

## EXERCISE 5 CNIDARIA: OBSERVATION AND CLASSIFICATION OF SPECIMENS

### Structure

- 5.1 Introduction
  - Objectives
- 5.2 Material Required
- 5.3 Observations of Cnidarians
  - Obelia* Colony
  - Medusa of *Obelia*
  - Physalia*
  - Aurelia*
  - Metridium*
  - Acropora*
  - T.S. of *Hydra* through Testis
  - T.S. of *Hydra* through Ovary
- 5.4 Terminal Questions

### 5.1 INTRODUCTION

The phylum Cnidaria or Coelenterata, includes the familiar hydras, jelly fishes, sea anemones and corals. You have already studied about Cnidarians in Units 4 and 7 of LSE-09 course. These are often brilliantly coloured. They exhibit radial symmetry. The Cnidarians possess two basic metazoan structural features. One, there is an internal space for digestion, called in Cnidarians as gastrovascular cavity. This cavity lies along the polar axis of the animal and opens to the outside at one end to form a mouth. The presence of a mouth and digestive cavity permits the use of a much greater range of food sizes than is possible in the protozoans and sponges. Two, in Cnidarians a circle of tentacles, representing extensions of the body wall, surrounds the mouth to aid in the capture and ingestion of food.

The Cnidarian body wall consists of three basic layers: an outer layer of epidermis, an inner layer of endodermal cells lining the gastrovascular cavity, and between these two a layer called mesoglea. The mesoglea ranges from a thin, non-cellular membrane to a thick, fibrous, jelly-like, mucoid material with or without wandering amoebocytes. A considerable number of different cell types compose the epidermis and gastrodermis, but there is only a limited degree of organ development.

The different structural types are present within the phylum. One type, which is sessile, is known as the polyp. The other form is free swimming and is called the medusa. Typically, the body of a polyp is a tube or cylinder in which the oral end, bearing the mouth and tentacles, is directed upward, and the opposite, or aboral end is attached,

The medusoid body resembles a bell or an umbrella with the convex side upward and the mouth located in the centre of the concave undersurface. The tentacles hang down from the margin of the wall. In contrast to the polypoid mesoglea (middle layer) which is more or less thin, the medusoid mesoglea is extremely thick and constitutes the bulk of the animal. Because of this mass of jelly-like mesogleal material, these Cnidarian forms are commonly known as Jelly-fish. Some Cnidarians exhibit only the polyp form, some only the medusoid form, while others pass through both in their life cycle. Except for the hydras that are found in fresh water, cnidarians are marine and are found in shallow waters.

### Objectives

This exercise will enable you to:

- identify the specimen and give its scientific and common name,
- classify up to class level, and give the reasons for the classification listed by you,

- draw a labelled diagram of the specimen, and
- monitor any special features in the life history.

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## 5.2 MATERIAL REQUIRED

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1. Museum specimens - *Physalia*, *Aurelia*, Sea Anemone, *Acropora*
2. Compound microscope
3. Binocular microscope
4. Permanent slides - *Obelia* colony, Medusa of *Obelia*, T.S. of Hydra through testis and ovary.

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## 5.3 OBSERVATION OF CNIDARIANS

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Cnidaria are Radiata in which:

1. Nematocysts are present.
2. Adult movement is by muscular activity.
3. The body is either a polyp or a medusa, and these alternate in the life-cycle of many species.
4. A planula larva is developed.

### 5.3.1 *Obelia* Colony

Examine the slide under low power of microscope/binocular. Note the details of the colony starting from its basal end to the terminal structure. On the branches note different types of zooids and their distinctions from each other.

#### General Characters

*Obelia* colony is a highly branched structure and consists of a horizontal hydrorhiza attached to the substratum and several vertical branches or hydrocauli which bear zooids. The colony is dimorphic consisting of:

- i) Polyps or hydranths that are nutritive zooids having vase-shaped body with mouth and tentacles. The polyp is enclosed by a perisarc covering called hydrotheca.
- ii) Blastostyles are club-shaped without tentacles. These are enclosed in gonotheca, the perisarc covering. Buds arise from its axis, which develop into medusae.
- iii) Life history exhibits regular alternation of asexual and sexual generation or metagenesis.

#### Habit and Habitat

Marine, colonial, sedentary, in shallow water region, attached to substratum.

#### Geographical Distribution

Widely distributed from Arctic region down to Gulf of Mexico and Pacific Coasts.

#### 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	Cnidaria	Nematocysts are present, adult movement is by muscular activity. The body is either a polyp or a medusa, and these alternate in the life cycle of many species. A planula larva is developed.

Class **Hydrozoa** The polyp typically alternate with the medusa. The medusa possesses a velum and a nerve ring.  
 The enteron is not subdivided by vertical septa,  
 The gonads are ectodermal in origin.  
 There may or may not be a skeleton.  
 The tentacles of the polyp are generally solid.  
 The members almost always form colonies.

Genus *Obelia*

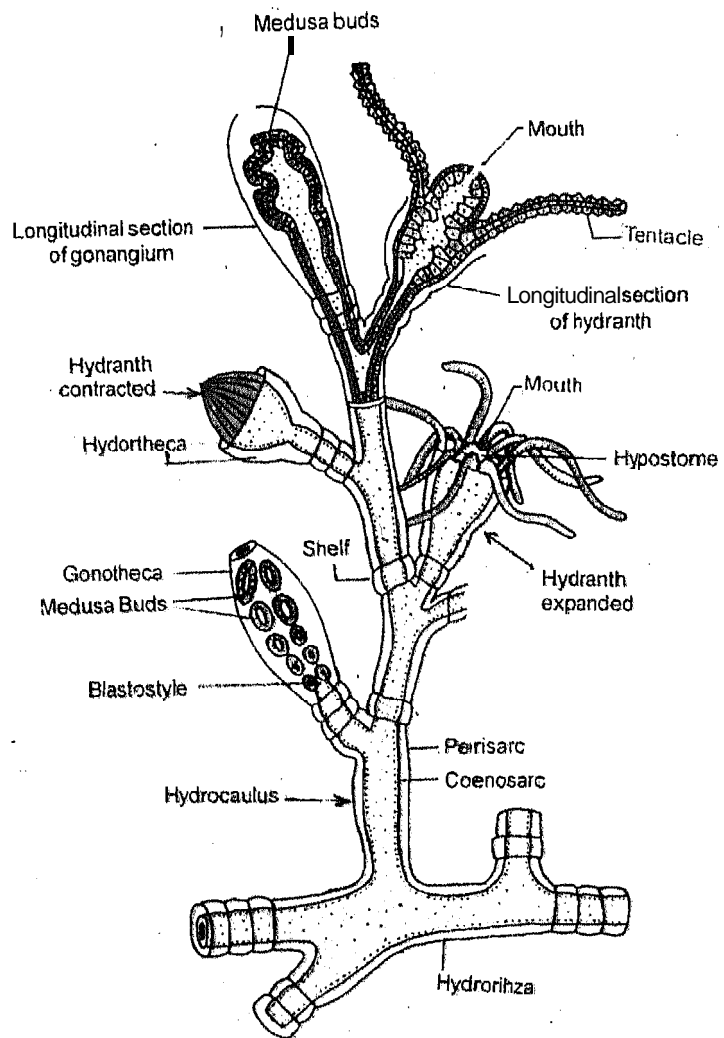


Fig. 5.1: *Obelia* colony.

**5.3.2 Medusa of *Obelia***

Examine the slide of medusa of *Obelia* and note the following characters. It is a life-history stage of *Obelia*.

**General characters**

The following are the identification characters of the Medusa,

- i) Medusae are saucer-shaped. These bear gonads and produce sperm or ova for sexual reproduction.
- ii) Gonads are borne on radial canals.
- iii) Medusa is a free swimming reproductive zooid of *Obelia* colony developing asexually on the blastostyles.

- iv) Margin of the umbrella with a true velum and a circlet of tentacles. Medusae are craspedote i.e. with velum.
- v) Four **adradial** tentacles carry statocysts at their base.
- vi) **Mouth** rectangular borne on **manubrium** which is present in the **centre** of inner or sub-umbrellar surface.

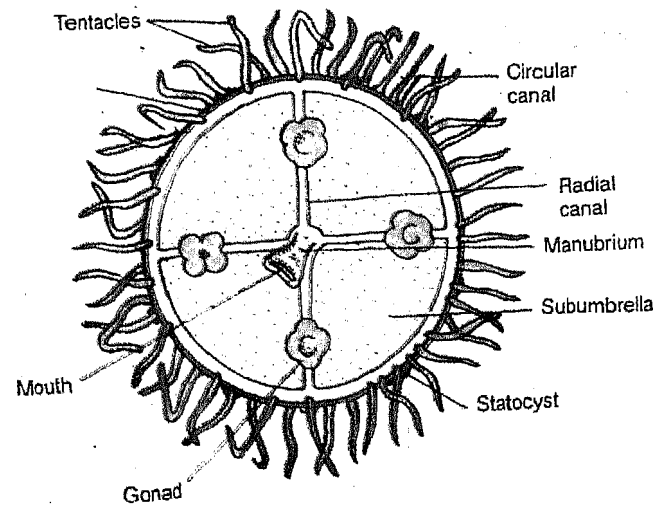


Fig. 5.2: Medusa of *Obelia*.

**Habit and Habitat:** It is a free living and swimming stage of *Obelia*.

**Geographic Distribution:** Widely distributed from Arctic region down to Gulf of Mexico and Pacific coasts.

**Classification and its Justification**

Kingdom	<b>Animalia</b>	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	<b>Cnidaria</b>	Neurotoxins are present. Adult movement is by muscular activity. The body is either a polyp or a medusa, and these alternate in the life cycle of many species. A planula larva is developed.
Class	<b>Hydrozoa</b>	The polyp typically alternate with the medusa. The medusa possesses a velum and a nerve ring. The enteron is not subdivided by vertical septa. The gonads are ectodermal in origin. There may or may not be a skeleton. The tentacles of the polyp are generally solid. The members almost always form colonies.
Genus	<i>Obelia</i>	

**5.3.3 Physalia**

Observe the specimen in the jar from all sides. You will be able to observe the following characters.

**General characters**

- i) It is a colonial form, brightly coloured, blue or purple unichambered float – the pneumatophore, filled with gas having the composition of air.

- ii) The gas is secreted by gas gland present in the underside of the pneumatophore. It is hydrostatic in function.
- iii) Upper surface of the float is drawn into a sail or crest and has an opening called pneumatopore.
- iv) *Physalia* exhibit the highest degree of polymorphism. The colony consists of:
  - Gastrozooids or nutritive zooids with mouth but without tentacles.
  - Blastostyles or gonophores or reproductive zooids bear clusters of medusae,
  - Dactylozooids or protective zooids with tentacles and nematocysts.
  - Tentacles are very long and coiled. Carry batteries of nematocysts.
  - Collection of all of the zooids forms cormidia.
- v) It is popularly known as Portuguese man-of-war. ("Man-of-war" refer's to a warship denoting its highly aggressive nature as a predator)

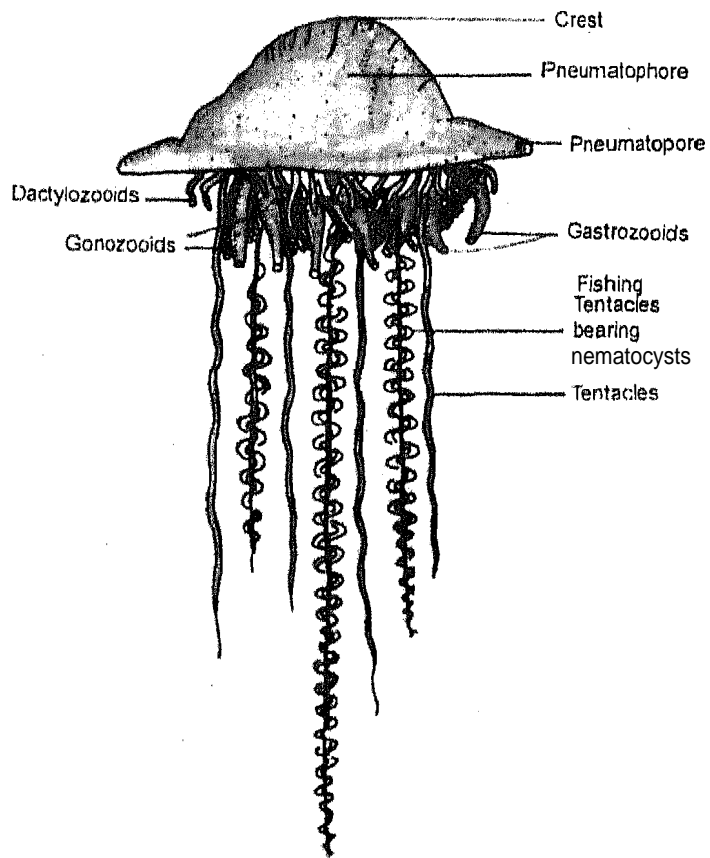


Fig. 5.3: *Physalia*.

#### Habit and Habitat

Marine, pelagic, colonial and floating form.

#### General Distribution

Found in tropical and subtropical seas.

#### Classification and its Justification

Kingdom	<b>Animalia</b>	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	<b>Cnidaria</b>	Nematocysts are present. Adult movement is by muscular activity. The body is either a polyp or a medusa, and these alternate in the life cycle of many species. A planula larva is developed.

The polyp typically alternate with the medusa. The medusa possesses a velum and a nerve ring. The enteron is not subdivided by vertical septa. The gonads are ectodermal in origin. There may or may not be a skeleton. The tentacles of the polyp are generally solid. The members almost always form colonies.

Genus *Physalia*  
Common name **Portugese Man of War**

**5.3.4 Aurelia**

Observe the specimen in the jar from different sides, and study the details.

**General Characters**

Aurelia is disc-shaped with a convex exumbrellar surface and a concave subumbrellar surface.

- i) It is found in coastal waters of all seas.
- ii) It has a gelatinous, transparent and coloured body.

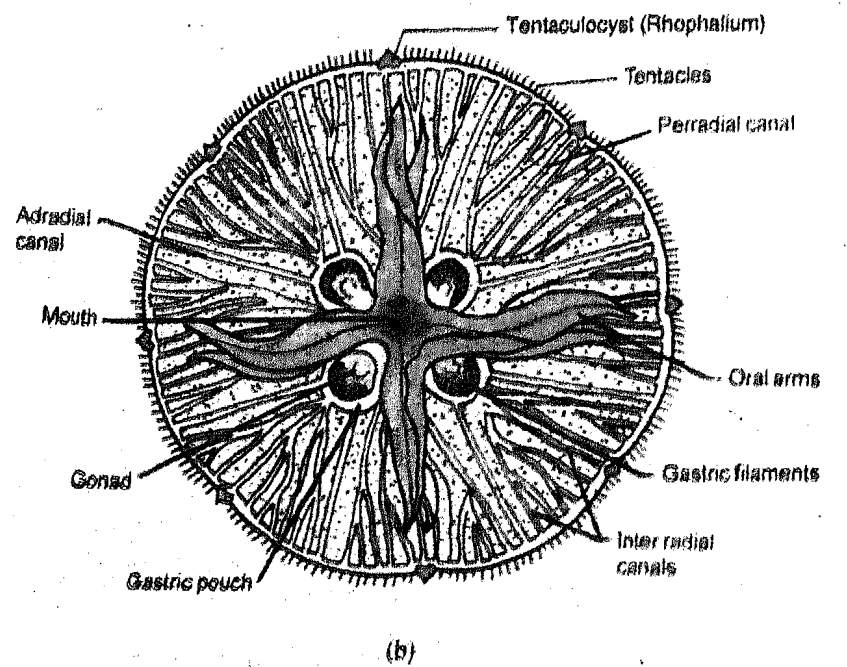
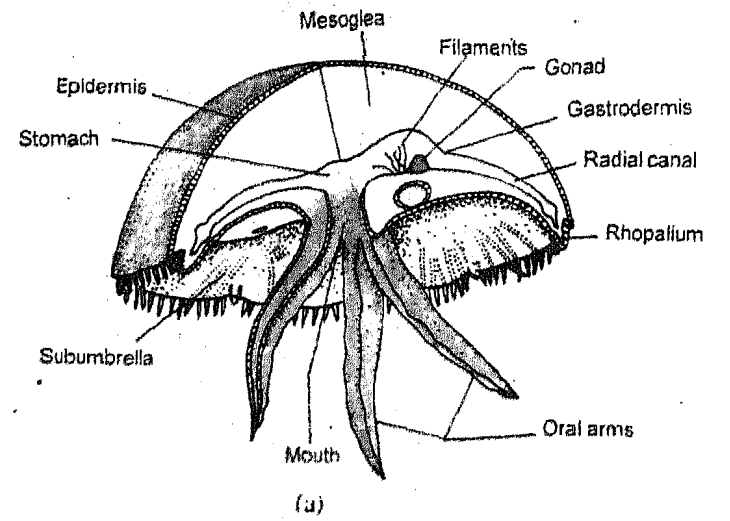


Fig. 5.4: *Aurelia*: (a) Side view (in section); (b) Oral view.

- iii) The subumbrellar margin of the umbrella beset with tentacles and broken into 8 notches.
- iv) Each notch has a tentaculocyst and a pair of marginal lappets.
- v) The squarish mouth borne on a short manubriuni, placed in the centre of subumbrellar surface.
- vi) Angles of the mouth drawn into four long oral arms.
- vii) Gonads two pairs, horse-shoe shaped and placed on the floor of the four gastric pouches.
- viii) Sexes are separate and life cycle presents alternation of generations.

#### Habit and Habitat

It is a marine, solitary jelly fish.

#### Geographical Distribution

Found throughout the world in coastal waters.

#### Classification and its Justification

Kingdom	<b>Animalia</b>	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	<b>Cnidaria</b>	Nematocysts are present. Adult movement is by muscular activity. The body is either a polyp or a medusa, and these alternate in the life cycle of many species. A planula larva is developed.
Class	<b>Scyphozoa</b>	The medusoid form is dominant and the polyp form is greatly reduced or absent. The medusa possesses neither a velum nor a nerve ring. The enteron of either the adult or the larva is subdivided by vertical septa. The gonads are endodermal in origin. The tentacles are solid. The members are solitary. Marine forms only.
Genus	<i>Aurelia</i>	

#### 5.3.5 *Metridium*

Observe the specimen. This is one of the commonly known sea anemone (anemone is a kind of flower of the same group as sunflower).

#### General characters

- i) Body short, cylindrical, differentiated into oral disc, column and pedal disc.
- ii) Oral disc is flat with a slit-like mouth surrounded by numerous short and hollow tentacles.
- iii) Column differentiated into thin walled distal portion Capitulum and thick walled proximal portion – Scapus.
- iv) Wall of scapus is perforated by small openings called cinclides.
- v) Basal disc broad and muscular meant for attachment.
- vi) Gastrovascular cavity divided into compartments, usually by six pairs of mesenteries.
- vii) Stomodaeum carries two siphonoglyphs.

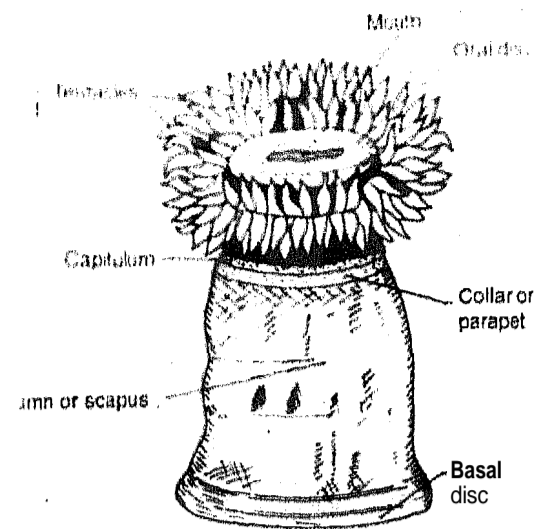


Fig. 5.5: *Metridium*.

**Habit and Habitat**

It is a sessile, bright coloured solitary flower like form, Attached to substratum like rocks, etc.

**Geographical Distribution**

Found in coastal waters of Atlantic, Pacific and Indian Oceans.

**Classification and its Justification**

Kingdom	<b>Animalia</b>	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	<b>Cnidaria</b>	Nematocysts are present. Adult movement is by muscular activity. The body is either a polyp or a medusa, and these alternate in the life cycle of many species, A planula larva is developed,
Class	<b>Anthozoa</b>	The polyp form is dominant and the medusoid form is absent, The enteron is subdivided by vertical septa. The gonads are endodermal in origin. A skeleton may or may not be present. The tentacles are hollow. The members are colonial or solitary.
Genus	<i>Metridium</i>	
Common name	<b>Sea anemone</b>	

**5.3.6 Acropora**

Observe the specimen and look for the following characters (In the dried specimen you will not be able to see soft parts like polyps),

**General characters**

- i) Colony tree-like with numerous terminal and the lateral polyps which are enclosed in cylindrical cups or corallites separated by perforated coenosteum. (In the dried specimen you will not be able to see soft parts like polyps),



- ii) Terminal polyps contain 6 tentacles and lateral polyps possess 12 tentacles.
- iii) Corallite is made up of calcium carbonate secreted by the polyps.

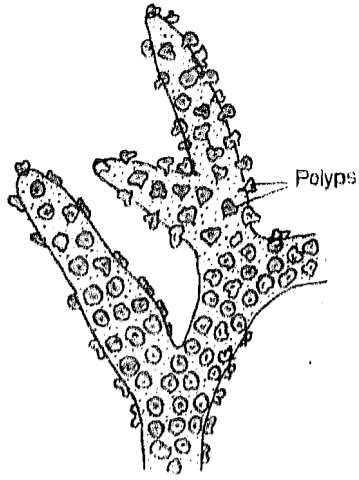


Fig. 5.6: *Acropora*.

#### Habit and Habitat

Major coral reef builders. These are marine, colonial forms.

#### Geographical Distribution

Found in tropical waters of Australian seas, West Indies and Florida.

#### 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	Cnidaria	Nematocysts are present. Adult movement is by muscular activity. The body is either a polyp or a medusa, and these alternate in the life cycle of many species. A planula larva is developed.
Class	Anthozoa	The polyp form is dominant and the medusoid form is absent. The enteron is subdivided by vertical septa. The gonads are endodermal in origin. A skeleton may or may not be present. The tentacles are hollow. The members are colonial or solitary.

Genus *Acropora* (*Madrepora*)

Common name Stag horn coral

#### 5.3.7 T.S. of *Hydra* through testis

When you examine a slide of T.S. of *Hydra* through testis under low power, you will be able to observe the following structural details. If required, change to high power carefully so as not to break the slide. You have already studied about the organism in theory course LSE-09.

1. Body wall consists of an outer ectoderm and an inner endoderm with a cementing non-cellular mesoglea in between.
2. There is a single central cavity, the gastro-vascular cavity or coelenteron, lined by endoderm.

3. The ectoderm cells are columnar and are of various types namely – epithelio-muscular cells, interstitial cells, gland cells, nerve cells, sensory cells and nematocysts.
4. The endodermal cells are cylindrical and are of various types namely: Nutritive, muscular, secretory, sensory and nerve cells.
5. The testis arises on the ripper region of the body of the animal as a conical surface from the interstitial cells of the ectoderm. It is bounded by a layer of ectodermal cells.
6. It contains numerous spermatogonia which give rise to spermatozoa.
7. A mature sperm has a swollen head, a narrow middle piece and a long slender tail.

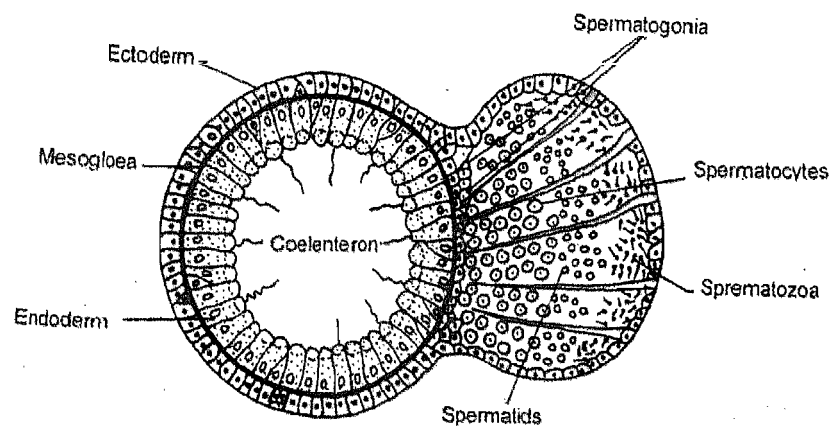


Fig. 57: T.S. of *Hydra* through testis.

### 5.3.8 T.S. of *Hydra* through ovary

You will observe the following details while examining the slide of T.S. of *Hydra* through ovary.

1. Body wall consists of an outer ectoderm and an inner endoderm with a cementing non-cellular mesoglea in between.
2. There is a single central cavity, the gastro-vascular cavity or coelenteron, lined by endoderm.
3. The ectoderm cells are columnar and are of various types namely – epithelio-muscular cells, interstitial cells, gland cells, nerve cells, sensory cells and nematocysts.
4. The endodermal cells are cylindrical and are of various types namely: Nutritive, muscular, secretory, sensory and nerve cells.
5. Ovary develops on the lower region of the body of *Hydra* from the interstitial cells of the ectoderm. It is surrounded by a layer of ectodermal cells.
6. The ovary consists of a large spherical ovum with a centrally situated nucleus and granules of reserve food in its cytoplasm.
7. The germ mother cell or oogonium located in the centre of the ovary enlarges, becomes amoeboid and undergoes reduction division to form the ovum.

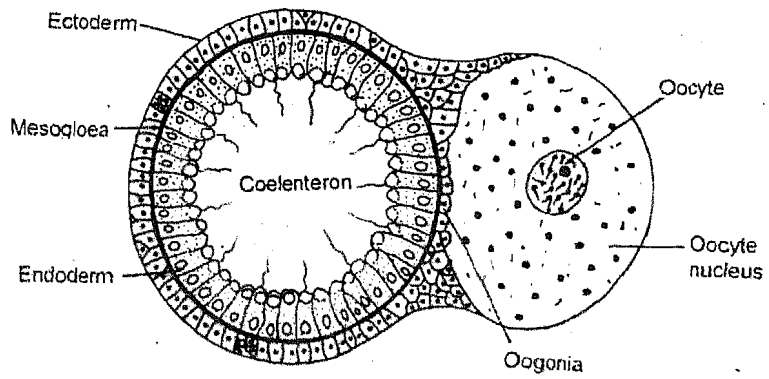


Fig. 5.8: T.S. of *Hydra* through ovary.

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### 5.4 TERMINAL QUESTIONS

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1. List the characters of Cnidaria.

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2. Compare the body wall of a sponge and a Cnidarian.

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3. What is polymorphism? Describe this phenomenon from the example studied by you\*

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4. In what way do you feel that the study of a coral is important?

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