CBCS GENERIC; FIRST SEMESTER..B.SC. HONS
COURSE.PAPER .GENERIC ELECTIVE 2

UNIT 2PHYLUM PORIFERA :GENERAL CHARACTERS AND CLASSIFICATION UP TO CLASSES

CANAL SYSTEM IN SYCON

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Introduction

Porifera animals are also called as Sponges. Sponges have managed to conceal their true animal nature for several centuries. They are sessile, profusely branched, have no clear way of capturing or eliminating food. They also show very little response to external stimuli. Some of the sponges are even green in color due to presence of symbiotic algae and hence were regarded as plants by many early researchers. Later they were proved as animals after the discovery of their feeding system and life cycle.

It was Robert Grant who coined the term Porifera which in Latin means pore bearing animals (L. Porus=pore; ferre=to bear). Huxley and Sollas first proposed the separation of sponges from eumetazoans. It is believed that sponges might have evolved from the colonial choanoflagellate protozoans. Sponges represent an evolutionary blind offshoot.

General Characters of Phylum Porifera

- They are distributed between Arctic to Temperate regions.
- Sponges are sessile and mostly marine. Some live in fresh water
- They are solitary or colonial in nature found attached to stones or molluscan shells or wooden pieces in the waters.
- Their body is vase-like, tubular, cushion-like or cylindrical in shape. They exist in various colours like bright red, yellow, orange, pink or violet or even white and black. Some sponges have symbiont algae and thus appear green in colour.
- Majority of sponges are asymmetrical and some are radially symmetrical

- Between the pinacoderm and choanoderm is a gelatinous mesohyl. Mesohyl has various types of amoebocytes like,
- Sclerocytes which produce spicules
- Spongocytes which produce spongin fibres.
- Myocytes are the contractile cells found around osculum.
- Archaeocytes are totipotent cells capable of giving rise to any other cell type.
- The central cavity is called as spongocoel or atrium. It opens outside through an osculum.
- The water circulatory system of sponges is called as canal system or aquiferous system. It helps in food acquisition, respiratory gas exchange and excretion

- In an ascoid sponge, water enters the spongocoel through ostia and exits through osculum.
- Aquiferous system and high totipotent nature of the cells are the two characteristic features of sponges
- Mesohylar endoskeleton consists of inorganic (calcareous) spicules or proteinaceous (spongin) fibres or both. Spicules are designated according to the number of axes (Eg: Monaxon, triaxon, tertaxon) or according to the number of rays (Eg: monactinal, hexactinal, teractinal)
- Sponges are suspension feeders or filter feeders. Digestion is intracellular. Choanocytes engulf food particles suspended in water, partly digests and passes on to an archaeocyte for final digestion.

- Disposal of excretory wastes primarily ammonia and respiratory gas exchange occur by simple diffusion. Most cells of fresh water sponges contain contractile vacuole for Osmoregulation.
- Nerve cells and sensory cells are absent. If nervous system is present it is of primitive type in some species with bipolar or multipolar cells formed into a network. Sponges are capable of responding to a variety of environmental stimuli by the closure of osculum.
- Asexual reproduction takes place by fragmentation, budding and the formation ofgemmules and reduction bodies

- Sponges are capable of regenerating viable adults from fragments. Fresh water sponges and a few marine sponges produce small gemmules, which remain dormant during winter.
- Sponge cells have remarkable power of regeneration. Even if a sponge is divided into minute pieces, the cells aggregate to form functional sponge.
- Most sponges are hermaphrodite but exhibit protandry or protogyny. Spermatozoa arise primarily from choanocytes. Eggs arise from archaeocytes or differential choanocytes.

- Fertilization is cross or internal. Spermatozoa are taken into the aquiferous system of neighbouring individuals. Choanocytes transfer them to the eggs in mesophyl.
- Cleavage is holoblastic. Development is indirect and includes,
- Coeloblastula larva (holoblastula with flagellated cells) or
- Amphiblastula larva (Coeloblastula with flagellated & non-flagellated cells) or
- Parenchymella/parenchymula larva (Solid blastula with outer layer of flagellated cells) or
- Trichimella larva (solid blastula with flagellated cells around the equator)

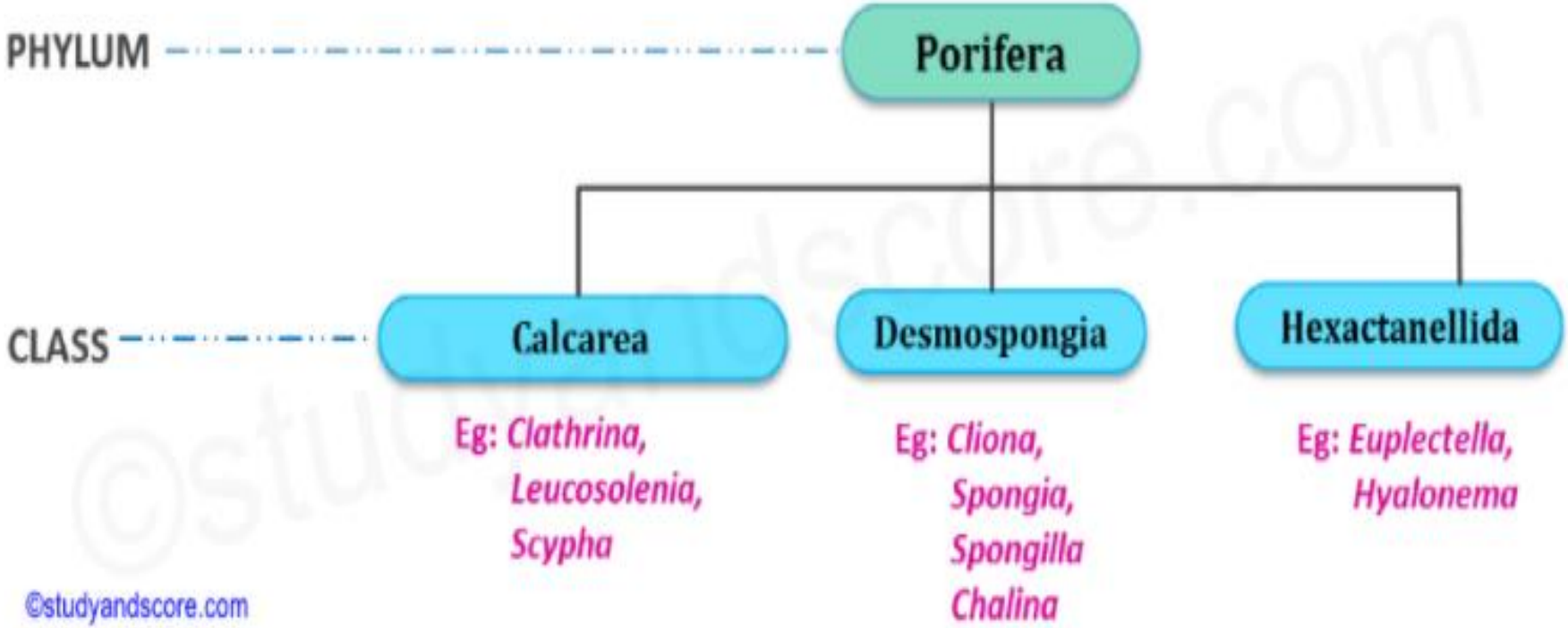
Classification of Phylum Porifera

There are about 5,000 living species of sponges included in this phylum Porifera. All the species of this phylum are grouped into three classes depending mainly on the nature of the skeleton.

They are both marine and fresh water forms. They live up to a depth of 8,500 m in the sea.

They generally flourish in the warm waters. In the matter of size they are highly variable. Their size may vary from few centimeters to several meters.

The following is the classification of phylum Porifera:



Class I: Calcarea (L. Calcarius=limy)

The sponges of this class are small.
They all are exclusively marine forms living in shallow waters.
Their skeleton is made up of calcareous spicules.
Body many be cylindrical or vase like
They may either live in colonies or solitarily
Body organization may be asconoid, syconoid or leuconoid type.
Development includes coeloblastula or amphiblastula larva
Ex: Clathrina, Leucosolenia, Scypha

Class II: Hexactanellida (Gr. Hex=six; Actin=ray)

This class includes glass sponges.
The sponges of this class are of moderate size.
They all are exclusively marine forms living in deep waters.
Their skeleton is made up of six-rayed siliceous spicules.
Body may be cup, urn or vase like
They may either live in colonies or solitarily.
Development includes trichemella larva
Ex: Euplectella, Hyalonema

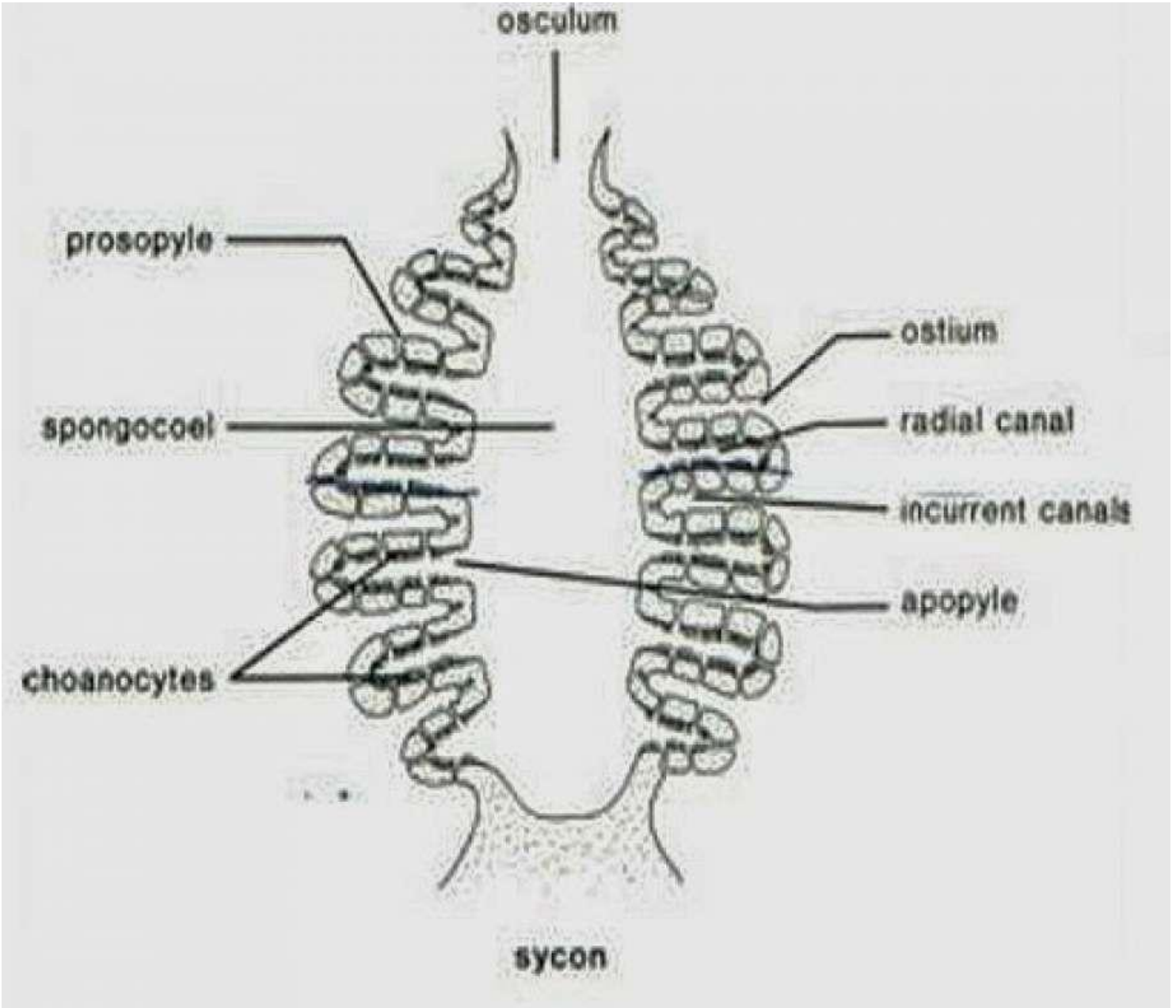
Class III: Desmospongiae (Gr. Demas=frame; Spongos=sponges)

The sponges of this class are large sized.
They include marine water or brackish water or fresh water forms
Their skeleton is made up of siliceous spicules or sponging fibers or both or none.
Body is vase or cup or cushion shaped
They may either live solitarily or in colonies
Body organization is leuconoid type
Development includes parenchymula larva
Ex: Cliona, Spongia, Spongilla, Chalina

What are totipotent cells?
Sponges are sessile animals. Then what is the use of flagella in sponges?
Chart the classification of phylum Porifera.
What is the meaning of the term Desmospongiae and Hexactanellida?
Give the examples of the class Calcarea.

CANAL SYSTEM OF SYCON

- Sycon is a sedentary sponge. It leads an aquatic life The body of sycon shows pores and canals which form a complex canal system. ... The opening of incurrent canal shows a pore membrane. This will show one or two ostia, through which water enters into the incurrent canals.


osculum
prosopyle
spongocoel
choanocytes
ostium
radial canal
incurrent canals
apopyle
sycon

Sycon is a sedentary sponge. It leads an aquatic life The body of sycon shows pores and canals which form a complex canal system. It is called sycon type of canal system. It is useful to draw water current inside the body. These water currents bring in food and oxygen. The body wall of sycon contains outer dermal layer and inner choanoderm. in between these two layer mesenchyme is present. The body wall is folded regularly and develop a regular canal system.

1) Ostia: The body wall is folded. In between two folds an incurrent canal is present. The opening of incurrent canal shows a pore membrane. This will show one or two ostia, through which water enters into the incurrent canals. The ostium is surrounded by myocytes. These amoebocytes will work as sphincters. They can close these openings or open them to regulate the inflow of water.

2) Incurrent canals: In between two folds of the body wall an incurrent canal is present. These canals end blindly towards inside. This is lined inside by pinacocytes. These are flat cells and are contractile.

3) Prosopyles: The incurrent canal opens into the radial canal through prosopyles'.

4) Radial canals: In between two incurrent canals a radial canal is present. It ends blindly to the exterior. It leads into excurrent canal internally. Radial canal is lined with choanocytes or flagellated cells. Hence these chambers are called flagellated chambers.

5) Apopyle: Radial canal opens into excurrent canal through an opening called apopyle. The apopyle is also surrounded by Myocytes.

6) Excurrent canal: It is short and wide chamber. It opens into spongocoel. This canal is lined with flat epithelial cell like the spongocoel. The board opening between excurrent canal and sponogocoel is also called internal ostium.

7) Spongocoel: The central part of the cylinder of sycon will show a hollow cavity called spongocoel. it is lined with epithelial cells. At the apex it opens out through osculum.

Because of the action of flagella of choanocytes water is drawn into the body. This is called incurrent water. This brings in food and oxygen. Hence it is called nutritive current. The water that goes out of the osculum is called excurrent water.

- **Functions of Sponge Canal System:**
- **It brings constant supply of water into the body and helps in respiration.**
- **Water brings with in small food particles which are used by the sponge.**
- **It helps in the process of reproduction.**
- **It helps in the process of discarding waste matter out of the body.**

THANK YOU