ANIMAL

KINGDOM

BY MRIDUL YADU

MBC – Mridul Bhaiya Classes

B.Sc 1st NOTES

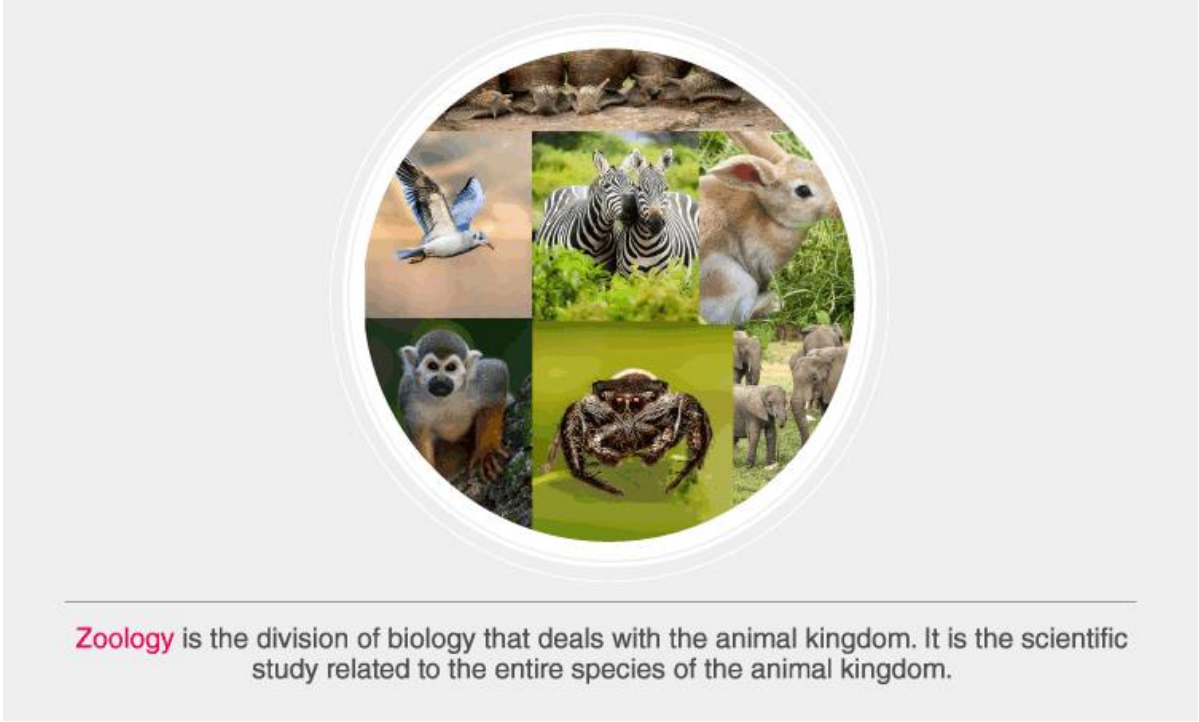
ZOOLOGY NOTES

PART - 01

GENERAL CHARACTERISTICS AND CLASSIFICATION OF PROTOZOA AND PORIFERA

TYPE STUDY – PARAMECIUM AND SYCON

- ✓ Detailed notes
- ✓ PYQs with answers
- ✓ Graphics included



UNIT – 01 (SEMESTER 1ST)

TOPICS TO BE COVERED

A. General Characteristics and Classification of Phylum Protozoa (Upto Class)
Protozoa – Type study : Paramecium

B. General Characteristics and Classification of Phylum Porifera (Upto Class)
Porifera – Type study : Sycon

GENERAL INTRODUCTION :

ANIMAL KINGDOM

In our day to day life we observe various types of small and large sized animals, but animal kingdom is very vast in comparision to our knowledge. It is necessary to classify animals of such a large group, so that Zoologist may provide all the necessary information about the animals he is studying.

What is Classification ??

"Division of animals on the basis of similarities and dissimilarities of characters is known as classification"

NOTE : Taxonomy is the branch of Zoology deals with the classification and naming of animals

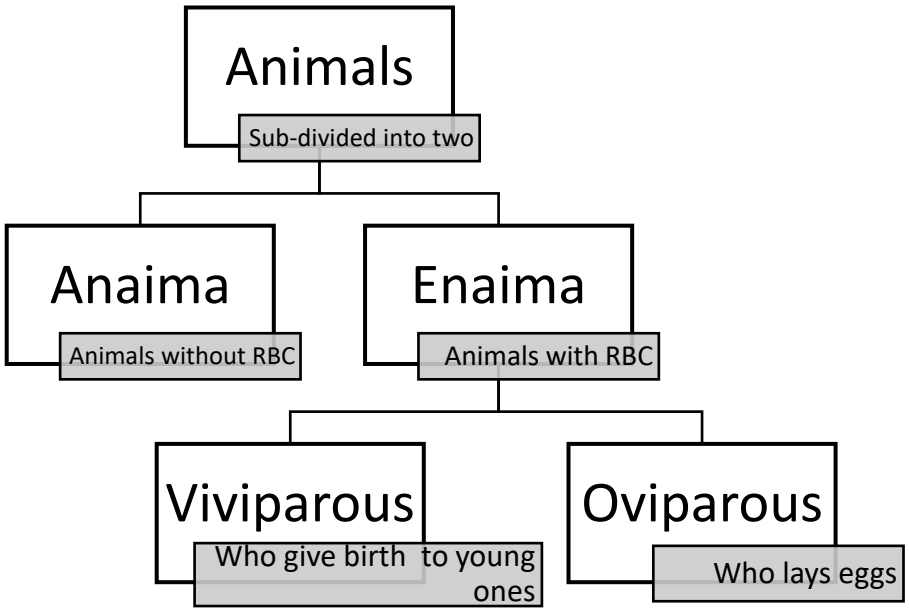
Basic Features of All Animals

1. Multicellulatiry
2. Holozoic mode of nutrition
3. Eukaryotic
4. Nervous system
5. Locomotion etc

} METAZOA

Brief History of Classification

Aristotle was the first to classify the living beings on the basis of similarities and dissimilarities into two main divisions :



After Carolus Linnaeus's Two kingdom Classification, **Haeckel** gave Three kingdom Classification where he included **Kingdom Protista** which includes lower grade of micro-organism (e.g protozoa) and other microplants which cannot be differentiated easily into a separate kingdom.

Basis of Classification

1. Level Of Organisation

i. Protoplasmic Level of Organisation
ii. Cellular Level of Organisation
iii. Tissure level of Organisation
iv. Organ Level of Organisation
v. Organ System Level of Organisation

2. Body Plan

i. Cell Aggregate type : These animals have cluster of cells with no coordination among themselves and are not organised into tissue.

ii. Blind Sac Type : There is only one opening in its digestive system

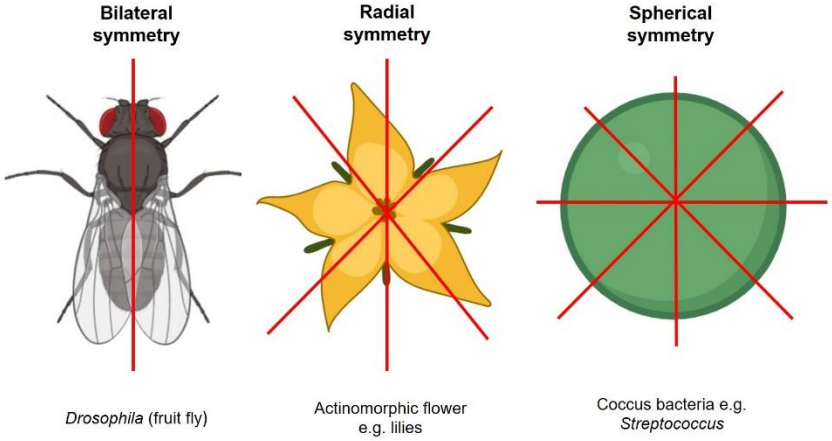
iii. Tube-within-a-tube Type : It has two tube, one followed by body wall and other is formed within it by digestive tract. The digestive system is continous tube with an opening at each end.

3. Body Symmetry

i. Asymmetrical : When body of the animal cannot be divided in two equal halves.

ii. Symmetrical : When body of the animal is divisible into two halves by more one or more planes.

a) **Spherical symmetry :** The animals have spherical shape and hence any plane passing from the center divides the organisms into two equal halves.
b) **Radial Symmetry :** The body parts radiate from a central axis in a manner that any plane that passes through the central axis divides the organism into two similar halves.
c) **Bilateral Symmetry** : The right side of an organsims is the mirror image of the left side such that the body is divided into right and left side in one plane only.



4. Segmentation

Segementation is differentiation of the body into distinct portions called segments.

i. Metameric Segmentation : When segmentation affects both external and internal parts, it is called metameric Segmentation.

ii. Pseudometamerism : When the body is naturally divided, for example, segments of tapeworm.

5. Germ Layers

The bilateral symmetrical animals develop embryologically from three layers of tissue. Inner layer or Endoderm ; An outer Layer or Ectoderm ; Middle layer or Mesoderm.

i. Diploblastic : In this, cells are arranged into two embryonic layers, an external ectoderm and internal endoderm with an undifferentiated mesoglea (middle glue).

ii. Triploblastic : In this, the developing embryo has a differentiated mesoderm as the third germinal layer.

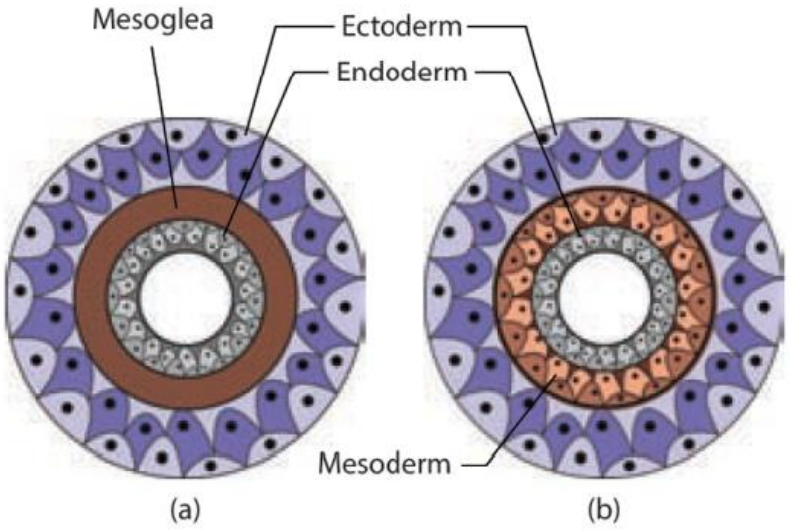


Figure 1.4 Showing germinal layers: (a) Diploblastic and (b) Triploblastic.

6. Coelom

Simple animals such as sponges and Coelenterates can allow the passage of substance in and out of the body very efficently. This task is accomplished with the help of coelom which is a body cavity between the body wall and gut wall and is lined by mesoderm.

i. Coelomates : These animals contain coelom.

ii. Psedocoelomates : These animals contain fluid filled cavity (pseudocoel or false cavity) that houses the organs but is not lined by mesoderm.

iii. Acoelomates : These animals do not contain coelom. If their organs are present, they are embedded within the other tissues of the body.

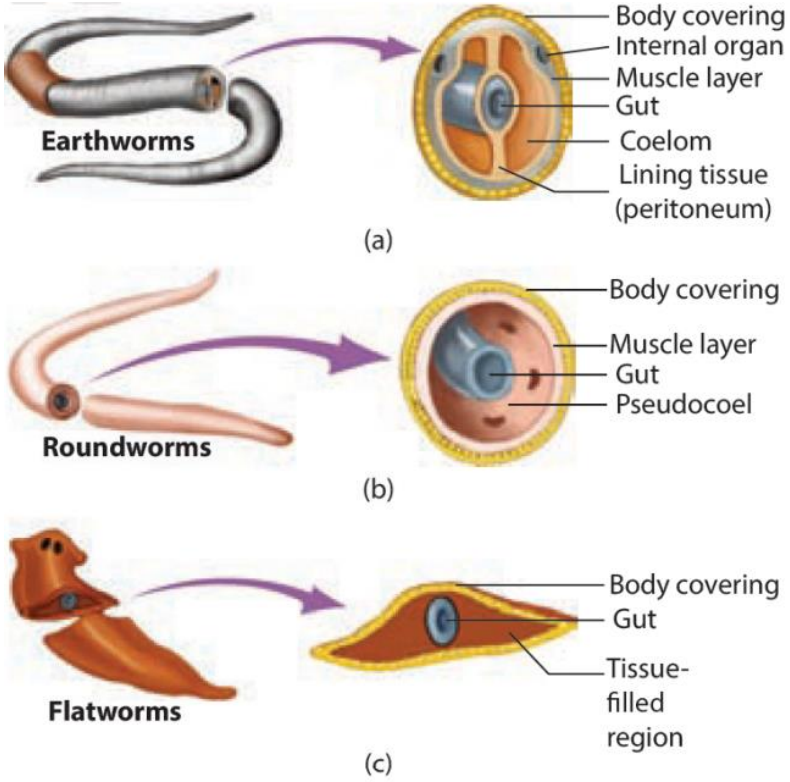
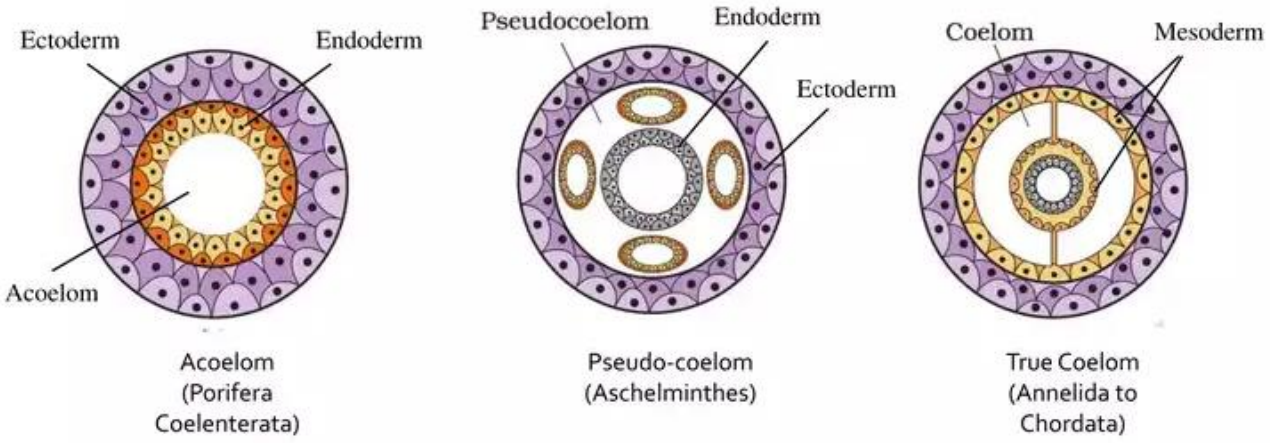


Figure 1.5 Animal coelom. (a) Coelomate, (b) pseudocelomate and (c) acoelomate.



7. Notochord

Notochord is a rod-shaped structure, derived from mesoderm, formed dorsally between the nerve cord and the gut (stomach and intenstines) during embryonic development.

i. Chordates : Animals with notochord at some stage of their life cycle.

ii. Non-chordates : Animals without notochord. It constitutes organisms from porifera to hemichordata.

8. Types Of Organ Systems

Digestive System

i. Intracellular Digestion : When the ingested particles are digested by the ezymes secreted by the food vacuoles within the cells.

ii. Intercellular or Extracellular : When the food particles are digested outside the cells in alimentary canal.

- **Complete :** If there are two openings in the digestive system (one for intake and another for elimination)
- **Incomplete :** If the same opening serves as mouth and anus.

Circulatory System

i. Closed Type : When the blood circulates within blood vessels but does not come in contact with the other body cells as it circulates throghout the body.

ii. Open Type : When during its flow, it mixes with tissue fluid and bathes the internal tissues, body cavities or sinuses of an animal

Reproductive System

Sexual Dimorphism is observed in cases where the male and female organisms can be differentiated just by appearance.

i. Dioecious : An individual bearing organs of only one sex is termed as dioecious.

ii. Monoecious : An individual producing both eggs and sperms is termed monoecious.

During the growth and development of the organsims into a mature individual, various changes are induced at various stages. The development can be :

i. Direct Development : When the embryo develops directly into a young one. Which resembles its parent in all aspects except color and size.

ii. Indirect Development : When the young one undergoes metamorphosis in various larval stages to develop into an individual that has little resemblance with its parent.

Excretory System

i. Glandular : A large cell is connected to the excretory pore by a duct which ends in ampulla.

ii. Tubular : Two or more longitudinal canals are connected anteriorly with each other.

Skeletal System

i. Exoskeleton : It lies outside the body. It is formed of dead structures like chitinous plates and claws in mammals.

ii. Endoskeleton : It is present inside the body. It is formed of living structures like cartilages and bones in vertebrates.

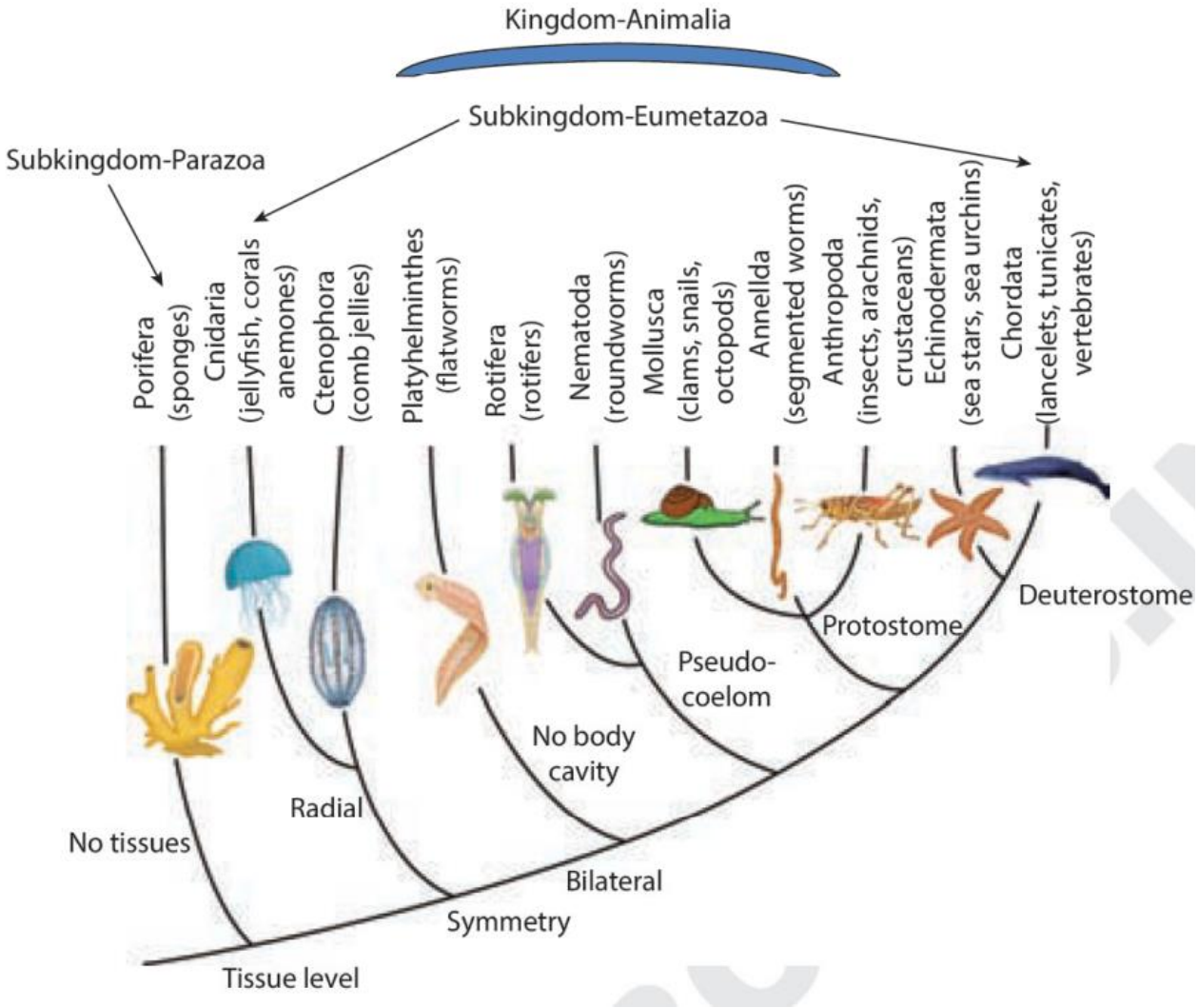


Fig : Animal Classification

Points to Remember

The main features that form basis of classification in animals is shown in Figure 1.7.

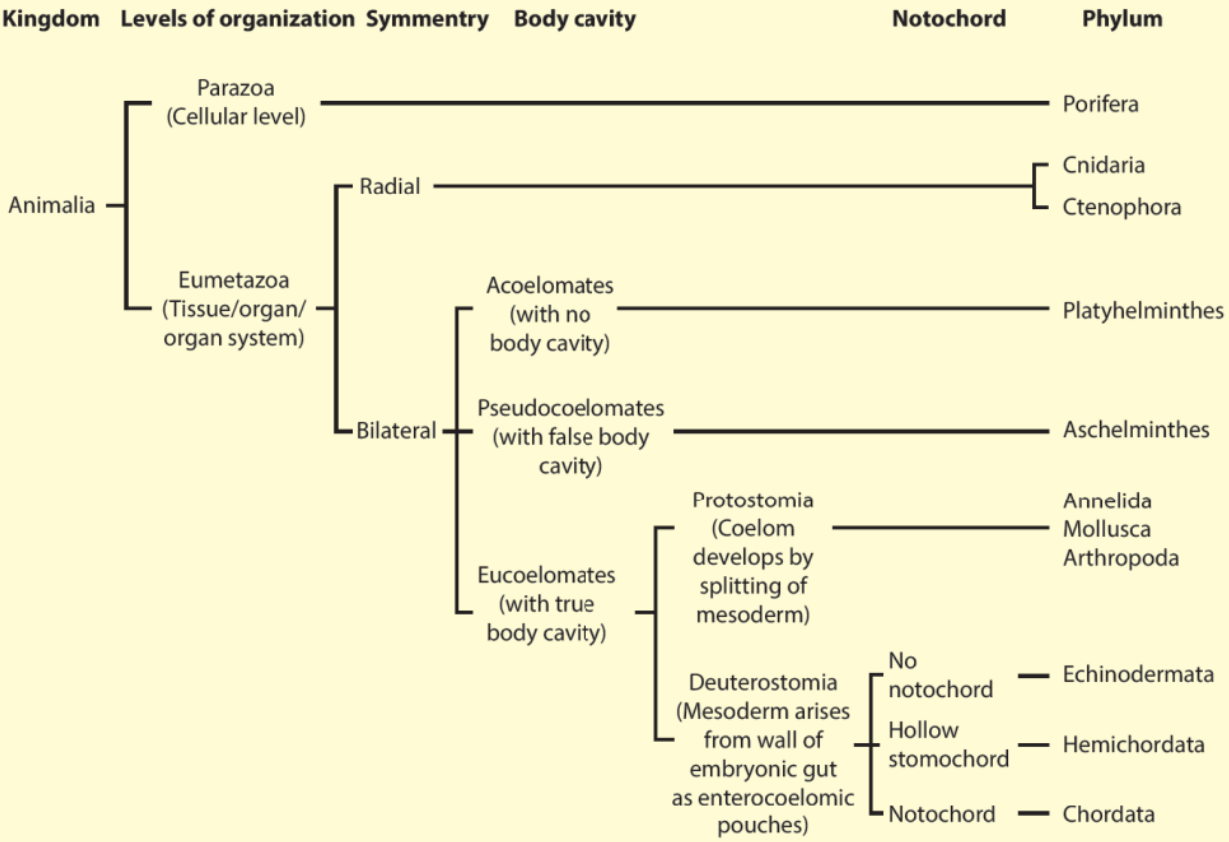
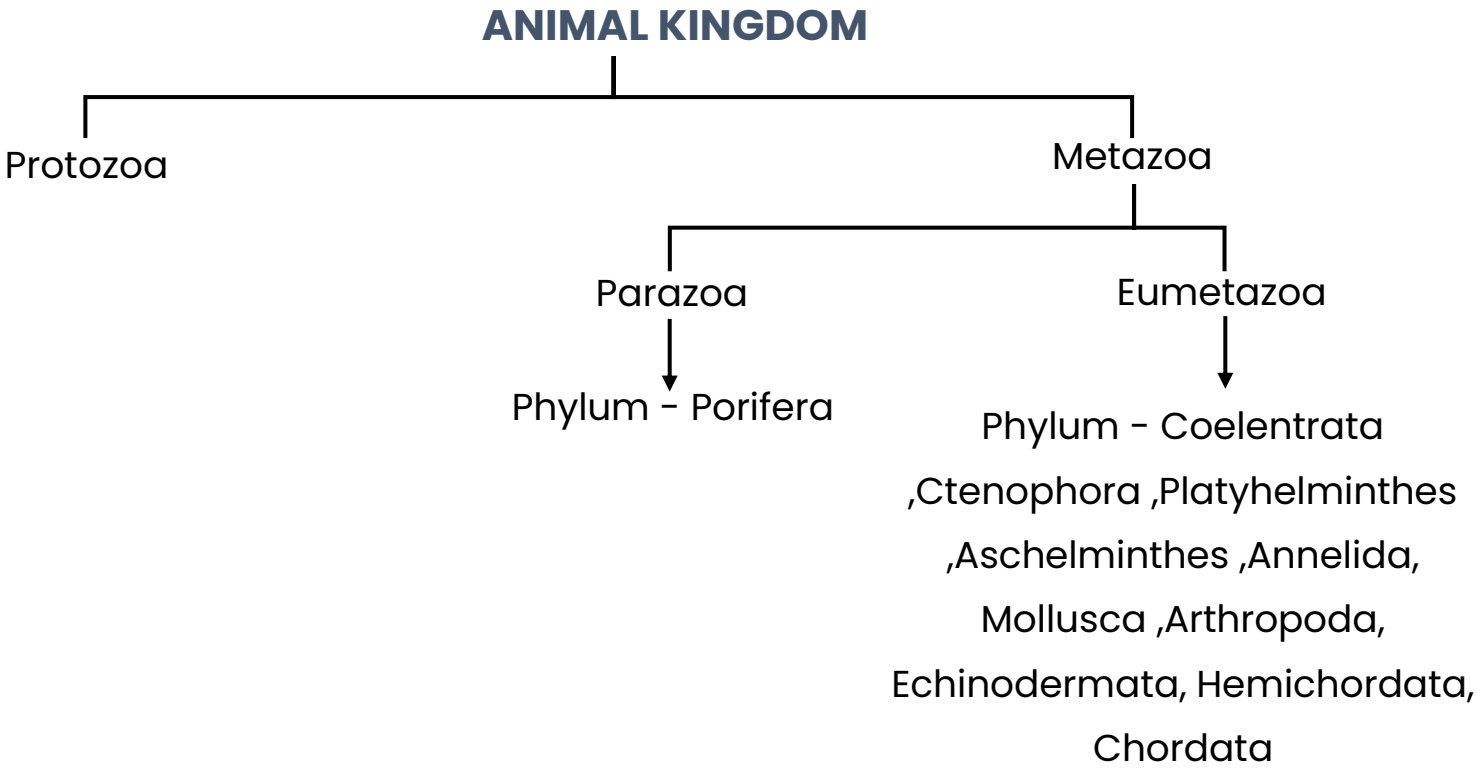


Figure 1.7 Summarization of features used in animal classification.



UNIT-01

GENERAL CHARACTERISTIC AND CLASSIFICATION OF PHYLUM PROTZOZOA

TYPE STUDY - PARAMECIUM

[Greek Proto = first/Primitve + Zoan = animals]

→ Structrually simplest and most primitive unicellular animals.
→ Protozoans were first studied by **Leeuwenhoek** with the help of microscope and referred to them as microscopic animalcules.
→ The term Protozoa was coined by **Goldfuss**
→ The study of Protozoa constituents **Protozoology**

All the animals of this group are acellular or unicellular. Structurally simple and most primitive, yet capable of performing all essential vital activities and having an independent existentance that is why they may be called as non-cellular or acellular animals.

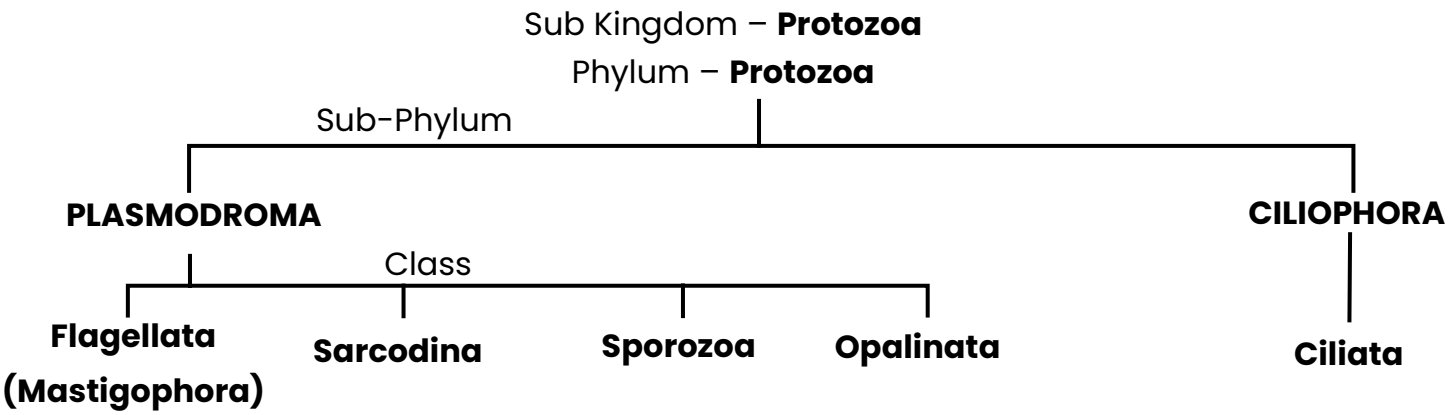
About more than 50,000 species are known (30000 living and 20000 extinct)

General Characteristics

1. Protozoa are minute, usually microscopic unicellular animals.
2. Simplest and most primitive of all animals, With protoplasmic grade of organisation.
3. Body of this group is unicellular, organelles are present.
4. One or several Nuclie which are monomorphic or dimorphic
5. **Shape of body** : Variable – Spherical, Oval, Elongated, Irregular
6. **Body symmetry** : None, Bilateral, Radial or spherical
7. Solitary or forming colonies/colonial or both
8. Body naked or covered by thin pellicle. Some with hard covering called shell, and other with exoskeleton called as test or lorica
9. **Locomotion** : Psedopodia or Flagella or Cilia or in some locomotry organ is absent
10. Single cell perform all activities
11. **Nutrition** : Holozoic (animal like), holophytic (Plant like), Saprophytic or Parasitic.
12. **Respiration and Excretion** : Through General Surface of body by diffusion.

13. **Reproduction** : asexual [Fission or budding] and sexual [gametes or conjugation].
14. **Life Cycle** often exhibits alternation of generation.
15. **Excretion and osmoregulation** through Contractile Vacuoles.
16. Some animals of this phylum form Cyst or spores during unfavourable conditions.
17. **Habitat** : Free living, Generally Aquatic (Fresh Water, Sea Water/Marine, Moist area). Parasites and Symbiotic are found inside the body of the other animals

Classification



SUB-PHYLUM

1. PLASMODROMA

→ Locomotion is either by Pseudopodia or Flagella.
→ Nucleus one or many, generally all are alike.
→ Nutrition autotrophic or heterotrophic or by both type.
→ Sexual reproduction by complete fusion or syngamy, but no spore formation.
→ Asexual reproduction by binary fission or by multiple fission.
→ Life cycle exhibits alteration of generation.

Class – 1. Flagella or Mastigophora

[**Gr** : Mastix = whip + phoros = bearing **L** : Flagrum = a whip]

Characters

1. Protoplasma is not differentiated into Ecto or Endoplasma.
2. Presence of a firm and elastic covering of a pellicle or cuticle and body form is always constant.
3. Presence of single nucleus

4. Simple, Primitive, Solitary and colonial
5. Some flagellates are pigmented and exhibit both protozoan and algal characters.
6. Locomotory organelle – Flagella, In some pseudopodia is also formed.
7. Nutrition : Autotrophic and Heterotrophic or Both
8. Asexual reproduction by longitudinal binary fission.
9. Free living or parasitic.
10. Ingestion at definite cytosome.

EXAMPLES – *Euglena, Trichomonas, Tripansuma, Leishmania*

Class – 2. Sarcodina

[**Gr** :Sarcodes = fleshy]

Characters

1. Mostly Free living or parasitic and aquatic
2. Internal or external shell is present on the body of some. In some skeleton may be present.
3. Locomotion by Pseudopodia.
4. Nutrition : Holozoic, or saprophytic type.
5. Presence of contractile vacuoles in fresh water animals. Contractile vacole is absent in sea/Marine water and parasitic animals.
6. Reproduction generally asexual and by binary fission.
7. Generally sopres are not formed in the animals.

EXAMPLES – *Entamoeba histolytica, E.coli, E.gingivalis*

Class – 3. Sporozoa

[**Gr** : Spora = seed + Zoan = animal]

Characters

1. Animals are found as extra or intra-cellular parasite in the body of invertebrate and vertebrate animals.
2. Presence of a covering of a cuticle over the body.
3. Locomotry organs absent.

4. Absence of contractile vacuoles
5. Nutrition : Saprobiotic type, and ingestion by diffusion from the general surface of body.
6. Asexual Reproduction : Multiple Fission
   Sexual Reproduction : Conjugation, after which spores are formed.
7. Presence of alteration of generation in life cycle.

EXAMPLES – *Plasmodium, Saucocystis*

Class – 4. Opalinata

Characters

1. Cytosome absent.
2. Cilia are of similar size and are uniformly distributed all over the body.
3. Nucleus two or more all of similar nature.
4. Sexual reproduction by conjugation.
5. Contractile vacuole absent.
6. Ectocommensal or present as an endoparasite in the intestine of animal.

EXAMPLES – *Opalina*

2. CILIOPHORA

[**L** : cilium = eyelid + ferre = to bear]

→ Cilia are in the form of locomotory organelles
→ Nucleus two – Micro and Macronucleus
→ Asexual reproduction : Binary fission and budding
→ Sexual reproduction : Conjugation
→ Absence of alteration of generation in life cycle.

Class – 1. Ciliata

Characters

1. Generally the animals are solitary, free swimming, some are ecto and endoparasites
2. Mostly aquatic animals – Fresh water or sea/marine water.

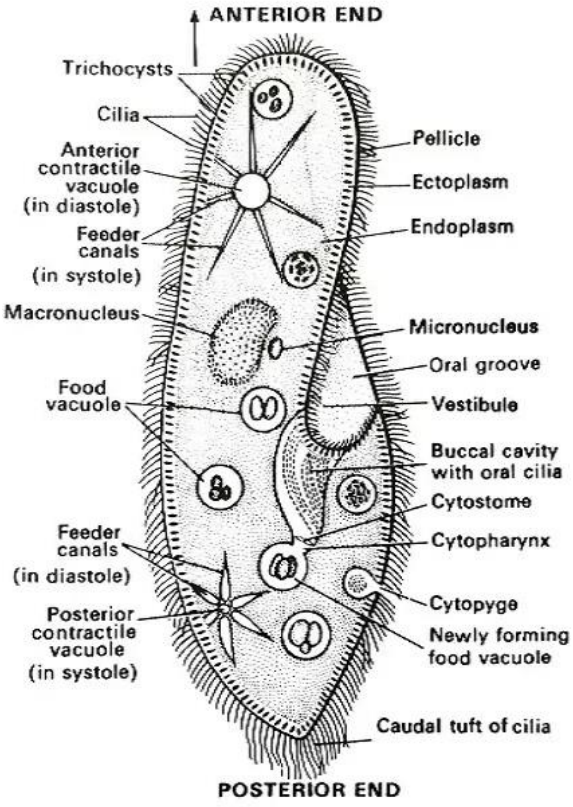
3. Presence of firm pellicle covering over the body.
4. Presence of numerous cilia on body as locomotory organelle
5. Presence of one or more contractile vacuoles.
6. Except parasite, cytosome is present in all the animals
7. Nutrition : Holozoic
8. Absence of tentacles.
9. Absence of alternation of generation in life of animals
10. Asexual reproduction by binary fission and budding.

EXAMPLES – *Paramecium, Balantidium*

TYPE STUDY : PARAMECIUM

CLASSIFICATION :

Phylum – Protozoa
Sub Phylum – Ciliophora
Class – Ciliata
Order – Hymenostomatida
Genus – Paramecium

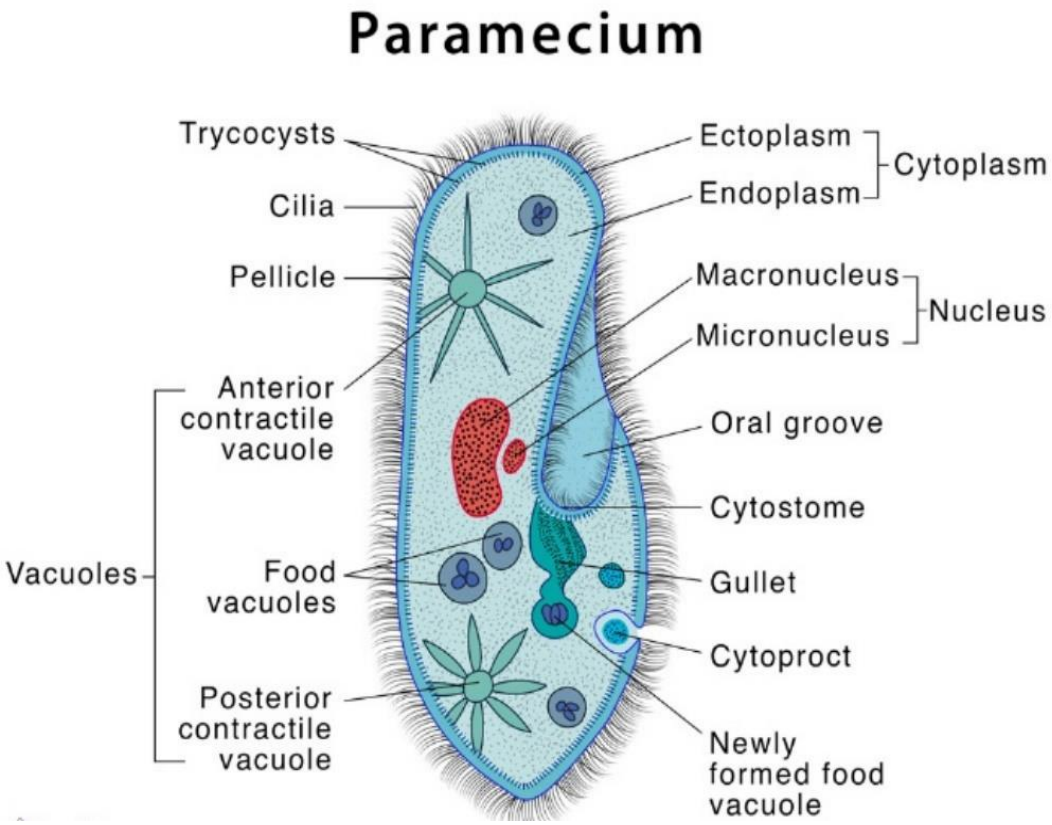


CHARACTERS :

1. **Habitat** : Free living found in fresh water ponds.
2. **Shape** : Slipper like
   Body is covered by **Pellicle.**
   Anterior end is spherical and Posterior end is pointed.
3. Cytoplamsa is differentiated into Ecto and Endoplasm.
4. Cilia are present and helps in locomotion.
5. On the Postero-lateral side of the body a depression – Mouth/**Cytosome** is present which opens posteriorly into **cytopharynx**
6. Cytopharynx opens into round reservoir.
7. Very small spindle shaped structure are present in ectoplasm known as **Trichocyst**.
8. Two types of nuclei : One small micronucleus and one large Macronucles.
9. Presence of two contractile vacuoles – one at posterior end and one at anterior end. Around them radiating canal are present.
10. Both Sexual (Conjugation) and Asexual Reproduction (Binary Fission) takes place.

HABIT AND HABITAT :

Paramecium caudatum (**Gr** : Paramekes = oblong + **L**. : caudata = tail) is available all over the world in fresh water ponds, rivers, pools, lakes etc. (some are found in marine water). It is visible from naked eyes and looks like sole of slipper, hence known as '**slipper animalcule**'



STRUCURE :

Shape and Size :

→ It is small unicellular microscopic animal.

→ It is roughly cylindrical in shape (slipper like), being round at the anterior end and pointed at the posterior end.

→ Ventral or oral surface is flat and the dorsal aboral surface is convex.

(A) External Structure :

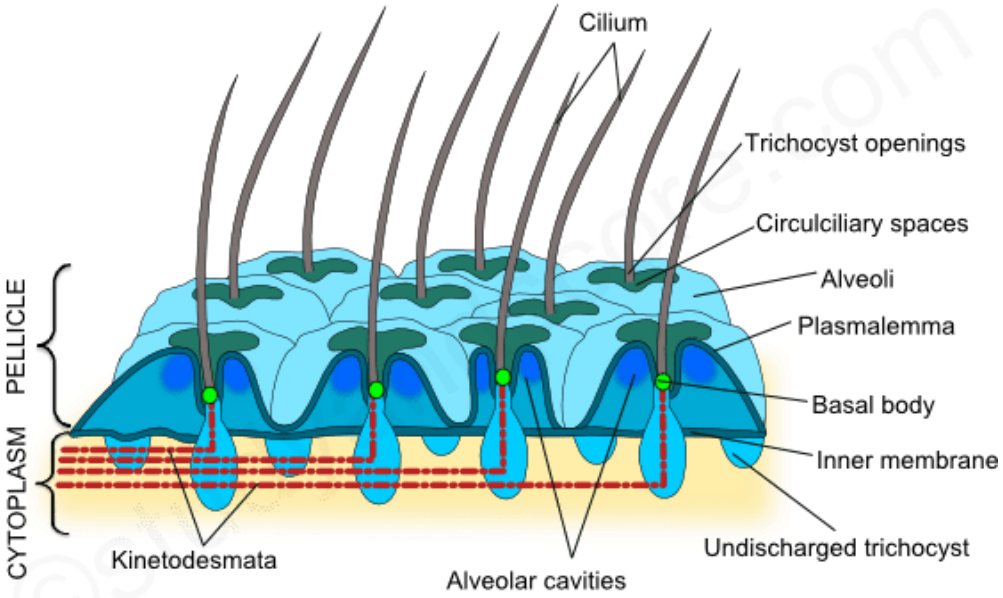
1. Pellicle : The body is covered by a firm, double layered and elastic pellicle formed by a cuticle.

→ It holds the shape and elasticity of the body.

→ It is found to be made up of large depressions, each hexagonal depression is perforated by a small aperture, through which a single cilium projects out.

→ The anterior and posterior margins of hexagonal depression bear the openings of **Trichosyst.**

→ Each depression represents alveolar, all these alveolar together forms the double layer, which are known as **outer alveolar membrane** and **inner alveolar membrane** respectively.



ULTRA STRUCTURE OF PELLICLE AND INFRA CILIARY SYSTEM

2. Oral Groove and Mouth apparatus :

On ventral surface a clear and oblique depression is present which is known as oral groove. It is also called **Vestibule**

→ Due to this paramecium becomes asymmetrical.

→ The vestibule leads directly to fixed oval shaped opening known as **cytosome** or mouth.

→ Extending directly from the cytosome towards center of body is **Cytopharynx**

→ The cytopharynx then turn sharply towards posterior side to become slender opening the **oesophagus.**

→ Finally cytopharynx leads into forming of **food vacuole.**

→ Undigested food is eliminated through small aperture known as **Cytopyge.**

3. Cilia :

The entire body of the paramecium is covered with several small cilia.

→ Cilia occur in longitudinal rows over body, this condition is known as **holotrichous.**

→ Its internal surface contains watery substance the **matrix.** In matrix eleven longitudinal fibrils, 9 at periphery and 2 at centre are present.

→ Each fibril composed of two subfirbril A and B. From each subfibril two arms arises.

→ The two central fibril is covered with common membrane.

→ In between peripheral and central fibrils, radially oriented fibres are present.

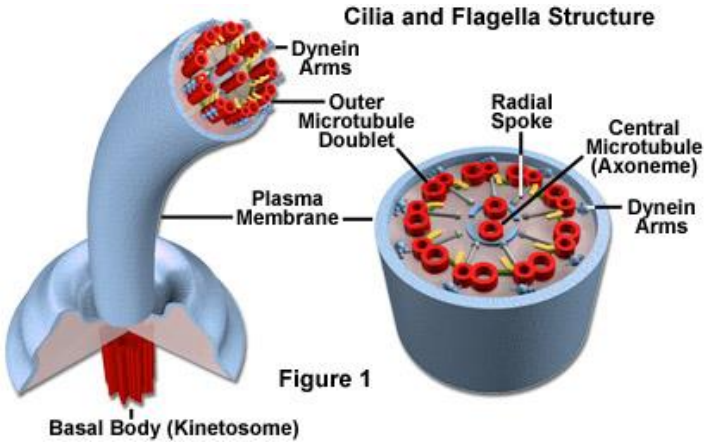
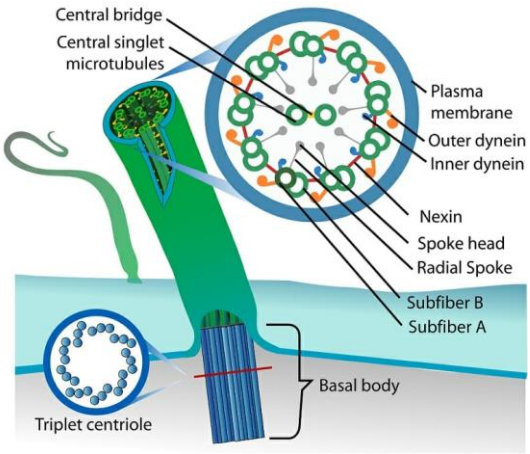


Figure 1



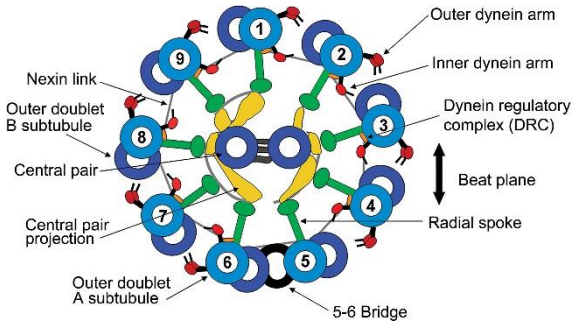
Two types of cilia are present in Paramecium – (a) Somatic cilia (b) Buccal cilia

(a) Somatic cilia : They are of same length arranged in longitudinal rows. Certain Long cilia forms **Caudal tuft.**

(b) Buccal cilia : The cilia of mouth apparatus is known as Buccal cilia.

Function of cilia

(i) They help in swimming
(ii) The oral groove cilia helps in the ingestion of food,
(iii) They help in receiving the sensory impulse.



(B) Internal Structure :

1. Cytoplasm :

The cytoplasm is differentiated into **Ectoplasm** and **Endoplasm**.

(i) Ectoplasm : Outer most part of cytoplasm. It contains Trichosyst and Infraciliary sys.

(a) Tricocyst - They are special type of rod shaped organelles,

→ Each trichocyst has a long shaft and a conical **head** or **spike** covered over by a protoplasmic cap.
→ In shaft a fibrous protein **Trichinin** is present.
→ It serve to anchor the substratum and able to paralyse the prey.

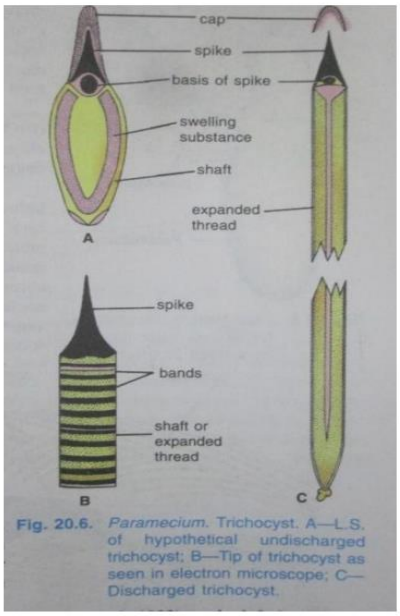
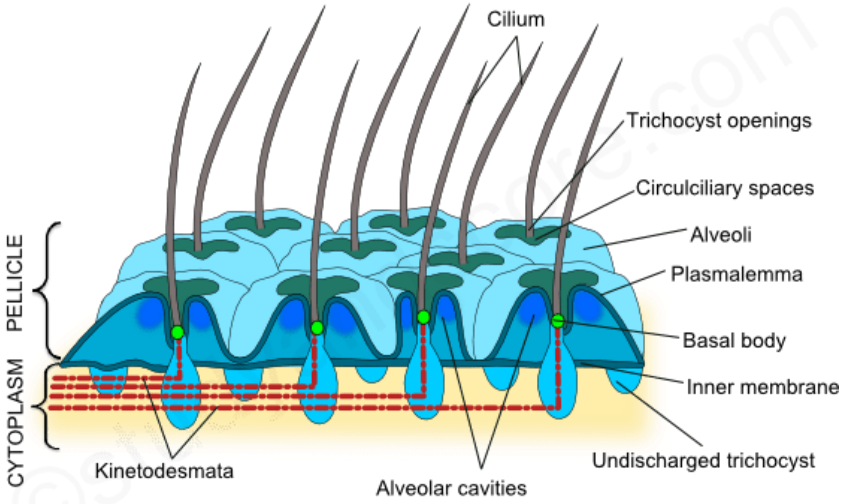


Fig. 20.6. *Paramecium*. Trichocyst. A—L.S. of hypothetical undischarged trichocyst; B—Tip of trichocyst as seen in electron microscope; C—Discharged trichocyst.

Mechanism :

- Trichosyst when simulated, cap is lifted and water enters the capsule, so that substance of capsule expand and immediately shot a hollow thread with spike attached to it.

(b) Infraciliary system – The cilia together with their associated organelles **basal granule** and **kinetodesmata** just below pellicle alveoli is called infraciliary system.



ULTRA STRUCTURE OF PELLICLE AND INFRA CILIARY SYSTEM

(i) Endoplasm : It is inner, soft and more fluid part of cytoplasm.

(a) Nucleus – There are two types of nucleus. **Macronucleus** (it control all the vegetation and bioloical activities in body) and **Micronucleus** (it participate in reproduction)

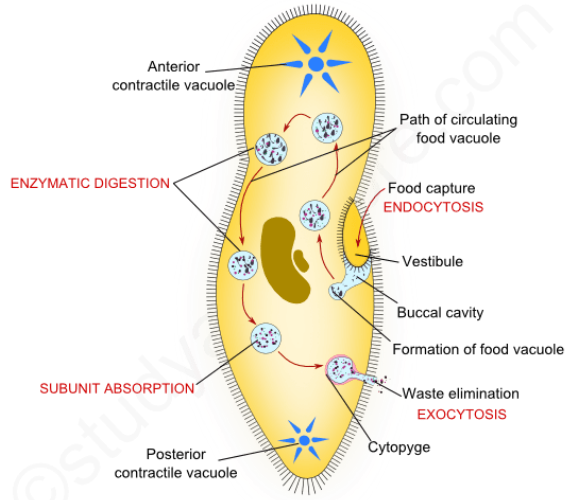
(b) Contractile Vacuoles – It has two contractile vacuoles (anterior and posterior).

Function of contractile vacuole :

(i) They remove excess of water.
(ii) The vacuoles are also excretory and repiratory.
(iii) They are osmoregulatory structures.

(c) Food Vacuoles – These vacuoles have food materials in the process of digestion.

As soon as vacuole is separated from the cytosome it is swept away by the rotatory streaming movement of endoplasm known as **Cyclosis.**



FORMATION OF FOOD VACUOLE AND PROCESS OF CYCLOSIS IN PARAMECIUM

LOCOMOTION :

Paramecium mainly moves by the motion of cilia, and its steam line body also helps in the swimming. The important feature of Paramecium is the high speed of locomotion.

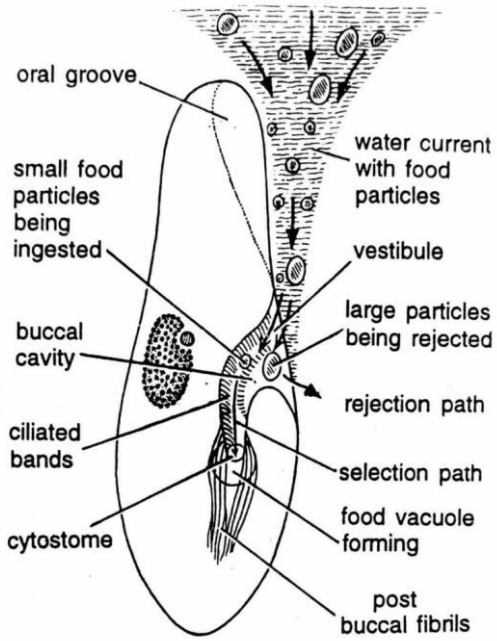
Paramecium performs locomotion by two methods.

(i) Cililary movement
(ii) By metaboly or Body contraction

NUTRITION :

- In paramecium the nutrition is of Holozoic type.
- It generally feed on bacteria, diatoms, algae, and yeast etc. It is a selective feeder and shows a choice in the selection of food.
- It does not wait for food, but hunt for it actively.
- Digestion and Assimilation is done through food vacuoles.
- Food vacuoles are carried by steaming movement of endoplasm cyclosis.

- Food vacoles gradually become smaller which is eliminated from the body through the cytopyge.



RESPIRATION AND EXCRETION :

In paramecium the respiration and excretion takes place thorugh the semi permeable pellicle.

Respiration : In this process soluble oxygen of water is taken from surrounding water by diffusion, and is used in protoplasmic molecules.

Excretion : Most of the nitrogeneous substance soluble in water, diffuses outside the body by pellicle and contractile vacuoles.

OSMOREGULATION

The regulation of water contents and excretion done by contractile vacuoles in paramecium is known as osmoregulation (balance of ions).

REPRODUCTION

Paramecium reproduces both sexually and asexually. It reproduces asexually by transverse binary fission and sexual by conjugation.

Beside it undergoes Endomixis, Hemimixis, Cytogamy and Autogamy.

1. Transverse Binary fission :

→ Paramecium reproduces asexually by transverse binary fission during favourable condition.

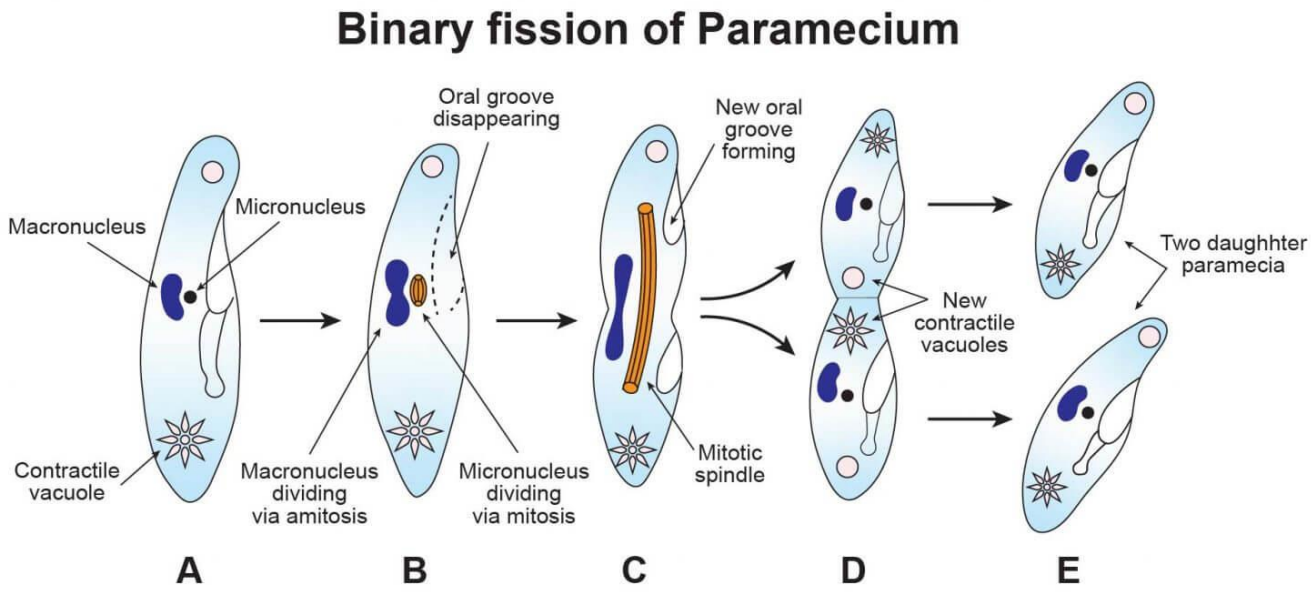
→ In this process the macronucleus elongates and divides by amitosis into two, and micronuclie divides into two by mitosis. And both daughter nuclei separate and moves to opposite poles.

→ After this cytopharynx is budded off and forms a second cytopharyx which moves apart.

→ Two new contractile vacuoles appear.

→ A transverse furrow appears in the middle of the body and deepens until the cytoplasm is completely divided.

This results In two daughter paramecia of equal size, each containing a set of cell organelles.



2. Conjugation :

In paramecium conjugation is a temprorary union of two individual during which there is exchange of nuclear material.

→ Conjugation takes place between two different strains + and – of the same species. Also known as conjugants.

→ Conjugants become sticky and adhere together by sticky nature of ectoplasm. And unite by their oral groove.

→ The pellicle in between degenerates and a protoplasmic bridge is formed between two animals.

→ Macronucleus of each conjugants gradually disintegrate and finally destroyed. And micronucleus in each undergoes meiotic division to produce four haploid micronuclei.

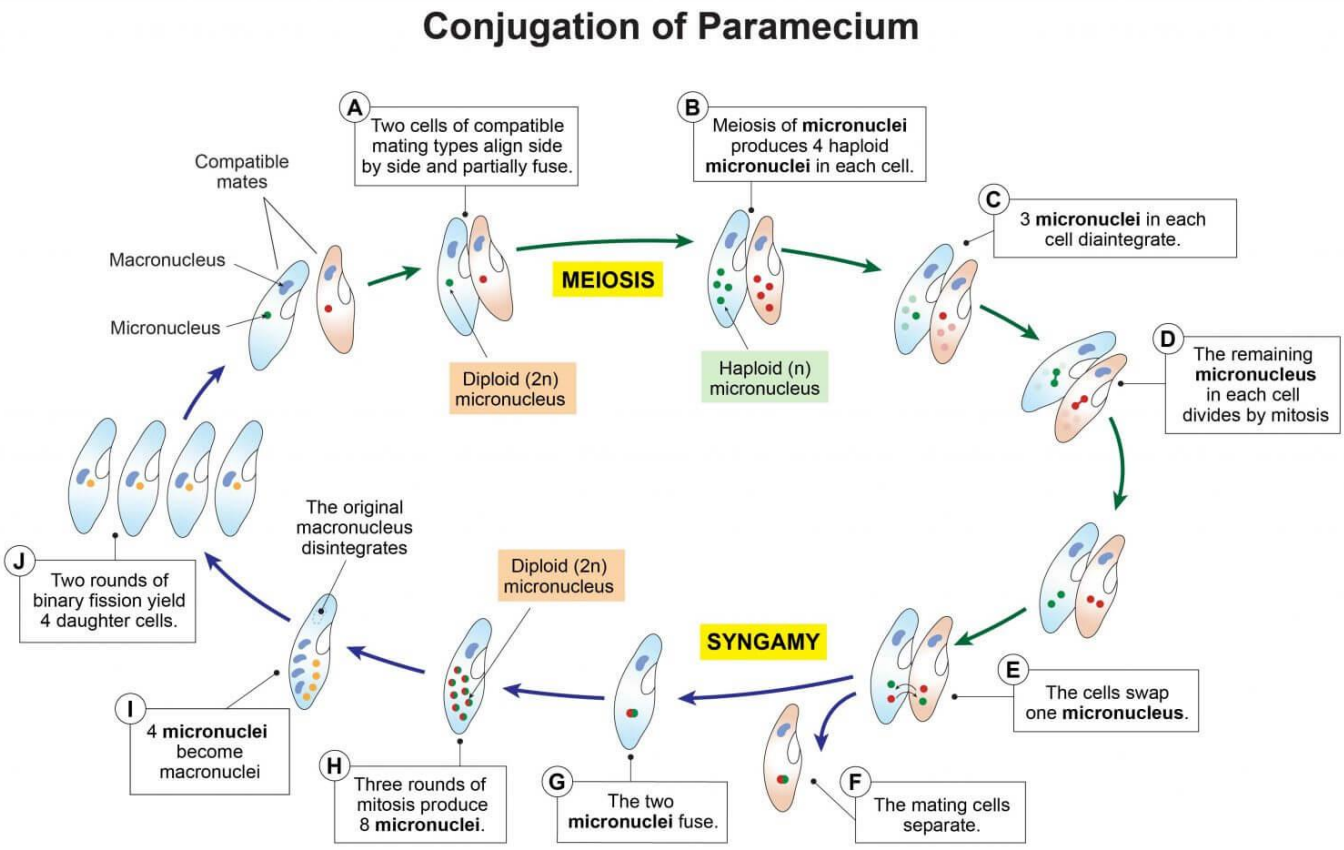
→ Three of these four micronuclei degenerate in each, so that only one remains. The remaining micronuclei divides mitotically into two unequal gametic nuclei.

→ Small pronucleus is called as male or wandering pronucleus. Whereas larger pronucleus is called femal or stationary pronucleus.

→ The male fuses with female and zygote is formed. After this both conjugants separates.

→ In each, the zygote nucleus divides thrice mitotically to produces eight nuclei, four becomes micronuclei and four becomes macronuclei. Out of these 3 micronuclie degenerates.

→ Left out micronucle divides twice, and undergo two cytosomal division. Resulting in four daughter paramecium each.



Features and Singnificance of Conjugation

1. The paramecium which takes part in this process are different from that of common paramecium and are small and sticky.
2. In this process the fusion of two individual is temporary.
3. Conjugaation is in between the two different strains of same species.
4. In this process there is a exchange of nuclear material between the two individual.
5. After conjugation, individuals seperates and multiplies and grows by asexual methods.
6. In this process there nuclear exchange and reorganisation and in last eight daughter paramecium are formed.

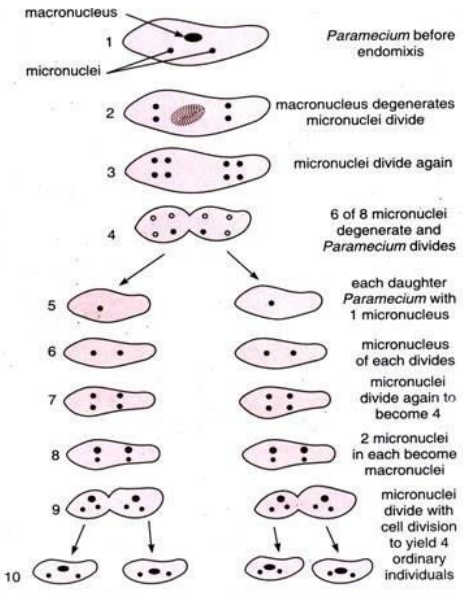
Benefits of conjugation

a) Rejuvenation
b) Nuclear reorganisation
c) Heredity variation

3. Endomixis :

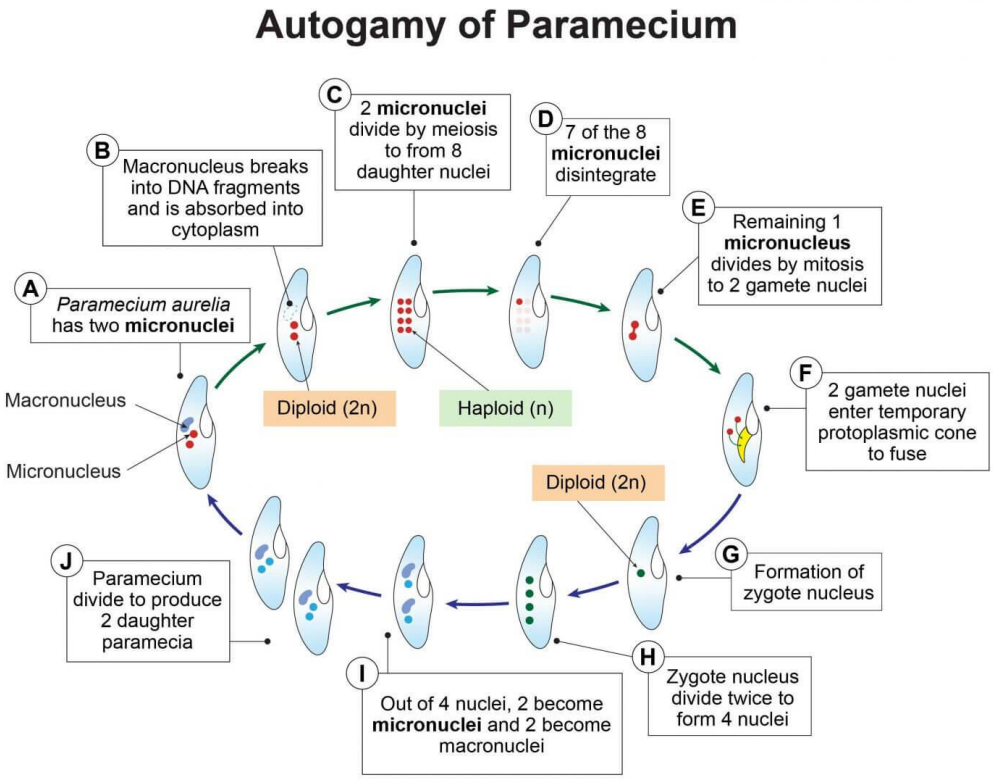
In this process, nuclear organisation occur in only one individual ; after that animal body is divided into two daughter animal.

- It occurs within single individuals.
- In the process, the vegetative macronucleus degenerates and disappears.
- While the micronuclei divide twice by mitosis forming 8 daughter nuclei of which 6 degenerates.
- At this stage, animals divide by fission into 2 cells, each with one micronucleus.



4. Autogamy :

In this process two micronucleus of the same individual fuse together.



→ The Macronucleus breaks into fragments and is absorbed into cytoplasm.

→ 2 micronuclei divide by meiosis to form 8 daughter nuclei

→ 7 of the 8 micronuclie disintegrate.

→ Remaining 1 micronucleus divides by mitosis to 2 gamete nuclei

→ 2 gamete nuclei enter temporary protoplasmic cone to fuse.

→ Formation of zygote nucleus

→ Zygote nucleus divide twice to form 4 nuclie

→ Out of 4 nuclie, 2 become micronuclie and 2 macronuclie.

→ Paramecium divide to produce 2 daughter paramecia.

GENERAL CHARACTERISTIC AND CLASSIFICATION OF PHYLUM PORIFERA

TYPE STUDY - SYCON

[Greek Porus = pore + ferrae = to bear]

→ Porifera are lowly organised multicellular animals. They are commonly known as '**sponges**'.

→ Multicellular, but tissueless, having perforated body by canals and chambers through which water current flows.

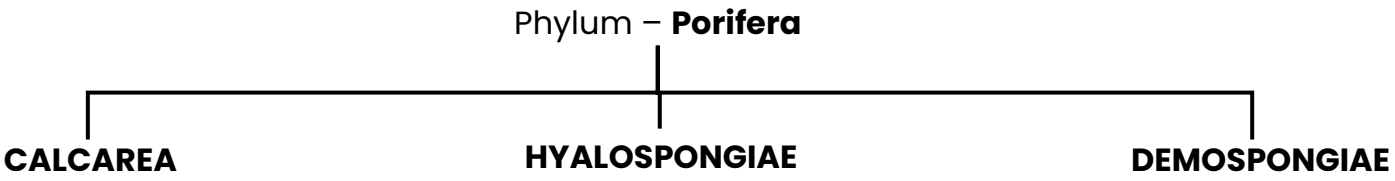
→ Body is perforated by many small pores the **ostia**. This phylum has 10000 species.

General Characteristics

1. **Habitat :** Mostly the animals are aquatic. (Mostly Marine, Some are found in fresh water)
2. Sponges are sessile, sedentary, solitary and colonial.
3. **Shape :** elongated, tubular, vase-shaped, disc-shaped
4. **Symmetry :** Body is branched and asymmetrical.
5. **Body Organisation :** Cellular level of organisation.
6. They are **diploblastic.** Body wall has outer pinacoderm and inner chanoderm and in middle mesenchyma is present (non – cellular and undifferentiated)
7. Body is perforated by mean of pores. The pores are called ostia.
8. **Canal system** is present in the body for flow of water.
9. Skeleton of Calcoreous or siliceous spicules or spongin fibres or both.
10. **Digestion** : Extracellular, no mouth organs and digestive system.
11. **Respiration** : takes place by intake of oxygen which comes in with the current of water.
12. **Excretory organ** : Absent.
13. **Nervous and Sensory cells** are absent. The functions of the body are carried on by the cells independently or little co-ordination.
14. **Reproduction** both Asexual and Sexual. Asexual by budding and gemmules. Sexual by gametogony.
15. Cross fertilization is the rule. Cleavage is holoblastic
16. **Development** : Indirect – free swimming larva is formed.

17. Sponges shows a great power of regeneration.
18. Sponges are either unisexual or hermaphrodite or both.

Classification



Class – 1. Calcarea

[**Gr** : Calx = lime]

Characters

1. Exclusively marine, shallow water animals.
2. Structural organisation of animal is very simple.
3. Body colour white or brown.
4. Body shape is vase like or cylindrical.
5. Small sized
6. Animals are either solitary or colonial.
7. Skeleton calcareous megascleres spicules.
8. Canal system is of Ascon, Sycon and simple Rhagon type.

Example : Sycon, clathrina

Class – 2. Hyalospongia

[**Gr** : Hyalos = glass + sponge]

Characters

1. Mostly marine many in deep sea.
2. Body shape is cup, urn or vase shaped.
3. Skeleton colourless, transparent and made up of shined siliceous spicules.
4. Body surface is multinucleate network.
5. Absence of outer pinacoderm.
6. Also known as "**Glass sponges**"

Class – 3. Demospongia

[**Gr** : demas = frame + sponges]

Characters

1. Mostly marine but some species are fresh water.
2. Shape is spherical, vase shaped, cup or cushion like.
3. Generally thick and brightly coloured.
4. Skeleton is generally made of spongin fibre.
5. Spicules are brightly coloured, divided into **micro** and **megascleres.**
6. Found in both shallow or deep water.
7. Animals are solitary or colonial.
8. Canal system is lecon type and is more complicated.
9. Flagellated chamber are small and round.

TYPE STUDY : SYCON OR SCYPHA

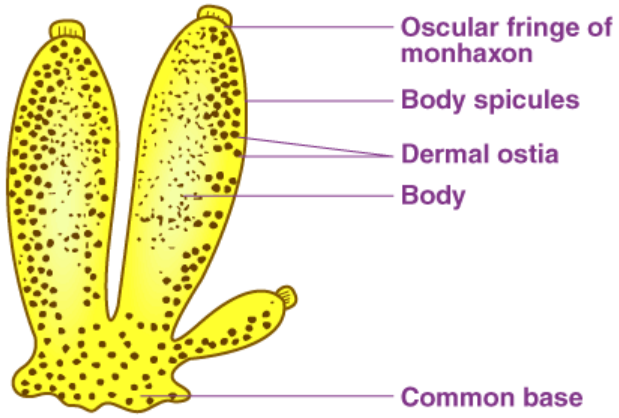
CLASSIFICATION :

Phylum – Porifera

Class – Calcarea

Order – Sycettida

Genus – Sycon



CHARACTERS :

1. They are found attached with rocks, stones or aquatic plants in shallow sea water.
2. Body is tubular or vase-shaped, brown or grey in colour.
3. Canal system is of Sycon type.
4. Skeleton consists of calcareous spicules made up of $CaCo_3$
5. Choanocytes are found on the wall of flagellated chambers.
6. Each colony consists of two or more than two cylindrical branches which are joined with stolon.
7. Flagellated chambers open into spongocoel by apopyles.

HABIT AND HABITAT :

Sycon is marine calcareous sponge. It is found attached to submerged rocks or other materials and substrata in shallow sea water.

Other names : Sypha, Urn Sponge and Crown Sponge

STRUCTURE :

(A) External Structure :

→ Sycon colony seems to be tree like structure in appearance in which two or three cylindrical branches are present.
→ Each branch is vase shaped hence it is known as Urn Sponge or Crown Sponge.
→ Its colour is grey or light brown.
→ The distal or free end of each cylinder communicates to the outside world by a large terminal opening the **Osculum.**
→ Osculum is surrounded by oscular fringe of monaxon spicules.
→ These spicules are made up of $CaCO_3$
→ Body has pores (**Ostia**) which lead into central body cavity of spongocoel.

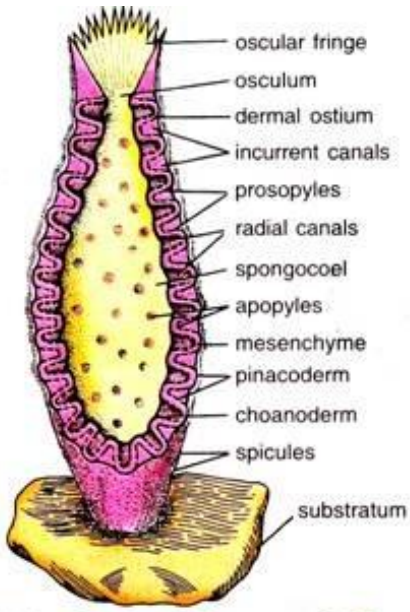


Fig. 26.2. *Scypha.* A diagrammatic L.S. of a cylinder showing gross internal structure.

(B) Internal Structure :

→ A hollow cavity spongocoel is present throughout the length of the body.
→ A complex system formed by canals and pores is present in the body which provides a definite passage for flowing of water current in body.
→ Canal System consists of three parts :

(i) Incurrent canal :

- Incurrent canals are formed by the infolding of the body wall. The water current enters through these canals into the body of sycon.

- These canals opens outside by ostia, inner side they end blindly.
- These canals are lined by pinacocytes.
- It opens into radial canals through intercellular spaces known as prosopyle.

(ii) Flagellated chambers or Radial Canals :

- These canals are formed by the involution of the body wall.
- These are lined internally by flagellated cells or choanocytes.
- These canals are also known as radial canals.
- The incurrent and radial canal is parallel and alternate to each other.

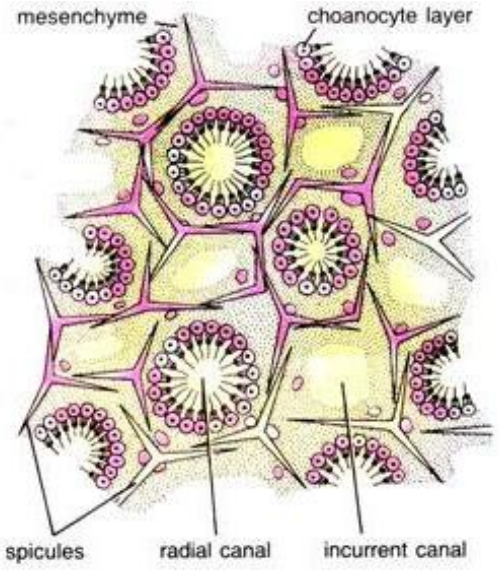


Fig. 26.3. *Scypha* cylinder. Diagrammatic V.S. through the wall.

(iii) Excurrent Canals :

- The radial canals open directly into the paragastric cavity through excurrent canal.
- The excurrent canals are lined by pinacocytes cells.

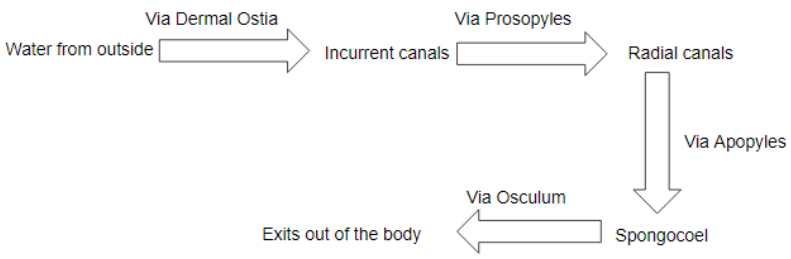
CANAL SYSTEM :

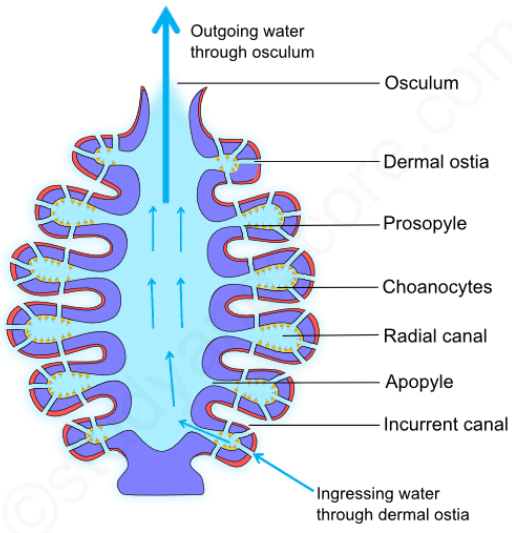
Sycon's digestion, excretion, respiration and reproduction etc. All activities are carried out by water current medium.

The water current develops by the continious movement of choanocytes. The folding of wall provides the passage for flowing water current in the body, which forms canal system.

Canal sytem is of Sycon type.

WATER CIRCULATION :





Sycon type canal system (Ex: Scypha)

NUTRITION :

Sycon ingest food – minute protozoans, Bacteria, Diatoms etc along with water current.

Sycon is a **filter feeder** because only very small particles of food can enter through the ostia.

DIGESTION :

The attached food particles are engulfed by the chanocytes in the form of food vacuoles.

Digestion in sycon is completely intracellular i.e within the cell.

Undigested food is egested from amoebocytes or collar of choanocytes into spongocoel and from there removed by the outgoing current of water.

RESPIRATION AND EXCRETION :

No specific cells in the sponges for the process of repiration and excretion.

All cells of body are in direct contact with water, hence all the cells directly perform the process of respiration and excretion by diffusion.

REPRODUCTION :

Sycon reproduces both by sexual and asexual methods.

A. By Budding :

Small Buds are formed at the base of the stolon of sycon, which grows for sometimes and forms new sponge.

B. Branching :

In this method small pieces breaks and separated from the body of the sponge, and forms new colonies by branching.

C. Formation of Reduction bodies :

During unfavourable condition the body of sycon breaks up into small pieces. The reduction bodies having both the layers of wall are able to develop into separate sponge in favourable time.

D. Gemmule :

In this method the archeocyte cells gather into a ball like structure. These cells have reserve food material and when sponges dies in unfavourable condition, Only gemmules are left out. Archeocyte comes out in favourable condition and forms new sponges.

BY SEXUAL REPRODUCTIONS

There are no specific gonads in Sycon, but during breeding season archeocytes cells are modified to form sperms and ovum.

Sycon is monoecious or hermophrodite sponge, hence sperms and ovum are found in the same individual. But they are **protogynous**. i.e female mature earlier than the male gametes, but **cross fertilization** is generally found.

Spermatogenesis :

- The archeocytes which forms the sperms are called spermatogonia.
- The spermatogonia are situated below the chonacytes in the mesenchyme.
- The spermatogonium divide twice or thrice into daughter cells - spermatocytes so formed produce sperms.
- By the flagellar movement of the tail the sperm after swimming in water reaches the other sponge.

Oogenesis :

- Ovums are produced by the modification of the large archeocytes. These cells are called **oocytes.**
- Around oocytes nurse cells are present which have reserve food material in it.
- Oocyte grows in size and afterwards divides twice and changes into **ovum.**
- It is established in the wall of radial canal, here fertilization takes place.

Fertilization :

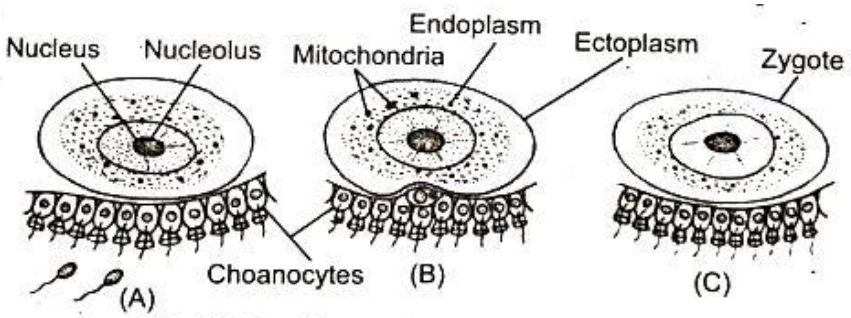
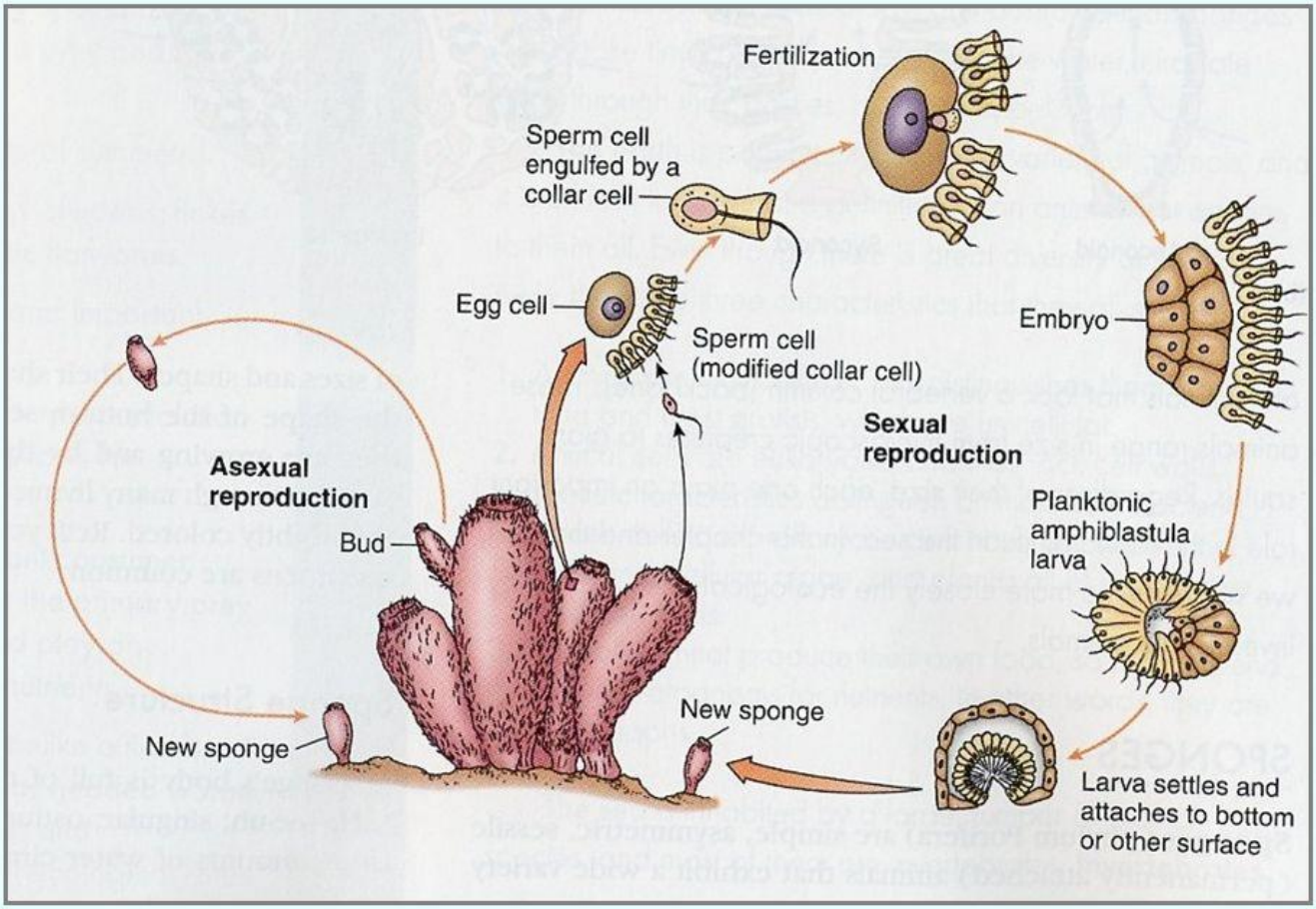


Fig. 28. Fertilization in Calcareous Sponge.

- In sycon fertilization is internal.
- Sperm of sponge after taking its way into the body of sponge enters Into choanocytes of near by ovum.
- After entering ovum, the tail of sperm disintegrate and head becomes round, around which a capsule is formed.
- Now chanocytes losses its collar and flagellum and becomes amoeboid. These are called carrier cells.
- Carrier cells moves in the mesenchyme and when comes in contact with any ovum, stick to it and makes the sperm free; so that sperm enters into ovum and fertilize the ovum and forms zygote.

Embryonic Development :

Amphiblastula larva



This Chapter Ends here !! But not your work

Go to Practice Questions, Solve Dpps attend MCQs and revise the notes after some 2nd 4th and 7th day

To get 95+ you have to keep on revising what you studied.

[Remember Consistency and HardWork Gives Great Result]

NOTES MADE BY

MRIDUL YADU