flower is much larger and consists of a rosette of carpels which bear ovules along the two margins.

Example: Cycas, Pinus and Coniferous trees.

Division Angiospermae

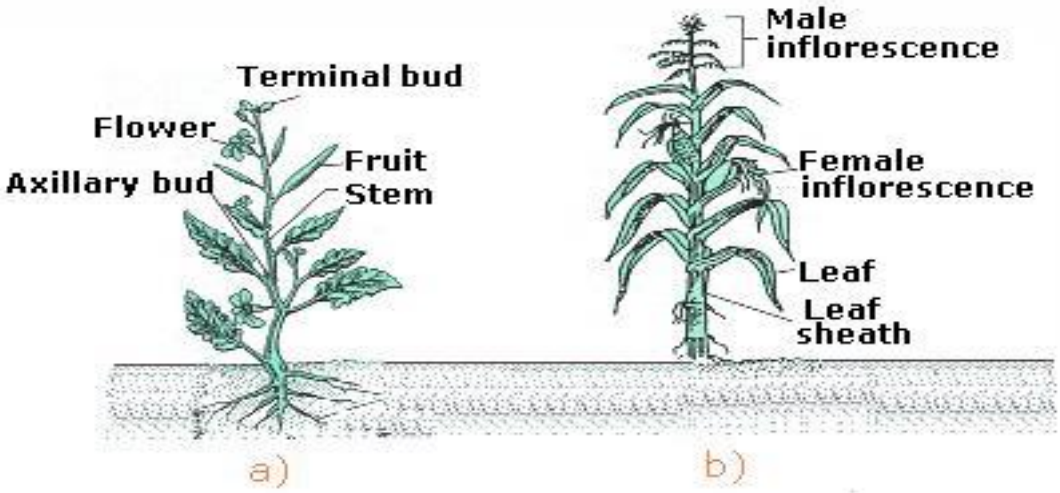
This group constitutes the largest group of plants. Seeds are produced inside an ovary which later becomes the fruit. These are highly evolved group of plants. The plant body is distinctly differentiated into roots, stem and leaves. Based on the number of cotyledons (seed-leaves) that form the seed this group is divided into:

- Monocotyledons (One seed leaf)

Example: Rice, Wheat

- Dicotylidons (two seed leaves)

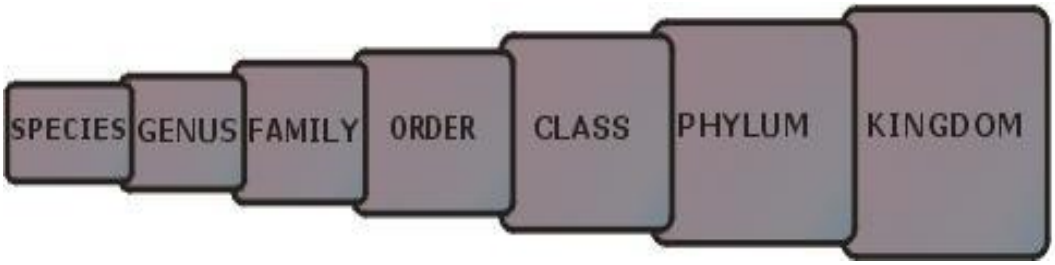
Example: Beans, Mango



a) A dicot plant (Brassica campestris - mustard)
b) A monocot plant (Zea mays - maize)

Diversity of Organisms-Animal Kingdom

The following classification telescope clearly indicates the mechanism behind the classification of the Animal Kingdom.

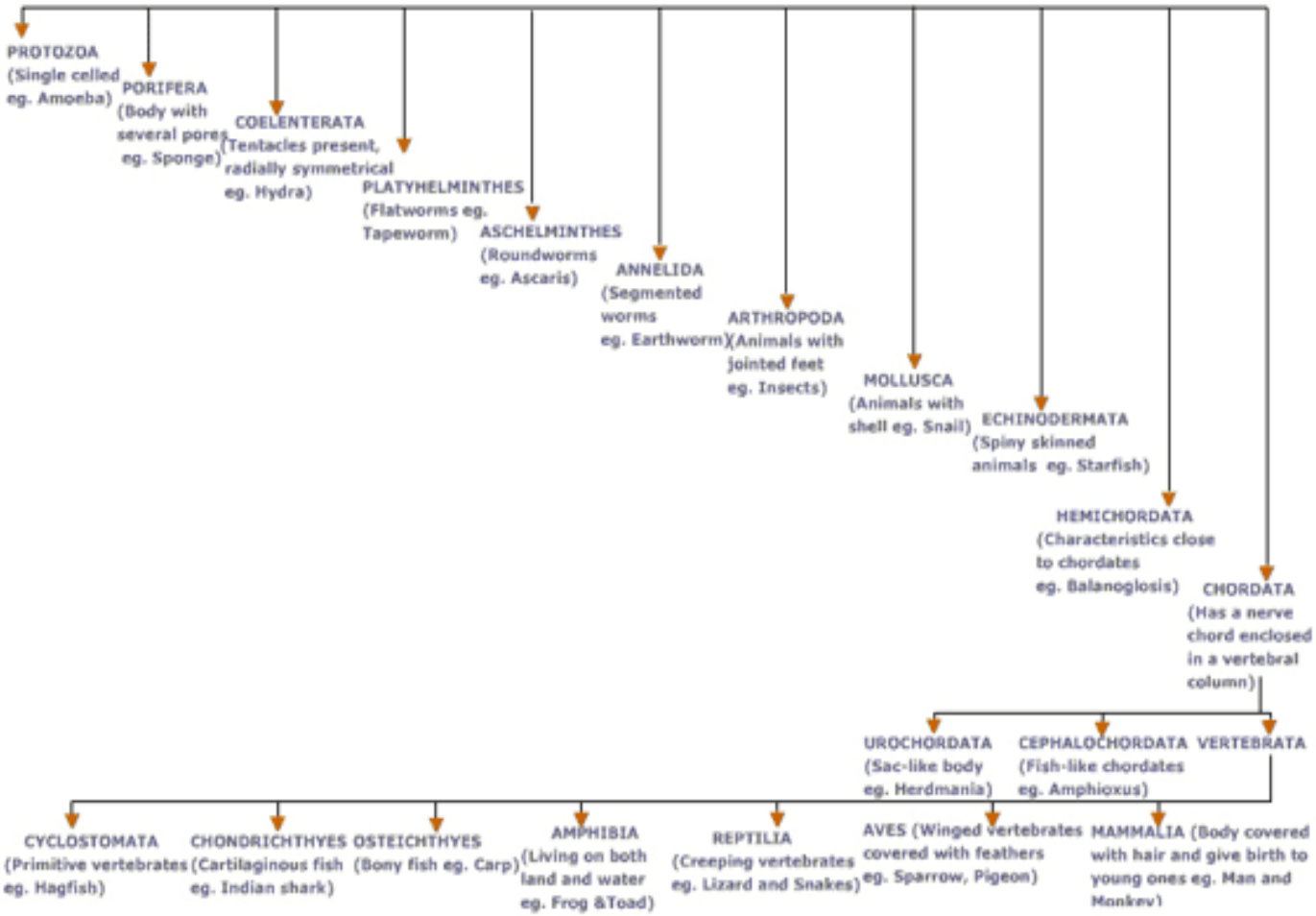


The classification telescope for the animal kingdom

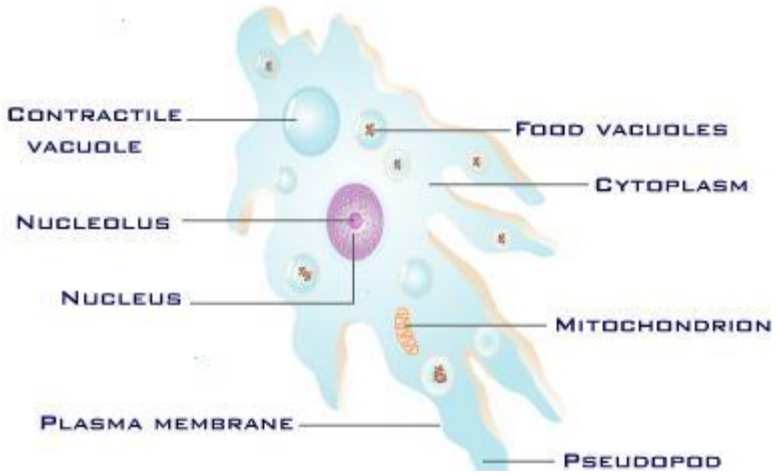
The chart given below briefly outlines the classification of the Animal Kingdom.

Kingdom Animalia

The Animal Kingdom is divided in several phyla mainly on the basis of the cell organisation, symmetry, presence or absence of notochord and body cavity. Animals are arranged progressively from simple single-celled protozoans to highly complex mammals. Given below are some of the main characteristics of each phyla.



Protozoa



Amoeba

- Unicellular (single celled) animals.
- Aquatic, free-living or parasitic organisms.
- Locomotion with the help of finger-like projections called pseudopodia, cilia or flagella.
- Nutrition is heterotropic.
- Reproduction is by binary or multiple fission and conjugation.

Example: Amoeba, Euglena, Paramecium, Plasmodium.

Porifera:

Sponge

- The simplest multicellular animals. The cells are loosely held together and do not form tissues.
- Aquatic in habitat (mostly marine).
- Ostia (pores) are present all over the body, with a single large opening on top called osculum.
- Food and oxygen enter the organism along with water into a canal system.

- Support system made up of tiny needle-like formations. They may be made of silica, calcium or spongin fibres.

- Reproduction may be sexual, asexual or budding.

Example: Sycon, Spongilla, Euptectella

Cnidaria:

Sea Anemone

- Two layered body which is radially symmetrical.

- Aquatic in habitat which includes both fresh water and marine.

- The outer layer has tentacles armed with stinging cells cnidoblasts which can release venom into the victim. The inner layer encloses a body cavity called gastro vascular cavity.

- Animals in this group exist in two types of individuals called zooids- polyps and medusae. Polyps are fixed and lead solitary or colonial life , while medusae are free swimming.

- Alternation of generation takes place in colonial forms. Polyps and medusae alternate with each other during the life cycle.

- Reproduction is usually asexual i.e., by budding in the polyp form and sexual in medusa form.

- Exoskeleton made of lime is found in corals.

  Example: Hydra, Obelia, Aurelia, Metridium

Platyhelminthes (Flatworms)


Tapeworm

- Simplest triploblastic organisms showing bilateral symmetry.
- Mostly parasites in other animals.
- Body in dorsoventrally flat and leaf like or ribbon-like with bilateral symmetry.
- The body cavity has only one opening which serves as both the mouth and the anus.
- Hermaphrodites i.e, male and female sex organs present in one individual.

Example: Planaria, Liver Fluke, Tape Worm

Phylum Aschelminthes (round or thread worm) Or nemathelmenthes

Ascaris

- Triploblastic body showing bilateral symmetry.
- Parasitic or free living.
- Body is long, smooth and cylindrical.
- Alimentary canal begins with the mouth and ends with the anus.

Example: Ascaris (Round worm), Enterobius (Pinworm)

Annelida:

Earthworm

- Occur in moist soil, fresh water and sea.
- Body is soft and segemented, triploblastic with bilateral symmetry.
- First animal with the coelom (body cavity).
- Body is covered by a non-chintinous cuticle which may have chitinous setae, or parapodia.
- Reproduction is generally sexual, but some may reproduce asexually by rejuvination i.e, by regrowing broken segments.

Example: Nereis (sand worm), Aphrodite (sea mouse)

Pheretima (earthworm), Hirudinaria (leech)

Arthopoda


Butterfly

- This is the largest phylum with almost 80% of the animals kingdom in this phyla.
- Body is bilaterally symmetrical and segmented. It is divided into head, thorax and abdomen.
- Possess jointed legs which may be modified for walking, swimming feeding and feeling.
- Exoskeleton is chitinous which is shed periodically by moulting.
- Body cavity is reduced and filled with blood (haemocoel).
- Respiration is by lungs, book lung and trachea.

Example: Apis (honey bee), Aranea (Spider), palaemon (prawn), Scolopendra (Centipede).

Mollusca:

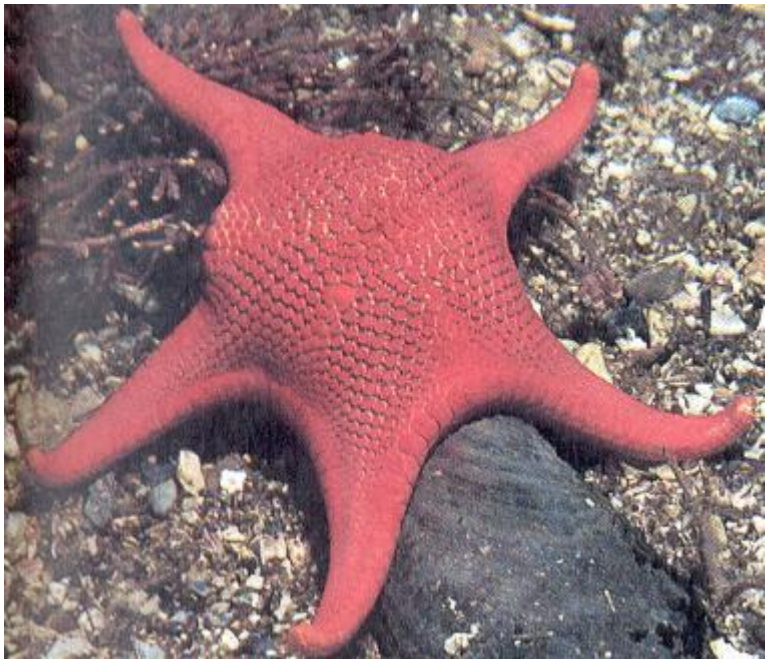

Snail

- Aquatic in habitat but some land forms are also seen.
- Body is soft and divided into three regions (head, dorsal visceral mass and ventral foot).
- Body enclosed in a hard calcareous shell.

- Breathe through gills, land molluscs have lungs.
- Sexes are separate.

Example: Chiton, Pila (snail), unio (fresh water mussel), octopus.

Echinodermata:



Star fish

- Marine in habitat.
- Body is radially symmetrical, star shaped, spherical or elongate, Exoskeleton is spiny.
- Head is absent and five radially arranged arms present.
- Locomotion is with the help of tube feet.
- Sexes are separate.

Example: Asterias (star fish), Echinus (sea urchin),

Holothuria (sea cucumber), Antedon (feather star)

Chordate:

This phylum is characterized by three unique features, at least during the early stages of their development.

- A rod like structure called notochord lying above the digestive tract.
- A tubular nerve cord lying above the notochord.
- A pair of gill slits in the pharangeal region.

Only the nerve cord persists throughout the life of the organism. The notochord is usually replaced by a vertebral column and the gill slits disappear during the embryonic stage. Phyllum chordata is divided into three subphyla

- Sub phylum urochordata.
- Sub phylum cephalochordata.

Sub phylum Urochordata

Pyrosoma

- Marine in habitat.
- Notochord is found in the tail in the larval form. Hollow nerve cord is also present in the larva.
- Body is covered by a tunic.
- Phyarynx has several gill slits.

Example:

Herdmania, Doliolum, Pyrosoma

Sub phylum cephalochordata

Brachiostoma

- Headless, tiny fish-like chordates.
- Notochord, nerve cord without a distinct brain, gill slits and a port anal tail present.

Example:

Branchiostoma (Amphioxus)

Subphylum vertebrata

- This includes the majority of chordates.
- Head is prominent.
- Nervous system and exoskeleton are highly developed.
- Notochord is replaced by a jointed vertebral column.
- Two pairs of appendages (limbs).
- Aquatic animals have gills.

Subphylum vertebrata is sub divided into seven classes

- Cyclostomata
- Chondrichthyes
- Osteichthyes
- Amphibia
- Reptilia
- Aves
- Mammalia

Class cyclostomata:

Petromyzon (lamprey)

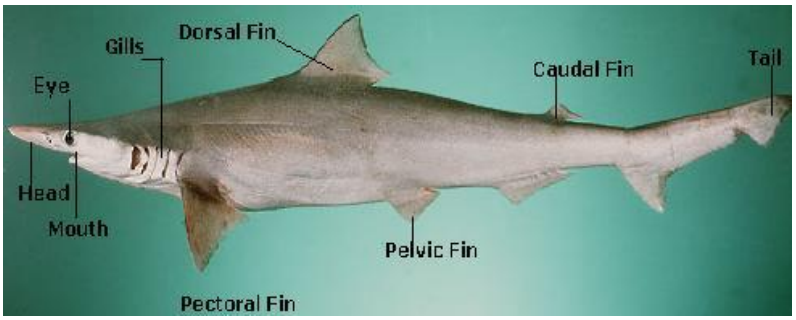
- Very primitive vertebrates.
- Do not have jaws. Being ectoparasites, mouth is of the sucking type with the help of which they stick to the host.
- Notochord present.
- Respiration is by gills enclosed in pouches.
- Heart has two chambers.

- Is cold blooded.
- Gonad is single and fertilization is external.

Example:

Petromyzon (Lamprey)

Class chondrichthyes (cartilaginous fish)



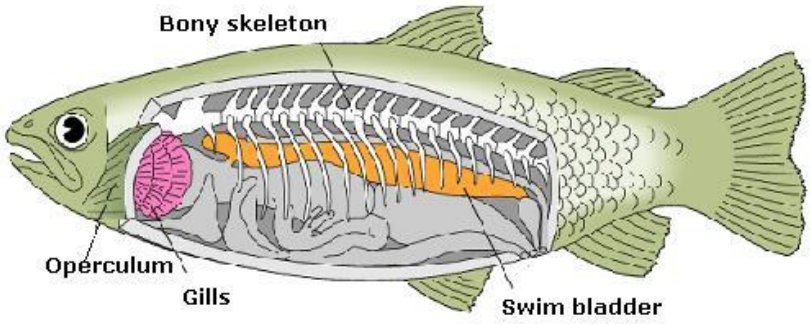
Scoliodon

- Large marine organisms.
- Body is flat, disc shaped or spindle shaped.
- Body is covered with placoid scales.
- Skeleton is cartilaginous.
- Respiration is through gills.
- Heart is two chambered.

Example:

Scoliodon (Indian shark), Torpedo (electric ray), Trygon (sting ray)

Class Osteichthyes (bony fish)



Labeo rohita (rohu)

- Found in lakes, rivers and seas.
- Spindle shaped body covered with cycloid or tenoid scales.

- Mouth is anterior.
- Skeleton is partly or completely bony.
- Gills are filamentous.
- Heart is two chambered.

Example:

Labeo (carp), Exocoetus (flying fish), Hippocampus (sea horse),

Anabas (climbing perch), Protopterus (lung fish)

Class amphibia

Dendrobates

- Live in both water and on land.
- Respiration is by gills, lungs or skin.
- 3 chambered heart.
- Is cold blooded.
- Have two pairs of pentadactyl (5 digit) limbs which may be absent in some cases.

Example:

Rana (frog), Bufo (toad), Hyla (tree frog), Necturus

Class Reptilia (creeping vertebrates)

Flying lizard (Draco)

- Mostly terrestrial.
- Heart is 3 chambered, is cold blooded.
- Breathe through lungs.
- Body covered with scales.
- Have two pairs of pentadactyl (five digit) limbs which are absent in snakes.

Example:

Hemidactylus (wall lizard), chameleon, Draco (flying lizard)

Class Aves (birds)

Sparrow

- Arboreal in habitat i.e, they live on trees.
- Warm blooded. 4 chambered heart.
- Body covered with feathers.
- Lungs have membranous extensions called air sacs to make the body light.
- Mouth is surrounded by a beak. Teeth are absent.
- Fore-limbs are modified into wings.

Class mammalia (mammals)

Chimpanzee

- Most intelligent of all organisms.
- Warm blooded with 4 chambered heart.
- Give birth to young ones.
- The mother suckles her young ones on milk secreted by special glands called mammary glands.
- Body covered with hair.
- Have two pairs of pentadactyl limbs.
- Breathe through lungs.