Phylum Porifera

Sponges belong to Phylum Porifera (Lat. Porus=pore; ferre=to bear). They are the most primitive among the multicellular organisms.

General Characters

- ✓ Sponges are divided into three classes based on the composition of their spicules and skeletal fibers. They are: Calcerea, Desmospongia, and Hexactinellida.
- ✓ Examples: *Clathrina, Sycon (Scypha), Grantia, Euplectella, Hyalonema, Oscarella, Plakina, Thenea, Cliona, Halichondria, Cladorhiza, Spongilla, Euspondia,* etc.
- ✓ Sponges are solitary or colonial in nature and found distributed in all seas. They are attached to rocks, stones or shells or wooden pieces in the waters or coral to provide a suitable substratum.
- ✓ The sponge's body is vase-like, tubular, cushion-like or cylindrical in shape with different colours like bright red, yellow, orange, and pink or violet or even white and black.
- ✓ Sponges are mostly asymmetrical and some are radially symmetrical.
- ✓ No tissue or organ is present in sponges. Only cells display a considerable degree of independence. Sponges are sessile and freely branched in structure.
- ✓ Body wall consists of two epitheloid layers (epitheloid resembles epithelium but lacks basal lamina and cell junctions): an outer pinacoderm and an inner choanoderm.
- ✓ Epithelial-like cells called pinacocytes form the outermost body, called a pinacoderm, that serves a protective function similar that of our epidermis. Scattered among the pinacoderm are the ostia that allow entry of water into the body of the sponge. These pores have given the sponges their phylum name Porifera—pore-bearers.
- ✓ Choanocytes are flagellated cells which line the spongocoel and form the so called 'choanoderm': the layer represents endoderm of a diploblastic poriferan organism. The flagella help in creating a unidirectional flow of water around the body of sponge. Choanocyte also has a collar made of microvilli. These cells capture microcopic food particles. Digestion is also intracellular, taking place within choanocyte.

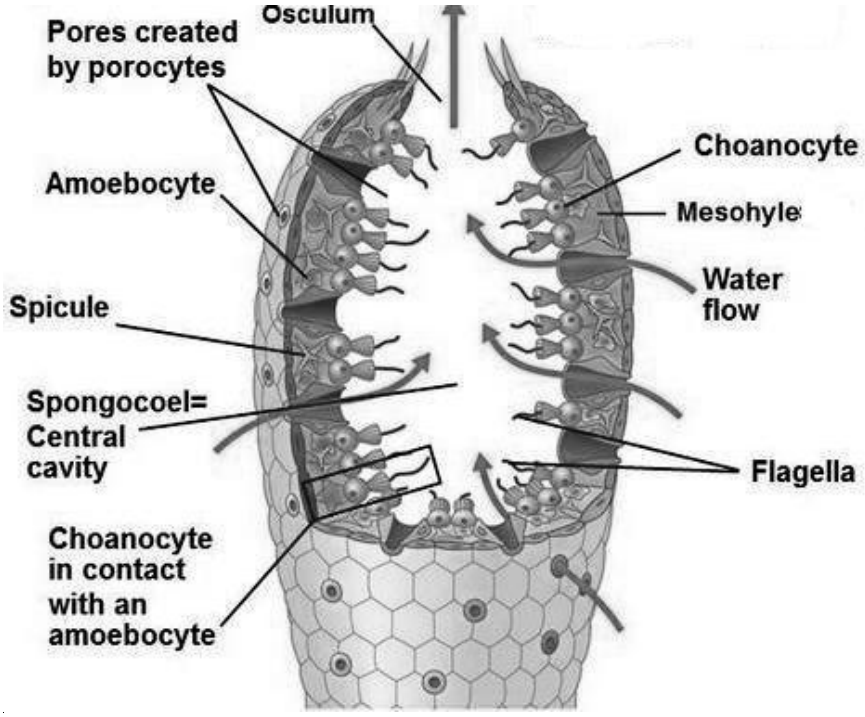


Fig 1. Sponge- structure

- ✓ 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.
- ✓ Spongocoel or atrium is the central cavity of the sponges. It opens outside through an osculum.
- ✓ The unique character of sponges is the water circulatory system also called as canal system, which 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)
- ✓ The mode of feeding of Sponges is suspension feeders or filter feeders. Digestion takes place as intracellular. Choanocytes engulf the suspended food particles water, partly digests and passes on to an archaeocyte for final digestion.
- ✓ Sponges undergo disposal of excretory wastes primarily ammonia and respiratory gas exchange through simple diffusion.
- ✓ No nerve cells and sensory cells are present. Sponges are capable of responding to a variety of environmental stimuli by the closure of osculum.
- ✓ Asexual reproduction happens by fragmentation, budding and the formation of gemmules and reduction bodies. 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 canal 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).

- ✓ The organization of sponges are grouped into three types which are ascon type, sycon type, and leuconoid type, due to simple and complex forms.

References:

Barnes R D (1980) Invertebrate zoology, 4th edn. Holt-Saunders International Edition

Jordan EL and Verma PS. 2018. Invertebrate Zoology. 14th Edition. S Chand Publishing.

Kotpal RL. 2017. Modern Text Book of Zoology- Invertebrates. 11th Edition. Rastogi Publications.

Sycon-Detailed study

Sycon (Scypha) is a marine sponge widely distributed predominantly in shallow water of temperate regions. They inhabit to shells, rocks and they are sedentary.

Classification
Phylum: Porifera
Class: Calcarea
Order: Heterocoela
Family: Sycettidae
Genus: Sycon (Scypha)
Sycons are typically small in size and they range from 2.5cm to 7.5cm in height.

Habit and Habitat
Sycons live as a solitary/colonial life. They attach to the solid substrate such as shells and rocks of corals and molluscs.

Structure of Sycon:
Sycon is a diploblastic animal .The body wall is made by two layers: 1) Dermal layer and 2) Gastral layer. In between them mesenchyme is present.

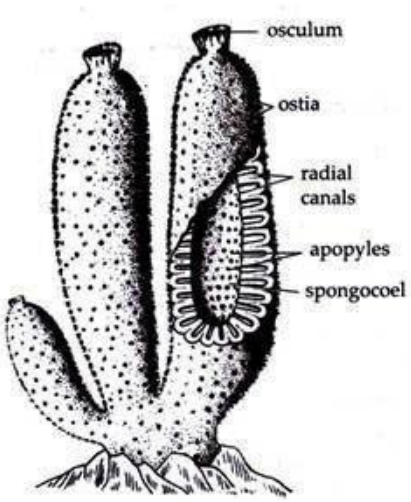


Fig. 1. External structure of Sycon

Ostia: The surface contains numerous microscopic polygonal elevations. Every elevation remains separated from the other by a system of depressed lines. These depressed areas contain groups of minute pores, the ostia or inhalant pores. Water enters the cavity of the sponge through these spores.

Osculum: At the free end of each cylindrical branch there is a small opening, the exhalant or excurrent pore or the osculum. Water comes out of the sponge through this opening. The osculum remains surrounded by a delicate fringe.

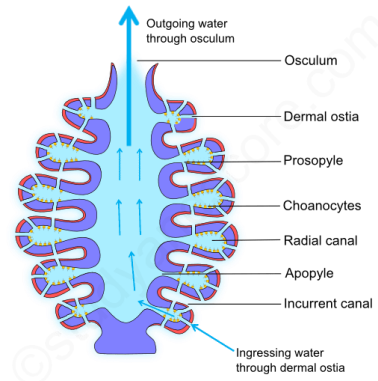
Spongocoel or the paragastric cavity: Each osculum leads into a narrow passage inside the cylinder. The passage is called paragastric cavity or spongocoel.

Skeleton: The soft and geletinous body of Sycon is supported and protected by numerous minute calcareous spicules. These are large one rayed (monaxon) spicules around the osculum. They form the oscular fringe. The fringe prevents entry of other animals into the paragastric cavity of the sponge. Simple needle like monaxon oxeote spicules project out of the body of the sponge through the elevated polygonal areas. These spicules provide a bristly appearance to the sponge.

Canal System

Sycons exhibit a canal system which is an anatomical peculiarity, unique to them. It penetrates the body with watcher channels. The canal type precisely seen in Sycon is Syncoid Stage I type, more advanced than asconoid canal system. The Ostia opens into a central cavity through a system of canals, the central cavity is known as spongocoel.

The body is organized into a complex network of canals and pores, which goes on to form the aquiferous or the canal system. The body wall is composed of Choanoderm, Mesenchyme and Pinacoderm.



Sycon type canal system (Ex: Scypha)

Source: studyandscore.com

Ostia – these dermal pores are lined by thin membranes. These possess two openings, one for entry and one for the exit. The closing and opening of Ostia for water flow is regulated by myocytes

Sponogocoel/Paragastric or gastral cavity – osculum leads to a large central canal known as spongocoel, named variously. Its wall is lined by pinacocytes, which are ectodermal flattened cells. Osculum is engirdled by a layer of cells known as myocytes acting as sphincters, contractile in nature. Spongocoel appears to open to the outside through the osculum

Radial canals – evaginations of the body wall. The body wall lining of the spongocoel is shoved periodically as finger-like projections known as radial canals whose walls are lined with choanocytes. The outer end of the radial canal is closed while the inner end is openly mediating with the spongocoel via the excurrent canal

Incurrent canal – this tubular structure is found between two successive radial canals, hence are alternatively arranged. Invaginated folds of the body wall. The inner end of the incurrent canal is blind whose walls are lined by pinacocytes (flat and ectodermal). Gastral cortex, a thickened mesoglea is found between the radial and the incurrent canal. Ostia is located on the pore membrane engirdled by contractile myocytes acting as sphincters, checking the openings

Prosopyles – these minute pores are found between the radial and incurrent canals. Each of these is an intercellular channel in Sycons, through which the incurrent canals open into the radial canals. Porocytes, to which prosopyles open into, are cylindrical and thick-walled, possessing a nucleus in the cytoplasm towards one end. It regulates the inflow of water and is highly contractile

Excurrent canals: these canals are used by radial canals to mediate with the spongocoel and are wide and short canals whose walls are lined by pinacocytes

Apopyles – these are engirdled by contractile myocytes and are the openings of the radial canals in spongocoel.

In sycon the skeleton contains calcareous spicules. These are of the following types,

(i) Large one rayed needle like Monaxon spicules, (ii) Simple monaxon spicules project from dermal layers on the walls of the radial canals, (iii) Triaxon spicules are present on the walls of spongocoel. (iv) Tetraxon spicules are present on the walls of spongocoel.

Feeding habit:

The food of sycon is small minute bacteria, diatoms, protozoans etc. The food particles come into the sponge along with water current. The digestion is intracellular. The food particles are usually captured by the choanocytes. Digestion takes place in the choanocytes. The digested food is passed to other cells. The reserve food is stored in the form of fats, glycogen and Droteins in the thesocyte. The undigested marter sent out through osculum along with excurrent water current.

Respiration and Excretion : Both respiration and excretion take place by simple diffusion between the cells of sponge and water.

Reproduction: Asexual and sexual methods. Budding is the common asexual method.

Sexual reproduction is carried on by the development of sperms and ova. Fertilization is internal. In the life history Amphiblastula larva is seen.

References:

Barnes R.D (1940-1995). The invertebrates volume I to IV Mc graw hill book co.
Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.
Ekambaranatha Iyer and T.N Anantha Krishnan (1992). A manual of Zoology Vol-I (Invertebrata) Part I and II Viswanathan and co.
https://www.biology-today.com/
https://www.studyandscore.com/
Jordon E.Z and P.S. Verma (1995). Invertebrate Zoology 12th ed. Sultan Chand and co.
Kotpal R.L., (All series) Protozoa, Porifera, Coelenterata, Annelida, Arthropoda, Mollusca and Echinodermata – Rastogi publications.

CANAL SYSTEM IN SPONGES

In all sponges, the body is the perforated with large number of apertures through which water enters inside body and flows through a system of criss-crossing canals collectively forming the canal system which is a characteristic feature of Phylum Porifera. The main function of canal system of sponges helps in food acquisition, respiratory gas exchange and also in excretion.

Types of canal system in sponges

In sponges, the following types of canal systems are found:

1. Ascon type
2. Sycon type
3. Leucon type

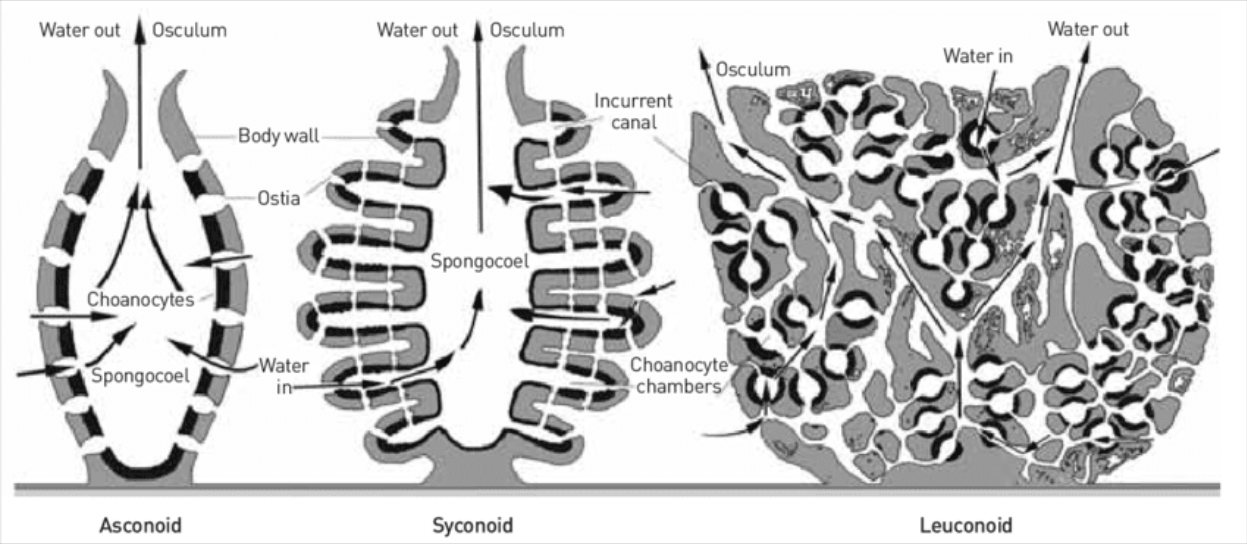


Fig.1. Types of canal system in sponges

1. **ASCON TYPE**

- It is the simplest type of canal system and is found in Leucosolenia.
- Ostia present on the surface of body and lead directly into the spongocoel.
- It is lined by flagellated choanocyte cells.
- Spongocoel opens to the outside through a narrow circular opening, the osculum located at the distal free end of the sponge body.
- In which, water enters through ostia into spongocoel and goes out of body through the osculum.

2. **SYCON TYPE**

- This type of canal system is present in syconoid sponges, e.g. Scypha.

- In which, body wall is secondarily folded to form incurrent and radial canals. It opens into the spongocoel by an opening called apopyle. Both types of canals are interconnected by minute pores called prosopyles.
- Incurrent pores or ostia are found on the outer surface of body and open into the incurrent canals, which lead into adjacent radial canals through minute openings called prospyles.
- Radial canals are the flagellated chambers. It opens into central spongocoel by internal openings called apopyles.
- Spongocoel is a narrow, without flagellated cells but is lined by pinacocytes and opens to exterior through the osculum.

3. LEUCON TYPE

- This type is a characteristic feature of the leuconoid sponges e.g., Spongilla.
- In this type, the radial canals get separated into small rounded or oval flagellated chambers by further folding of the body wall. Incurrent canals open into flagellated chambers through prosopyles. Flagellated chambers, in their turn, communicate with excurrent canals through apopyles.
- Excurrent canals are formed as a result of division of spongocoel. It has almost disappeared in these sponges. Thus excurrent canals communicate with the outside through a small spongocoel and an osculum.
- This type of canal system has varying degree of complexity of canals. Further it can be classified into three types: Eurypylous type(E.g. Plakina), Aphodal type (E.g. Geodia) and Diplodal type (E.g., Spongilla and Oscarella).

References:

Barnes R.D (1940-1995). The invertebrates volume I to IV Mc Graw Hill book co.

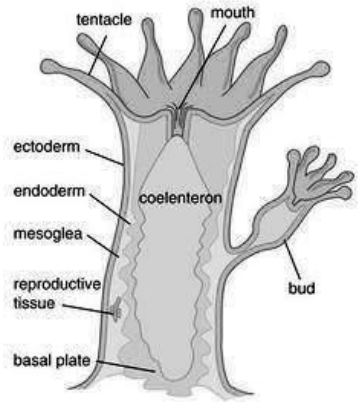
Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.

Ekambaranatha Iyer and T.N Anantha Krishnan (1992). A manual of Zoology Vol-I (Invertebrata) Part I and II Viswanathan and co.

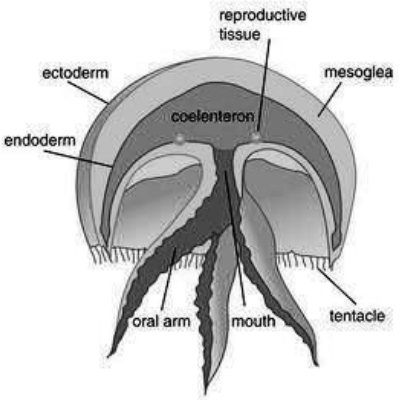
Phylum Cnidaria

General Characters of Phylum Cnidaria

- ✓ Phylum Cnidaria or coelenterate comprises notable cnidarians include hydras, the corals, Portuguese men-of-war, jellyfish, sea anemones, sea whips, sea pens, and sea fans.
- ✓ Habitat: More than 10,000 living species of Cnidarians are distributed. Among them, they are mostly marine animals whereas only 20 species inhabit in freshwater.
- ✓ Grade: They are diploblastic and show tissue grade of organization.
- ✓ Symmetry: The body is radially symmetric but sea anemones show biradial symmetry



Polyp structure



Medusa structure

- ✓ Structure:
- ✓ Cnidarians have calcareous skeletons which form the framework of the reefs and atolls in most tropical seas.
- ✓ Polyp and medusa are the two different forms of cnidarians. Polyp is hydroid form which is sessile with mouth-up orientation. Medusa is umbrella or bell shaped with mouth down orientation. It swims by constricting the bell.
- ✓ The body wall of cnidarians is composed of an outer epithelium called as epidermis, an inner epithelium called gastrodermis, a gelatinous mesoglea between the outer and inner epidermis. Mesoglea contains of amoeboid cells derived from ectoderm. Mesoglea is thin in polyps; but thick in medusa. It is important for buoyancy.
- ✓ The body wall encompasses stinging cells called as cnidocytes, which help in defense and capture of prey.
- ✓ Coelenterons or gastro vascular cavity is the blind sac-like central cavity of cnidarians, which opens out by mouth surrounded by tentacles. Ingestion as well as for egestion are served by the mouth.
- ✓ In medusa of cnidarians, the coelenterons is specialized into stomach, radial canals and ring canal. Coelenterons helps in digestion and circulation.

- ✓ Digestion: They feed on zooplankton, although some utilize larger animals and some are suspension feeders. Prey is caught with tentacles and immobilized by cnidocyst. Digestion is initially extracellular, then intracellular.
- ✓ Respiration: Exchange of respiratory gases and elimination of the excretory wastes occurs by diffusion through the body wall.
- ✓ Neurons: They are interconnected to form a pair of nerve nets, one in epidermis and the other in the gastrodermis. Nerve impulse can travel in any direction. Medusae have nerve rings and ganglia around the margin of the bell besides nerve nets.
- ✓ Reproduction: Asexual reproduction takes place through budding, fission and fragmentation. Cnidarians are commonly unisexual but some are bisexual. Fertilization takes place externally. Cleavage is holoblastic. Development is indirect and includes a free swimming ciliated larval stage called planula.
- ✓ Cnidarians have remarkable power of regeneration.

Classification of Phylum Cnidaria

Phylum Cnidaria is classified into three Classes namely:

1. Class Hydrozoa
2. Class Scyphozoa
3. Class Anthozoa

Class I: Hydrozoa	Class II: Scyphozoa	Class III: Anthozoa
• Mostly marine animals but some may also live in fresh water. • Chiefly colonial. Some appear solitary. • Medusa stage is absent in few animals. Sometimes both polyp and medusa stages are present in few animals of this class. Medusa is craspedote (presence of velum) • Coelenteron of the polyps of this class is undivided • Mesoglea is acellular • Cnidocytes are restricted to the epidermis • Gonads also occur in the epidermal region	• Marine in nature • Medusa stage is predominant in this class. Medusa is acraspedote (No velum) • Mouth is surrounded by four oral arms. • Mesoglea is cellular and contains amoebocytes • Cnidocytes occur in the epidermis and also in the gastrodermis region • Gonads occur in the gastrodermal region. • Polyps are solitary or may also exist in colonies. Polyp stage is syphistoma (body is divided by septa). This	• Truely marine • solitary or colonial • They are sedentary polyploid forms. No medusa stage • Mouth is oval and is surrounded by a whorl of tentacles resembling a flower like structure. • The mouth leads into tubular pharynx called stomodaeum that in turn opens into coelenteron. Coelenteron is divided into radial compartments by vertical septa called as mesenteries. • Cnidocytes occur in epidermal as well as gastrodermal region

• Their colonies are polymorphic with different types of zooids like gastrozooids (feeding type), dactylozooids (defensive type) and gonozooids (reproductive type) • Examples: *Hydra, Obelia, Physalia, Velella*	syphistoma produces juvenile medusa called as ephyrae by the process of strobilation. Finally this ephyra grows into the sexual adult medusa. • This class includes Jelly fish Examples: *Aurelia, Periphylla, Rhizostoma*	• Gonads occur in the gastrodermis. Examples: *Gorgonia, Fungia, Acropora, Corallium, Astraea*

References:

Barnes R.D (1940-1995). The invertebrates volume I to IV Mc graw hill book co.

Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.

Ekambaranatha Iyer and T.N Anantha Krishnan (1992). A manual of Zoology Vol-I (Invertebrata) Part I and II Viswanathan and co.

https://www.studyandscore.com/

Jordon E.Z and P.S. Verma (1995). Invertebrate Zoology 12th ed. Sultan Chand and co.

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Aurelia- detailed study

Aurelia belongs genus of scyphozoan jellyfish, commonly called moon jellies.

Classification

Phylum Cnidaria
Class Scyphozoa
Order Semaeostomeae
Family Ulmaridae
Genus *Aurelia*

Habit and Habitat

Aurelia is also known as moon-jelly or jelly fish. They are found in warm and temperate seas all over the world. It can be found either floating with water currents or feely swimming by the contraction movements of its bell. It is carnivorous and feeds on small animals with the help of its oral arms. It responds to various stimuli and is most active in diffuse light.

External morphology

Shape and size: Aurelia can be easily identified by its soft umbrella shaped body with four red or purple horseshoe shaped gonads on its upper surface and four long and narrow oral lobes hanging downwards from the lower surface. They have a convex aboral or exumbrellar surface and a concave oral or subumbrellar surface.

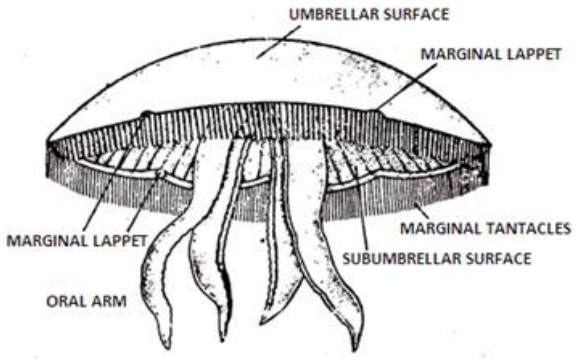

Fig.1. External structure of *Aurelia*

In *Aurelia*, the convex side of the umbrella is called exumbrellar surface and the inner concave surface of the umbrella is called sub-umbrella surface. The outline of the bell is circular with eight notches. The umbrella is thick in the middle and is thin on the margin. Parts of the umbrella of Aurelia will show the following parts.

Mouth and oral arms: In the middle of the sub umbrellar surface a very short and indistinct manubrium is present. At its free and tetrangular mouth is prominent. From the four corners of the mouth four long oral arms will arise. On the ventral side of each oral arm a ciliated groove is present. It leads into the mouth. The oral arms are present on per radial lines.

Sub - genital pits: On each 4 inter radii, 4 sub-genital pits are preset . They lead into a shallow cavity.

Velarium: On the margin of the umbrella a fold is present. It is called Velarium. It is an ectodermal projection with endodermal core.

Lappets and tentaculocysts : In the margin of the umbrella at 4 inter radial and 4 per radial positions, 8 lappets are present. In each notch a tenta culocyst is present, which is a sense organ.

Tentacles : In the margin of the umbrella, a number of tentacles are present. The tentacles have a number of cnidoblasts.

Gonads : Just above the sub genital pit, on 4 inter radial positions 4 horse shoe shaped gonads are present on the floor of the stomach alternating with 4 gastric pouches.

Life cycle

Aurelia has two main stages in its life cycle – the polyp stage (asexual reproduction) and the medusa stage (sexual reproduction).

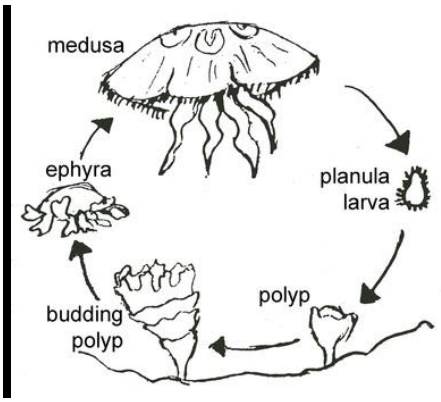

Fig.2. Life cycle of *Aurelia*

1. A mature polyp reproduces asexually, known as budding forming an entire colony of polyps.
2. Polyps specializing in reproduction produce ephyra (small medusae) by budding. The medusae swim off and mature. They then reproduce sexually. From the egg and the sperm of two medusae, a zygote is formed.
3. The zygote develops into a planula (larva).
4. The planula larva leaves the adult medusae, finds a shaded surface, and attaches itself to it.
5. The planula eventually develops into a new polyp, and the life cycle of the Aurelia starts again.

References:

Barnes R.D (1940-1995). The invertebrates volume I to IV Mc Graw Hill book co.

Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.

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CORAL REEFS

Coral reefs belong to the Phylum Cnidaria and Class Anthozoa. Various species of corals are found in all oceans of the world, from the tropics to the polar regions. Reef-building corals are scattered throughout the tropical and subtropical Western Atlantic and Indo-Pacific oceans. The largest coral reef in the world, the Great Barrier Reef, is home to at least 400 individual species of coral and thousands of different species of fish, mollusks, sea snakes, sea turtles, whales, dolphins, birds and more.

Coral reefs are shallow-ocean habitats that are filled with sea life. The massive structure that the coral reef is comprised of is actually built out of coral polyps, which are small marine animals that thrive in colonies. Hard structures are left behind when these marine creatures die, and the stony and branching structure that is left is limestone sturdy enough to create a habitat for new species.

Structure: A coral reef is composed of calcium carbonate, or limestone. This is absorbed from the water by colonies of coral polyps and coralline algae. Most the underlying foundation of the reef is dead, made up of layer upon layer of coral skeletons. The living reef is built over the top of this, by tiny coral polyps adding new limestone to the massive base structure.

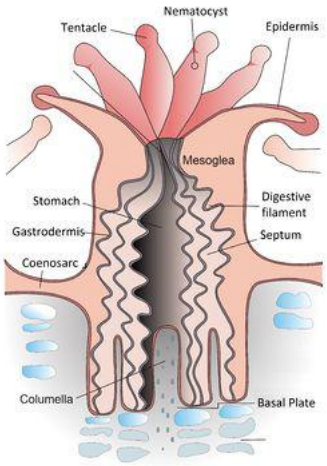

Fig. 1. Structure of Coral

The polyps make skeletons (or corallites) of calcium carbonate around themselves. The beautiful colour of corals comes from the colourful tentacles of the coral polyps and the zooxanthellae algae that live in the tissues of many species.

Corals are an ancient group having a simple, radially-symmetrical body with a single opening that serves as both a mouth and anus. The body is made up of two layers of cells, separated by a jelly-like layer with no internal organs. Corals possess specialised stinging cells called nematocysts on their retractable tentacles that are used to catch food.

Stony corals (or scleractinians) are the corals primarily responsible for laying the foundations of, and building up, reef structures. Massive reef structures are formed when each individual stony coral organism—or polyp—secretes a skeleton of calcium carbonate.

Most stony corals have very small polyps, averaging one to three millimeters (0.04 to 0.12 inches) in diameter, but entire colonies can grow very large and weigh several tons. These colonies consist of millions of polyps that grow on top of the limestone remains of former colonies, eventually forming massive reefs.

In general, massive corals tend to grow slowly, increasing in size from 0.5 to two centimeters (0.2 to 0.8 inches) per year. However, under favorable conditions (lots of light, consistent temperature, moderate wave action), some species can grow as much as 4.5 centimeters (1.8 inches) per year.

Coral reefs are built by and made up of thousands of tiny animals—coral "polyps"—that are related to anemones and jellyfish. Polyps can live individually (like many mushroom corals do) or in large colonies that comprise an entire reef structure.

A polyp has a sac-like body and an opening, or mouth, encircled by stinging tentacles called nematocysts or cnidae. The polyp uses calcium and carbonate ions from seawater to build itself a hard, cup-shaped skeleton made of calcium carbonate (limestone). This limestone skeleton protects the soft, delicate body of the polyp. Coral polyps are usually nocturnal, meaning that they stay inside their skeletons during the day. At night, polyps extend their tentacles to feed.

Most coral polyps have clear bodies. Their skeletons are white, like human bones. Generally, their brilliant color comes from the zooxanthellae (tiny algae) living inside their tissues. Several million zooxanthellae live and produce pigments in just one square inch of coral. These pigments are visible through the clear body of the polyp and are what gives coral its beautiful color.

Corals feed by one of two ways. Some species catch small marine life, like fish and plankton, by using the stinging tentacles on the outer edges of their bodies. Most corals, however, depend on algae called zooxanthellae to provide energy via photosynthesis.

Coral polyps produce carbon dioxide and water as byproducts of cellular respiration. The zooxanthellae cells use carbon dioxide and water to carry out photosynthesis.

Corals can reproduce both sexually and asexually. An individual polyp may use both reproductive modes within its lifetime.

The three main types of coral reefs are fringing, barrier, and atoll.

1. Fringing reefs grow near the coastline around islands and continents. They are separated from the shore by narrow, shallow lagoons. Fringing reefs are the most common type of reef that we see.
2. Barrier reefs also parallel the coastline but are separated by deeper, wider lagoons. At their shallowest point, they can reach the water's surface forming a "barrier" to navigation. The Great Barrier Reef in Australia is the largest and most famous barrier reef in the world.
3. Atolls are rings of coral that create protected lagoons and are usually located in the middle of the sea. Atolls usually form when islands surrounded by fringing reefs sink into the sea or the sea level rises around them (these islands are often the tops of underwater volcanoes). The fringing reefs continue to grow and eventually form circles with lagoons inside.

Coral reefs protect coastlines from storms and erosion, provide jobs for local communities, and offer opportunities for recreation. They are also are a source of food and new medicines. Over half a billion people depend on reefs for food, income, and protection. Fishing, diving, and snorkeling on and near reefs add hundreds of millions of dollars to local businesses.

References

Barnes R.D (1940-1995). The invertebrates volume I to IV Mc Graw Hill book co.
Barrington E.J.W (1979). Invertebrates structure and function 2nd edn. ELBS and Nelson.