

EXERCISE 3 PORIFERA-I: OBSERVATION AND CLASSIFICATION OF SPECIMENS

Structure

- 3.1 Introduction
 - Objectives
- 3.2 Material Required
- 3.3 Observation of Poriferans
 - Sycon*
 - Hyalonema*
 - Euplectella*
 - Spongilla*
 - Cross Section of *Sycon*
- 3.4 Terminal Questions

3.1 INTRODUCTION

If you are asked to identify a multicellular animal that has evolved for the first time in the geological time scale, you would look for members in the Poriferans. Since you are familiar with the unicellular animals from the earlier study, you would expect to see a many-celled animal in the next group of animals viz: the poriferans. As you observe the various examples, you will understand and appreciate the shape, size and modifications exhibited by the specimens. It is advisable that you go through unit 4 of LSE-09 and refresh your knowledge of sponges.

The initial advantage of becoming multicellular is the opportunity for increase in size. Larger organisms are less subject to attack, they have greater reserves within the body to withstand temporary unfavourable conditions and they are better able to determine their direction of movement against the flow of medium in which they live,

Sponges are sessile organisms with a low degree of individuality and organisation. They can be broken up and will grow into new sponges, or two individuals will grow together and apparently become one. Each is a hollow structure in which water is taken in through numerous minute pores scattered over the surface and passed out through one or several large apertures. Food particles and possibly dissolved organic matter are taken from the water. This type of feeding in which the major aperture is exhalant demands that the body of the sponge should be more or less rigid since collapse would preclude the intake of water. All sponges, therefore, have skeletons which may be either composed of spicules, calcareous or siliceous, or of an anastomosis of elastic fibres called spongin fibres. as in the familiar bath sponge. Spongin fibres are of two types. Spongin A fibres – composed of long unbranched fibrils of uniform width and Spongin B fibres made up of a halogenated scleroprotein. The form of skeleton is the major basis for sponge classification.

Sponges may be recognised by a single feature which is unique to them. They all have choanocytes, flagellate cells with a collar encircling the base of a single flagellum. In this practical exercise you will identify some specimen species of phylum Porifera and study the internal details of a poriferan.

Objectives

After performing this exercise you will be able to:

- identify the specimen and give its scientific and common name,
- classify up to order level and list the characters justifying the classification,
- describe its habit and habitat,
- draw a labelled diagram of the specimen, and distinguish a multicellular animal from an unicellular animalcule.

3.2 MATERIAL REQUIRED

1. The museum specimens of the following poriferans:
Sycon or *Scypha*
Hyalonema
Euplectella
Spongilla
2. Permanent slide of cross section of *Sycon*.
3. Compound microscope.
4. Hand lens

3.3 OBSERVATION OF PORIFERANS

The general characteristics belonging to this phylum are as follows:

1. The body is cellular.
2. The gametes are formed from specialised cells.
3. Choanocytes are always present.
4. The principal aperture of the body is exhalent.
5. During development (*amphiblastula*) the outer flagellate cells migrate inwards to form choanocytes and thus give rise to a reversal of each layer not found elsewhere in the animal kingdom.
6. The cells are comparatively independent of one another.
7. Sense organs and nervous system are absent.
8. There is no enteron lined by endodermal cells.

You will examine the listed specimens contained in museum jars or permanent slides for special structures wherever specified. If you feel the need, please use hand lens to observe certain details of the specimens.

3.3.1 *Sycon*

Look at the specimen contained in the jar by rotating it so as to get the view from all the sides. Note the following points/characters:

General Characters

- i) Branching colonial sponge consisting of several hollow cylindrical branches.

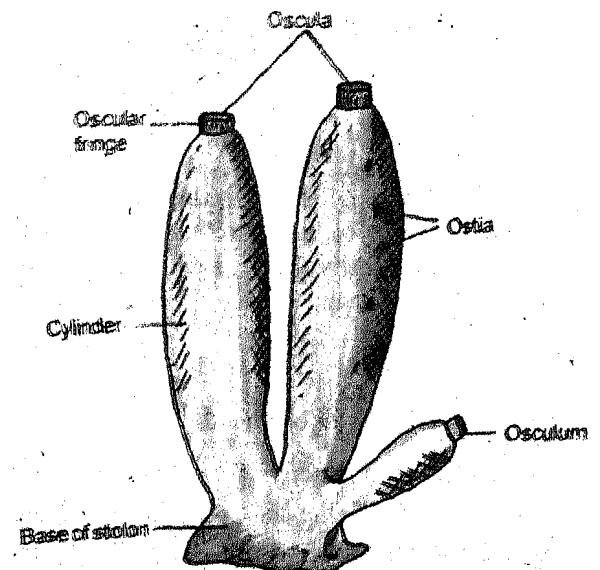


Fig. 3.1: *Sycon*.

- ii) It has a central paragaster/spongocoel and a terminal osculum.
- iii) Body wall is thick, perforated by ostia and permeated by an alternate system of incurrent canals and flagellated radial canals.
- iv) Canal system syconoid and course of water current is Ostia – Incurrent canal – Prosopyle – Flagellated chambers – Apopyles – Paragaster – Osculum – outside (visible only in microscopic section).
- v) The spicules are of various types like monaxon, triaxon or tetraaxon.
- vi) Hermaphrodite; reproduces sexually as well as asexually.

Habit and Habitat

Commonly found in shallow seas attached to rocks.

Geographical Distribution

Generally found in warm waters and widely distributed particularly near North Atlantic shores.

Classification and its Justification

The following are the reasons that justify the classification of *Sycon*.

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Porifera	The body of the animal bears numerous pores. The body exhibits cellular grade of organisation.
Class	Calcarea	The spicules are made of calcium carbonate.
Genus	<i>Sycon (Scypha)</i>	

3.3.2 Hyalonema

Observe the specimen from all directions and note the characters.

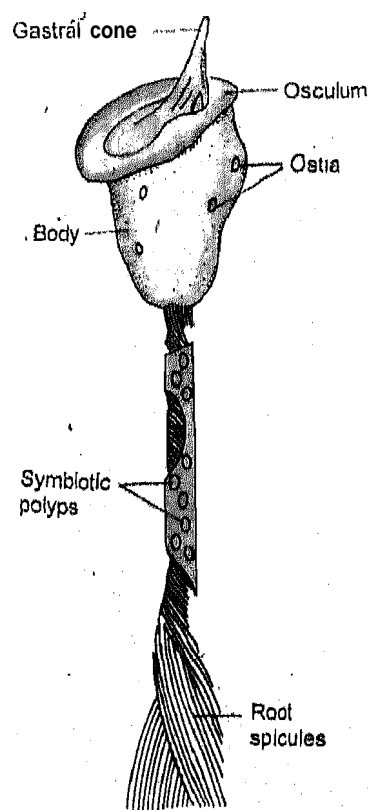


Fig. 3.2: *Hyalonema*.

General characters

- i) The body of the sponge is ball shaped borne on a long twisted 'rope like root' of siliceous spicules, hence commonly known as glass rope sponge.
- ii) The long siliceous spicules pass through the middle of the body as columella and often project as a gastral cone.
- iii) Canal system is leuconoid type and a spongocoel is absent in forms with a gastral cone. Course of water current is Ostia-Incurrent canal-Prosopyle-Flagellated chambers-Apopyle-Excurrent canal-Osculum-outside.

Habit and Habitat

Attached to substratum by root spicules in rather shallow deep waters of sea.

Geographical Distribution

Mostly found in the coastal regions of New England and America.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Porifera	The body exhibits cellular grade of organisation. The body of the animal bears numerous pores.
Class	Nexactinellida	The spicules are made up of hydrated silica and are six rayed.
Genus	<i>Hyalonema</i>	
Common name	Glass rope sponge	

3.3.3 Euplectella

Study the detail features of the organism by studying it from all the sides.

General Characters

- i) Body is curved, cylindrical and rigid about 12" long.
- ii) Osculum is protected by a sieve plate, the oscular sieve.
- iii) A tuft of siliceous root spicules are present posteriorly.
- iv) The canal system is syconoid, but true ostia are absent; the body is perforated by parietal gaps.
- v) Popularly known as Venus's flower basket. Dried skeleton of this sponge is used as a Wedding gift in Japan.

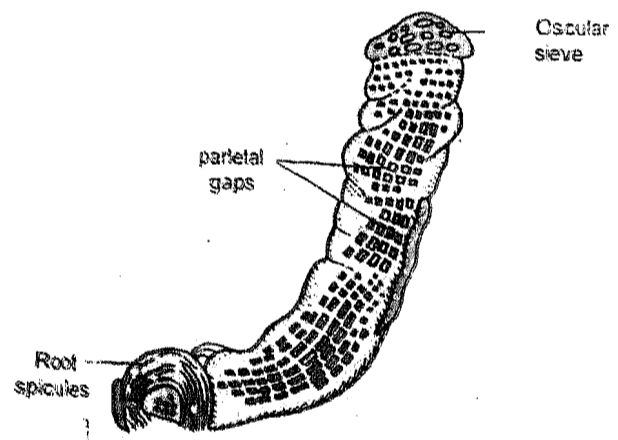


Fig. 3.3: Euplectella.

Habit and Habitat

It is a solitary animal, attached to substratum in deep sea.

Geographical Distribution

Found in abundance in Phillipines and West Indies.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Porifera	The body exhibits cellular grade of organisation. The body of the animal bears numerous pores.
Class	Hexactinellida	The spicules are made up of hydrated silica and are six rayed.
Genus	<i>Euplectella</i>	
Common name	Venus's flower basket	

3.3.4 *Spongilla*

Study the details of the organism from all the directions and note the following characters.

General characters

- i) Colonial, and highly branched.
- ii) Yellowish brown in colour but may be green due to the presence of symbiotic algae.
- iii) Body wall consists of a very thin dermal membrane perforated by ostia and oscula.
- iv) Canal system is Rhagon type. Water current is as follows. Ostia-Flagellated chambers-Apopyle-Paragaster-Oscula-outside.
- v) Siliceous spicules and spongin fibres are present.
- vi) Regeneration and gemmule formation is common.
- vii) Sexual and asexual reproduction are evident.

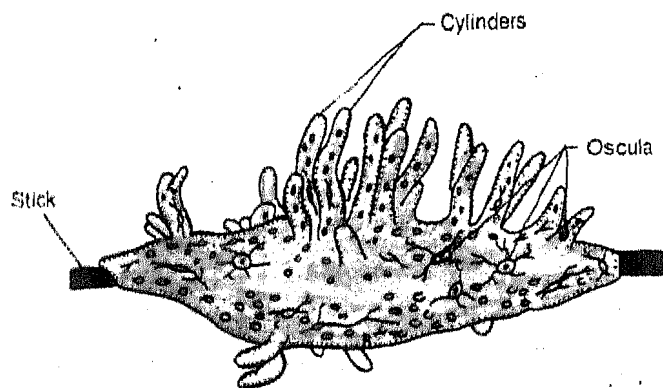


Fig. 3.4: *Spongilla*.

Habit and Habitat

It grows on substratum like submerged sticks and plants and found in ponds, lakes and slow flowing streams.

Geographical Distribution

Commonly found in warmer regions of India. At one time it was abundant in Delhi.

Classification and its Justification

Kingdom	Animalia	Animals, multi-cellular organisms with cells that lack a cell wall, many capable of movement or movement of some of their body parts or capable of movement at some time of their life cycle; heterotrophic nutrition.
Phylum	Porifera	The body exhibits cellular grade of organisation. The body of the animal bears numerous pores.
Class	Demospongia	Skeleton made of siliceous spicules, spongin fibres or of both or of none.
Genus	<i>Spongilla</i>	
Common name	Fresh water sponge	

3.35 Cross Section of Sycon

You have already seen and studied the specimen of Sycon. Now **examine** and **study** its cross section under low power of light microscope. If not in complete view, rotate the slide to get an idea of the section in totality.

You will be able to observe the following details:

1. The body wall consists of an outer dermal epithelium formed of a single layer of flattened pinacocytes.
2. The inner gastrodermis is formed of a single layer of choanocytes.
3. In between the two cellular layers is the mesenchyme cementing them, formed of living gelatinous matrix containing Sclerocytes, Archaeocytes, Collencytes, and calciferous spicules.
4. The thick folded body wall consists of incurrent canals and radial canals arranged alternately.
5. The incurrent canals are lined by pinacocytes and communicate with exterior by ostia and with the flagellated chambers by prosopyles.
6. The flagellated canals are lined by choanocytes and open into the paragaster through apopyles.
7. The paragaster is the central space bound by the body wall and lined by the pinacocytes.

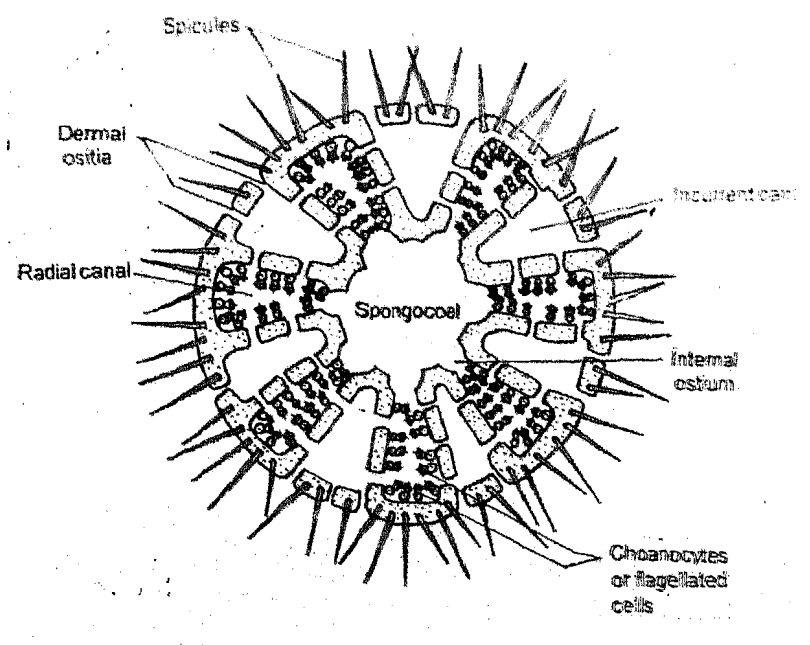


Fig. 3.5: Cross section of Sycon.

3.4 TERMINAL QUESTIONS

1. What are the characteristics of Sponges?

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2. How is multicellularity advantageous to an organism?

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3. Name a few **examples** of deep sea sponges? Mention their economic importance,

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List **five** characters seen in the T.S. of *Sycon*?

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