

Structure of Obelia

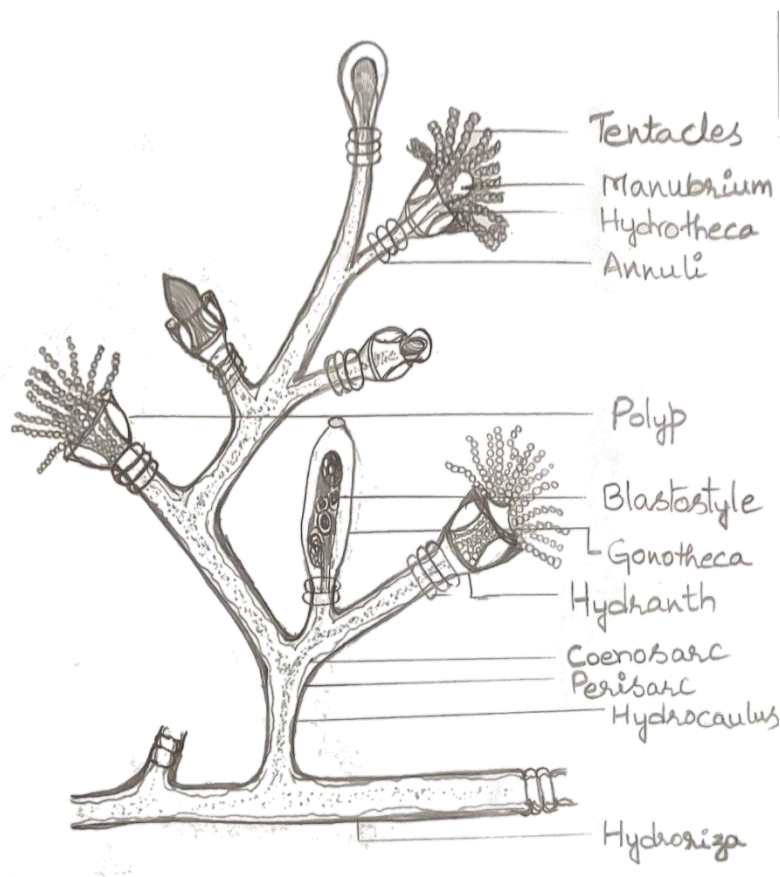
Introduction:

Obelia is worldwide in distribution looks like a plant and is observed in white or light brown in colour in the form of fur in the seas and oceans. It is usually known as Sea-fur. Its name is derived from the Greek word called 'obelias', means loaf baked on a spit.

As it is having three forms like polyp, medusa and blastostyle, it is described as trimorphic hydrozoan. Among many species like *O. geniculate*, *O. longissimi*, *O. bidentata*, *O. dichotoma*. *O. geniculate* is the most common example studied.

Habit and Habitat of Obelia:

It is sedentary, marine colonial form present throughout the world on the surfaces of sea weeds, rocks, wooden piles, molluscan shells etc., in the shallow water up to 80-100 meters depth. It is observed in both asexual forms as hydroid colony and sexual form as medusa.



OBELIA COLONY

Structure of Hydroid Colony:

Hydroid colony of obelia insensitive, transparent consists of horizontal hydrorhiza and vertical hydrocaulus.

Hydrorhiza:

Hydrorhiza is horizontal thread like root attached to the substratum. It is hollow tube and gives off vertical branches called hydrocaulus.

Hydrocaulus:

Hydrocaulus are vertical branches arising from hydrorhiza for a length of 2-3 cms. These are also hollow with short lateral branches alternatively in cymose manner. Each alternate branch bears terminal polyp zooids. Each ultimate branch terminates in nutritive zooids called hydranth and axils of the older polyps bears reproductive zooids called blastostyles or gonangia, thus obelia colony is dimorphic and when gonangia produces saucer shaped buds as a result of asexual reproduction and develops into sexual zooids called medusae, obelia colony becomes trimorphic colony. When only polyps are present the colony is described as monomorphic colony.

The branches of obelia and zooids possess hollow, living substance with tubular structure inside and hard, chitinous, nonliving, defensive layer outside. The layers of the colony are distinguished into two – coenosarc and perisarc.

Coenosarc:

The common stem or stalk, zooids and stalk of zooids consists of central hollow, tubular gastrovascular cavity or enteron made of cellulose. This is known as coenosarc canal. The coenosarc canal of all the zooids and mature obelia is continuous so that the food is passed onto the complete colony. Surrounding this cavity, the complete colony consists of inner endodermis bearing tentacles, outer epidermis and in between transparent, gelatinous mesoglea. All these three combinedly called as coenosarc.

Perisarc:

The epidermis of coenosarc secretes brown or yellow coloured, transparent, chitinous, nonliving, protective layer known as perisarc. In the immature stage coenosarc and perisarc are

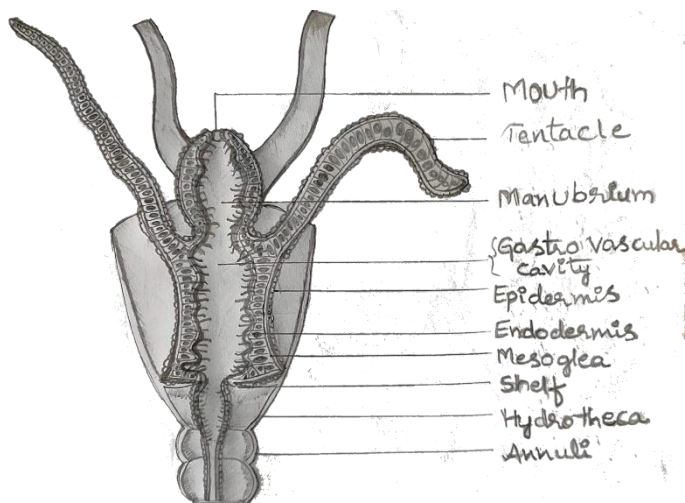
connected to each other and as the animal grows, they are separated by a space between them. Perisarc not only protects the colony but also gives support to the complete colony by acting as exoskeleton. It covers hydrorhiza, hydrocaulus and branches of the colony. The perisarc around the polyp forms funnel like wine glass shaped structure called hydrotheca. Not only this it also contains several annular constrictions called perisarc annuli giving an appearance of ring at the base of the polyp. These are called as sub branches and because of the presence of these the branches are able to bend easily.

Perisarc which is around the blastostyle is known as gonotheca. Blastostyle and gonotheca combinedly called as gonangium. The shelf present across the base of the hydrotheca gives support to hydranth. This makes hydranth to contract and withdraw into hydrotheca.

Zooids:

The individual form of the obelia colony is denoted by zooid. It is derived from the Greek word 'zoon' means animal and 'oid' means form. At the earlier stages when the colony possess only polyps or hydranths usually called nutritive zooid it is termed as monomorphic colony. When it develops blastostyles usually called budding or asexual zooids it is termed as dimorphic colony and lastly in the matured stage when it possesses medusae usually called sexual zooids, obelia colony is defined as trimorphic colony. Due to this obelia colony is described as Polymorphic animal.

I. Polyp or Hydranth:



Polyp is derived from Greek word 'polypus' means many-forted (outgrowths).

Hydranth is derived from Greek word 'hydra' means water serpent and 'anthos' means flower.

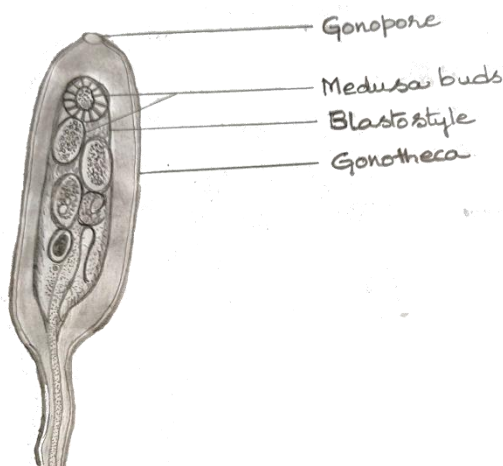
It is commonly called nutritive zooid which is also called as gastrozooid or trophozooid. It is just like miniature hydra with cylindrical body and is attached to the tip of the lateral branch of hydrocaulus. It looks like a yellow triangular cupproximal end is attached to the hydrocaulus and free at its distal ends. Surrounding this is perisarc called hydrotheca which is transparent and colourless, on which polyp rests. The free distal end contains bud like structure called manubrium or hypostome or apical cone.

Manubrium is about $\frac{1}{3}$ rd of the total length of polyp. Tip of the manubrium contains oval shaped opening called mouth. It is surrounded by 24-30 filiform long tentacles formed from both epidermis and endodermis. This aperture is capable of contraction and relaxations.

Inside

it is hollow and is connected to the coenosarc cavity internally.

II. Gonangium or Blastostyle:



GONANGIUM

The word gonangium is derived from two Greek words 'gonos' means seed and 'angeion' means vessel.

When the hydrocaulus is fully grown and the obelia colony is matured, from the base of the polyps transparent club shaped cylindrical buds are produced. They develop into blastostyles or gonozooids or blastozooids. The number of blastozooids is less than the hydranths.

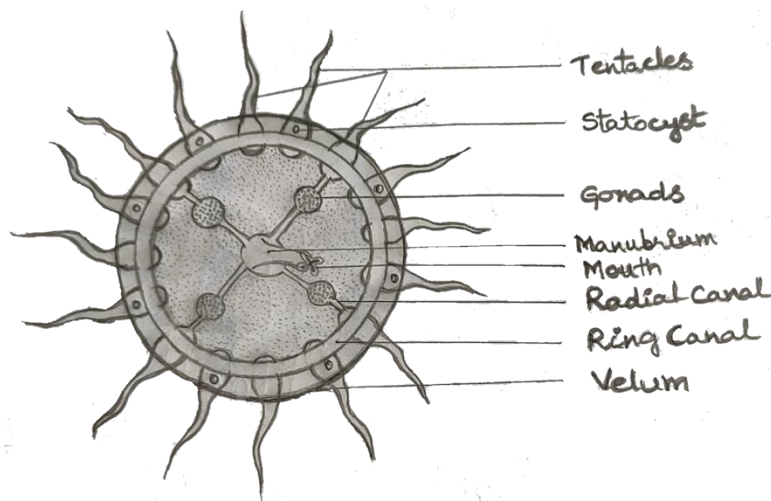
The perisarc layer surrounding the blastostyle is called gonotheca. This will be vase like, transparent, loose capsule. The proximal part of the blastostyle is almost closed. It does not possess mouth, tentacles. Gastrovascular cavity is much reduced. For the sake of food, they depend on nutritive zooids. The distal part is flattened disc like with a small aperture called gonopore.

Blastostyle from its lateral sides produces sexual zooids called medusae or gonophores by asexual type of reproduction called budding. Fully formed medusae detaches from the blastostyle into the surrounding water through gonopore, aperture present at the tip of the blastostyle.

Gonotheca, blastostyle and medusae all together called as gonangium.

III. Medusa:

Inside the gonotheca, blastostyle gives of buds by the process of budding which develops into umbrella shaped medusae. They get detached from the blastostyle and enters into the water through the gonopore of gonangium. They lead a free-swimming life by feeding in the water. These medusae buds are formed in large numbers in spring and summer season.



Shape and size:

Fully developed medusa is like umbrella or saucer shaped, transparent with a small stalk. It is radially symmetrical with 1-2 mm in diameter when formed and measures about 5-6 mm in diameter when it gets matured. In this open umbellar shape of the medusa, the outer convex surface is called ex-umbrella and the inner concave surface is called as sub-umbrella. Medusa consists of velum, manubrium and gastrovascular cavity. It also contains one circular canal

and four radial canals in four directions and are interconnected. Mature medusa possesses four gonads (either four testes or four ovaries as they are unisexual) in the center of the radial canal. The space surrounding the radial canal is called per-radius. The central portion between the two per-radius canals is called inter radius and the space between per-radius and inter radius is called ad-radius.

Manubrium:

In the center of the sub-umbellar surface a short, hollow handle like structure hangs which is called as manubrium. It is derived from Latin word 'manus' means handle. At the tip of the manubrium square shaped mouth is present which opens into the gastrovascular cavity. Mouth is surrounded by four oral lobes.

Gastrovascular cavity:

The mouth leads into the cavity of enteron or gastric cavity through the gullet of the manubrium. From the gullet it enters into the stomach present at the base of the manubrium and covers the complete central part of the umbrella. From the central stomach four radial canals start and distribute to the four sides and join with the circular canal at the margin of the sub-umbellar surface. The gastrodermis layer of manubrium, stomach and canals are ciliated for the easy passage of the food to different parts of the body.

Velum:

Velum is thin fold of the skin in the inward direction hanging from the edge of the umbrella of the medusa. It is characteristic feature of hydrozoan medusae, but it is insignificant in medusae of obelia colony. The medusae with velum are called ctenophores and the medusae without velum are called acraspedotes found in scyphozoa.

Tentacles:

From the edge of the bell-shaped structure of medusa small, contractile, solid shaped structures hang downwards. They are called as tentacles. The base of the tentacles is swollen and are called tentacular bulbs or vesicles. The number of the tentacles will be 16 in 16 directions; i.e. 4 in per-radius, 4 in inter radius and 8 in ad-radius regions particularly in the medusa of obelia colony. The number of these tentacles increases when the medusa grows.

Tentacular bulbs are provided with nematocyst and are pushed into the tentacles. In these vesicles or tentacular bulbs nerve cells, ectodermal cells with pigment granules are present which are regarded as sense organs called statocysts or lithocysts. In medusa of obelia colony statocysts are absent. Pigmented granules are considered as excretory products. Statocyst is tiny, circular closed vesicle containing fluid filled calcareous granules called otoliths. Otoliths are present in special cells called lithocyte. Lithocyte has sensory cells with sensory processes where the otoliths produce stimulus and transmitted to muscles through the nerves by which the bell-shaped medusa comes to the right position by the contraction of the muscles. So, the statocysts are described as balancing organs. Besides these a special cell called simple eye or Ocelli are present. These are photoreceptors, responding to light. Red, dark brown or black pigments are absent in these cells.

Differences between Polyp and Medusa

Sl. No	Polyp	Medusa
1.	It is stalkless, sedentary stage of the life cycle.	It is mobile, free living stage of the life cycle.
2.	Body is cylindrical (tube like).	Body is like open umbrella shaped (bell like).
3.	Animal is attached to the bottom with foot-like disk, manubrium is towards the upper side.	Animal is free living with the base on the upper side manubrium hangs towards the lower side.
4.	Animal bears 24-30 tentacles around the mouth and is referred as head.	In the early stages animal bears 16 tentacles and increases when the animal grows.
5.	Mouth is circular.	Mouth is square shaped.
6.	Velum is absent.	Velum is present.
7.	Body structure is simple.	Body structure is complex.
8.	Mesodermis is not well developed.	Mesodermis is well developed.
9.	Muscular and nervous systems are not well developed.	Muscular and nervous systems well-developed.
10.	Sensory organs are absent.	Sensory organs are present in the form of statocysts (photoreceptors).
11.	Gastrovascular cavity is simple.	The space between the mouth and the base

		of the manubrium consists of gastrovascular cavity with stomach, radial and circular canals.
12.	It is nutritive zooid.	It is sexual zooid.
13.	Gonads are absent.	Gonads are present on the radial canals
14.	Reproduces asexually by the processes called budding	Reproduces sexually by gametes
15.	Ex: Anthozoan animals - <i>Pennatula</i> (Sea pens), <i>Metridium</i> (Sea anemone), <i>Fungia</i> (Mushroom coral), <i>Alcyonium</i> (Dead man's finger), <i>Tubipora</i> (organ pipe coral) etc.,	Ex: Hydrozoan animals – <i>Obelia</i> (Sea fur), <i>Hydra</i> (Fresh water polyp), <i>Physalia</i> (Portugese man of war), <i>Millipora</i> (Coral forming hydrozoan), <i>Hallistemma</i> (highest polymorphic animal), <i>Velleella</i> , (little sail) <i>Porpita</i> (Blue button)