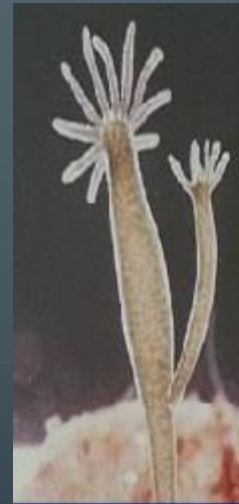


ANIMAL DIVERSITY & WILDLIFE CONSERVATION

Zoology Complementary Course for I Semester B.Sc. Botany
Complementary Course 1

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PHYLUM CNIDARIA (COELENTERATA)

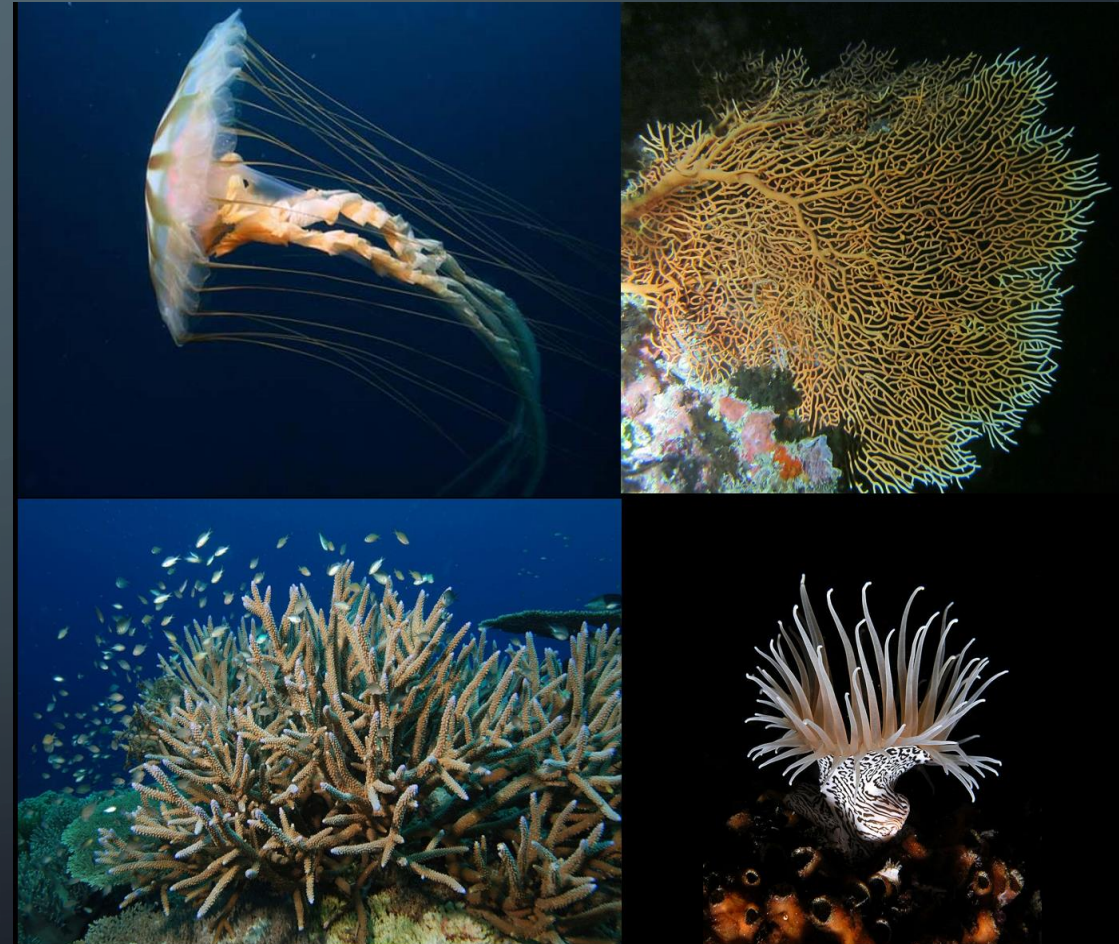


Phylum Cnidaria
Hydra, jellyfish, coral, & sea
anemones



PHYLUM COELENTERATA (CNIDARIA)

- Phylum Cnidaria or Coelenterata is a group of diploblastic, radially or biradially symmetrical and tentacle-bearing metazoans with blind - sac body plan and tissue grade of organization.



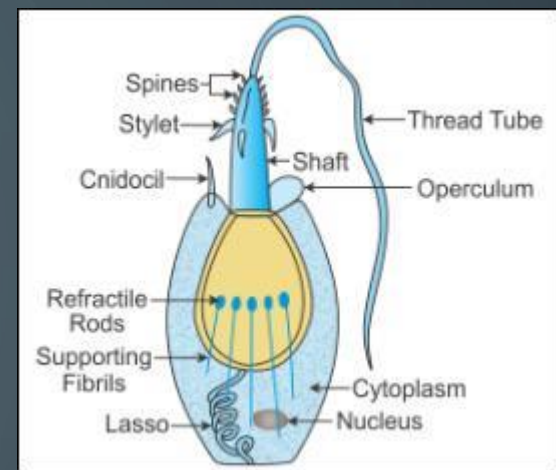
SALIENT FEATURES

- *Radial or biradial symmetry* : Cnidarian body is radially or biradially symmetrical. It is divisible into two similar halves by a vertical section along any plane passing through the oro-aboral axis.
- *Tissue grade organization* : In cnidarians, cells are arranged in organized functional groups to form only tissues; organs and organ systems are absent. Epithelial cells, muscle cells, nerve cells and nervous co-ordination are present.

SALIENT FEATURES

- **Diploblastic body wall** : The body wall of cnidarians is diploblastic or two-layered - outer epidermis and inner endodermis or gastrodermis. In between these two is a gelatinous extra cellular matrix, called mesogloea. It may be fibrous and thin or thick, often containing amoeboid cells, which are not arranged in a definite layer.
- **Tentacles** : Cnidarians have characteristic finger - like or thread - like structures, called tentacles. They are oral, basal, or marginal in position. Oral tentacles encircle the mouth. Tentacles are helpful in defence, locomotion and food collection. They are armed with batteries of offensive and defensive cells, called *cnidocytes*.

SALIENT FEATURES

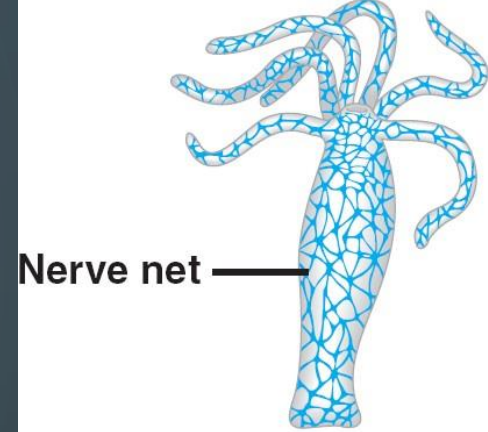


- Presence of *cnidoblasts* and *cnidae* : The presence of cnidoblasts (cnidocytes, nematoblasts, nematocytes, or stinging cells) is a unique feature of cnidarians (the name "cnidaria is derived from this feature). Cnidoblasts are specialized sensory cum effector epidermal cells, concerned with offence, defence and food capture. Each cnidoblast contains a poison-filled membranous capsule, called *cnida* (nematocyst or spirocyst).

SALIENT FEATURES

- *Presence of coelenteron* : Cnidarians have an internal digestive cavity, called coelenteron or *gastro-vascular cavity* (the name 'coelenterata' is derived from this feature). It opens out only by mouth, anus being absent. Digestion is extra-cellular as well as intracellular. Extracellular digestion occurs in the coelenteron with the help of the enzymes secreted by the gastrodermal gland cells. In intracellular digestion, the amoeboid gastrodermal cells ingest small food particles and digest them inside their food vacuoles.

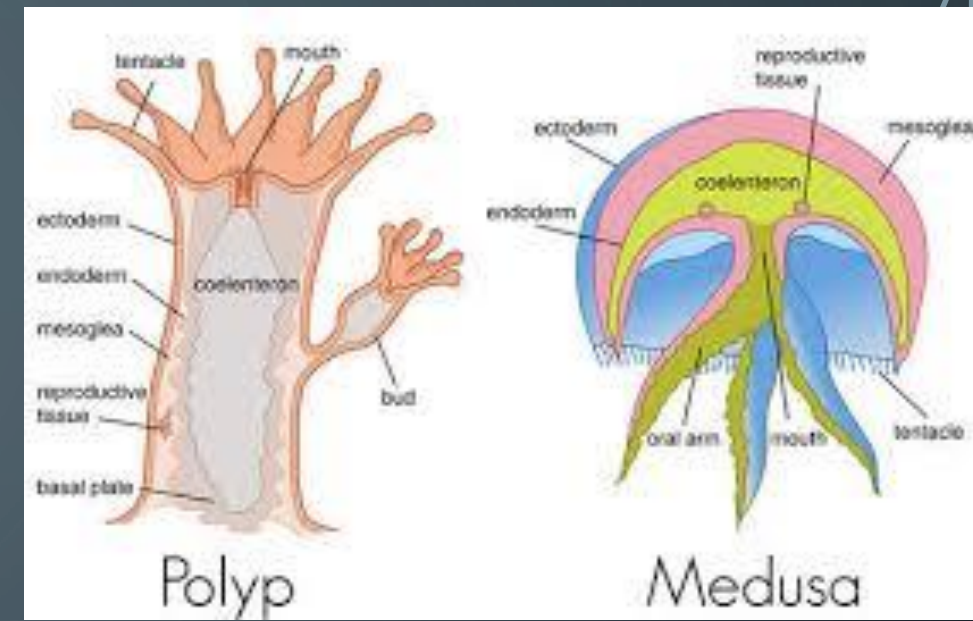
SALIENT FEATURES



(a) Hydra (cnidarian)

- **Primitive nervous system formed of a nerve net:** Cnidarian nervous system is very primitive. It consists of a superficial nerve net or nerve plexus of interconnecting neurons. The nerve net is formed of sensory neurons, motor neurons and interneurons. Sensory neurons monitor the environment and perceive stimuli. Motor neurons activate effectors, such as cnidoblasts and muscles. Interneurons join sensory neurons to motor neurons, link receptors with effectors, and form an irregular network.

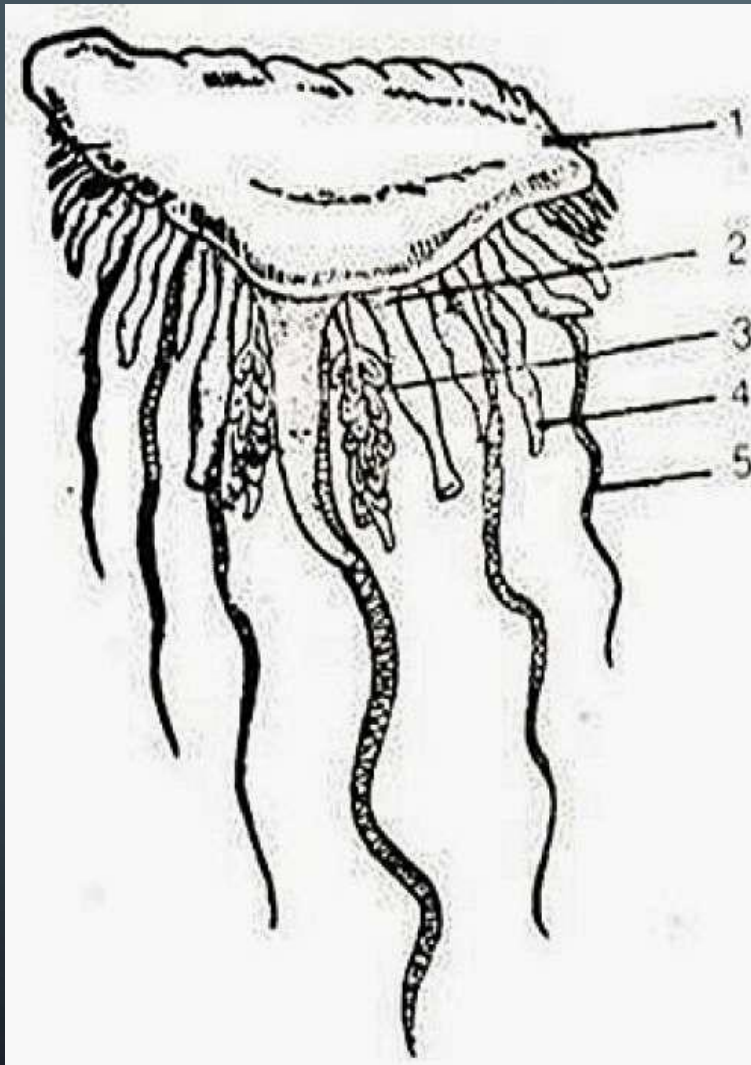
SALIENT FEATURES



- **Presence of polypoid and medusoid individuals** : Two kinds of individuals or zooids are found among cnidarians, *polyps* and *medusae*. *Polyps* are stalked, tubular and attaching asexual forms, with thin and poorly developed mesogloea and upwardly directed manubrium, mouth and tentacles. On the other hand, *medusae* are umbrella-like, free-swimming sexual forms, with soft and thick mesogloea and downwardly directed manubrium, mouth and tentacles. Medusoid adults are commonly known as 'jelly fishes', since their mesogloea is massive, gelatinous and buoyant.

SALIENT FEATURES

- ***Polymorphism and division of labour*** : Polymorphism is the condition in which the members of a species exist in two or more structurally and functionally different forms. It is exhibited by some colonial coelenterates. The members of these colonies are called *zooids*. There is clear division of labour among the zooids of such colonies. Based on this, three kinds of zooids can be recognized, namely *gastrozooids* or *trophozooids*, *gonozooids* and *dactylozooids*. Gastrozooids are nutritive, gonozooids reproductive, and dactylozooids defensive in function. "



PHYSALIA

- 1. PNEUMATOPHORE
- 2. GASTROZOOID
- 3. GONOOID
- 4. DACTYLOZOOID
- 5. TENTACLE

SALIENT FEATURES

- ***Asexual reproduction by budding*** : Cnidarians reproduce asexually as well as sexually. Asexual reproduction is by budding or gemmation. In some cases, the daughter individuals formed by budding will not detach from the parent. This results in colony formation.
- ***Sexual reproduction involves planula larva*** : Sexual reproduction in cnidarians involves indirect development and a ciliated, free-swimming pelagic larva, called *planula*. Planula is the fundamental larva of Cnidaria.

SALIENT FEATURES

- ***Metagenesis or alternation of generations*** : In the life cycle of many cnidarians, there is a regular and cyclic alternation between asexual and sexual generations. This is called metagenesis. The asexual generation is polypoid and the sexual generation is medusoid. Polypoid form undergoes budding and produces the medusoid form which in turn, undergoes sexual reproduction and gives rise to the polypoid form.
- Cnidarians are all aquatic forms and no one is terrestrial. Most of them are marine, while only a few live in freshwater.

CLASSIFICATION OF PHYLUM CNIDARIA

- The current system of classification prefers to divide the Phylum into four classes, namely *Hydrozoa*, *Scyphozoa*, *Anthozoa* and *Cubozoa*.

CLASS-HYDROZOA

- A group of fresh-water or marine, solitary or colonial, sedentary or free-swimming **coelenterates (cnidarians)** with polyps or medusae or both in the life cycle.
- **Tetramerous** or polymerous radial symmetry.
- Ideal diploblastic condition, with typically non-cellular mesogloea.
- Presence of an outer perisarcal covering, secreted by the epidermis.
- **Simple gastro**-vascular cavity, without stomodaeum, gastric filaments and septae or **mesenteries**.

CLASS-HYDROZOA

- Presence of polypoid and medusoid individuals.
- Medusae are typically *craspedote* (provided with velum).
- Occurrence of metagenesis, with distinct asexual polypoid and sexual medusoid phases in the life cycle.
- Sex cells or gametes are ectodermal, and are discharged directly to the outside.
- Sexual reproduction involves the ciliated, free-swimming, pelagic *planula larva*.
- Nearly 3000 species of hydrozoans are known
- **Examples:** *Hydra*, *Obelia*, *Physalia*, *Pennaria*, *Tubularia*, *Sertularia*, *Plumularia*, *Velella*, *Porpita*, *Halistemma*.

OBELIA

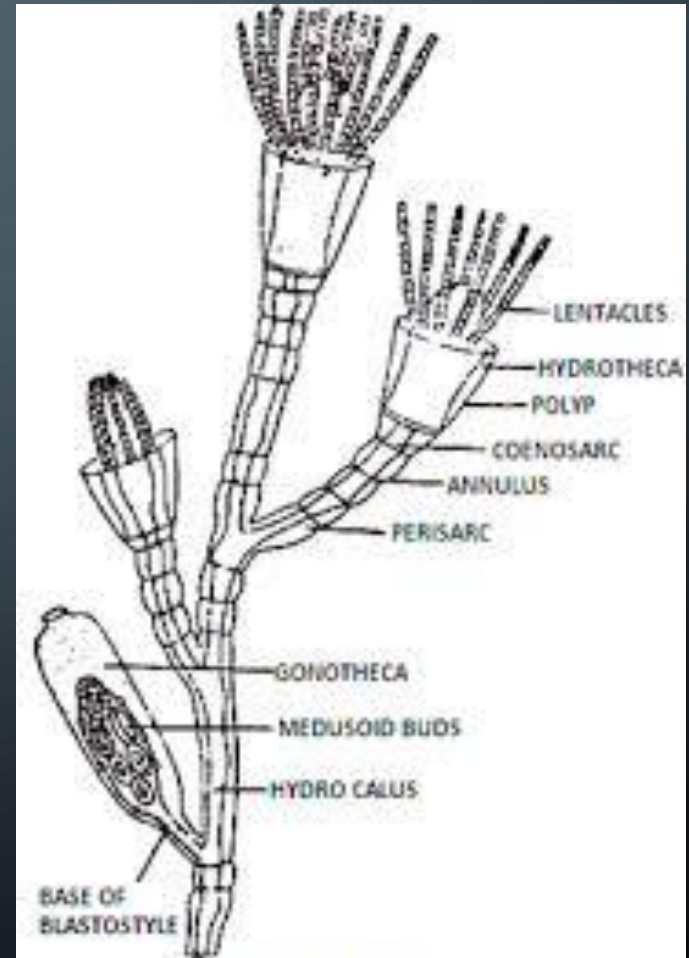


Fig. 101. OBELIA

HYDRA



PHYSALIA



VELELLA



CLASS SCYPHOZOA

- **A group of large-sized medusoid coelenterates, popularly known as jelly-fishes.**
- **Members are exclusively marine, pelagic and solitary.**
- **Polypoid phase is absent or reduced, and sometimes represented by an asexual form called *hydratuba* or *scyphistoma*. It develops directly to adult or gives off medusae by transverse fission. (m) Medusoid phase is prominent.**
- **Medusae are acraspedote; velum is absent or rudimentary.**

CLASS SCYPHOZOA

- ***Tentaculocysts or rhopalia* are the characteristic marginal sensory receptors.**
- **Gastro-vascular cavity has no stomodaeum. but has *gastric tentacles*.**
- **Mesogloea is usually cellular, containing wandering amoeboid cells.**
- Medusoid adults are dioecious, each with four gonads.
- **Gonads and sex cells are endodermal.** Sex cells are discharged to the **gastro-vascular cavity, and not directly to the outside.**
- **Around 200 or more** species of scyphozoans are known
- **Examples: *Aurelia, Cassiopeia, Rhizostoma, Lucernaria, Haliclystus*.**

AURELIA



RHIZOSTOMA



CLASS ANTHOZOA [ACTIONOZOA]

- The largest coelenterate class of solitary or colonial marine forms.
- Only polypoid forms are present; medusoid stage is completely suppressed.
- Cylindrical body with hexamerous, octomerous, or polymerous biradial or radio-bilateral symmetry. Oral end is expanded radially, forming an oral disc.
- Loosely cellular (mesenchymatous) mesogloea with wandering amoeboid cells and branching muscle fibres.
- A horny exoskeleton, secreted by the epidermis, is present in most forms.

CLASS ANTHOZOA [ACTIONOZOA)

- Gastro-vascular cavity has prominent stomodaeum. At one or both the ends, stomodaeum has a ciliated groove, known as *siphonoglyph*. Through this, genital products pass to the outside. (vi) Gastro-vascular cavity is divided into a large number of intercommunicating chambers by septae or mesenteries.
- Most individuals are unisexual. Gonads are endodermal. Sex cells are discharged to the coelenteron, and not directly to the outside.
- Anthozoa includes the coelenterates popularly known as sea-anemones, corals, sea pens, sea-fans and sea-feathers.
- More than 6000 species are known
- Examples: *Tubipora*, *Gorgonia*, *Pteroides*, *Adamsia*, *Edwardsia*, *Madrepora*, *Favia*, *Fungia*, *Zoanthus*, *Pennatula*, *Virgularia*, *Cavernularia*.

ADAMSIA



TUBIPORA



GORGONIA



CLASS CUBOZOA (CUBOMEDUSAE, CARYBDEIDA)

- Cubomedusae was *formerly* treated as an order under class Scyphozoa. But, currently it has been *elevated* to the rank of an independent class, called cubozoa, considering the nature of the nematocysts, velum and life cycle, which very clearly reveal that cubozoans are *not closely related* to other scyphozoans.
- Cubozoa is a group of large-sized, exclusively marine, free-swimming, solitary cnidarians, with a more or less quadrangular, umbrella-like, cuboidal body.

CLASS CUBOZOA

- Body is a colourless, transparent and cuboidal swimming bell, with four flattened sides and a simple margin.
- Four per-radial tentacles or tentacle groups, borne on *pedalia* (singular pedalum gelatinous basal expansion of tentacles). Tentacles are armed with highly virulent nematocytes. By virtue of this feature, cubozoans are popularly known as "sea wasps".
- Four stalked and inter-radial *rhopalia*, each with a *statolith* and one or more *ocelli*.
- Sub-umbrellar margin bends inward forming a *velarium* or pseudovelum
- Quadrangular manubrium in the centre of the sub-umbrella, basally encircled by four sub-umbrellar funnels.

CLASS CUBOZOA

- **Gastrodermal** lamella (endoderm lamella) extends to the bell margin with the **result that ex-umbrellar epidermis** gets completely cut off from the sub-umbrellar **epidermis**.
- Stomach occupies the summit of the bell, while the four gastric pockets are **located** on the four flat sides.
- Gastric pouches give off a canal into each rhopalium.
- Nervous system is well developed, with a marginal nerve ring and remarkably **complex eyes**.
- **Gonads are thin flaps**, eight in number.

CLASS CUBOZOA

- **Cubozoans are popularly called "box jellies" by virtue of the peculiar appearance of their body. They are also called "sea wasps" considering their venomous nematocysts and their virulent sting. They are expert swimmers and voracious feeders, subsisting mostly on fishes.**
- ***Examples : Chiropsalmus, Chiropsopus, Carybdea, Tripedalia, Tamoya***

CARYBDEA

