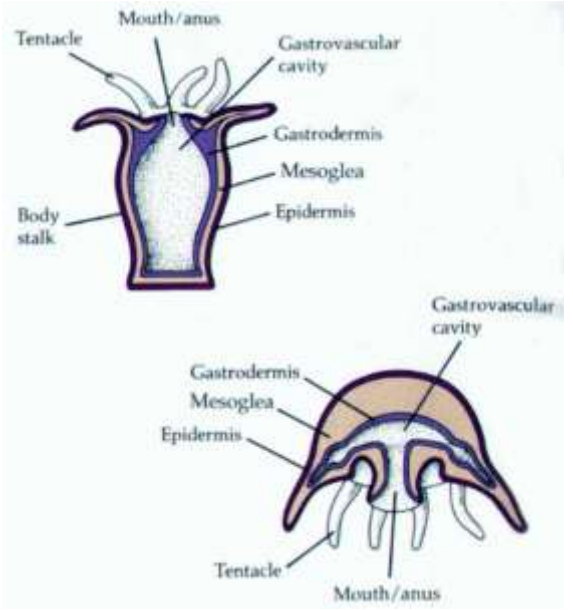
Dr. Khaled Al-Qaoud

Chapter 4

Cnidarians (Coelenterata)

Phylum Cnidaria

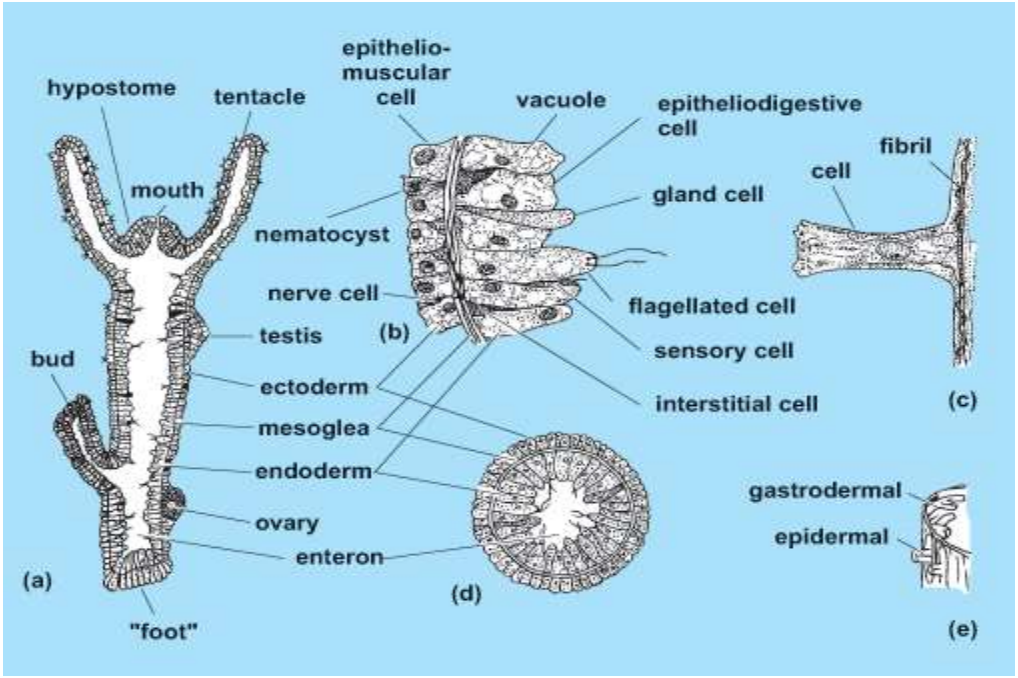
- **11,000 spp**
- **Free living in marine water mainly**
- **few spp in freshwater**
- **Carnivorous predators primarily with**
- **some spp in mutualistic symbiosis with algae**

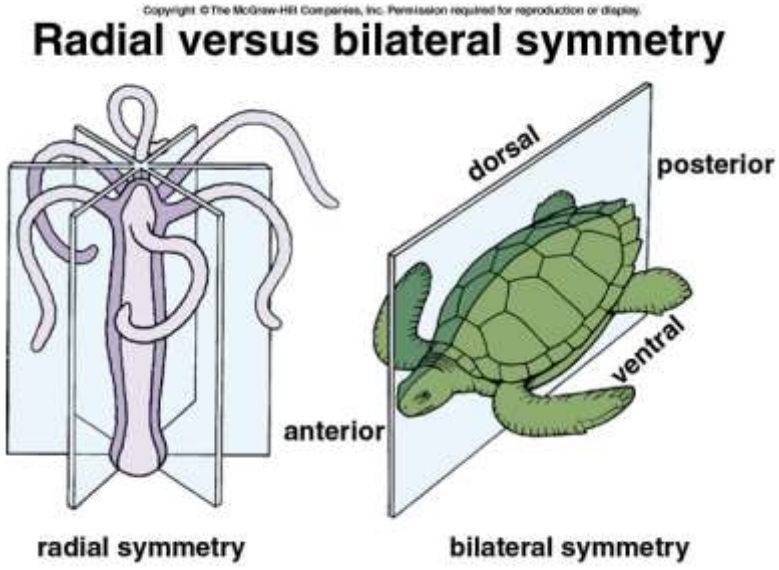


- **Dimorphic or polymorphic**
  - Polyp: anemone, tube with a mouth surrounded by tentacles, specialized in sedentary (sessile) life attached to substrate
  - Medusa: jellyfish, bell-shaped free-floating, swim by pulsating contractions

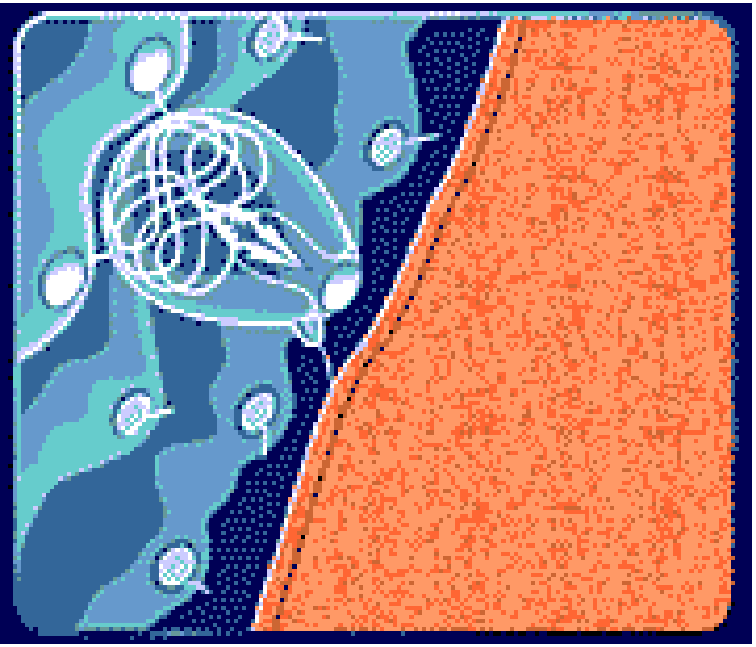
Phylum Cnidaria

- **Diploblastic with gelatinous non-living mesoglea (may contain amoeboid cells) between the epidermis (epitheliomuscular cells) and gastrodermis (nutritive muscular cells)**
- **Radially symmetrical; organic level of body organization; with nerve cell network and muscle cells;**
- **Gastrovascular cavity with one opening (mouth) surrounded by tentacles;**



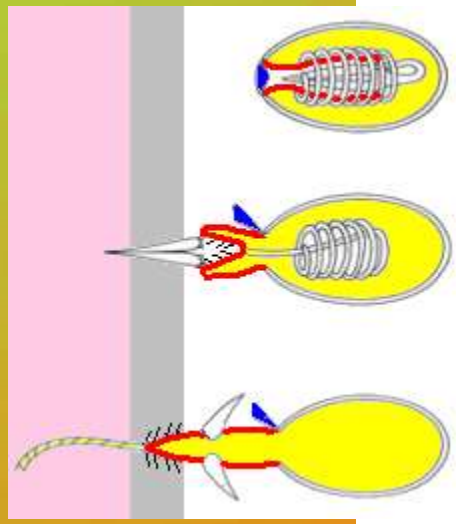


Phylum Cnidaria-feeding



- **Cnidoblasts are cells that secrete cnidae (nematocysts) and bear cnidocil that perceives chemical and tactile stimulation leading to nematocyst discharge**
- **Cnida is a proteinaceous capsule with operculum and internal long coiled tube under osmotic pressure;**
- **Nematocysts are >30 different types for different functions including food collection, defense and locomotion. They can wrap, stick to, penetrate or secreting proteinaceous deadly toxins. Into the prey.**

Cnidocyte with nematocyst



Trigger hair
Cnidocil

fluid

coiled thread

Undischarged
< 0.1 mm

Discharged

Classification of Cnidaria

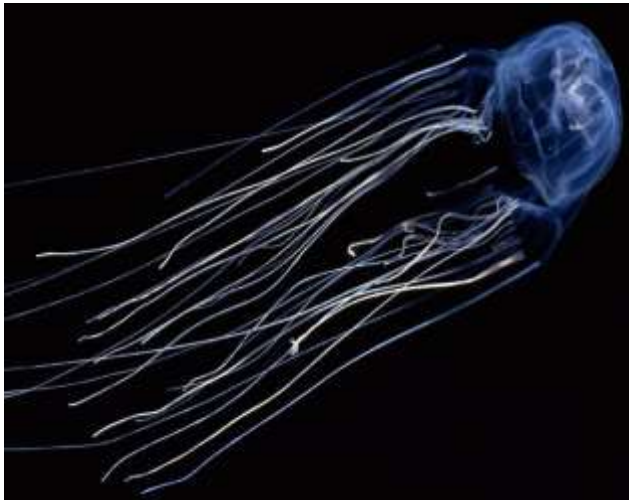
- **Classified into 4 classes: Scyphozoa, Cubozoa, Hydrozoa, & Anthozoa on the basis of dominant form and mode of asexual reproduction.**
- **1. Class Scyphozoa (Jellyfishes): 200 spp.;**
  - **All are marine active swimmers**
  - **live in mutualistic symbiosis with zooxanthellae algae in their tissues**

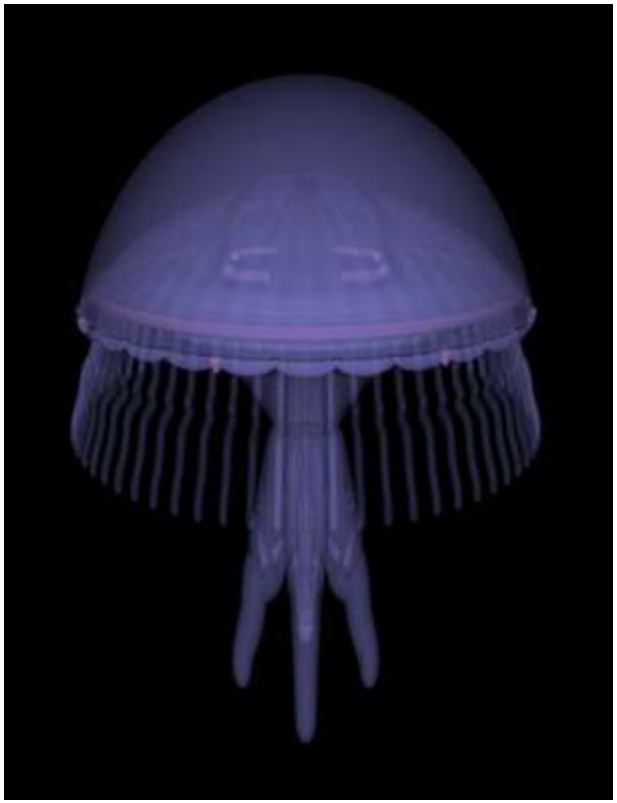
---Medusa stage dominant over a highly reduced polyp form;

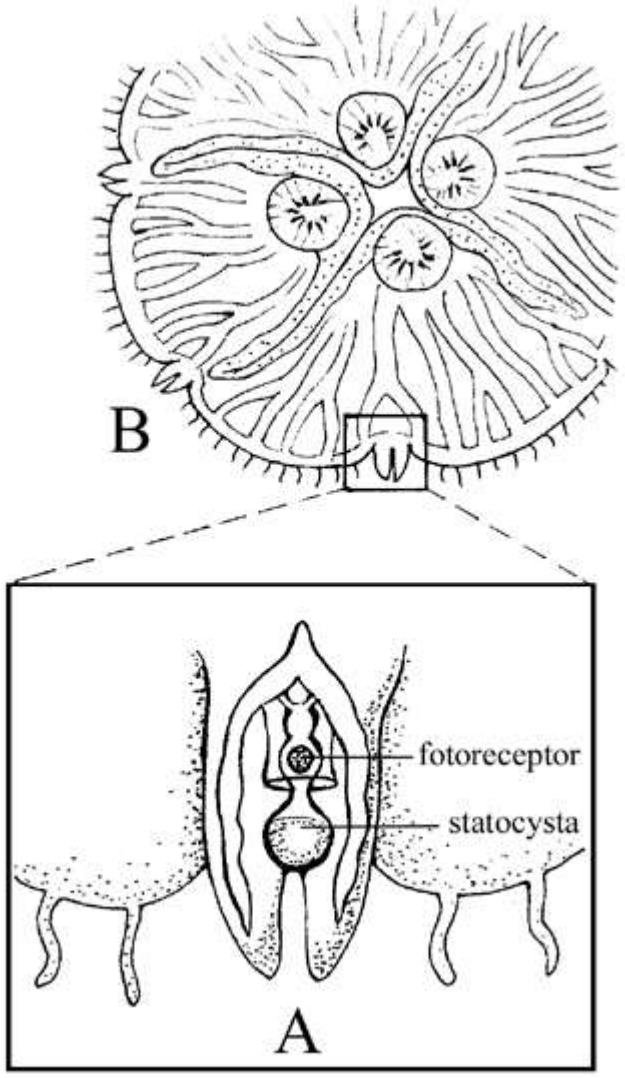
---Medusa with:

- **thick mesoglia**
- **many tentacles**
- **a mouth at end of muscular manubrium;**
- **Well developed gastrovascular cavity with:**
  - **gastric pouches**
  - **and fluid filled gastrovascular canals consisting of primary, secondary and tertiary radial canals (forming hydrostatic skeleton);**
- **Rhopalia as sensory organs that contain ocelli, statocysts and sensory tactile chemoreceptive lappets;**

Balance and photosensory organs







Rhopalia

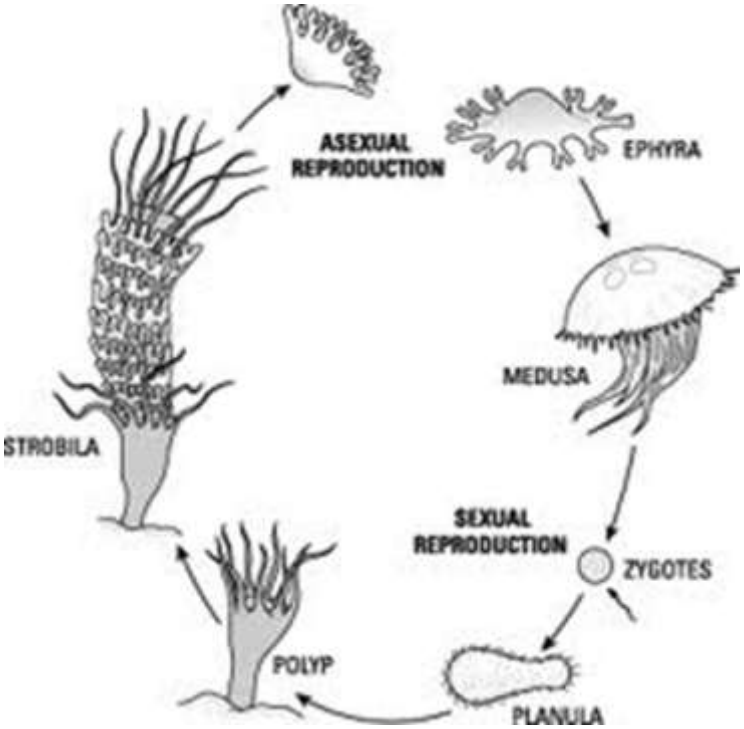
Class Scyphozoa

Reproduction-asexual and sexual

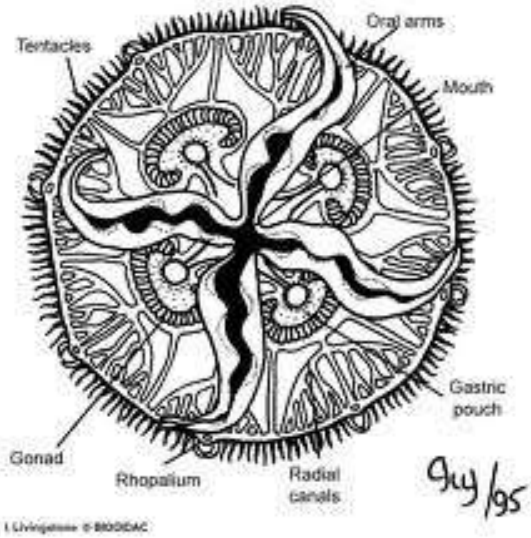
- **---Asexual reproduction by strobilization and formation of ephyrae (This is a unique characteristic feature of Scyphozoa)**

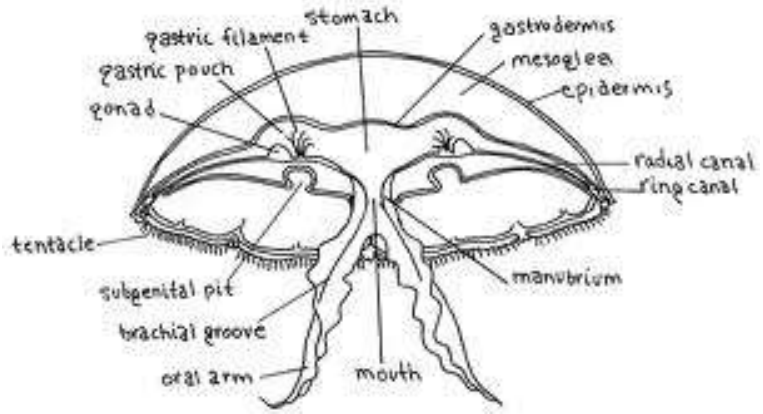
  ---Sexual reproduction by gametogony and spp. mostly dioecious with male and female medusas

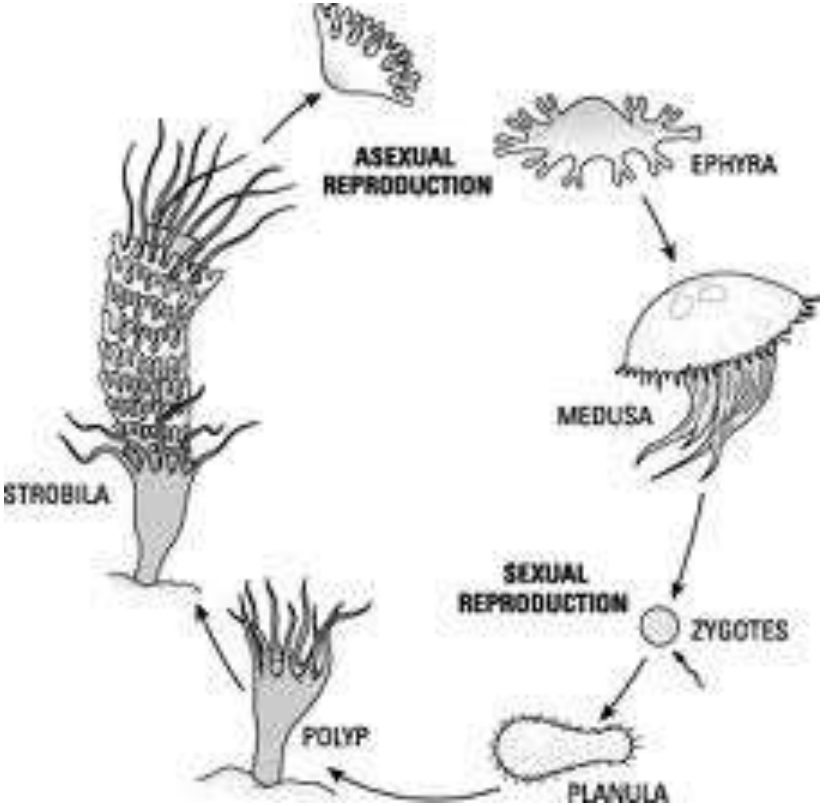
  ---Life cycle involves fertilized egg--- ciliated planula as larval stage--- scyphistoma---strobilization to produce ephyrae that detach successively forming male or female medusa.



Aurelia and Life Cycle







Class Cubozoa

scyphozoa (cubed animals)

- E.g. Sea wasps, Box jellyfish

- **All marine active swimmers and predators of fish**
- **Box-like cuboid medusa (cubomedusae) dominant over reduced polyp form**
- **No srobilization of polyp form.**
- **Medusa with only 4 very long tentacles studded with many nematocysts that are very toxic even to humans**
- **Four rhopalia equipped with complex lensed eyes.**
- **Asexual reproduction by branching of polyp stage**
- **Sexual reproduction by gametogony with male and female medusae**
- **Life cycle similar to that of scyphozoans but without strobilization.**

Example: *Carybdea*

Class Hydrozoa

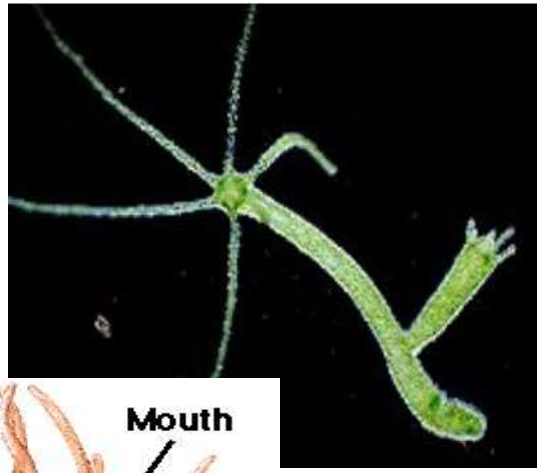
- **mostly marine, few in fresh water**
- **Alternate between polyp and medusa form**
- **Mostly with dominant colonial polyp form over reduced medusa stage, some with polyp form only**
- **Polyp mostly polymorphic with gastrozooids (for feeding & digestion), gonozooids (for medusa production), & dactylozooids (for defense);**
- **Medusas may be polymorphic with nectophores (for jet propulsion), phyllozooids (for defense), pneumatophores (for floating in water);**
- **Nematocysts restricted to epidermis; no amoeboid cells in mesoglea;**
  - **Asexual reproduction by budding;**
  - **Sexual reproduction by gametogony; spp. mostly dioecious with male and female medusae;**
- **Life cycle: Fertilized eggs released from female medusa (or female polyp in *Hydra)* and develop into ciliated planula that settle to form sessile polyp.**

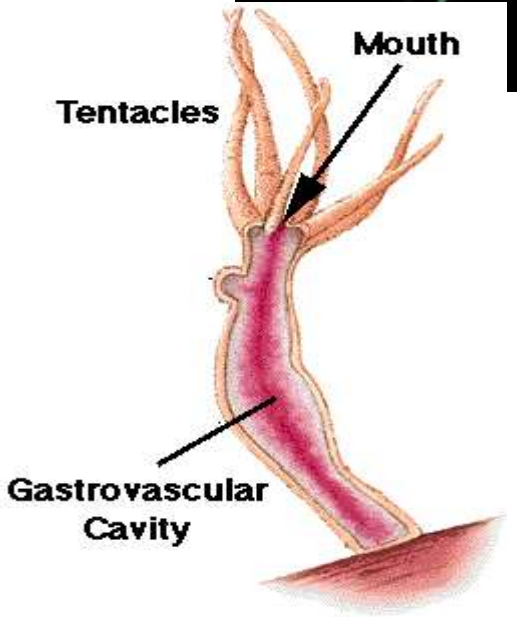
Examples: ***Hydra*** **(in freshwater; with polyp form)**
Obelia **(Marine colonial);**
Physalia **(Portuguese man-of-war).**

Phylum Cnidaria

Class Hydrozoa (Water Animals)

- Polyp form dominates or represented greater in the life cycle
- Order Hydroida
  - Most species are marine
  - Some of fresh water as Hydra
  - Smaller in size than Schyphozoa- few centimeters
  - Possess a velum that is a shelf of tissue extends to manubrum – for water pressure- fast swimming
  - None typical hydrozoan because the life cycle lacks the medusa stage completely
  - Most of other members are colonial





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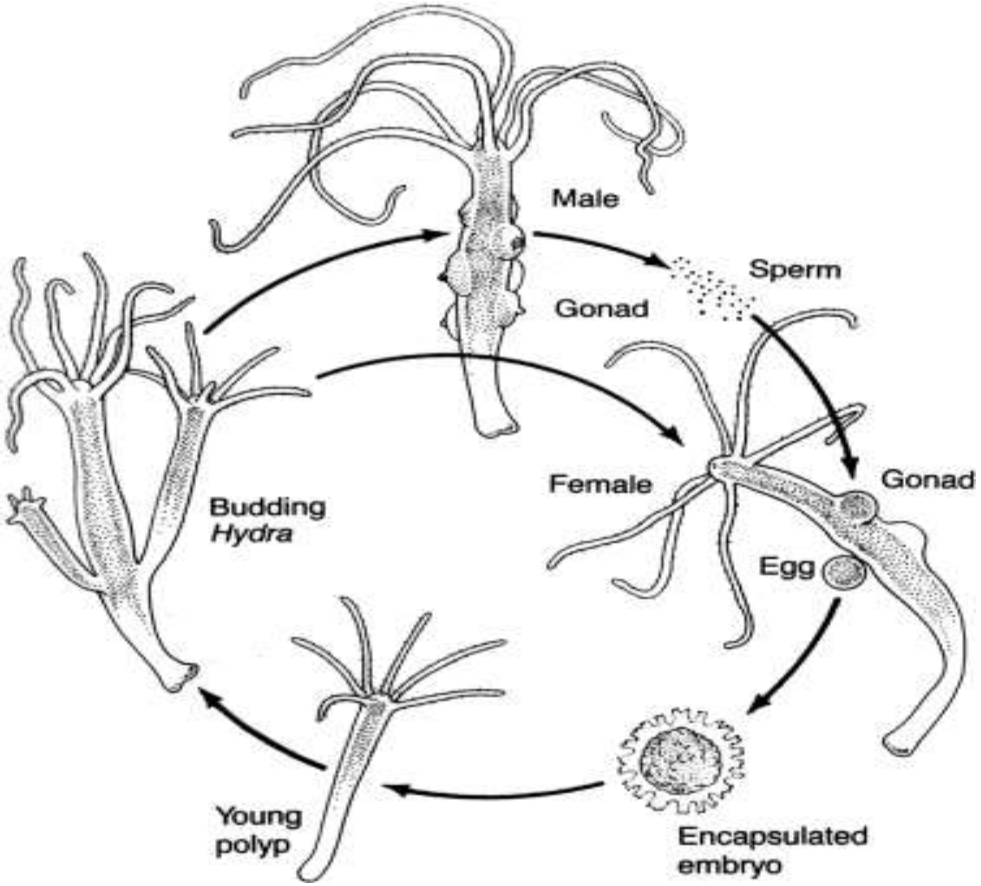
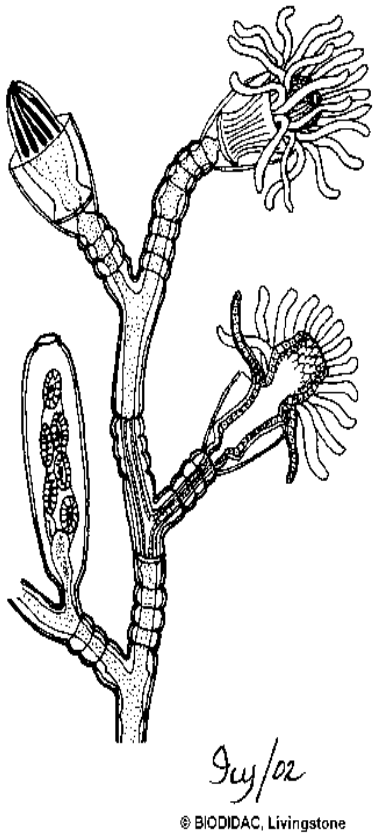
Hydra life cycle

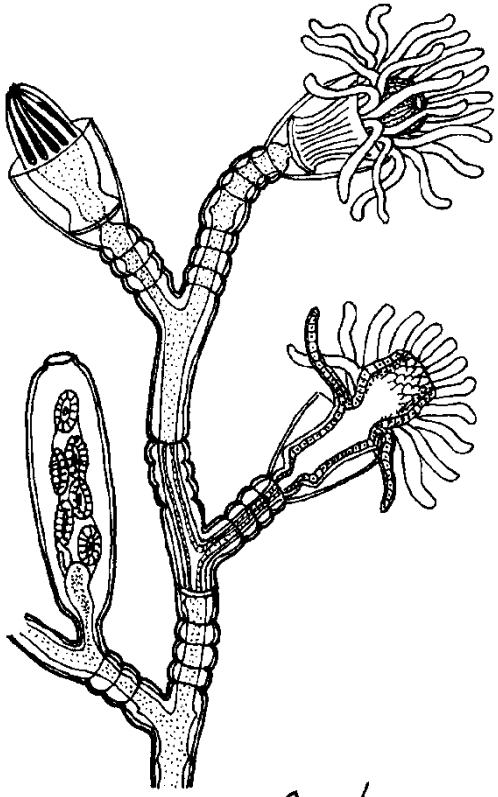


Class Hydrozoa

- Polyp forms
  - colonial
  - Specialized polyps (zooids)
    - Gastrozooid - Feeding
    - Gonozooid – Reproduction
    - Dactylozooid – Defense (tentacles), studded with nematocysts
  - *(examples: Hydra* with budding (*Hydra littoralis*), *Hydra* nematocyst slides

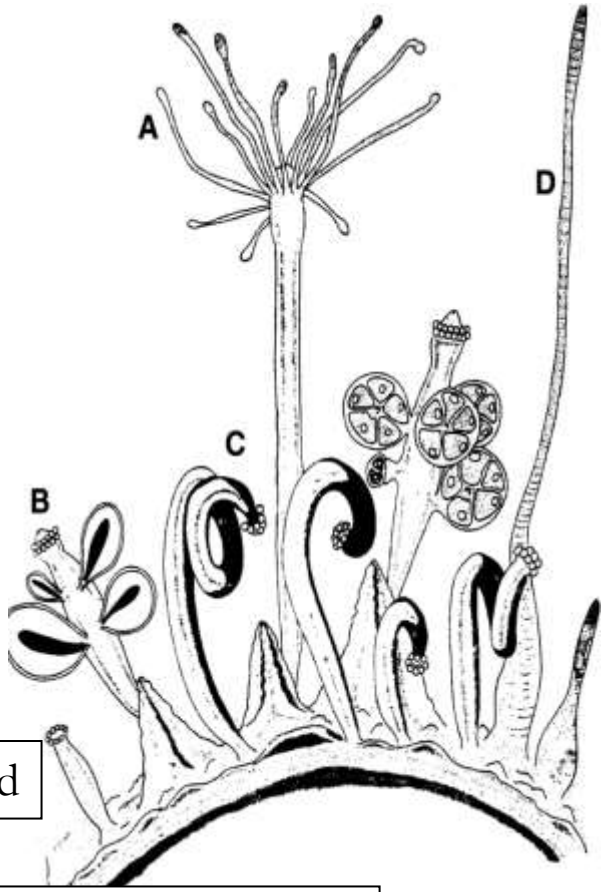


Phylum Cnidaria,
Class Hydrozoa , polymorphic polyps



gastrozooid

gonozooid

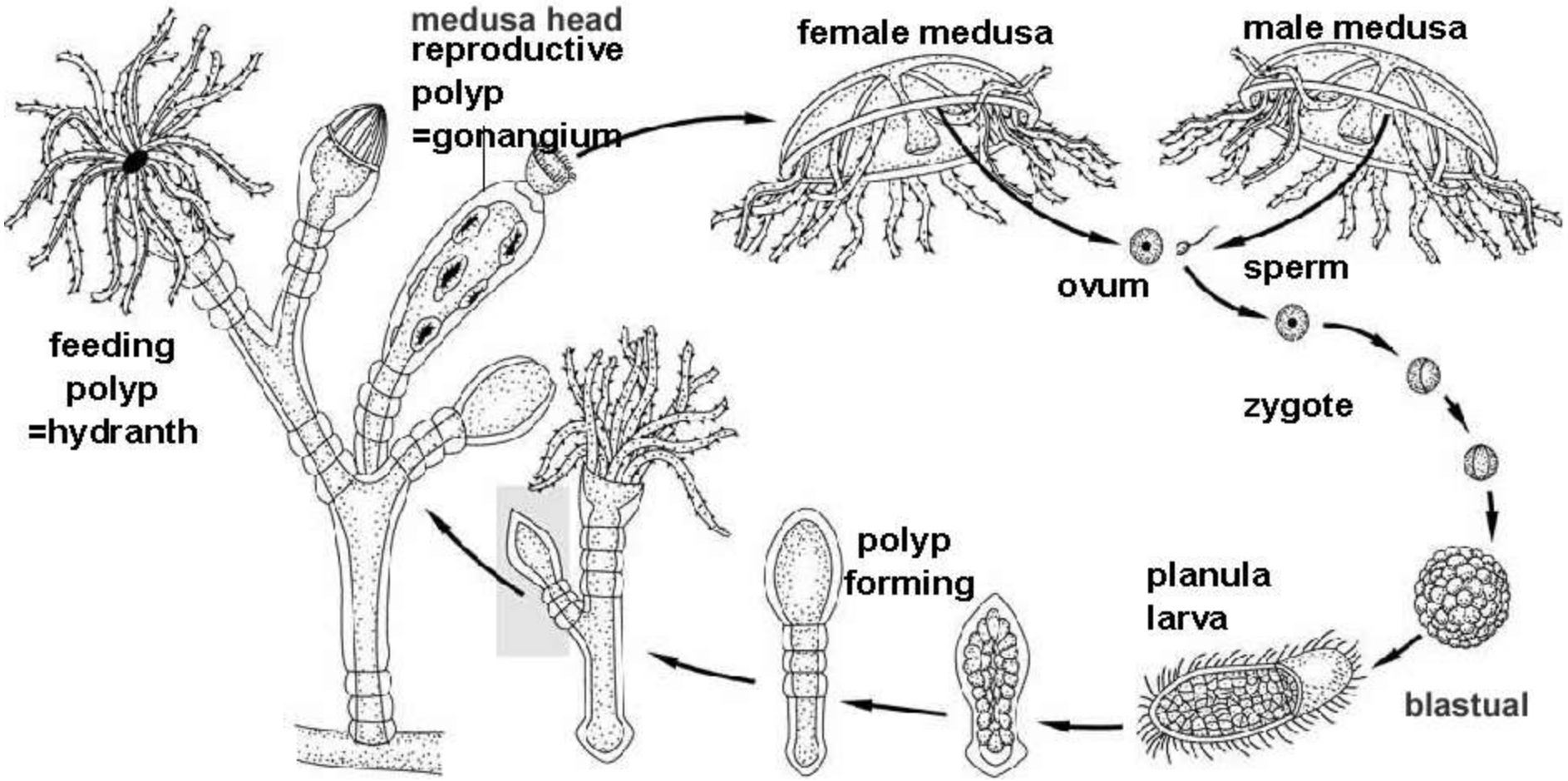


Dactylozooid

Protection full of nematocysts

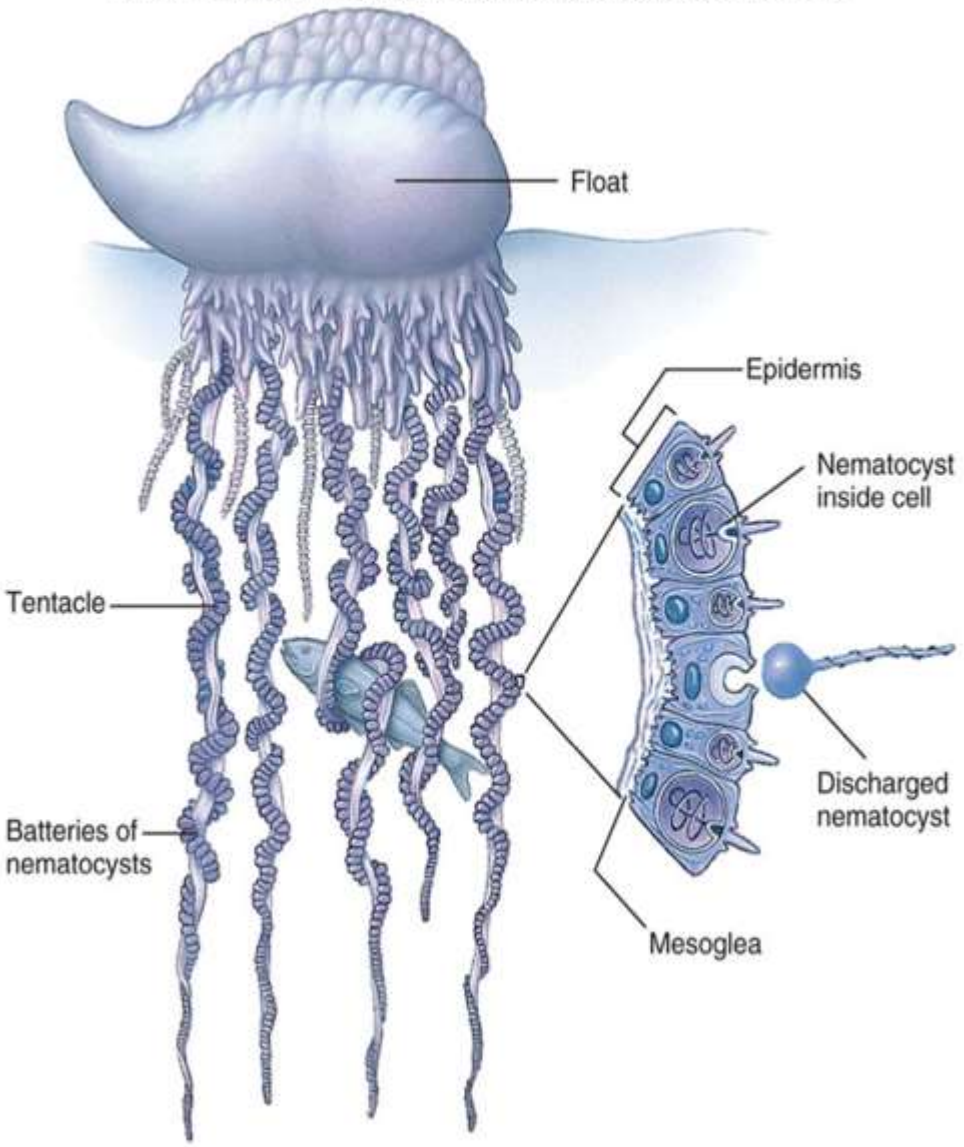
Lack tentacles and cant feed but get food through the GVC by Gastrozooid

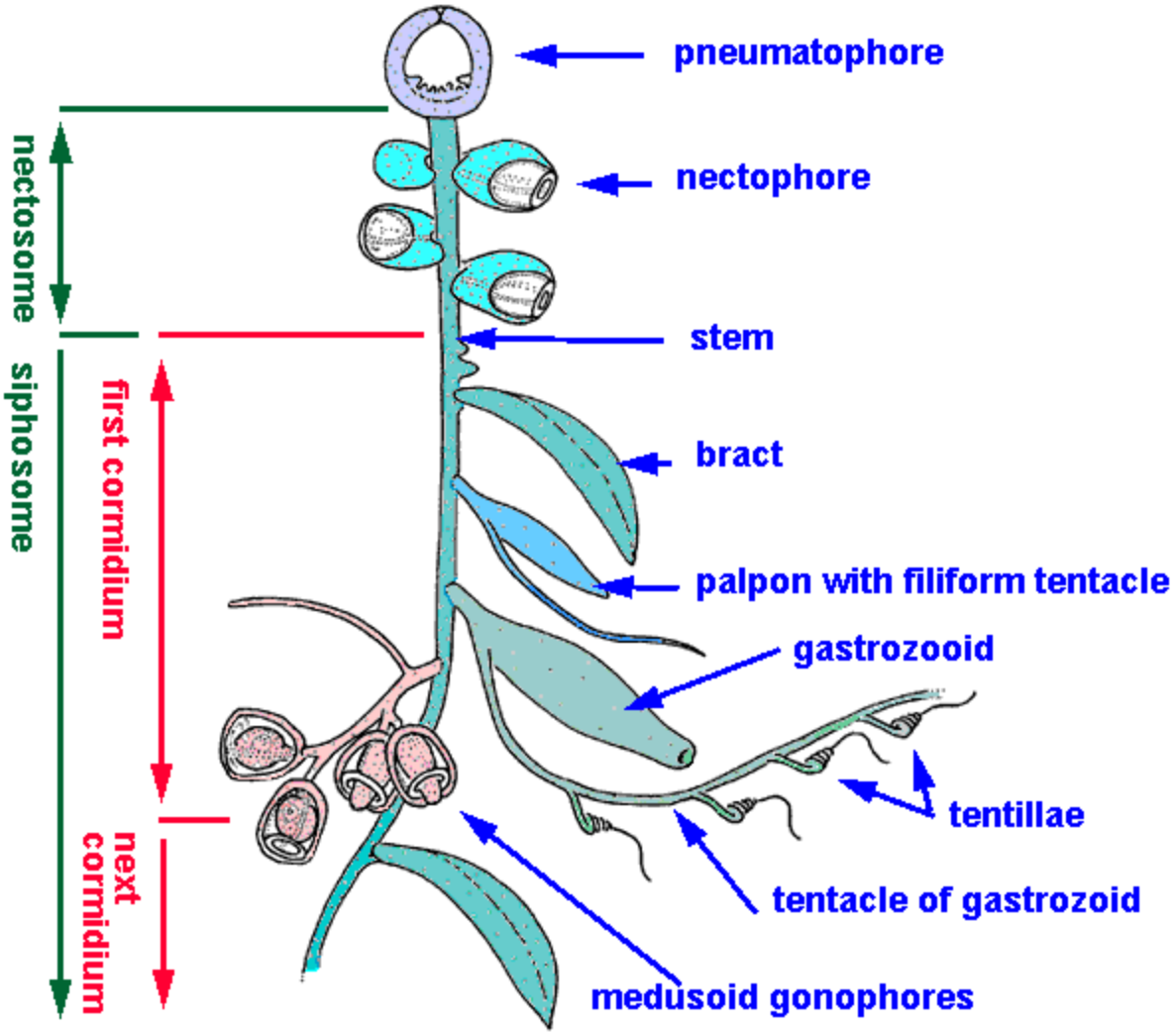
Reproduction in Obelia



- Medusa forms
  - **Order Siphonophores**
  – Colonial (e.g.- Portugese man of war)
  - Free loating Hydrozoans
  - – polyps and medusa forms simultaneously
    - Medusae serve as floats-propel colony through water
    - Polyp morph represented by gastrazoids, gonozooids, and dactylozooid (*Obelia* colony slide (label gastrozoids and gonozooids), *Obelia* medusa slide)

Pneumatophore: modified medusa full of gas for floating




pneumatophore
nectophore
stem
bract
palpon with filiform tentacle
gastrozooid
tentillae
tentacle of gastrozoid
medusoid gonophores
nectosome
siphosome
first cormidium
next cormidium

Classification of Cnidaria

Class Anthozoa

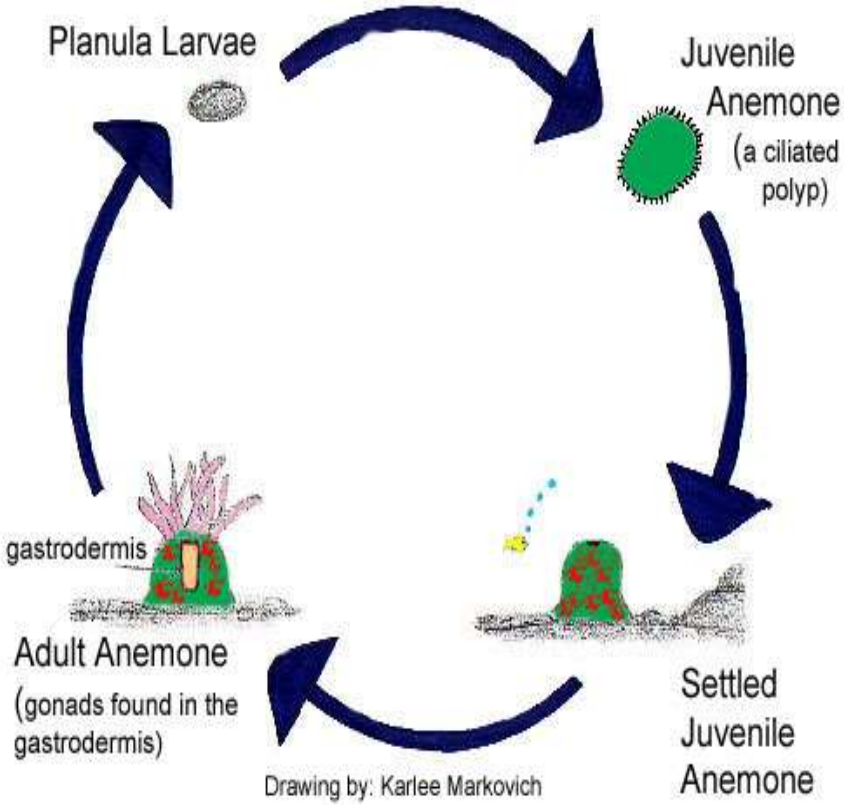
- **(Sea anemones and corals):**
- **Marine, solitary or colonial;**

Polyp forms only, no medusa stage

Many reproduce asexually by longitudinal or transverse fission or by pedal laceration

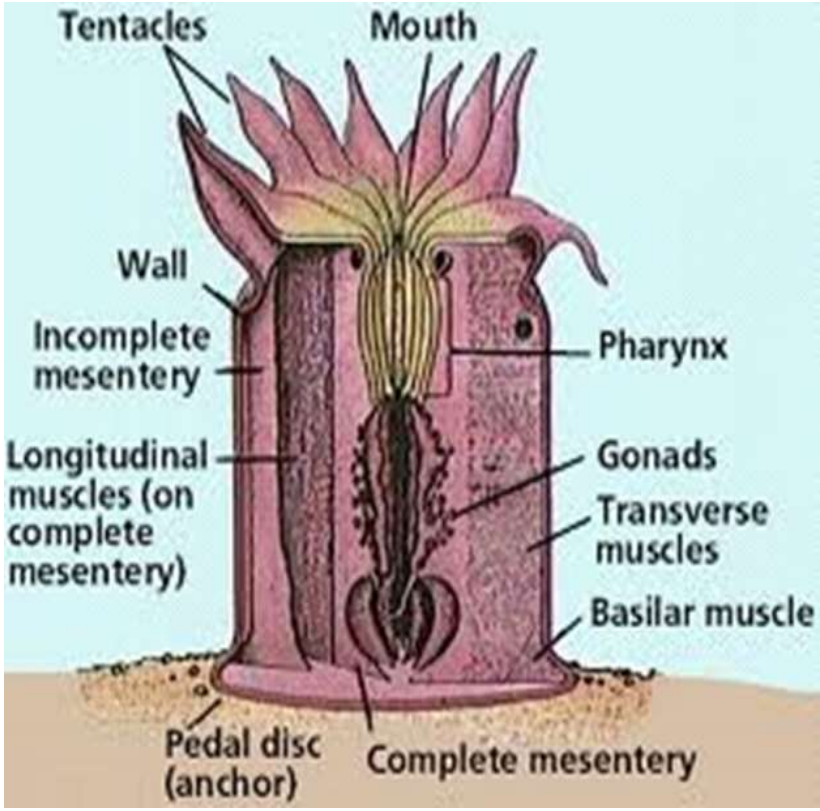
---Sexual reproduction by gametogony by dioecious or sequentially hermaphroditic polyps;

--- Life cycle involving fertilized eggs---planula larva that feeds and develops into a new polyp.



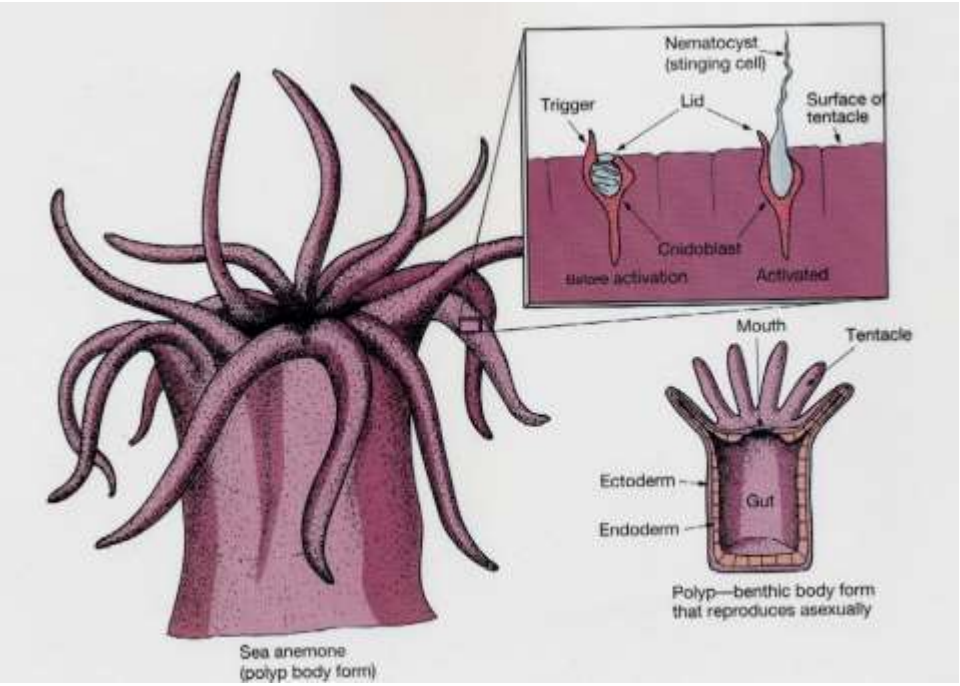
Differ from hydrozoans:

1. **Mouth opens into tubular pharynx**
2. **Gastrovasicular cavity partitioned by mesenteries. To increase the surface area**
3. **Gonads are found in the mesenteries**



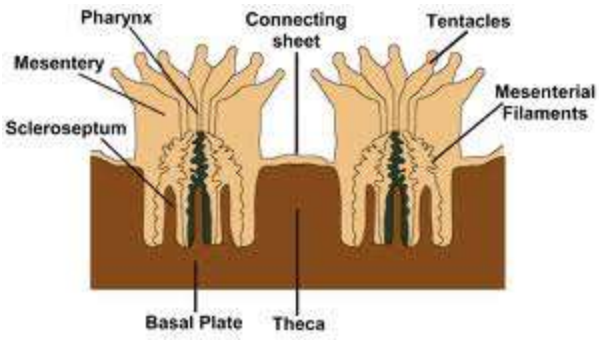
Class Anthozoa

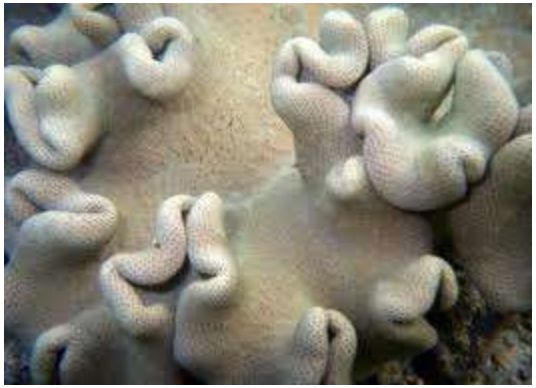
A coral colony consists of hundreds or thousands of tiny polyps. Each polyp is an individual animal (basically a small anemone).



Anthozoan Anatomy and Types

Soft Coral





Soft corals- Octocoralia

Hard coral- Hexacoralia Anatomy & Brain coral

Classification of Cnidaria VII

Anthozoa (Continued)

--- Two subclasses based on no. of mesenteries & type of skeleton:

--Subclass Hexacorallia (Zoantharia):

- **Solitary (sea anemone)**
- **colonial (stoney corals)**
- **Hexa or multiple of 6 plan for mesenteries**
- **tentacles surrounding mouth**
- **monomorphic polyps, never polymorphic**
- **Examples: *Metridium* (Sea anemone);**
- ***Agaricia*- A Scleractinean (stony) coral that secretes hard external calcarious skeleton that surround and infiltrate into each polyp; brain coral.**

- **Hermatypic: reef building corals, restricted to clear warm water**
- **Ahermatypic: non reef builders**

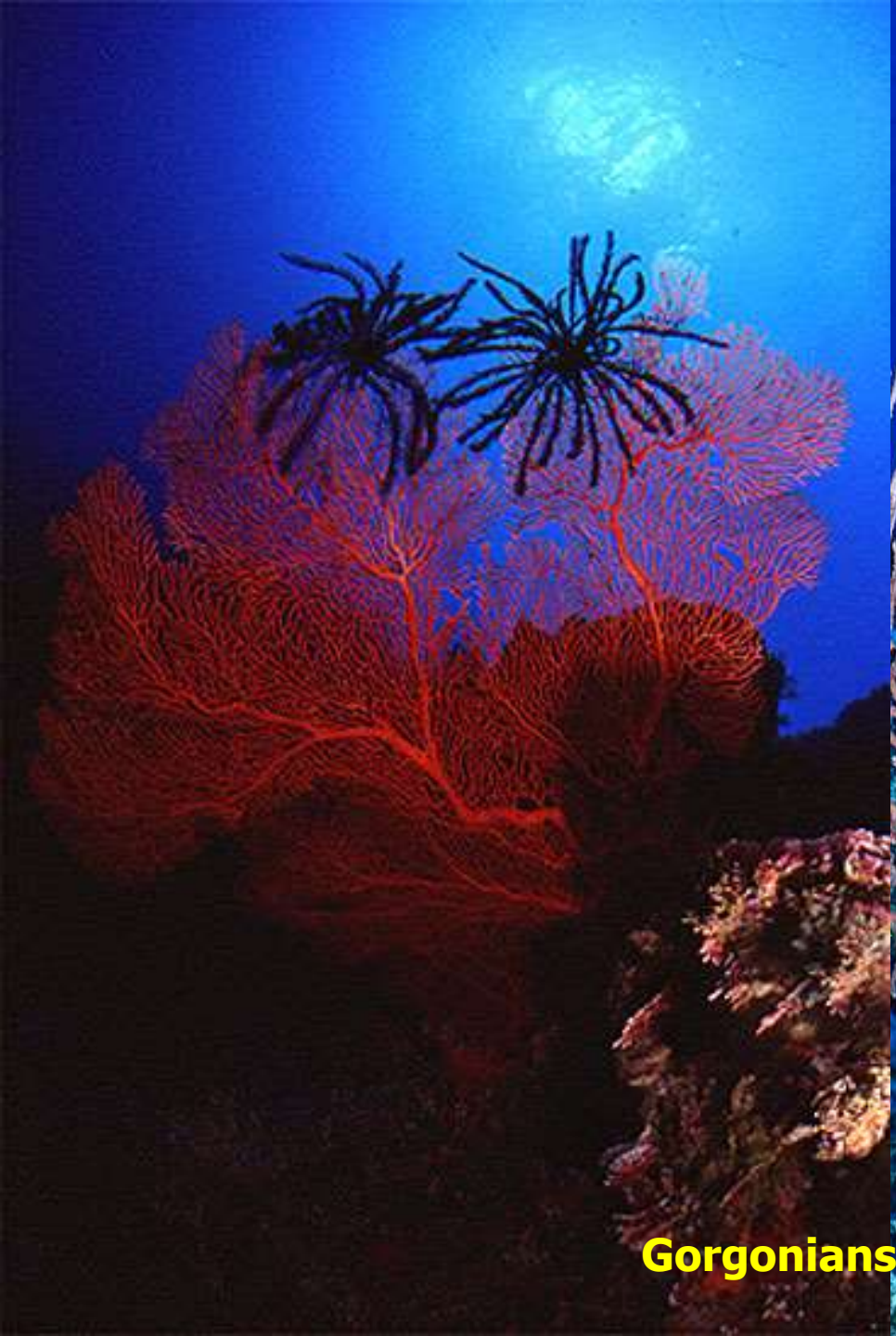
Anthozoans

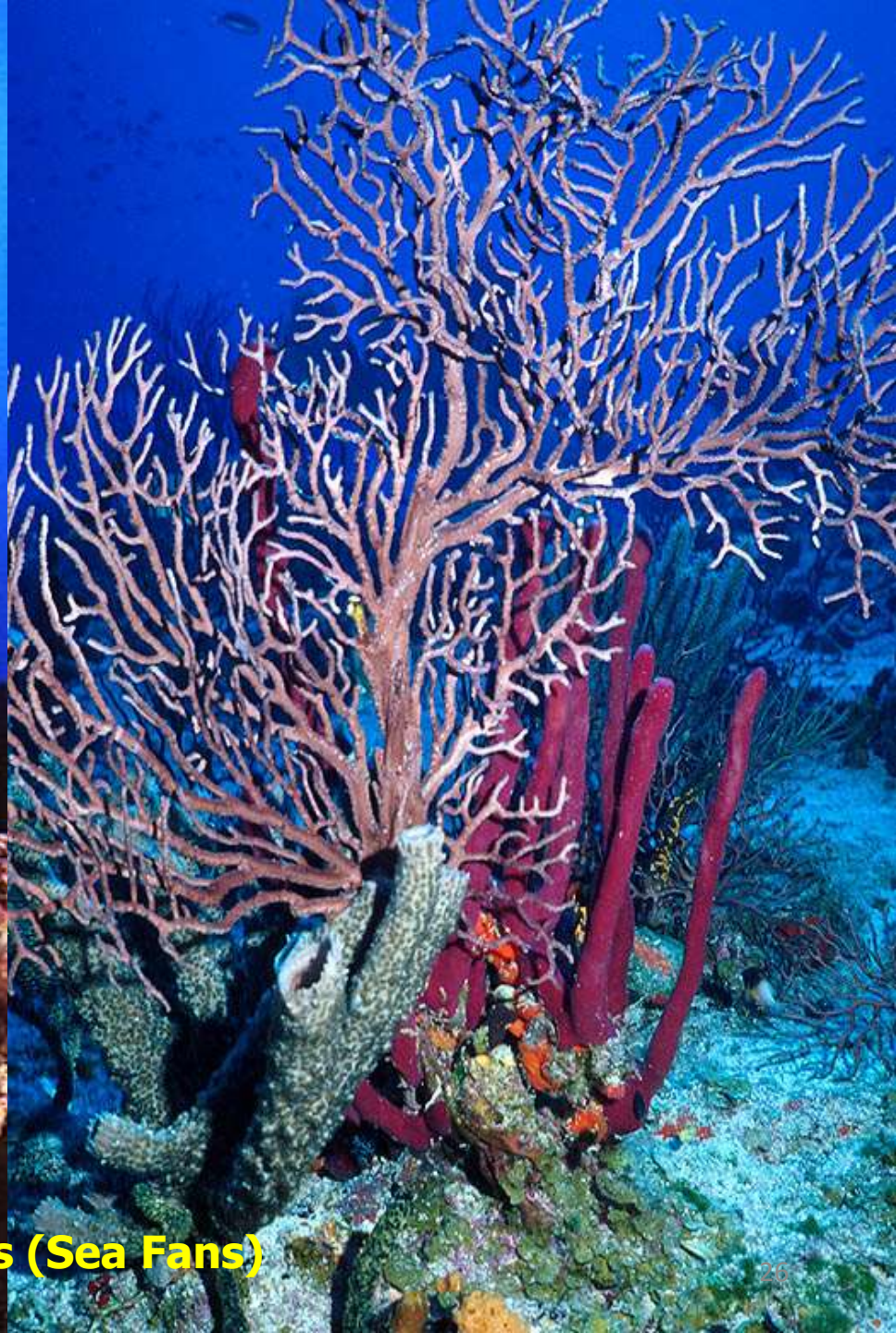
--Subclass Octocorallia (Alcyonaria):

- **octa (8) plan for mesenteries**
- **pinnulate tentacles around the mouth; polymorphic polyps mostly;**
- **thick mesoglia with calcarious or proteinaceous internal skeleton secreted by cells in mesoglia.**
- **All species are colonial and often polymorphic**

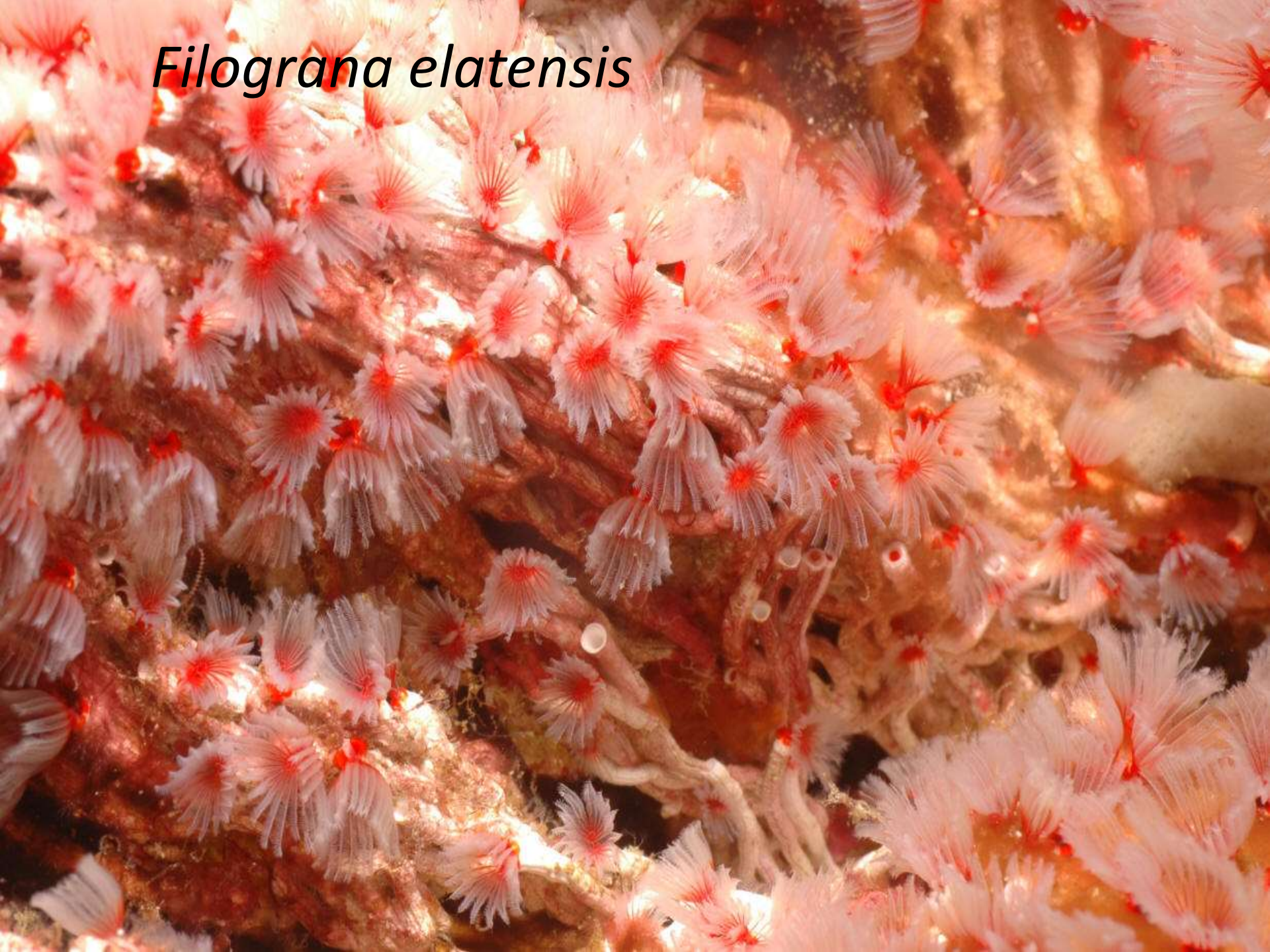
Examples: *Gorgonia* (sea fan), *Pennatula* (sea pen), Soft corals, horny corals, pipe corals, sea whips.

Gorgonians (Sea Whips)





Gorgonians (Sea Fans)


Filograna elatensis