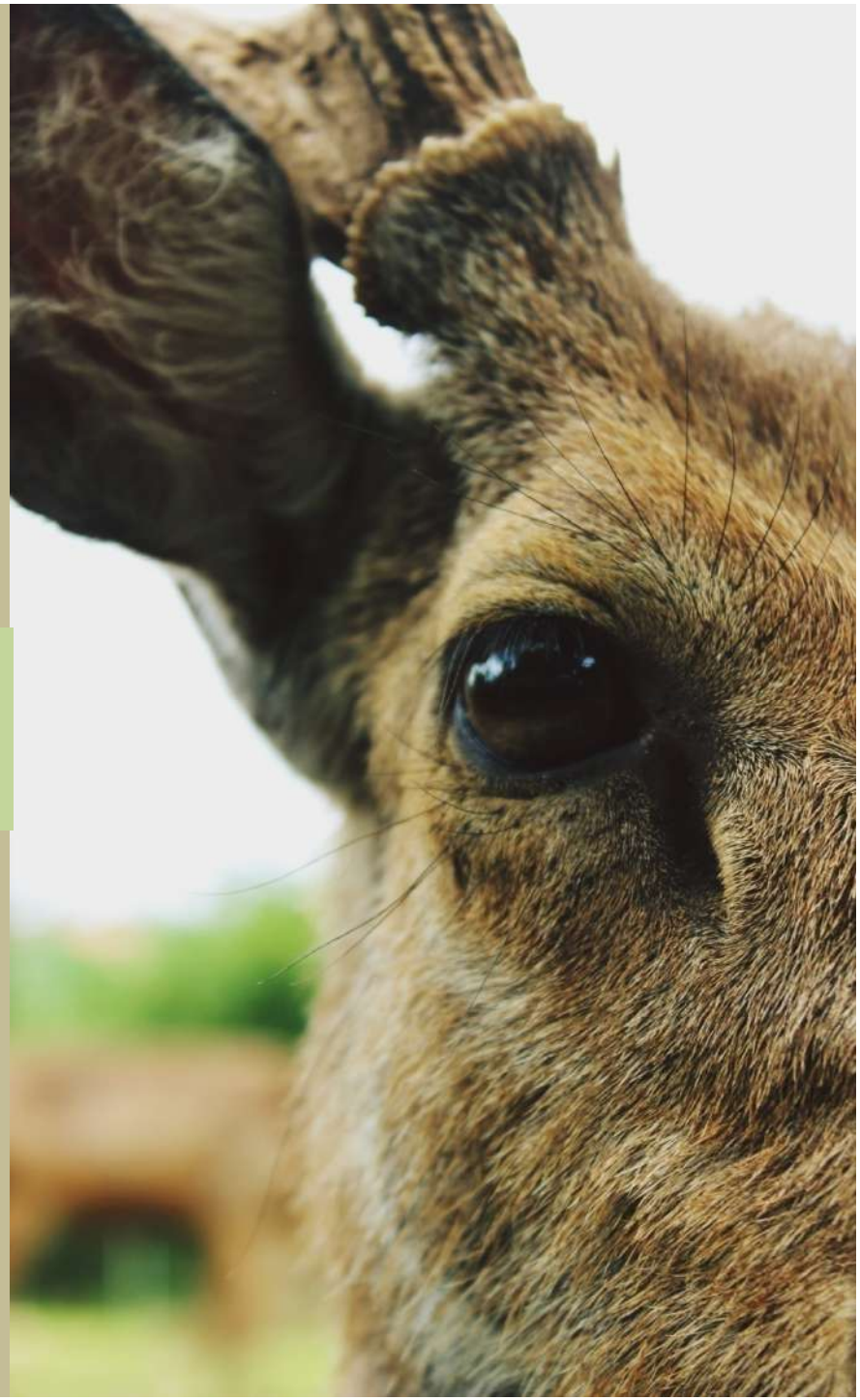
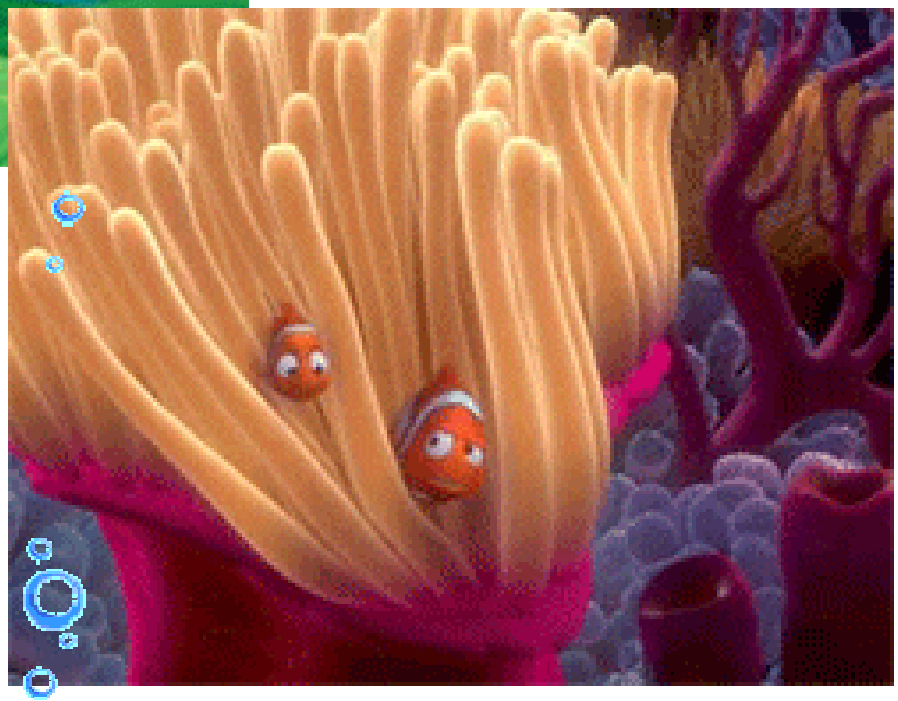
TAKSONOMI HEWAN

CHAPTER 4: CNIDARIA, CTENOPHORA, PLACOZOA



Husni Mubarok, S.Pd., M.Si.
Tadris Biologi
IAIN Jember



Cnidaria (10,000 species)

Termasuk Koral, Ubur-ubur& Hidra
Diploblastik, **Radial Simetri**, Rongga **Gastrovascular** dgn lubang/ bukaan (brtindak sbg mulut & anus)

A jelly

Ctenophora (100 species)

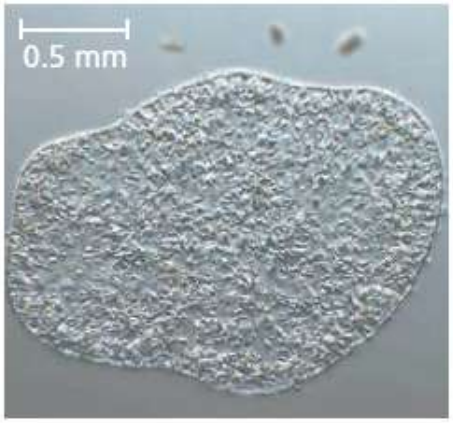
A ctenophore, or comb jelly

Comb Jellies/
Ubur-ubur Sisir
Diploblastik, Radial Simetri
8 "sisir" sillia → mendorong melewati air
Mangsa → tentakel → sel yg terspesialisasi terbuka → membungkus mangsa dgn benang yg lengket

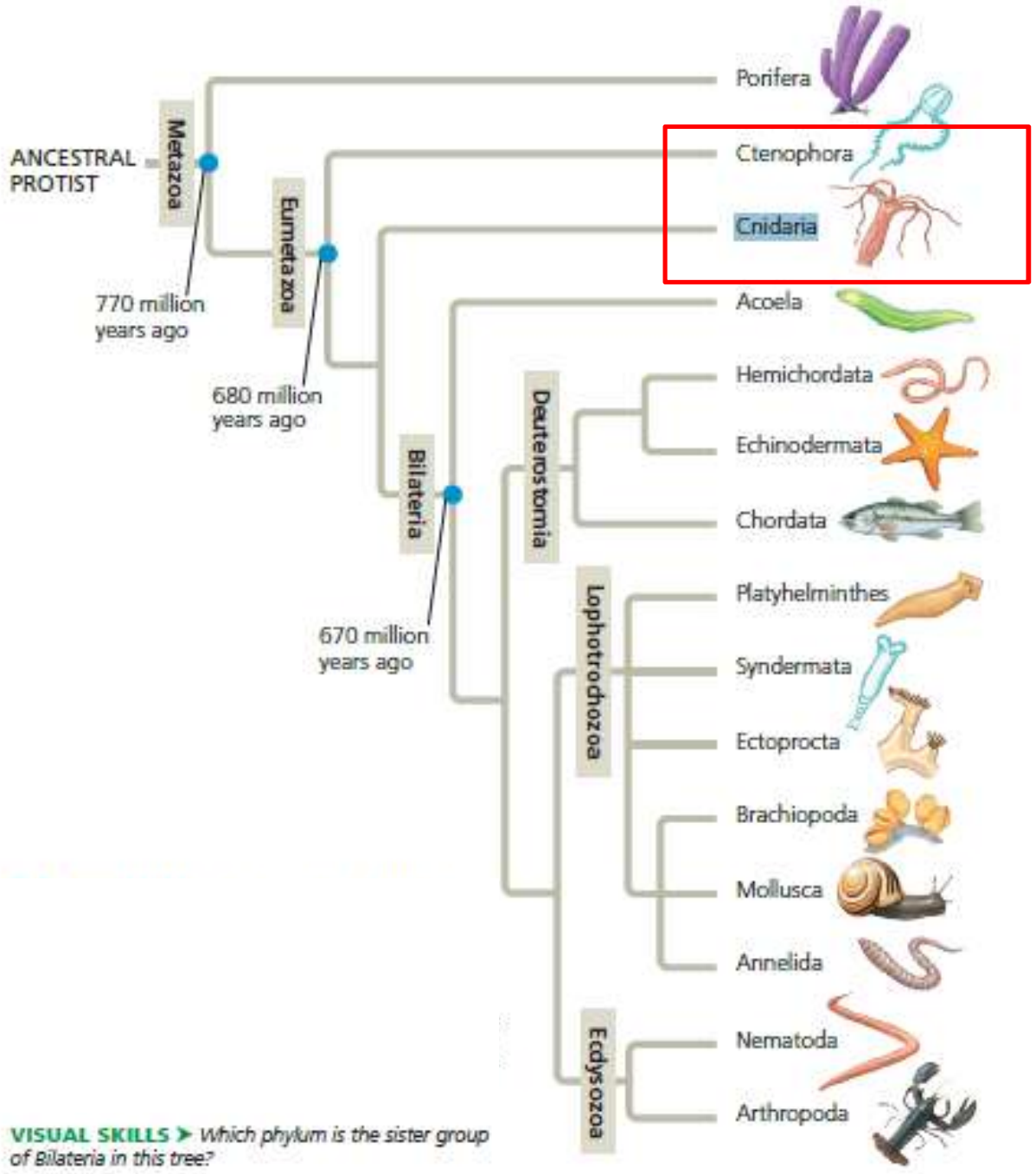
Placozoa (1 species)

Trichoplax adhaerens
Tdk tampak spt hewan
Simple bilayer, beberapa ribu sel

Basal animals → namun **belum jelas** evolusinya
Reproduksi → membelah mjd dua/ Budding multiseluler



A placozoan (LM)



VISUAL SKILLS ➤ *Which phylum is the sister group of Bilateria in this tree?*

Eumetazoa is a clade of animals with tissues. All animals **except for sponges** and a few others belong to a clade of **eumetazoans ("true animals")**

Members of this group **have tissues**, ex: muscle tissue and nervous tissue.

Basal eumetazoans, which include the phyla **Ctenophora (comb jellies)** and **Cnidaria**, are **diploblastic** and generally have **radial symmetry.**

PLOS ONE

CORRECTION

Correction: A Higher Level Classification of All Living Organisms

Michael A. Ruggiero, Dennis P. Gordon, Thomas M. Orrell, Nicolas Bailly, Thierry Bourgoin, Richard C. Brusca, Thomas Cavalier-Smith, Michael D. Guiry, Paul M. Kirk

OPEN ACCESS

Citation: Ruggiero MA, Gordon DP, Orrell TM, Bailly N, Bourgoin T, Brusca RC, et al. (2015) Correction: A Higher Level Classification of All Living Organisms. PLoS ONE 10(6): e0130114. doi:10.1371/journal.pone.0130114

Published: June 11, 2015

Rank
Superkingdom
Kingdom
Subkingdom
Infrakingdom
Superphylum
Phylum
Subphylum
Infraphylum
Superclass
Class
Subclass
Infraclass
Superorder
Order

Main ranks are in bold type; unnamed taxa are not counted.

doi:10.1371/journal.pone.0130114.t001

KLASIFIKASI CNIDARIA, CTENOPHORA. PLACOZOA

KINGDOM ANIMALIA

SUBKINGDOM N.N.

Phylum Cnidaria

Subphylum Anthozoa

Class Anthozoa

Subclass Hexacorallia

Order Actiniaria

Order Antipatharia

Order Ceriantharia

Order Corallimorpharia

Order Scleractinia

Order Zoantharia [= Zoanthidea]

Subclass Octocorallia

Order Alcyonacea

Order Helioporacea

Order Pennatulacea

Subphylum Medusozoa

Class Cubozoa

Order Carybdeida

Order Chirodropida

Class Hydrozoa

Subclass Hydroidolina

Order Anthoathecata

Order Gonoproxima

Order Leptothecata

Order Siphonophorae

Subclass Trachylina

Order Actinulida

Order Limnomedusae

Order Narcomedusae

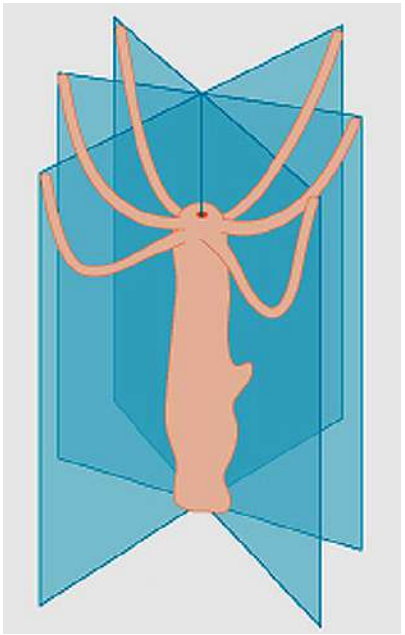
Order Trachymedusae

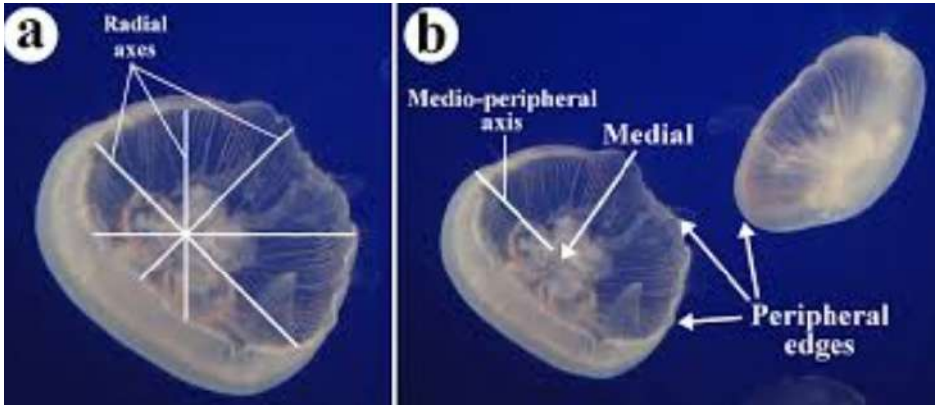
		Class Polypodiozoa	
			Order Polypodiidea
		Class Scyphozoa	
			Order Coronatae
			Order Rhizostomeae
			Order Semaeostomeae
		Class Staurozoa	
			Order Stauromedusae
	Subphylum Myxozoa		
		Class Malacosporea	
			Order Malacovalvulida
		Class Myxosporea	
			Order Bivalvulida
			Order Multivalvulida
	Phylum Ctenophora		
		Class Nuda	
			Order Beroida
		Class Tentaculata	
			Order Cambojiida
			Order Cestida
			Order Cryptolobiferida
			Order Cydippida
			Order Ganeshida
			Order Lobata
			Order Platyctenida
			Order Thalassocalycida
	Phylum Placozoa		
		Class Placozoa *(Trichoplax)*	


PHYLUM
CNIDARIA

CNIDARIA - BODY FORM

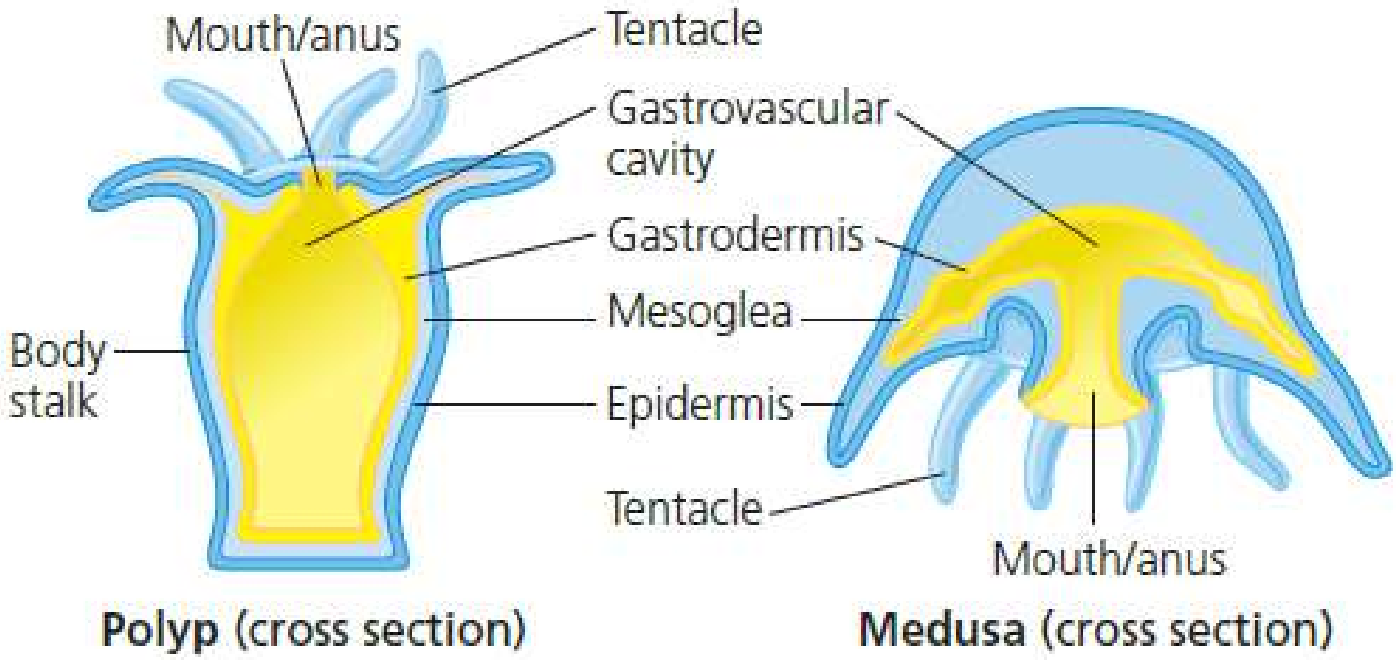
- Some in freshwater, but most marine
- **Radial symmetry** or **biradial symmetry** around a longitudinal axis with **oral and aboral** ends; **no definite head**
- **Extensible tentacles** usually encircle mouth or oral region
- Adult body two-layered **(Diploblastic)** with **epidermis** (from ectoderm) and **gastrodermis** (from endoderm)
- **No excretory or respiratory system** → **Diffusion**- oxygen from water moves into sponge cells (high to low)
- **No coelomic cavity**
- Two types of individuals: **POLYPS** and **MEDUSAE**





CNIDARIA - BODY FORM

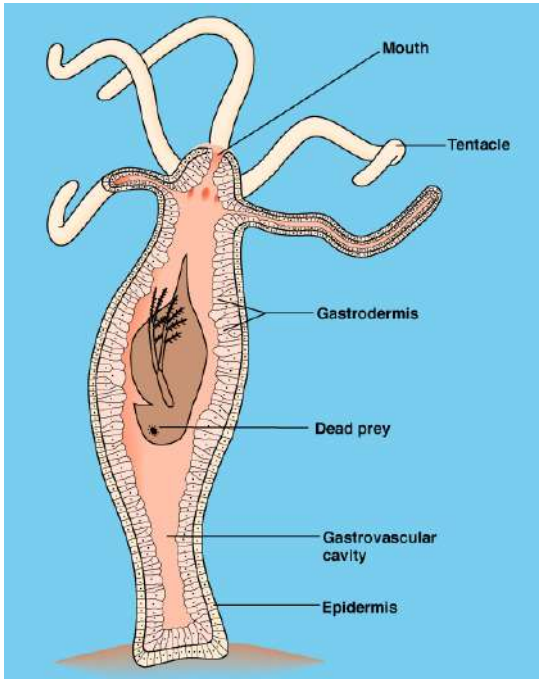
- **MESOGLEA**, an **extracellular matrix ("jelly")** lies between body layers; amount of mesoglea variable; mesoglea with cells and connective tissue from ectoderm in some
- Incomplete gut called **gastrovascular gavity**; often branched or divided with septa
- **Extracellular digestion in gastrovascular cavity** and **intracellular digestion in gastrodermal cells**



CNIDARIA - BODY FORM

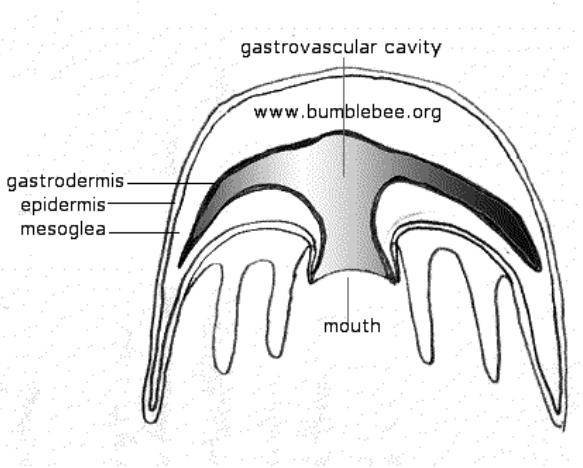
POLYP FORM

- Tubular body, with the mouth (Oral) directed upward.
- Sessile
- Other end (aboral) usually attached to a rock or other surface. EX: Corals and Hydras
- Around the mouth are a whorl of feeding tentacles.
- Only have a small amount of Mesoglea (Thin Mesoglea layer)



MEDUSA FORM

- Bell-shaped or umbrella shaped body, with the mouth is directed downward.
- Small tentacles, directed downward.
- Possess a large amount of Mesoglea (have thick mesoglea)
- Motile, move by weak contractions of body
- Ex: Jellyfish



CNIDARIA - BODY FORM – TYPE OF CELLS

CNIDOCYTES present, typically housing stinging organelles: **NEMATOCYSTS**

Epidermis → terdiri lima macam sel

1. **SEL EPITEL OTOT** (*epithelio-muscle cells*): berukuran besar merupakan pelindung tubuh
2. **SEL INTERSTISIAL** (*intertitial cells*): berukuran kecil, agak bulat, nukleus besar, tdp sel sperma, sel telur, cnidocyte
3. **SEL CNIDOCYTE**: tdp **NEMATOCYTE** bentuknya spt kapsul, bulat, lonjong. didlmnya tdp benang/ pipa/ berduri, yg ditembakkan ke luar. **NEMATOCYTE** tdp di tentakel dan ujung oral
4. **SEL KELENJAR LENDIR** (*mucus -secreting cells*): menghasilkan lendir yg digunakan sbg pelindung utk menangkap mangsa dan melekat pd substrat
5. **SEL SARAF INDERA** (*sensory nerve cells*): PANJANG, LANGSING, TEGAK LURUS EPIDERMIS. Pangkal sel indera berhub dgn sel saraf tersusun seperti jala pd epidermis dekat mesoglea.

CNIDARIA - BODY FORM – TYPE OF CELLS

TIPE NEMATOCYSTS

1. **PENGGULUNG (VOLVENT):** berukuran kecil berfungsi untuk menggulung mangsa
2. **PENUSUK (PENETRANT)** : berukuran besar mengandung 3 duri besar dan 3 deret duri kecil berfungsi menyuntikkan racun ke dlm tubuh mangsa
3. **TIPE PEREKAT (GLUTINANT)**: pipa halus yg ujungnya terbuka dan menghasilkan perekat.

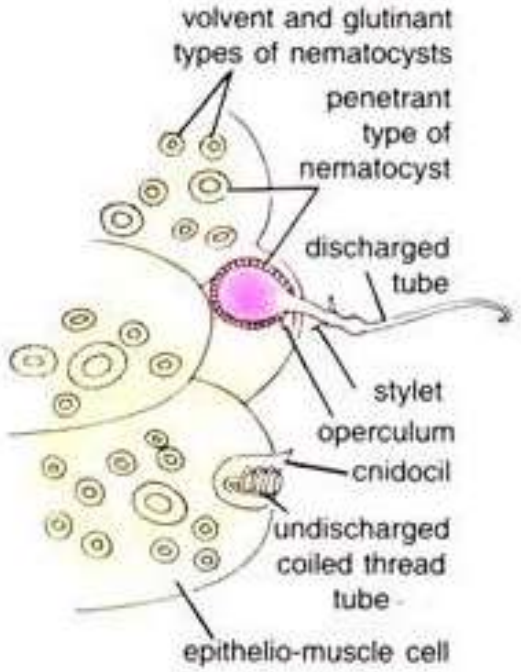
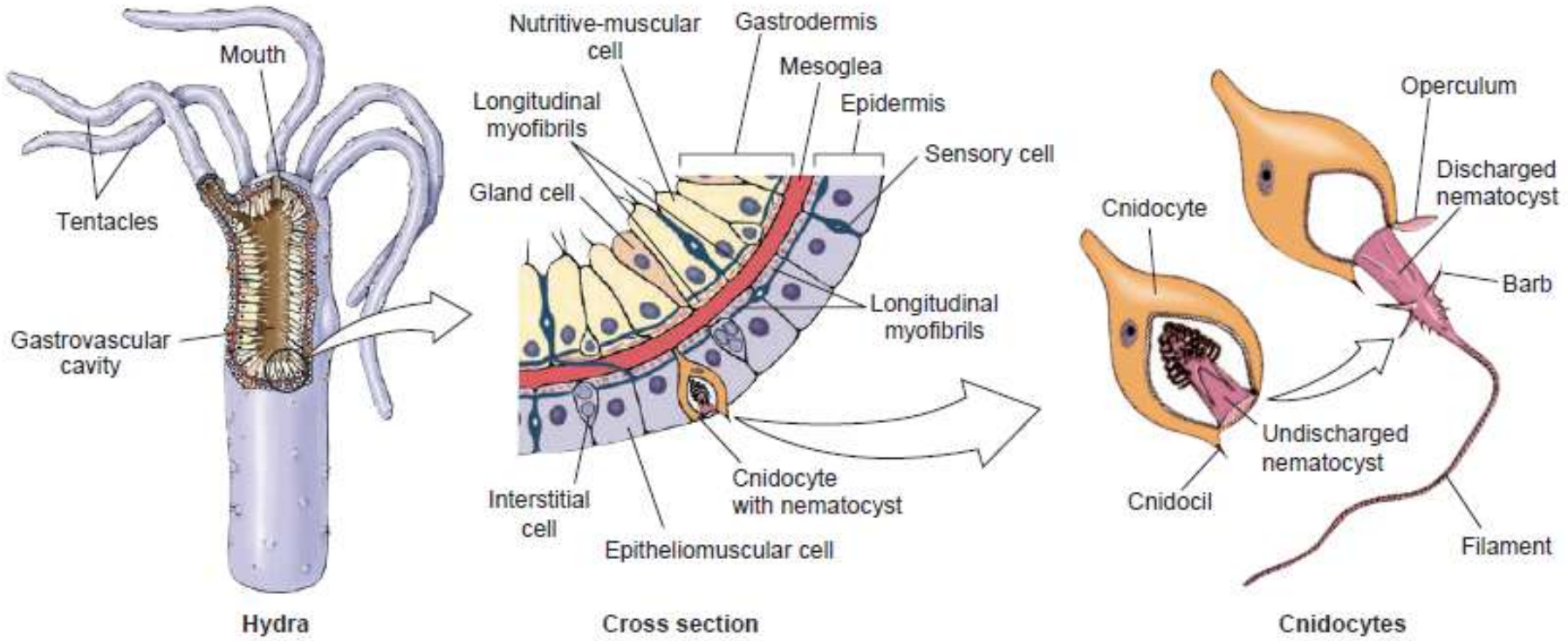


Fig. 31.10. A portion of tentacle showing epidermal cells with batteries of nematocysts.

- **RACUN YG DIKELUARKAN HYDRA TDK MEMBAHAYAKAN, NAMUN ADA SENGATAN UBUR-UBUR** *Physalia* dan *Chironex* sengatannya sangat menyakitkan, panas bahkan dapat mematikan.
- NEMATOCYTE hanya **dipakai sekali, kemudian dibuan**
- Untuk menggantinya sel intertisial membuat cnidocyte baru. Pada waktu memakan kehilangan 25% nematocyte.
- Penggantian kehilangan nematocyte tersebut memerlukan waktu 48 jam.

CNIDARIA - BODY FORM - TYPE OF CELLS



- Each Cnidocyte has a modified cilium - **CNIDOCIL**, and is armed with a stinging structure called a **nematocyst**.
- The undischarged nematocyst is composed of a long coiled thread

Kecuali Hydra, kebanyakan Cnidaria mempunyai nematocyst di dalam lapisan gastrodermis.

CNIDARIA - BODY FORM - TYPE OF CELLS

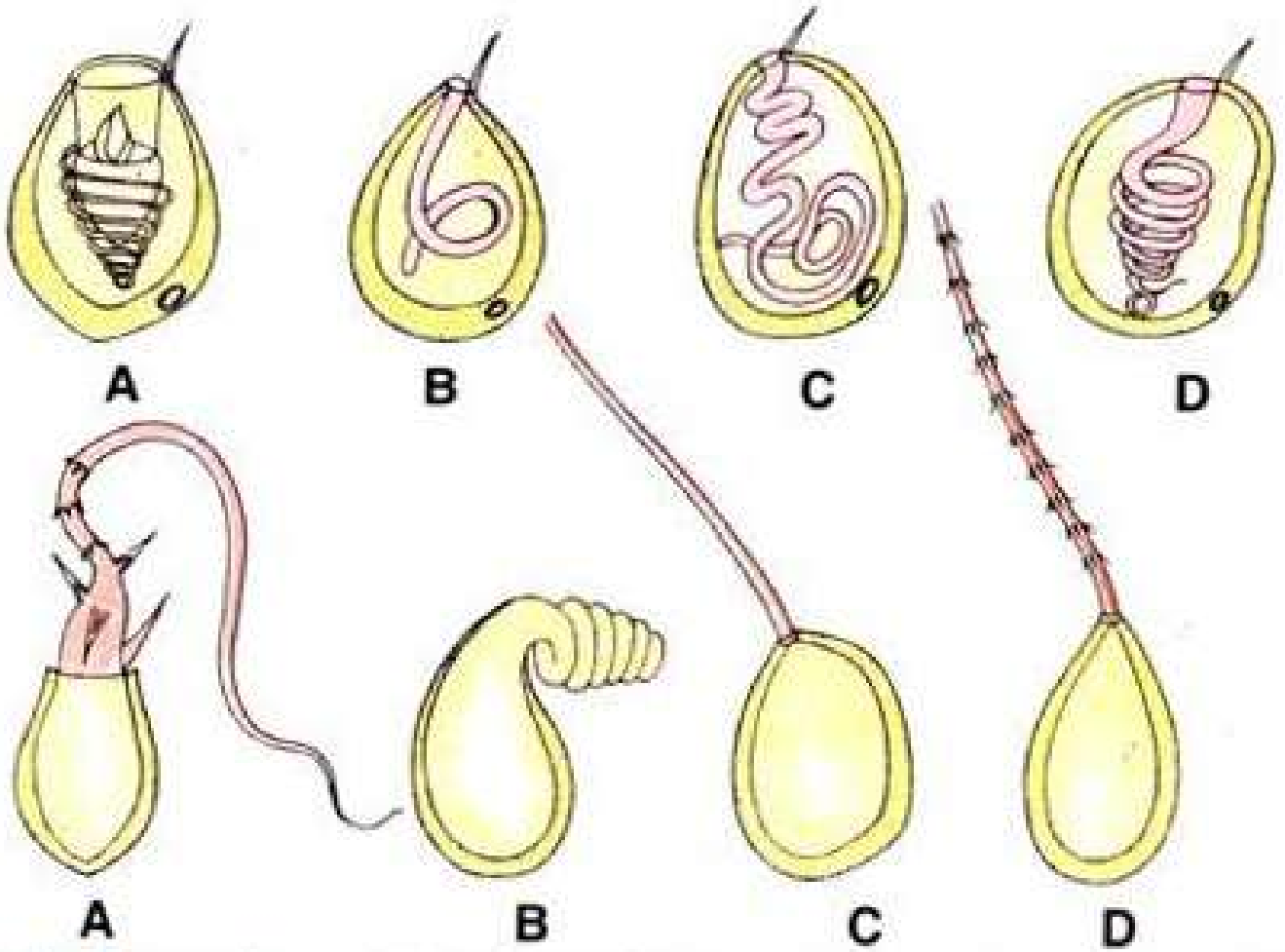
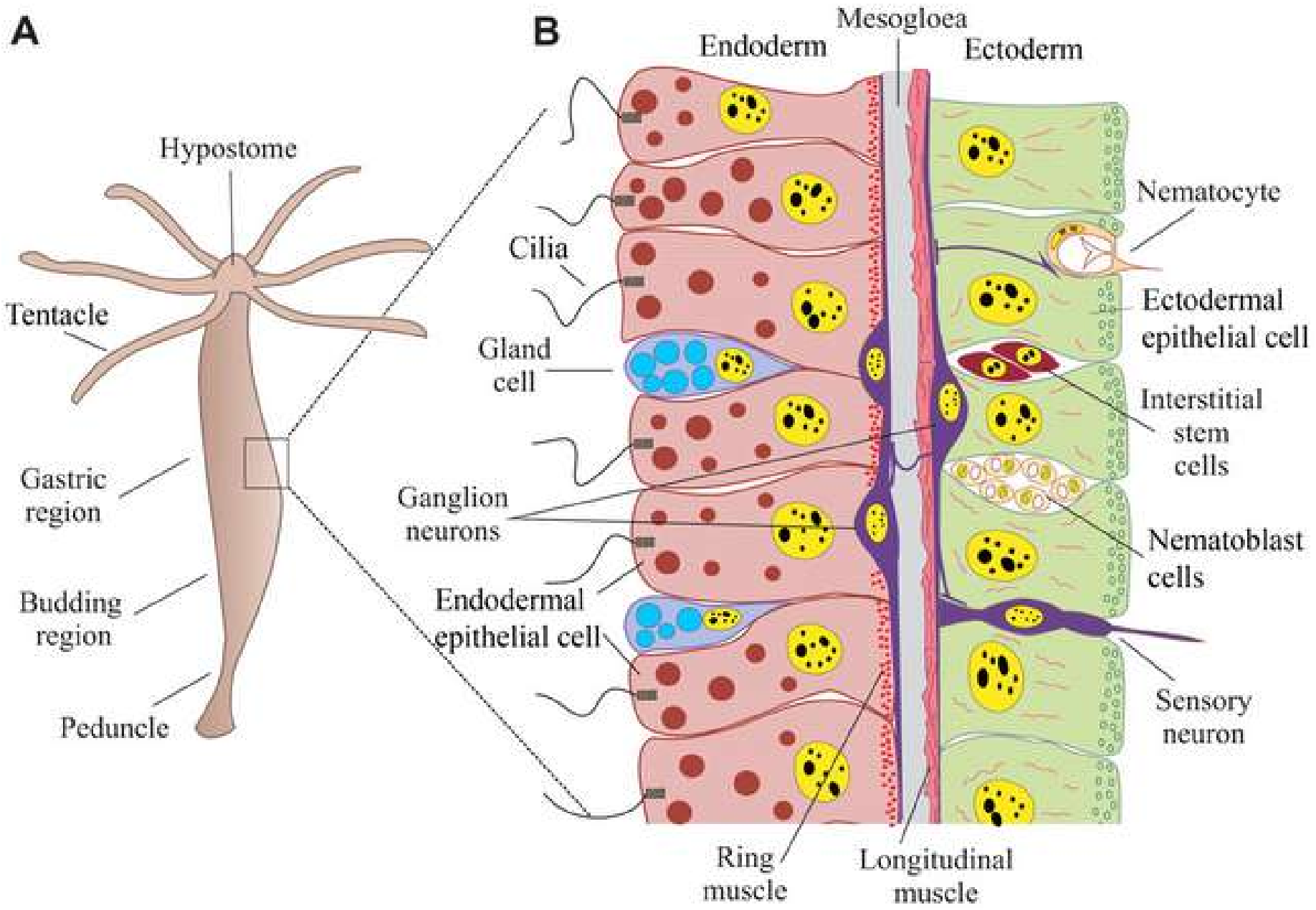


Fig. 31.11. *Hydra*. Types of nematocysts (upper figures undischarged; lower figure discharged). A—Penetrant; B—Volvent; C—Small glutinant; D—Large glutinant.

CNIDARIA - BODY FORM - TYPE OF CELLS



CNIDARIA - BODY FORM - TYPE OF CELLS

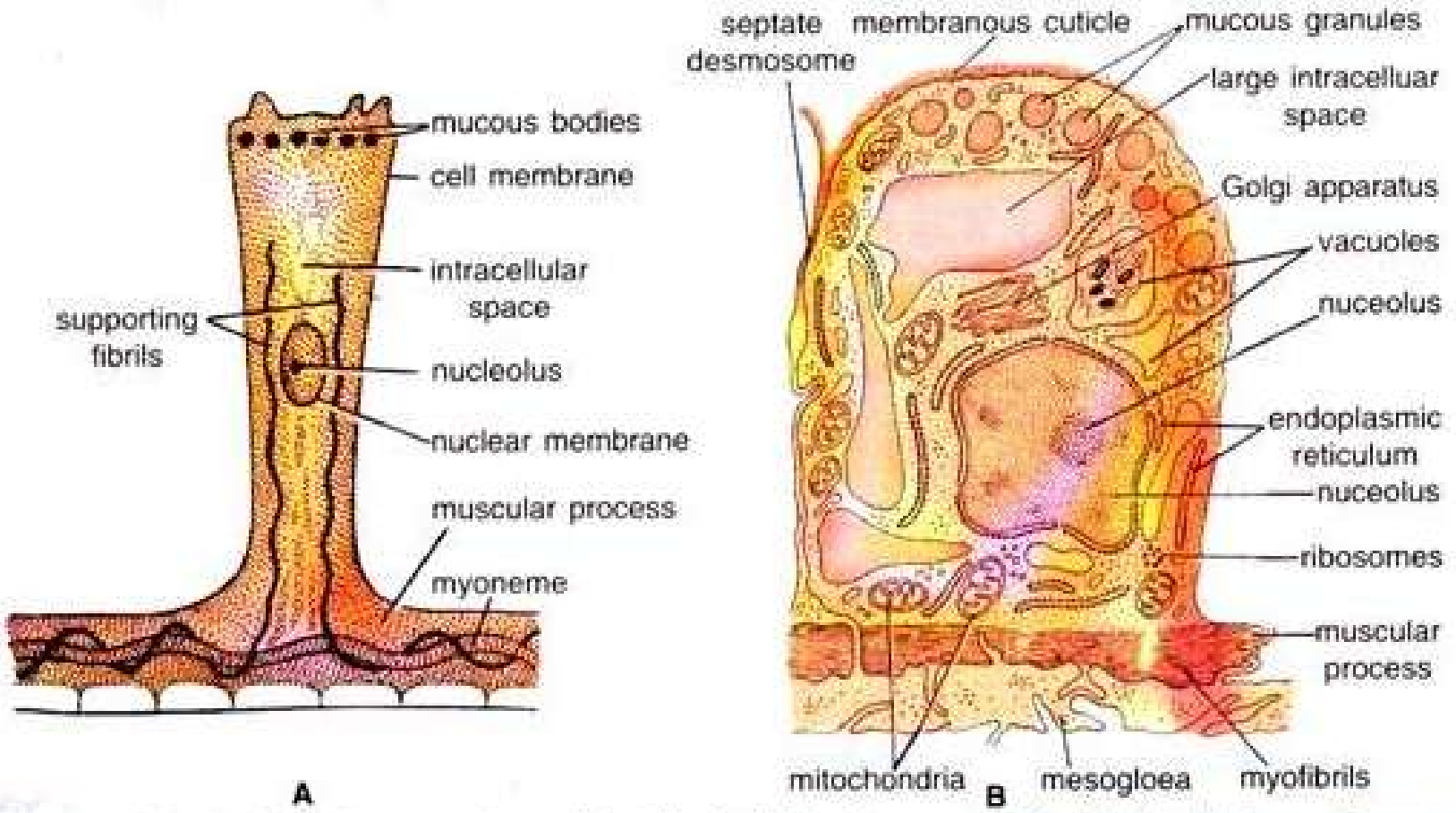
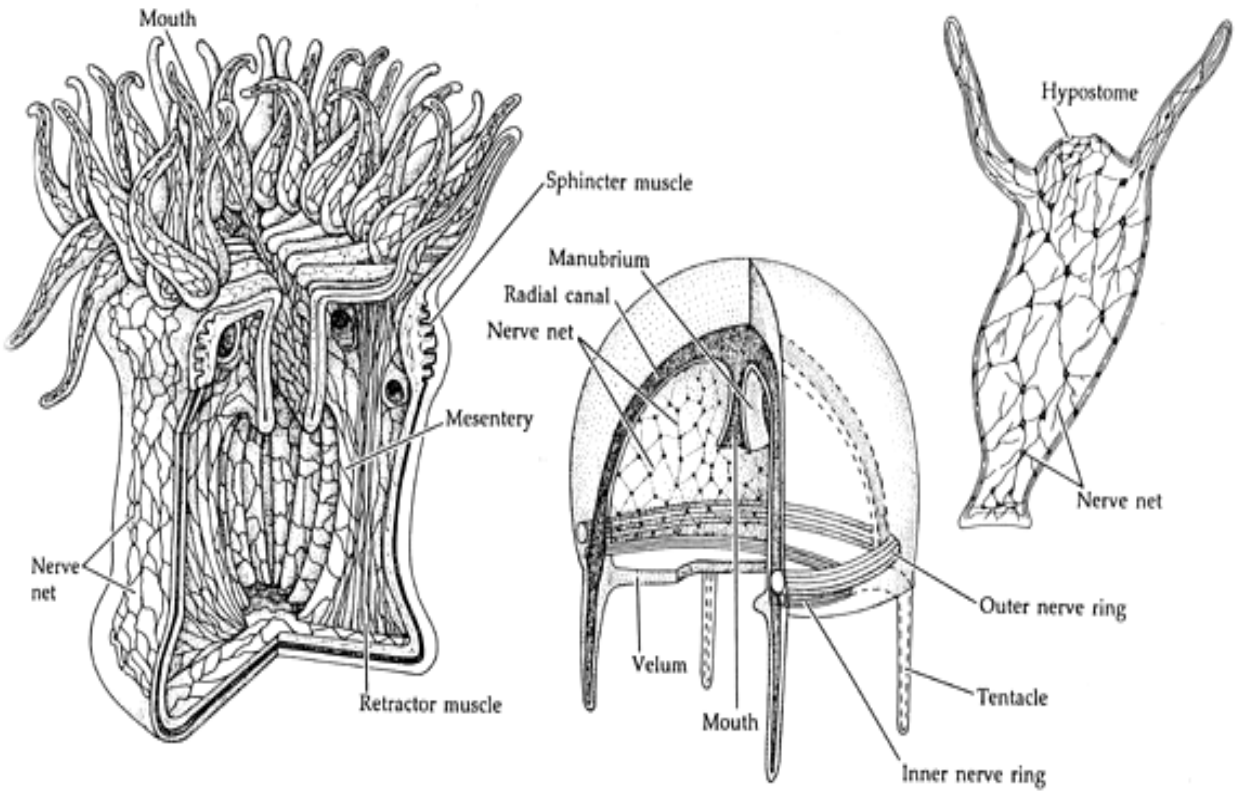


Fig. 31.6. *Hydra*. Epitheliomuscular cell. A—Under light microscope; B—Under electron microscope.

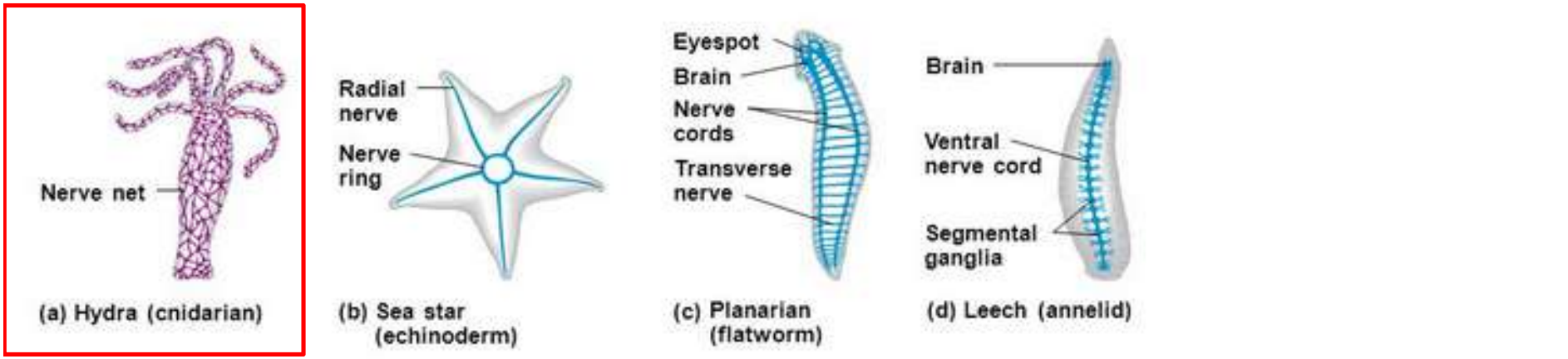
CNIDARIA - MOVEMENT & NERVE

- Muscular contractions via **EPITHELIOMUSCULAR CELLS** → outer layer of **longitudinal fibers at base of epidermis** and an **inner layer of circular fibers at base of gastrodermis**; modifications of plan in **Hydrozoan Medusa** (independent ectodermal muscle fibers) and other complex cnidarians



- Sense organs include well-developed **STATOCYSTS** (organs of balance) and **OCELLI** (photosensitive organs); **complex eyes in members of Cubozoa**
- Nerve net with **symmetrical and asymmetrical synapses;** diffuse conduction; two nerve rings in Hydrozoan medusae
- Stimulus in one part will spread across the whole body via the network

CNIDARIA - MOVEMENT & NERVE



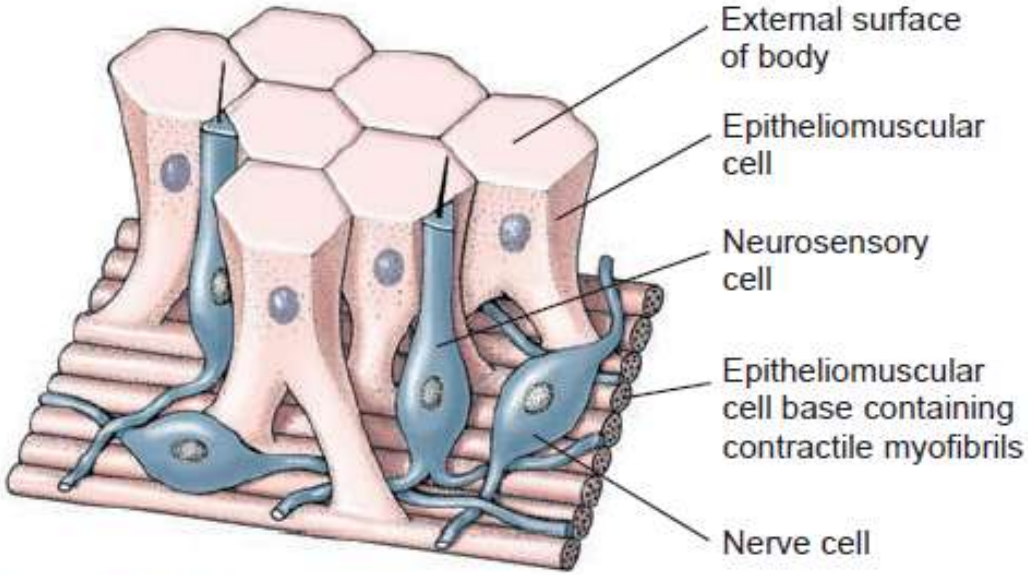


Figure 13.5
Epitheliomuscular and nerve cells in hydra.

CNIDARIA - MOVEMENT & NERVE

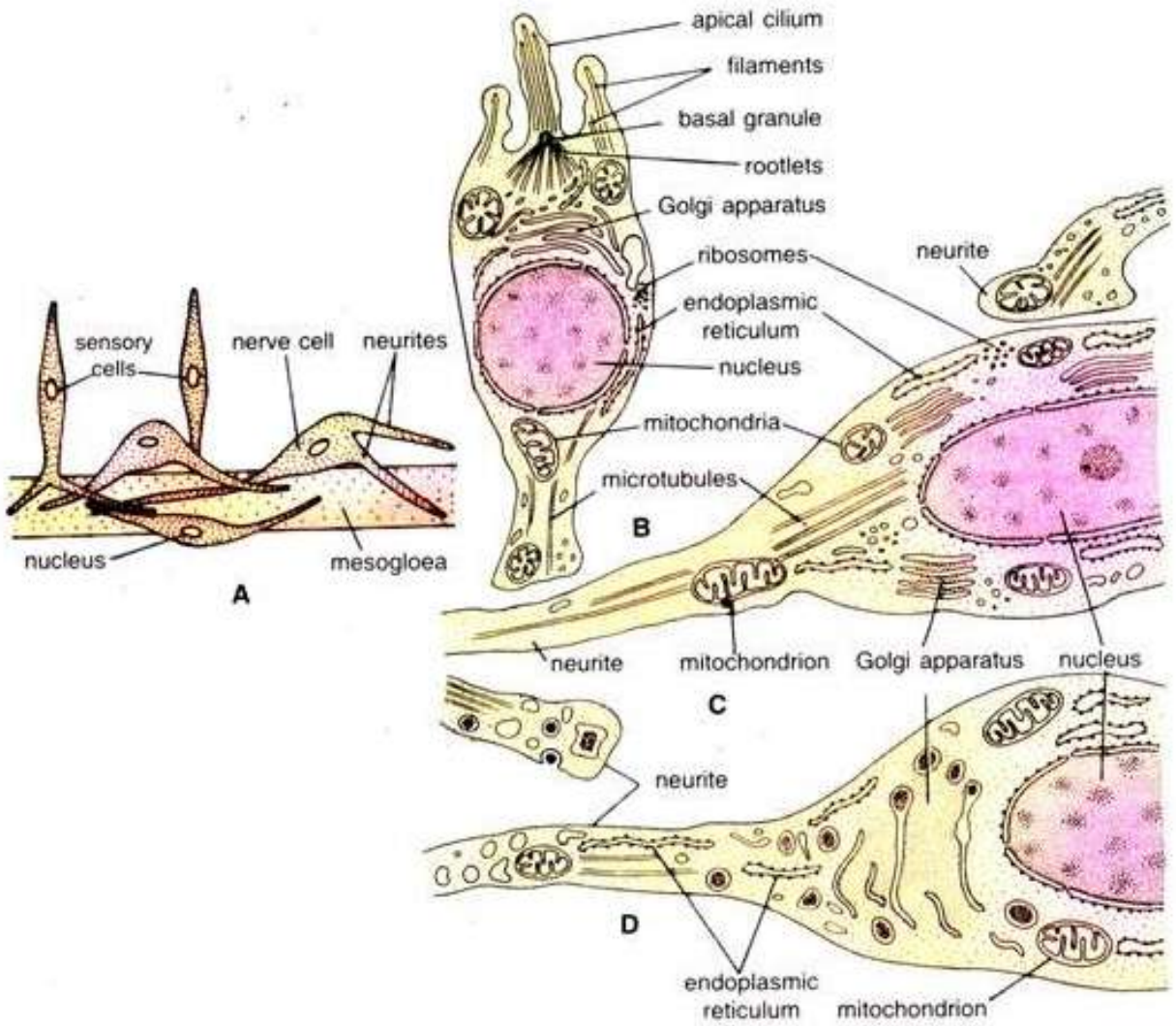
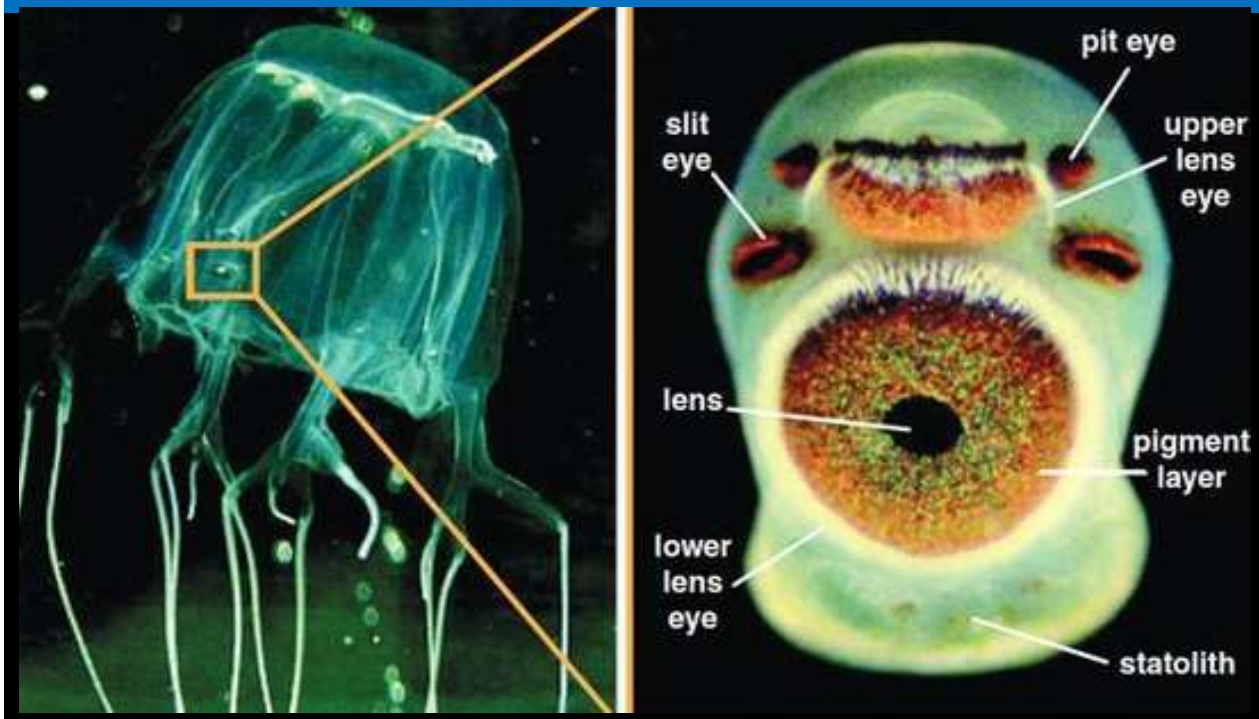


Fig. 31.12. *Hydra.* Sensory and nerve cells. A—Under light microscope; B—Sensory cell under electron microscope; C—Nerve or ganglion cell under electron microscope; D—Neurosecretory cell under electron microscope.

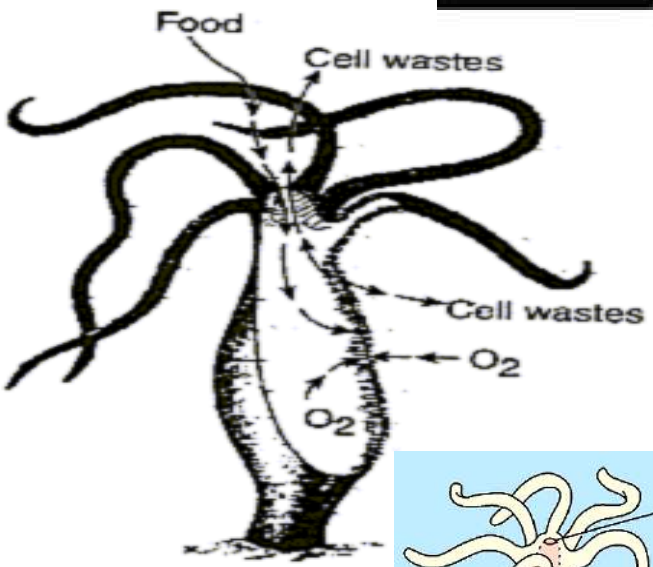
CNIDARIA - MOVEMENT & NERVE

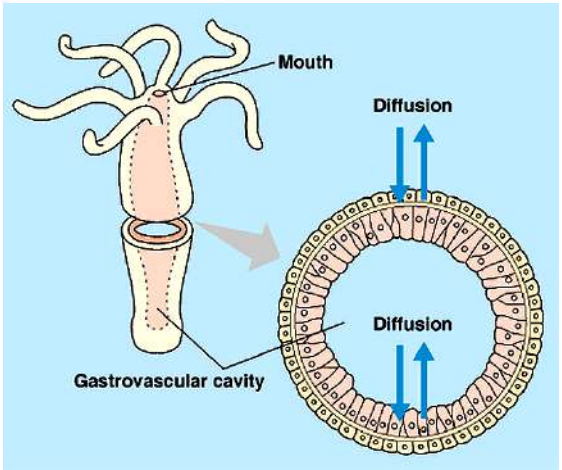


OCELLI (photosensitive organs)
In Box Jellyfish (Cubozoa)

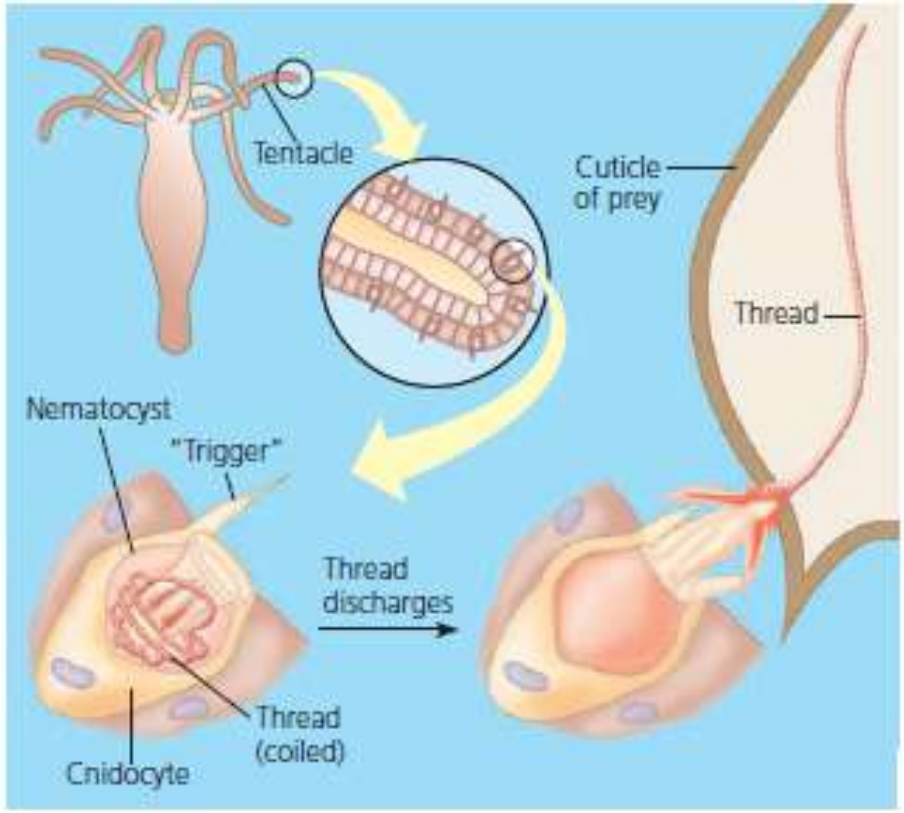
CNIDARIA - NUTRITION & FEEDING

- Cnidarians are **carnivores** with hydras and corals consuming **plankton** and some of the sea anenomes consuming **small fishes**
- They use they **tentacles** to capture prey and direct it toward the mouth → armed with batteries of Cnidocytes → Nematocysts
- Other kinds of cnidae have **long threads** that stick to or entangle small prey that bump into the cnidarian's tentacles.
- Digested in the gastrovascular cavity via **secretions from gland cells** (extracellular digestion, by enzyme); some food is **phagocytized** by special cells and digestion occurs intracellularly
- The gastrovascular → the elimination of waste
- There is no system of internal transport, gas exchange or excretion; all these processes take place via **diffusion**





CNIDARIA - NUTRITION & FEEDING



When triggered to release, either by touch or chemosensation, the nematocyst is released from the cnidocyte and the coiled thread is everted

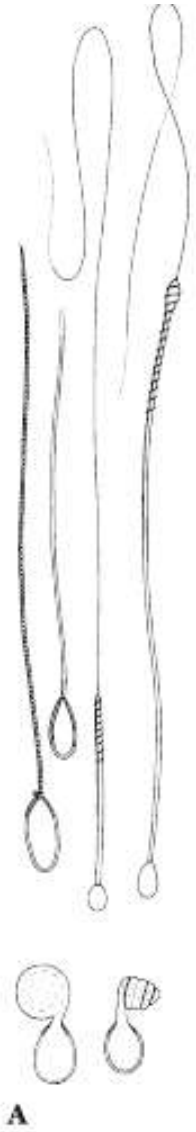


Figure 13.6

A, Several types of cnidae shown after discharge. At bottom are two views of a type that does not impale prey; it recoils like a spring, catching any small part of the prey in the path of the recoiling thread. **B,** Fired and unfired chidae from *Corynactis californica*.

CNIDARIA - NUTRITION & FEEDING

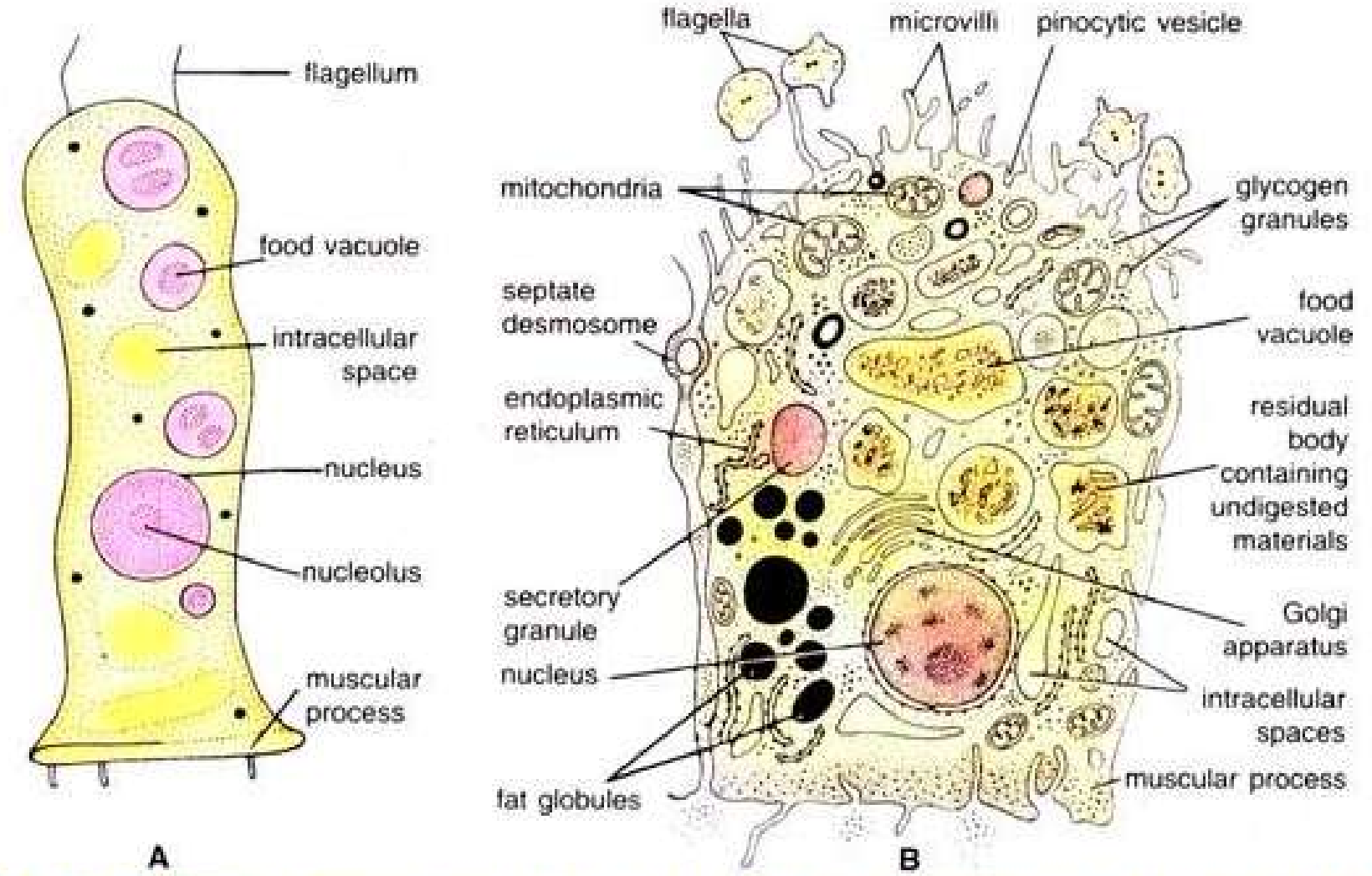


Fig. 31.13. *Hydra*, Nutritive muscle cell. A—Under light microscope ; B—Under electron microscope.

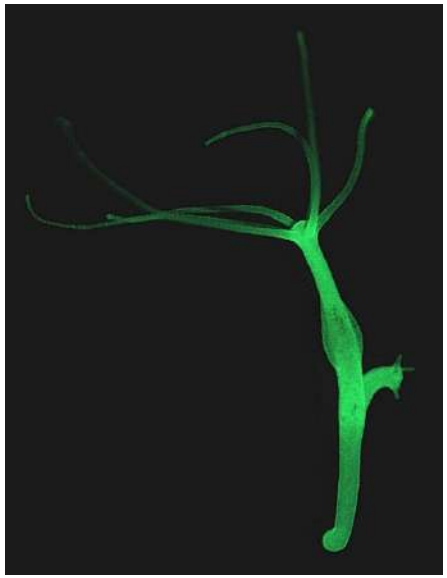
Hydra (freshwater)
or Artemia (brine shrimp)
(before eclosing)

CNIDARIA - REPRODUCTION

ASEXUAL reproduction by **budding in polyps** forms clones and colonies; some colonies exhibit **polymorphism (> 1 struktur within species)**

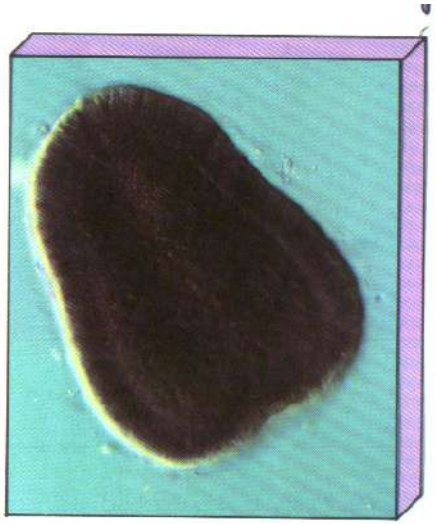
Ability of some cnidarians to regenerate lost parts or even a complete body

Sea anenomes engage in a form of asexual reproduction called **Pedal Laceration**



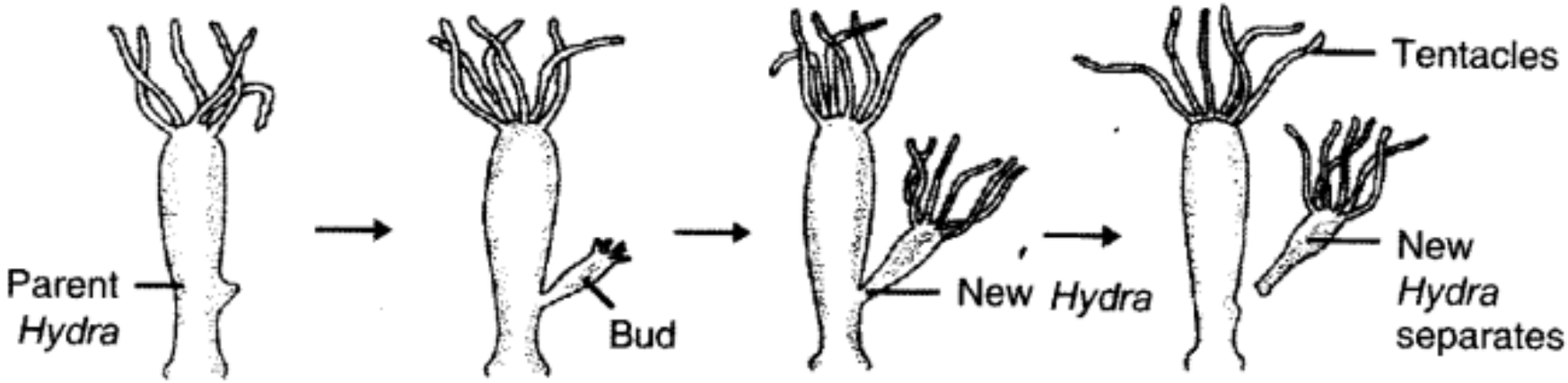
SEXUAL reproduction by **gametes in all medusae** and some polyps; monoecious or dioecious; holoblastic indeterminate cleavage;

Fertilization is external, with the zygote becoming a elongated, ciliated, radially symmetrical larva - **PLANULA LARVA**

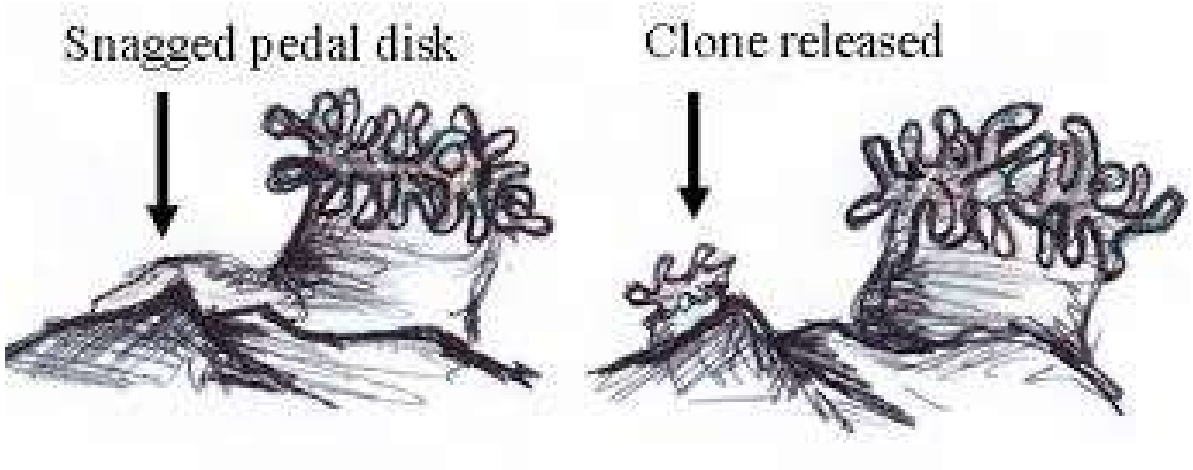


PLANULA LARVA

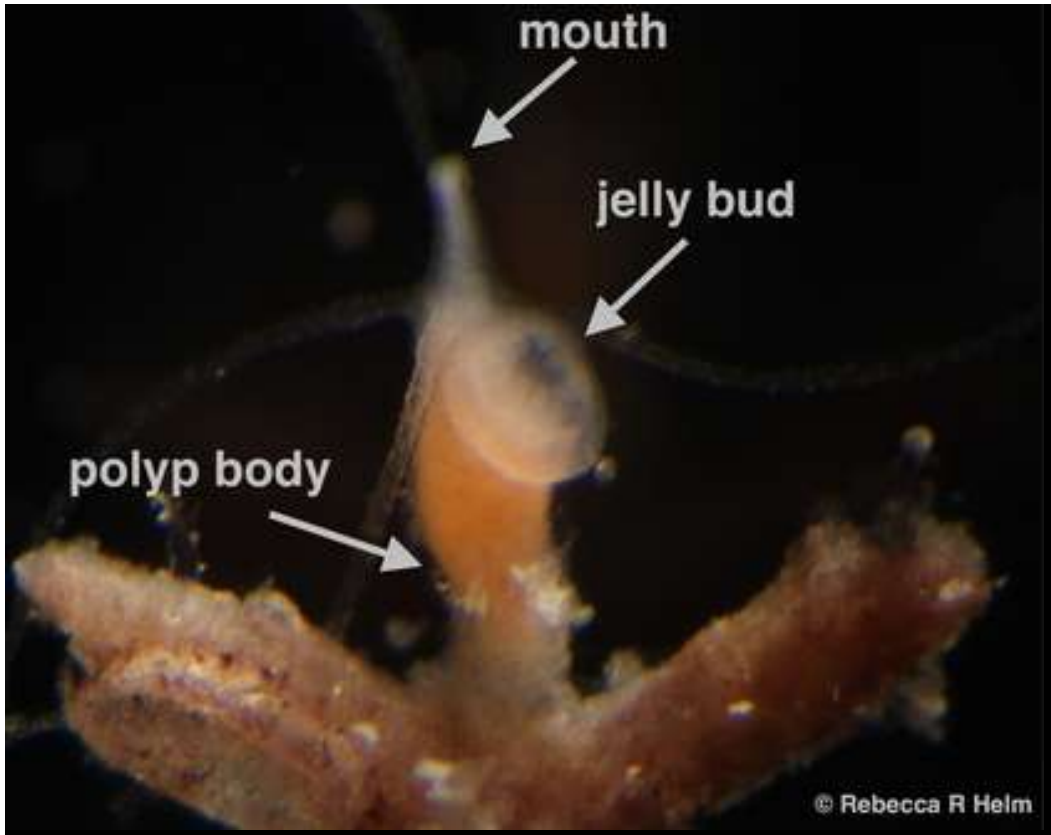
CNIDARIA - REPRODUCTION

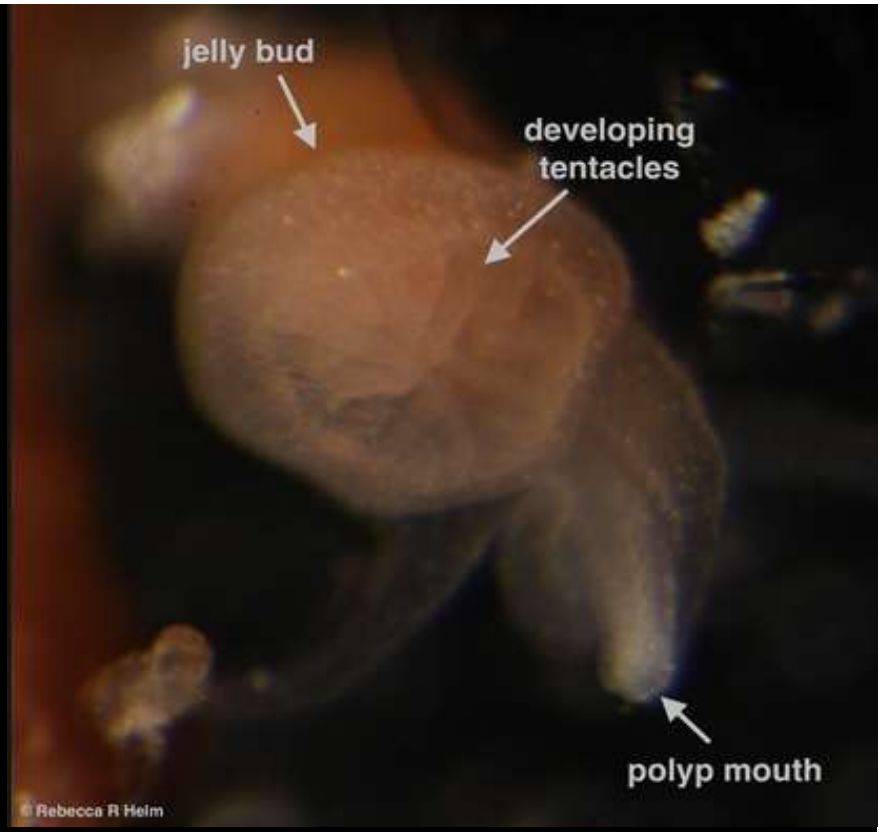


Budding



Pedal Laceration


mouth
jelly bud
polyp body
© Rebecca R Helm


jelly bud
developing tentacles
polyp mouth
© Rebecca R Helm


Injury
6 hours
18 hours
50 hours

CNIDARIA - REPRODUCTION

Figure 33.8 The life cycle of the hydrozoan *Obelia*. The polyp is asexual, and the medusa is sexual, releasing eggs and sperm. These two stages alternate, one producing the other.

1 A colony of interconnected polyps (inset, LM) results from asexual reproduction by budding.

2 Some of the colony's polyps, equipped with tentacles, are specialized for feeding.

3 Other polyps, specialized for reproduction, lack tentacles and produce tiny medusae by asexual budding.

4 Medusae swim off, grow, and reproduce sexually.

Feeding polyp

Reproductive polyp

Medusa bud

Portion of a colony of polyps

ASEXUAL REPRODUCTION (BUDDING)

Developing polyp

Mature polyp

Planula (larva)

Gonad

Medusa

MEIOSIS

SEXUAL REPRODUCTION

Egg

Sperm

FERTILIZATION

Zygote

6 The planula eventually settles and develops into a new polyp.

5 The zygote develops into a solid ciliated larva called a planula.

Key

Haploid (*n*)

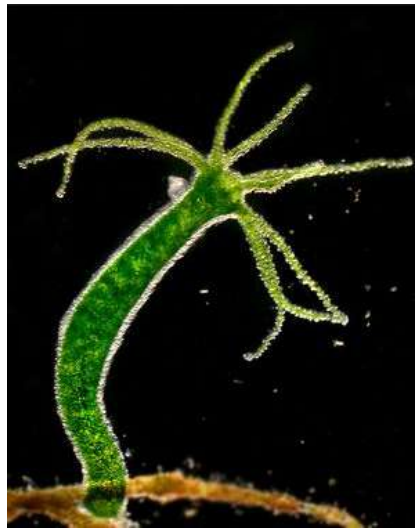
Diploid (2*n*)

CNIDARIA - ECOLOGICAL IMPORTANCE

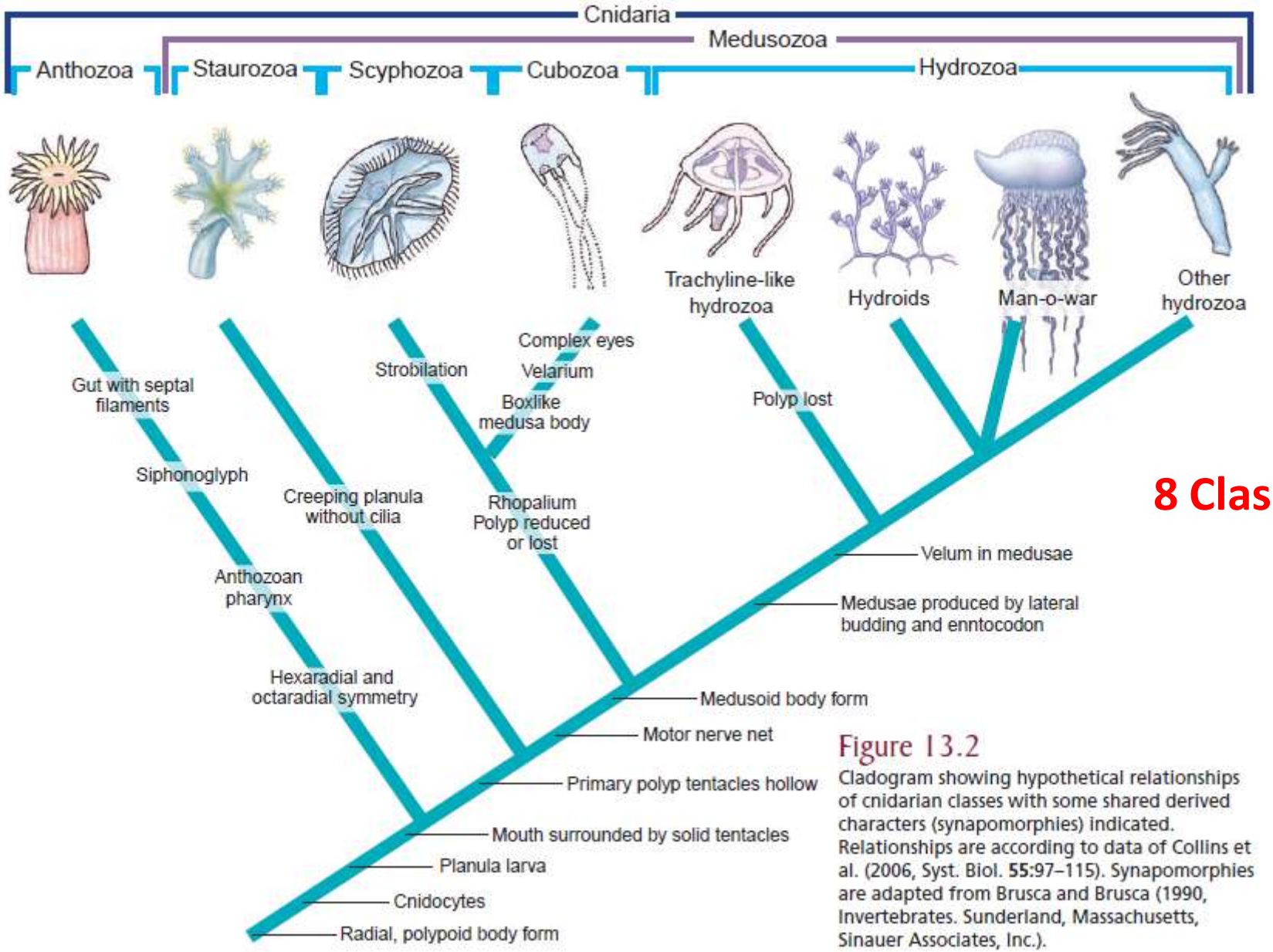
Amphiprion percula

- **Filter and clean the water**
- **Form symbiotic relationships with other ocean life, Ex:**
  - **Clownfish and anemone** (about predator-prey)
  - **Coral and many types of algae** (oral supply algae nutrients and algae supply corals oxygen)
- **Coral will die as the water temperature increases. Death of coral often precedes death of entire ecosystems**

The clownfish are immune (mucus) to the stinging cells of the clownfish anemone. Therefore the anemone provides protection and shelter for the clownfish and in turn the clownfish clean the anemone.



CNIDARIA - TAXONOMY



8 Class

Figure 13.2
Cladogram showing hypothetical relationships of cnidarian classes with some shared derived characters (synapomorphies) indicated. Relationships are according to data of Collins et al. (2006, Syst. Biol. **55**:97–115). Synapomorphies are adapted from Brusca and Brusca (1990, Invertebrates. Sunderland, Massachusetts, Sinauer Associates, Inc.).

CNIDARIA - CLASS ANTHOZOA

(Gr. *anthos*, flower)

- Exclusively marine; no medusa stage, **Polyp stage only**
- At one or both ends of the mouth is a ciliated groove called the **SIPHONOGLYPH;** generates a water current and brings food to the gastrovascular cavity
- Possess a well developed **PHARYNX**
- The gastrovascular cavity is large and petitioned by septa or **MESENTERIES**; increase surface area for digestion or support
- Edges of the septa usually have threadlike **ACONTIA THREADS,** equipped with nematocysts and gland cells

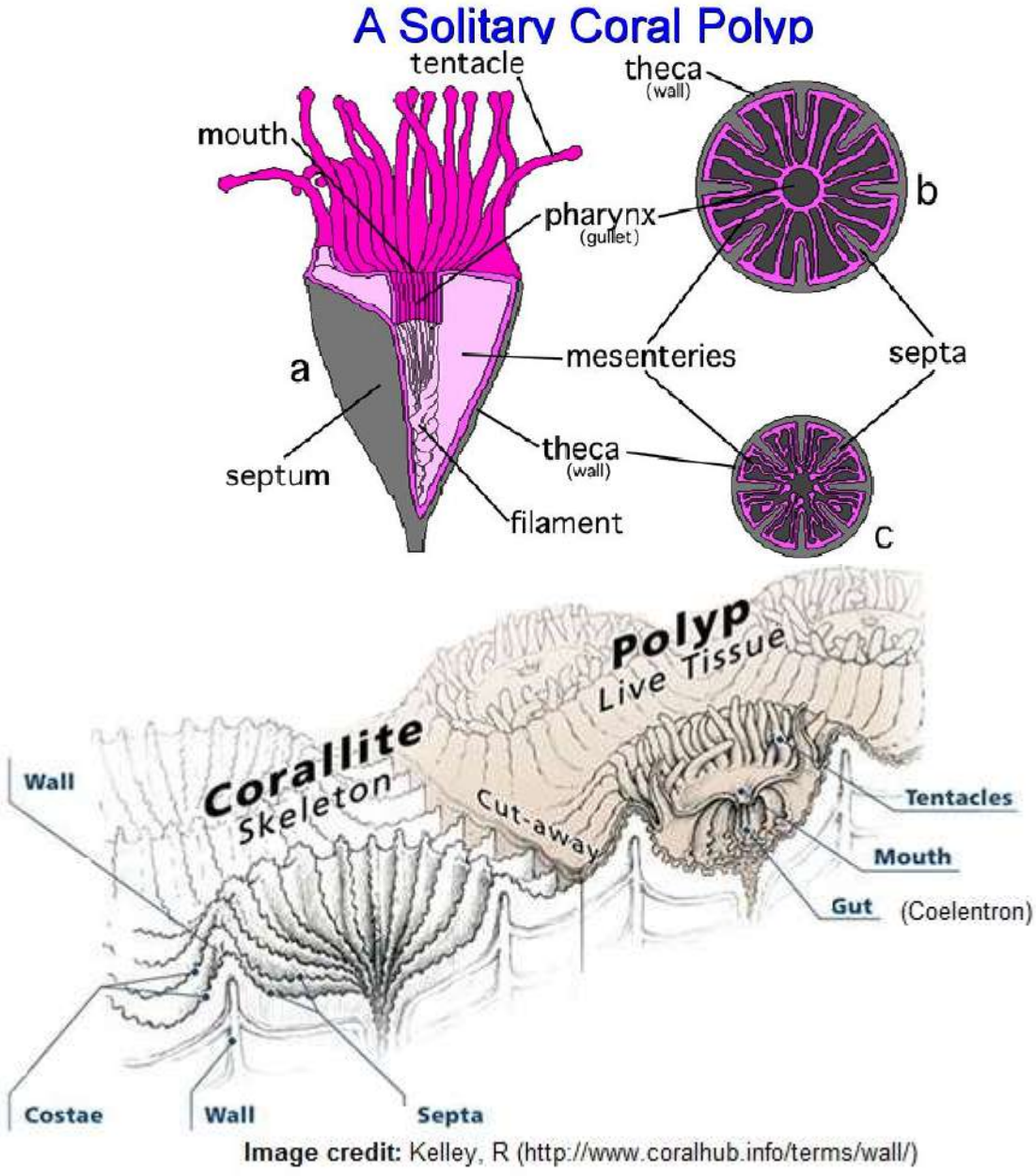
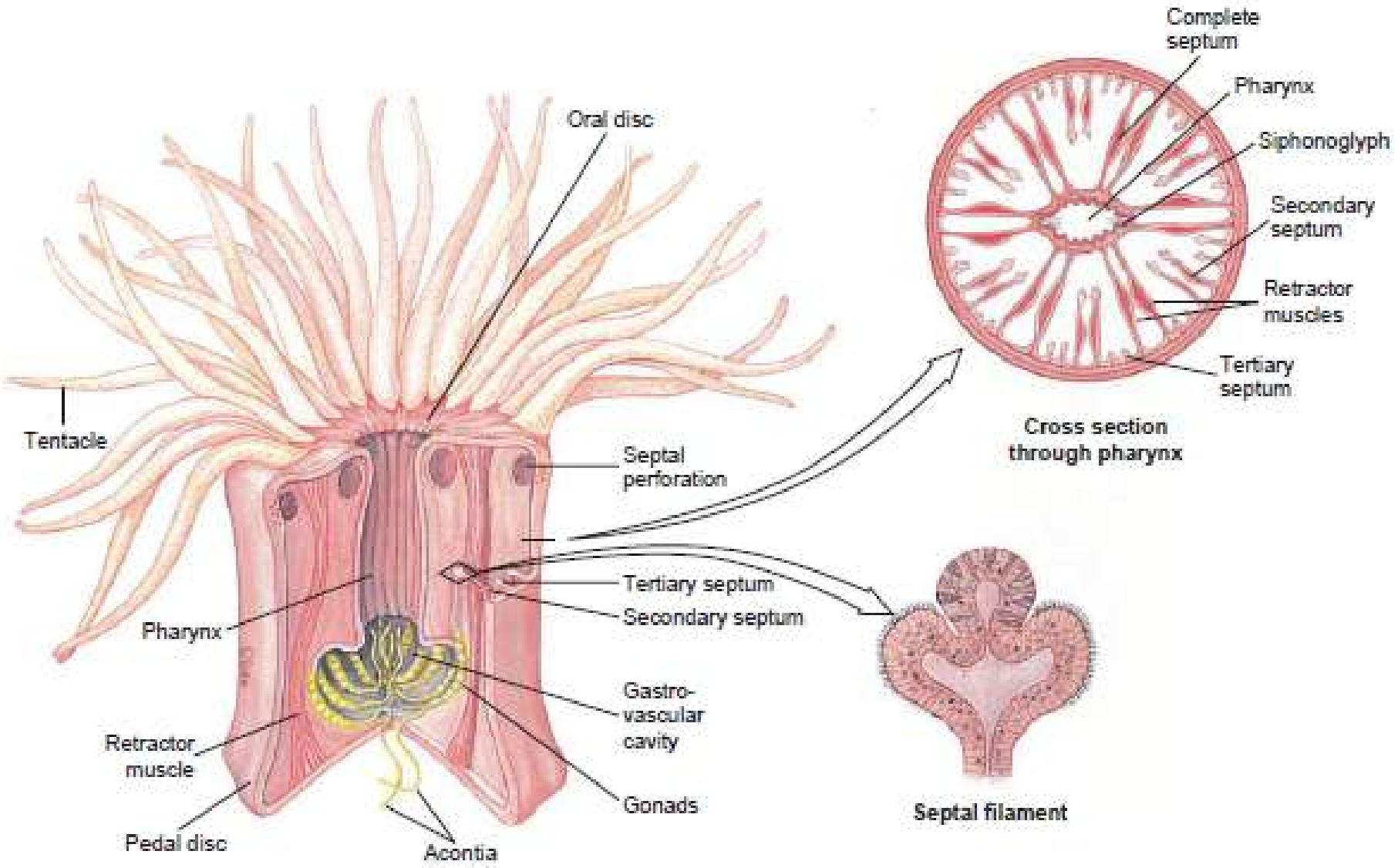


Image credit: Kelley, R (http://www.coralhub.info/terms/wall/)

CNIDARIA - CLASS ANTHOZOA



CNIDARIA - CLASS ANTHOZOA

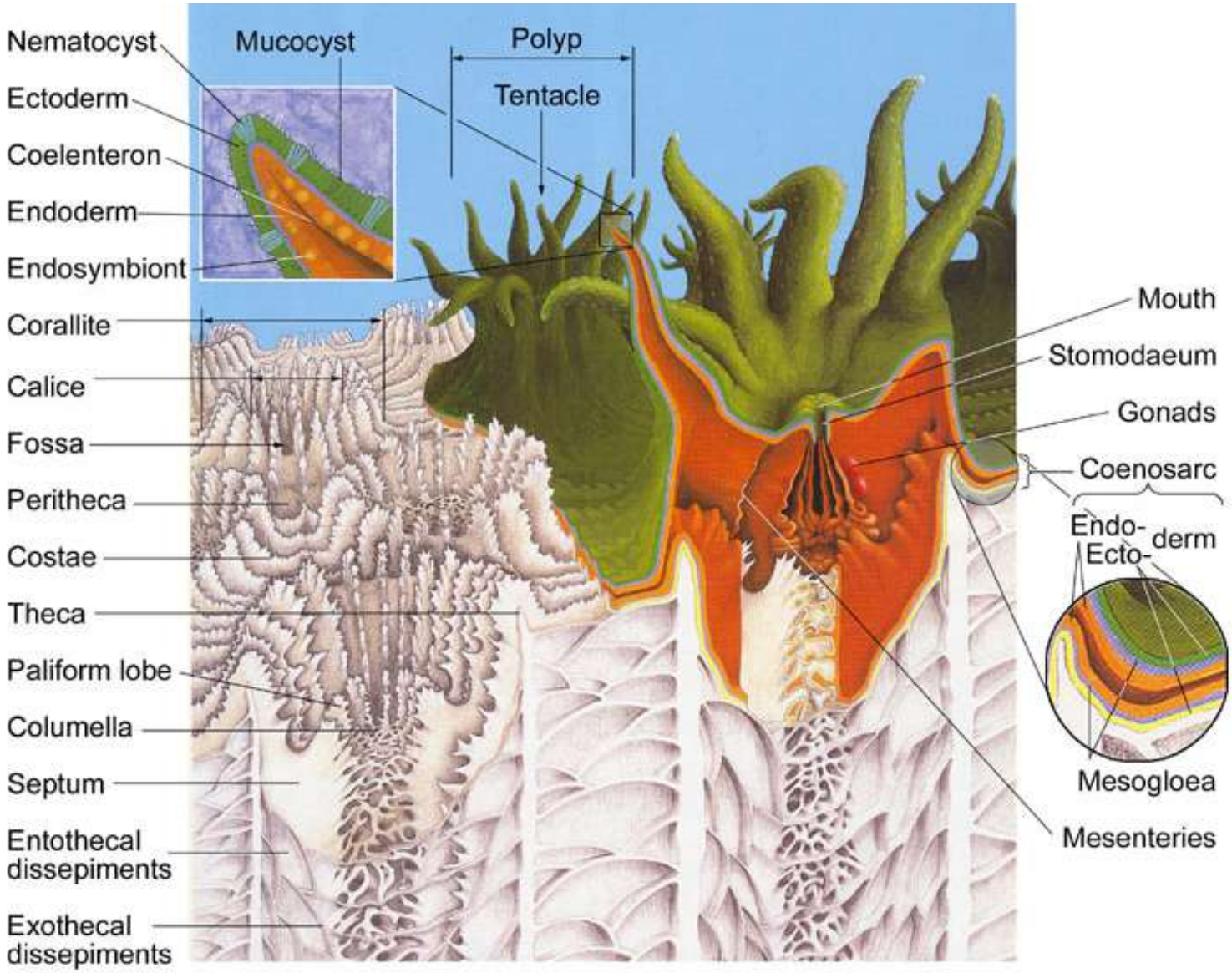
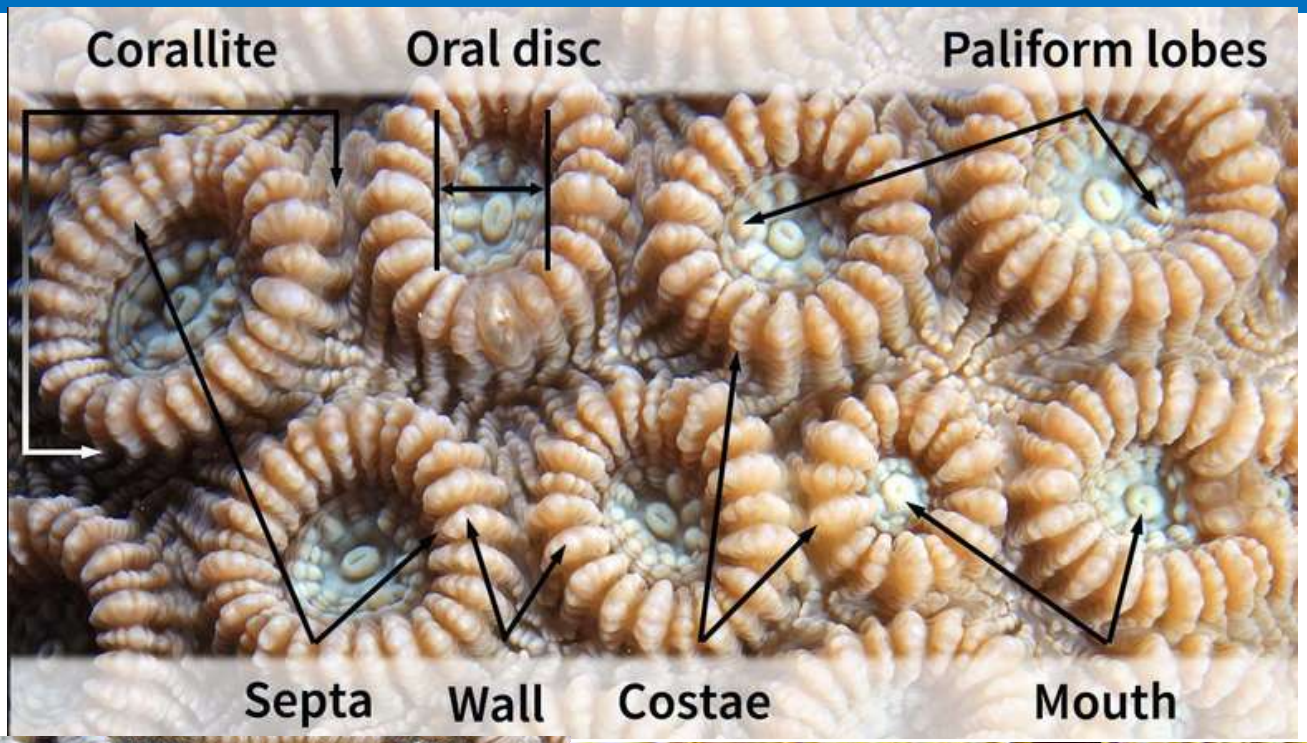
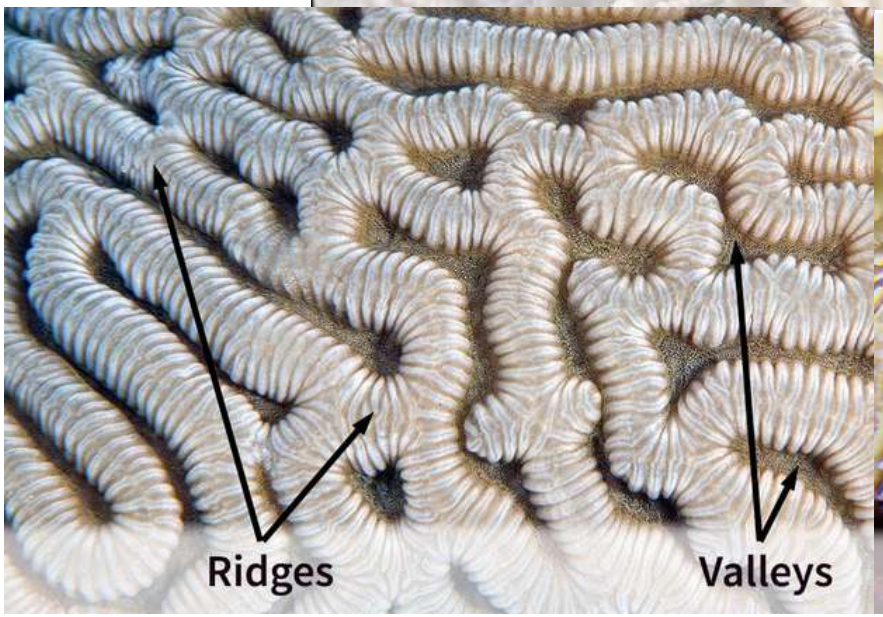


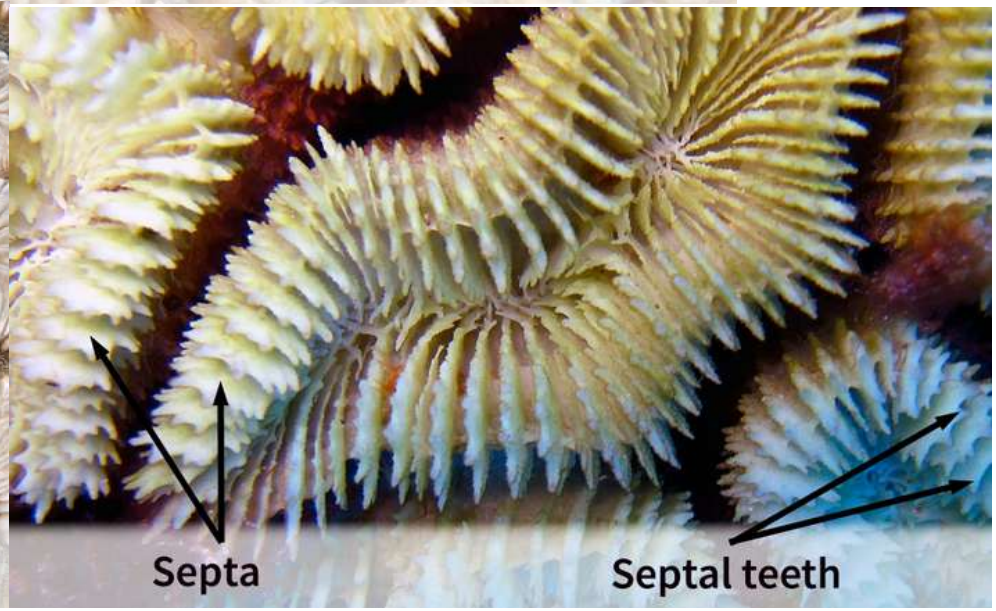
Fig.2.3: Schematic diagram of the major anatomical elements of the basic skeletal features of scleractinian corals.

(modified after Veron, 1986)

CNIDARIA - CLASS ANTHOZOA



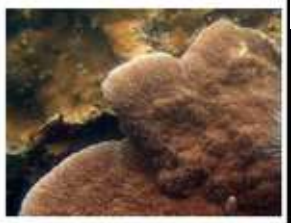




CNIDARIA - CLASS ANTHOZOA

The growth forms of corals

CNIDARIA - CLASS ANTHOZOA

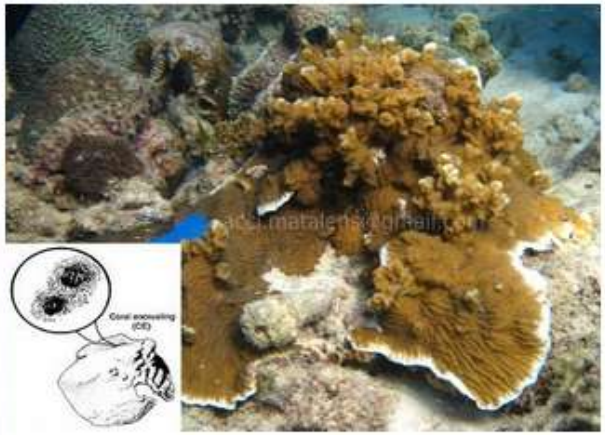
No.	Tipe Karang	Morfologi	Contoh Gambar
1.	Tipe bercabang (*branching*)	Memiliki cabang dengan ukuran cabang lebih panjang dibandingkan dengan ketebalan atau diameter yang dimilikinya.	
2.	Tipe padat (*massive*)	Memiliki koloni yang keras dan umumnya berbentuk membulat, permukaannya halus dan padat. Ukurannya bervariasi mulai dari sebesar telur sampai sebesar ukuran rumah	
3.	Tipe kerak (*encrusting*)	Karang tumbuh merambat dan menutupi permukaan dasar terumbu, memiliki permukaan kasar dan keras serta lubang-lubang kecil.	
4.	Tipe meja (*tabulate*)	Karang tumbuh membentuk seperti menyerupai meja dengan permukaan lebar dan datar serta ditopang oleh semacam tiang penyangga yang merupakan bagian dari koloninya	
5.	Tipe daun (*foliose*)	Karang tumbuh membentuk lembaran-lembaran yang menonjol pada dasar terumbu, berukuran kecil dan membentuk lipatan-lipatan melingkar	

Gambar 2. Coral Branching (CB)

Gambar 3. Coral massive (CM)

CNIDARIA - CLASS ANTHOZOA

Coral encrusting (**CE**); Bentuknya kerak dimana tubuhnya menyerupai dasar terumbu dengan permukaan yang kasar dan keras serta berlubang-lubang kecil.

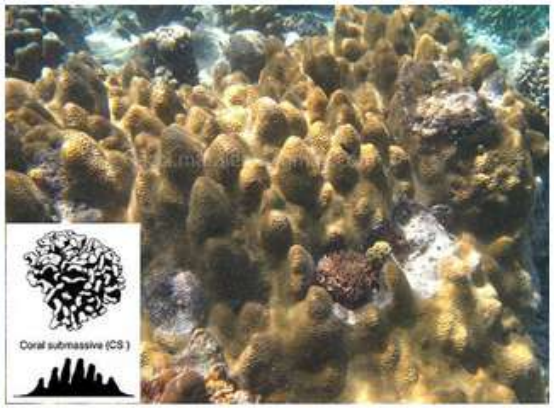


Gambar 4. Coral encrusting (**CE**)

Coral foliose (**CF**); tubuh bentuk lembaran-lembaran yang menonjol pada dasar terumbu, berukuran kecila dan membentuk lipatan atau melingkar.

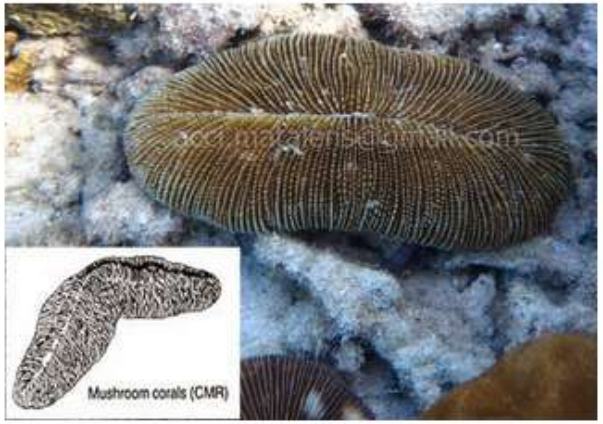
Gambar 6. Coral foliose (**CF**)

Coral submassive (**CS**); Benetuk kokoh dengan tonjolan-tonjolan atau kolom-kolom kecil.



Gambar 5. Coral submassive (**CS**)

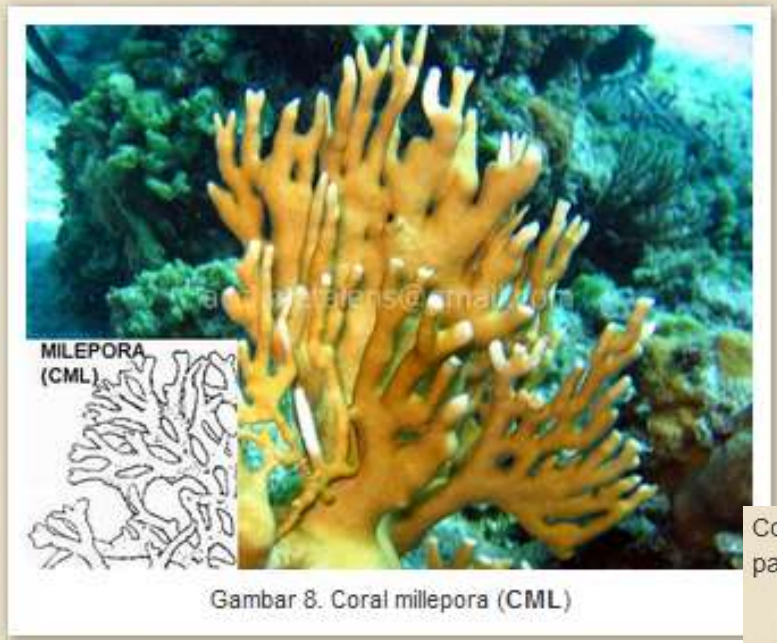
Coral mushroom (**CMR**); bentuknya seperti jamur dimana benrbentuk oval memiliki banyak tonjolan seperti punggung bukit beralur dari tepi hingga pusat mulut.



Gambar 7. Coral mushroom (**CMR**)

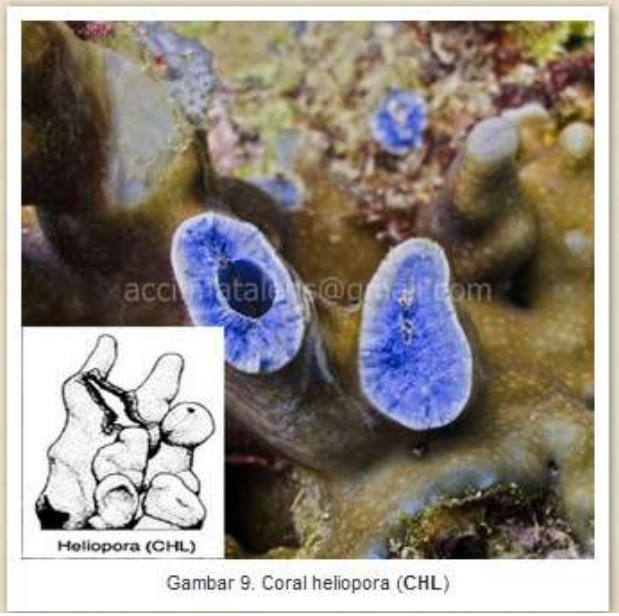
CNIDARIA - CLASS ANTHOZOA

Coral millepora (**CML**); Semua jenis karang apa dimana dapat dikenali dengan adanya warna kuning di ujung koloni serta rasa panas seperti terbakar jika tersentuh.



Gambar 8. Coral millepora (**CML**)

Coral heliopora (**CHL**); Semua karang biru yang dapat ditandai dengan warna biru pada rangka kapur karang.



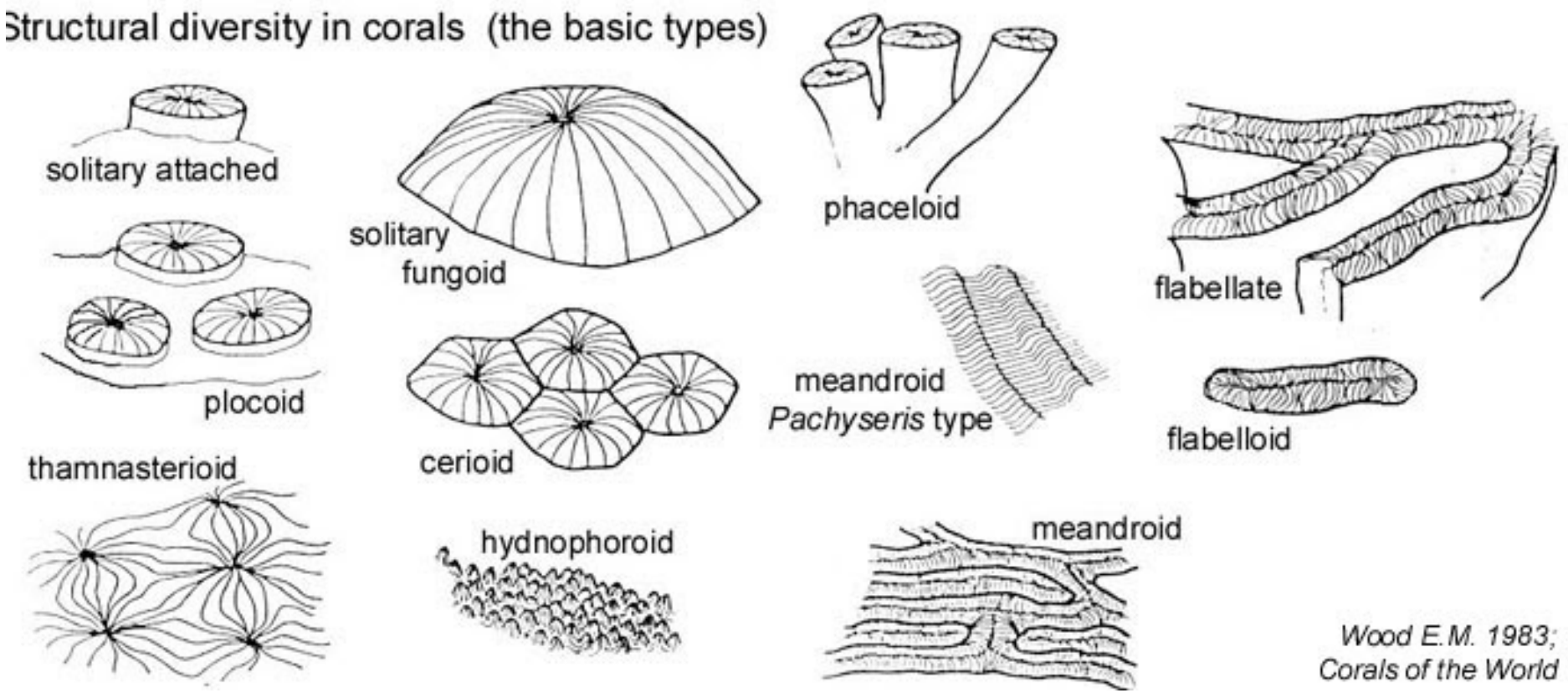
Gambar 9. Coral heliopora (**CHL**)

CNIDARIA - CLASS ANTHOZOA

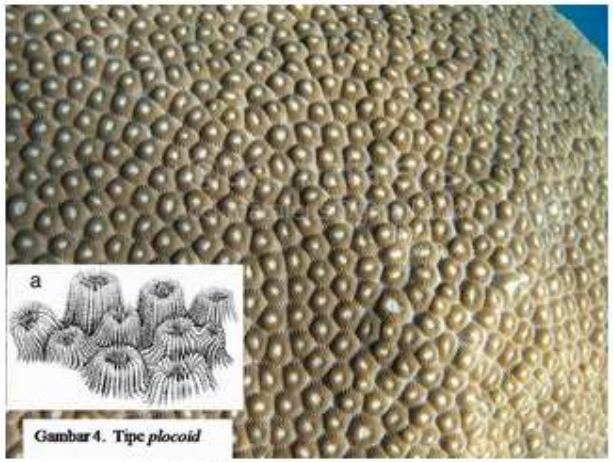
CORALLITE ARRANGEMENT AND FORMATIION

1. **Cerioid** = adjacent corallites share the same wall.
2. **Plocoid** = each corallite has its own separate wall.
3. **Phaceloid** = corals that have corallites of uniform height adjoined towards their base.
4. **Meandroid** = massive colonies that have corallite mouths aligned in valleys such that there are no individual polyps.
5. **Hydnophoroid** = septa fusing to form monticules or mould like structures

CNIDARIA - CLASS ANTHOZOA

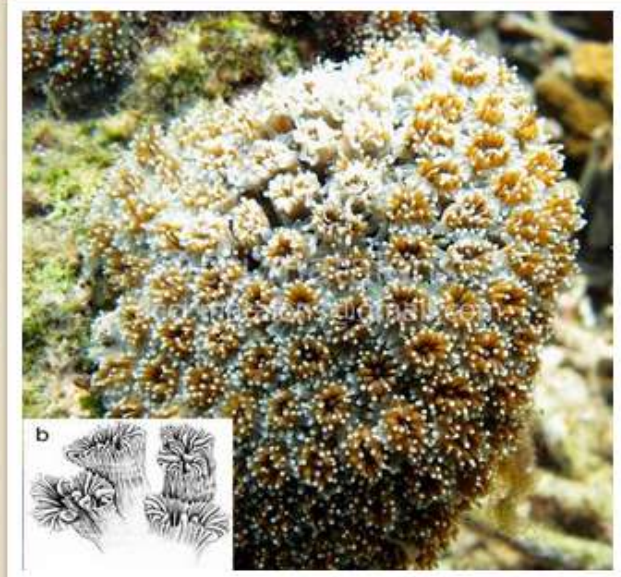


Tipe Placoid; masing-masing corallite memiliki dindingnya masing-masing dengan tonjolan menyerupai tabung yang dipisahkan oleh Coenosteum.



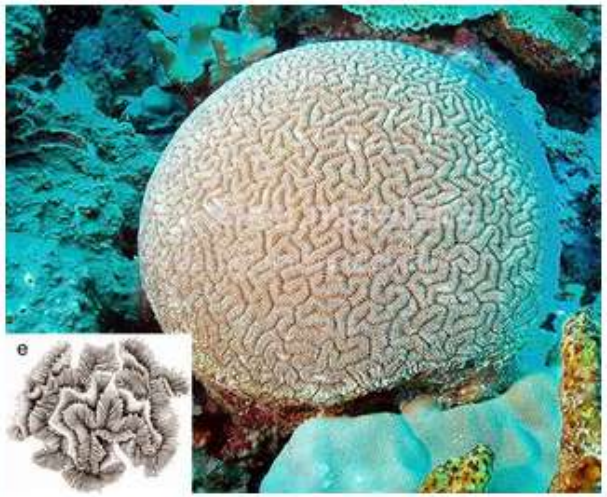
Gambar 15. Corallite karang tipe placoid

Tipe Phaceloid; apabila koralit memanjang membentuk tabung dan juga mempunyai corallite dengan dinding masing-masing yang dipisahkan oleh ruang kosong.



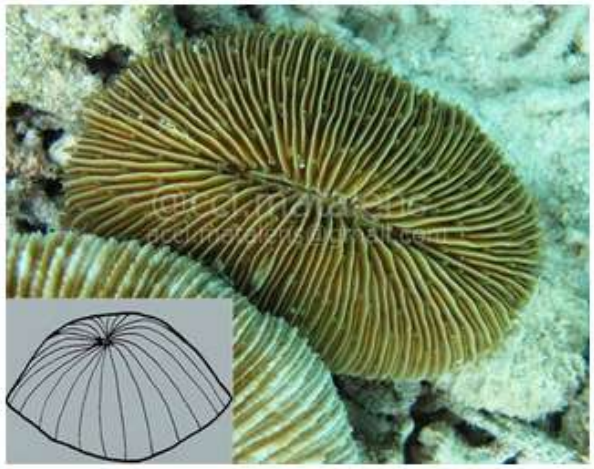
Gambar 16. Corallite karang dengan tipe phaceloid

Tipe Flabello-meandroid; seperti meandroid, dimana membentuk lembah-lembah memanjang, namun corallite tidak memiliki dinding bersama.



Gambar 17. Corallite karang tipe flabello-meandroid

Tipe Soliter; tipe ini hanya terdiri atas satu corallite (tidak berkoloni). Umumnya memiliki dua bentuk yaitu bulat dan lonjong.



Gambar 17. Corallite karang dengan tipe soliter

Tipe Cerioid; apabila dinding corallite saling menyatu (bersanding satu sama lain) dan membentuk permukaan yang datar.

Gambar 18. Corallite karang dengan tipe cerioid

Tipe Meandroid;apabila koloni mempunyai corallite yang membentuk lembah dan corallite disatukan oleh dinding-dinding yang saling menyatu dan membentuk alur-alur seperti sungai.

Gambar 19. Corallite karang dengan tipe meandroid

Tipe Themnasteroid; antar corallite tidak memiliki dinding, dimana membentuk kanal-kanal kecil yang terpusat.

Gambar 20. Corallite karang dengan tipe themnasteroid

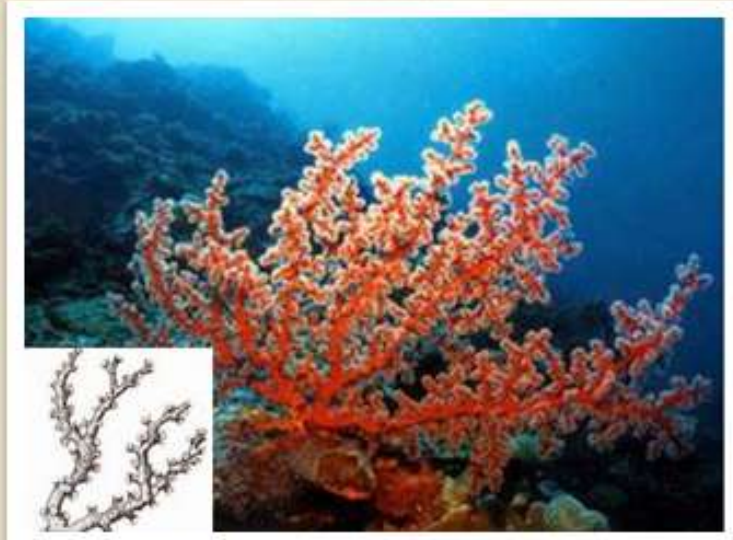
Tipe Hydnophoroid; Corallite terbentuk seperti bukit yang masing-masing memiliki dinding pembatas, tersebar pada seluruh permukaan koloni.

Gambar 21. Corallite karang dengan tipe hydrophoroid

Tipe Flabellatte; bentuk koloni karang yang berlekuk-lekuk atau mempunyai alur yang berkelok dengan masing-masing koralit mempunyai dinding yang terpisah.

Gambar 22. Corallite karang tipe flabellate

Dendroid; bentuk pertumbuhan koloninya hampir menyerupai pohon, dimana mempunyai cabang-cabang dan di ujung cabang biasanya di jumpai kalik utama.

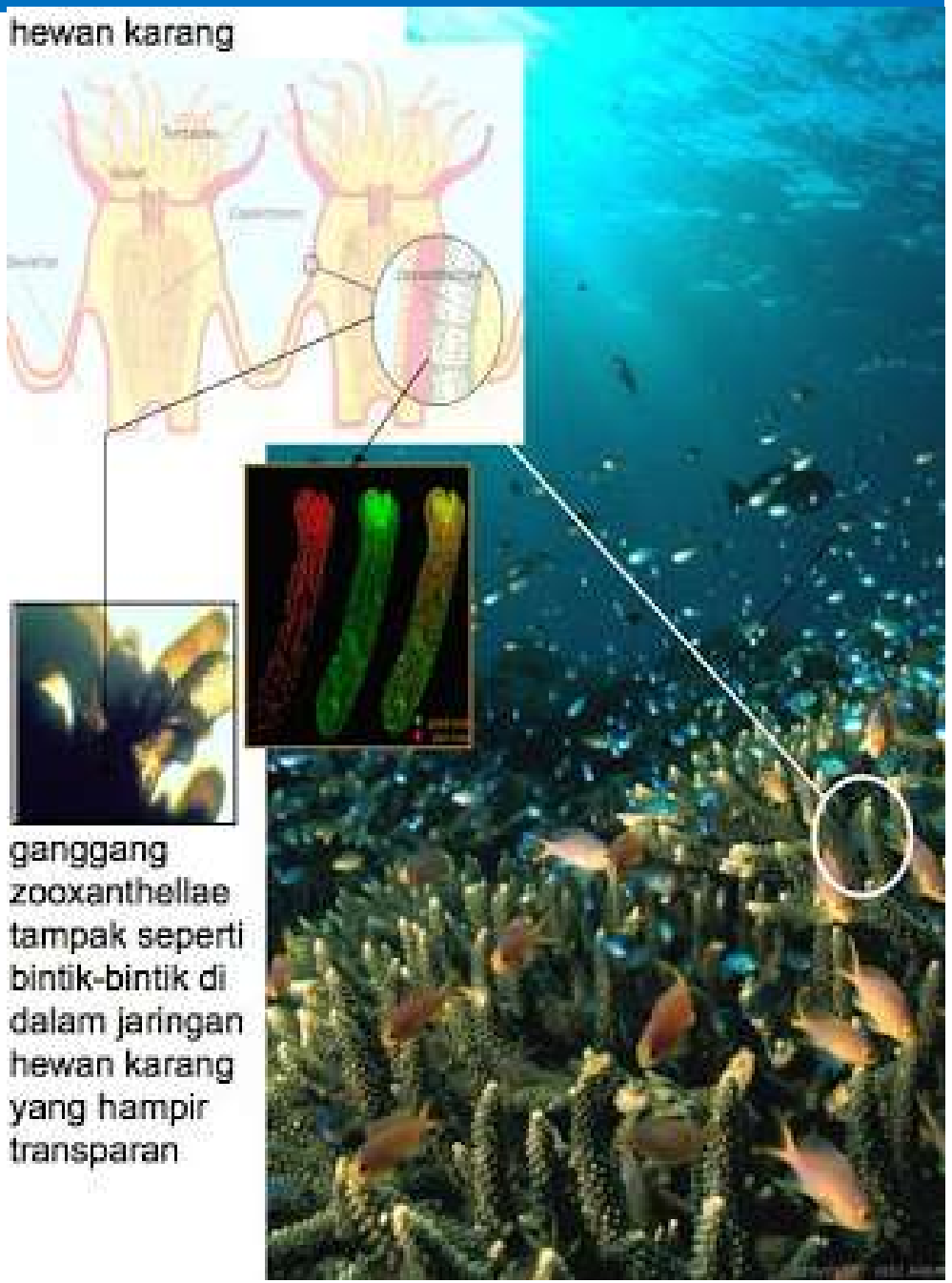


Gambar 23. Corallite karang tipe dendroid

CNIDARIA - CLASS ANTHOZOA

- Solitary anthozoans include sea anemones
- Most anthozoans are colonial (e.g. corals) and secrete external skeletons composed of **calcium carbonate**
- Corals obtain much of their energy from microscopic photosynthetic **green algae (zooxanthellae)** or **dinoflagellates** that live symbiotically inside the cells of the coral

Green Algae (zooxanthellae)



CNIDARIA - CLASS ANTHOZOA

- Some reproduce asexually by **budding**
- Others sexual with sperm and egg being released into the ocean where fertilization occurs
- Zygotes develop into planulae that settle and develop into polyps

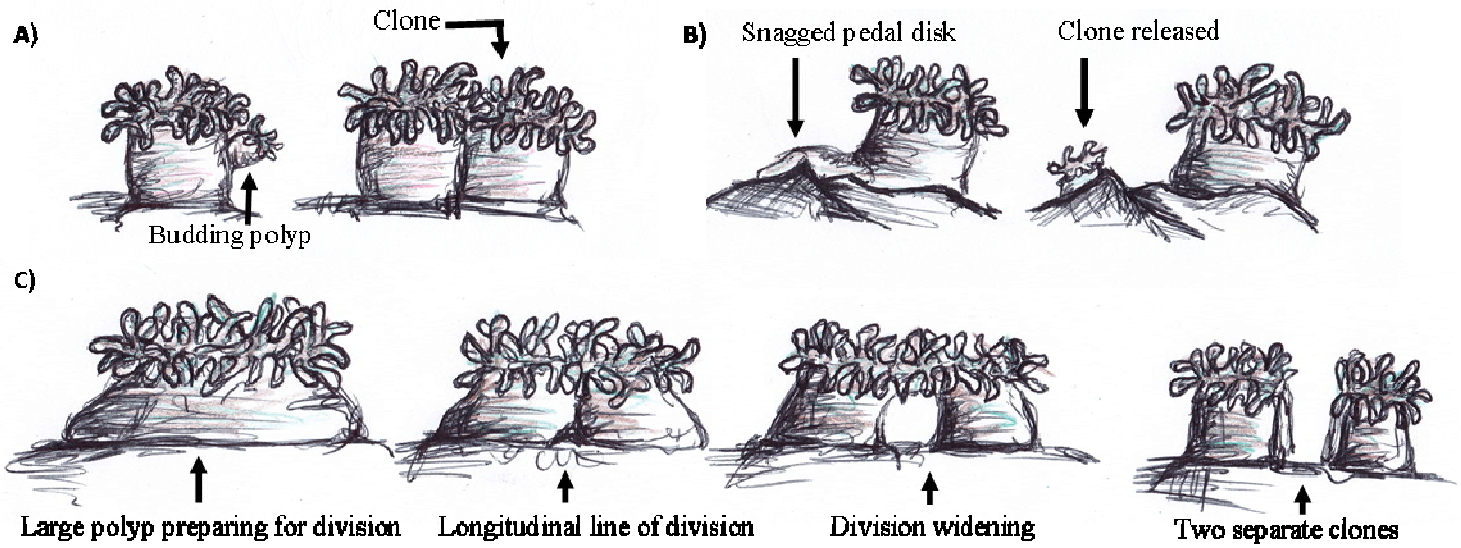
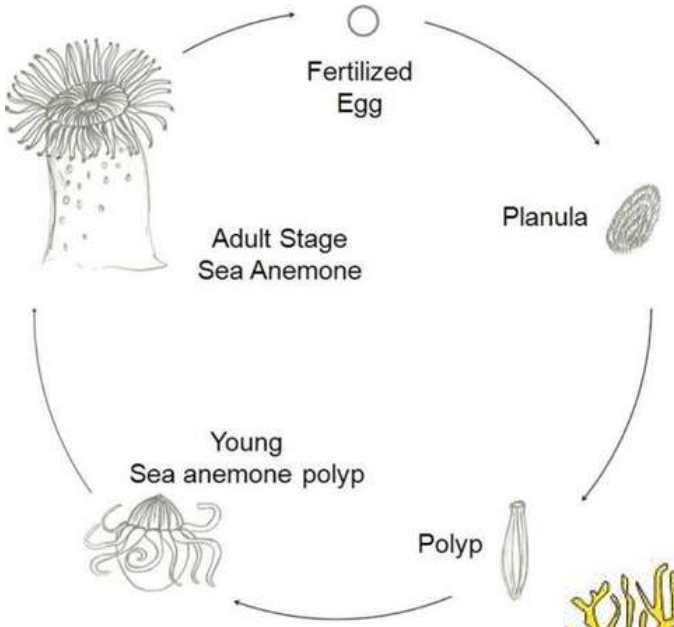
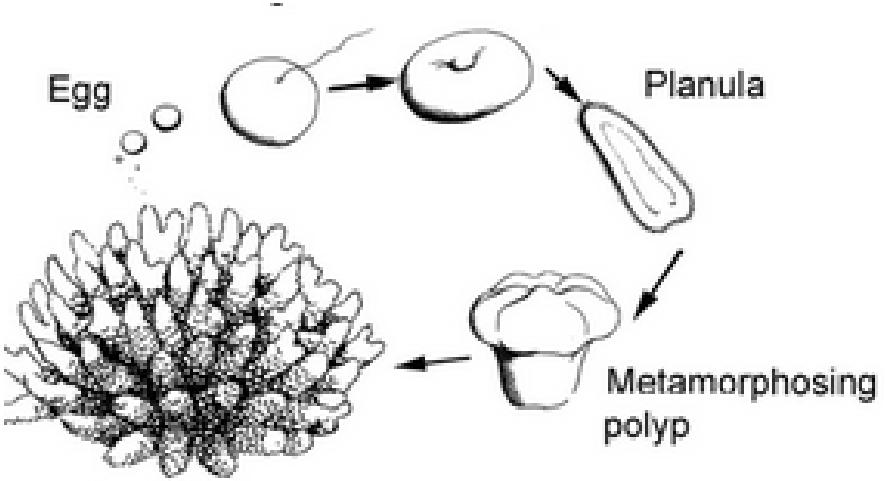
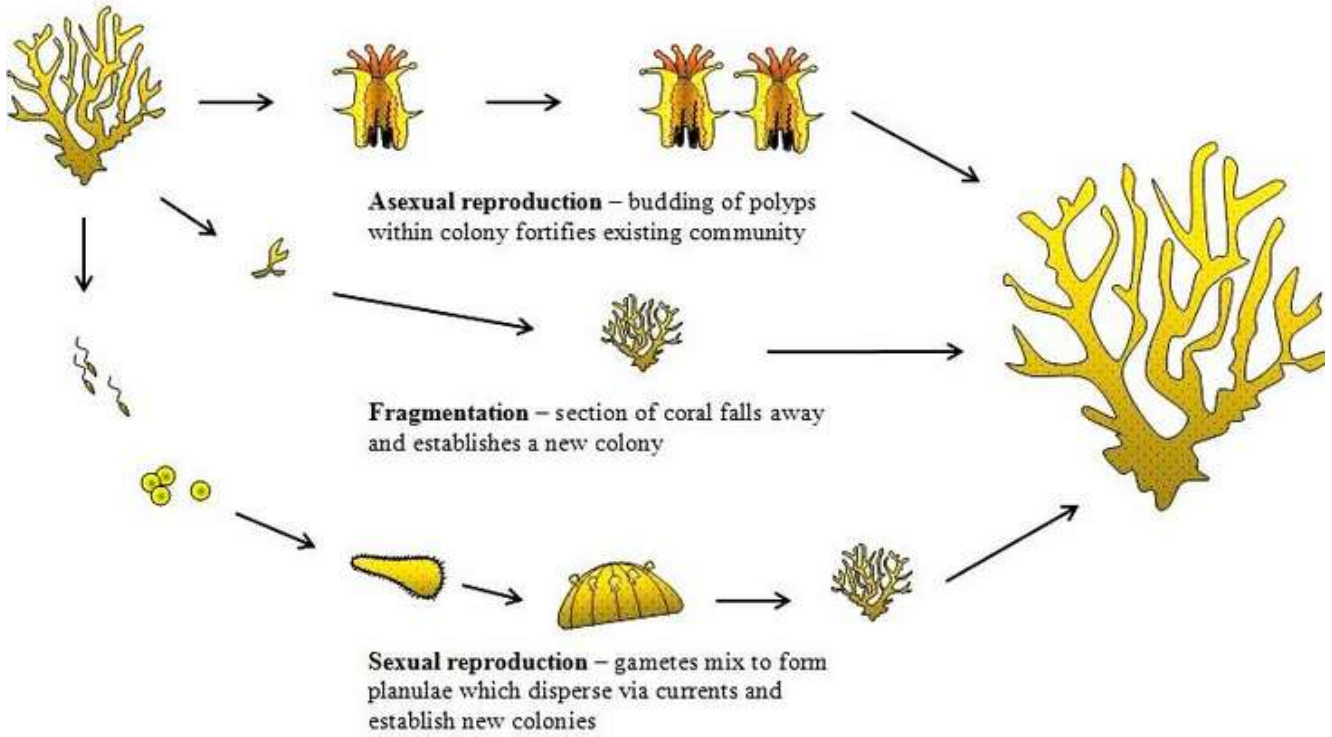


Image: Methods of asexual reproduction utilized by Actiniaria; A) Budding, B) Pedal laceration and C) longitudinal binary fission

CNIDARIA - CLASS ANTHOZOA







CNIDARIA - CLASS ANTHOZOA

Sub Class Hexacorallia

Sea anemones, hard corals, and others

- **6-part symmetry**
- Precipitate $Ca_3(CO_3)_2$ from sea water to produce skeletal structures that become **coral reefs**
- Contain Zooxanthella

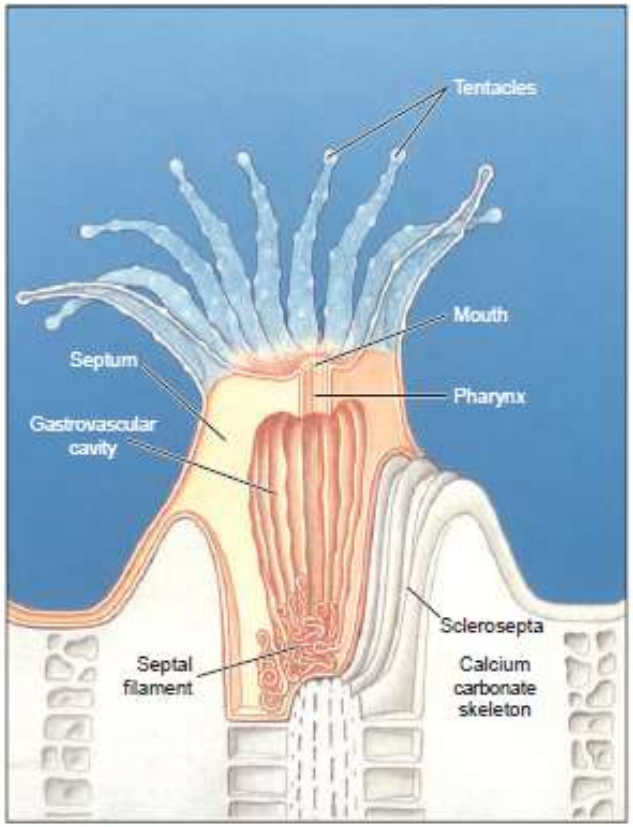


Figure 13.28
Polyp of a hexacorallian coral (order Scleractinia) showing calcareous cup (exoskeleton), gastrovascular cavity, sclerosepta, septa, and septal filaments.

Order Scleractinia

"True" Stony Corals

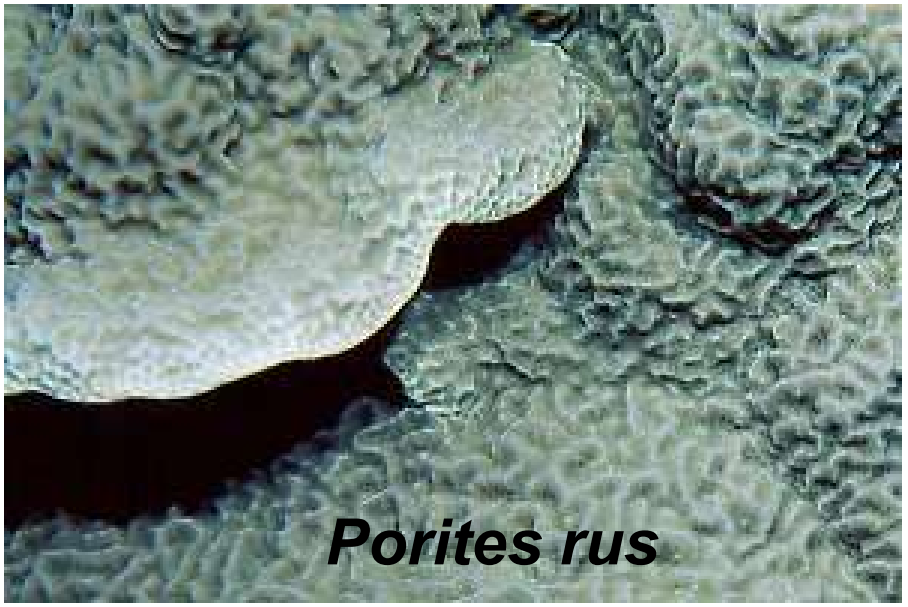
- Common species:
- Acroporidae- table
- Acroporidea- rice
- Agariciidae- flat lobe, corrugated
- Faviidae- crust, ocellated
- Fungiidae- humpback, mushroom
- Pocilloporidae- lace, antler, cauliflower
- Poritidae- finger, lobe, plate

Figure 13.29
Boulder star coral, *Montastrea annularis*, (subclass Hexacorallia, class Anthozoa). Colonies can grow up to 10 feet (3 m) high.

Gambar 1. Perbedaan Skeleton Karang Acropora dengan Karang Non Acropora

Order Scleractinia

"True" Stony Corals



Order Actinaria

Sea Anemones

A B

Figure 13.25

A. A sea anemone that swims. **B.** When attacked by a predatory sea star *Dermasterias*, the anemone *Stomphia didemon* (subclass Hexacorallia, class Anthozoa) detaches from the bottom and rolls or swims spasmodically to a safer location.

Order Zoantharia (Zoanthidae)

- No hard skeleton
- May be tough and leathery
- Shallow water forms
- Encrusting forms
- Some with zooxanthellae
- Polyp stage only

Order Antipatheria

Black Coral & Wire Coral

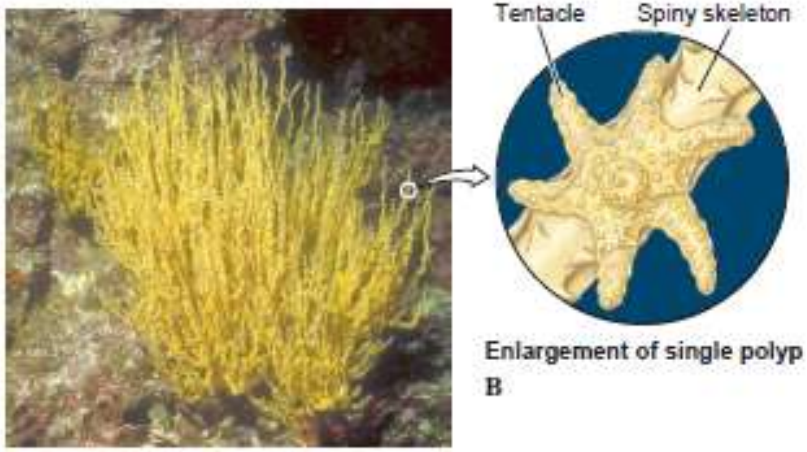


Figure 13.31

A, Colony of *Antipathes*, a black or thorny coral (order Antipatharia, subclass Ceriantipatharia, class Anthozoa). Most abundant in deep waters in the tropics, black corals secrete a tough, proteinaceous skeleton that can be worked into jewelry. **B**, The polyps of Antipatharia have six simple, nonretractile tentacles. The spiny processes in the skeleton are the origin of the common name thorny corals.

Coral-Zooxanthellae Symbiosis

- Symbiosis is a relationship that benefits both the coral and the Zooxanthellae
- Inside the sac of each coral polyp the zooxanthella
- The algae gives off oxygen and other nutrients that the coral polyp needs to live and the polyp gives the algae CO2 and a home
- This partly the reason that Coral live in shallow waters- to have proper access to sunlight

Bleaching and Death

- Recent increases in ocean temperatures have caused much stress on coral reefs
- Coral bleaching occurs when the Zooxanthellae leave due to the stress on the ecosystem
- The algae gives the coral their color and without them, the white limestone shells show through.
- Other plants will come to replace the algae which usually leads to the Coral dying.

This coral reef is undergoing massive coral bleaching

1 HEALTHY CORAL

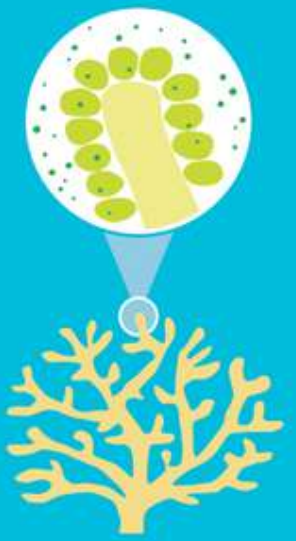
Coral and algae depend on each other to survive.

Corals have a symbiotic relationship with microscopic algae called zooxanthellae that live in their tissues. These algae provide their host coral with food and give them their colour.

2 STRESSED CORAL

If stressed, algae leave the coral.

When the symbiotic relationship becomes stressed due to increased ocean temperature or pollution, the algae leave the coral's tissue.



3 BLEACHED CORAL

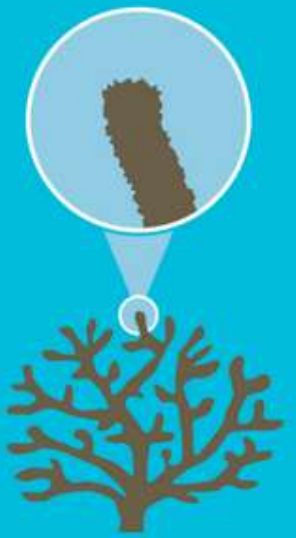
Coral is left bleached and vulnerable.

Without the algae, the coral loses its major source of food, turns white or very pale, and is more susceptible to disease.

4 DEAD CORAL

Coral is left bleached and vulnerable.

Without enough plant cells to provide the coral with the food it needs, the coral soon starves or becomes diseased. Soon afterwards, the tissues of the coral disappear and the exposed skeleton gets covered with algae.



Types of Coral Reefs

- Coral Reefs form in tropical waters as these waters satisfy their specific conditions:
  - Salinity between 34-37 ppt
  - Temperature between 25 to 37 °C
  - Lots of Sunlight that limits them to a depth of 40m

- **Fringing Reefs** – close to a landmass with either no lagoon or a narrow lagoon between reef and shore

- **Barrier Reef** – runs parallel to shore and has a wider and deeper lagoon

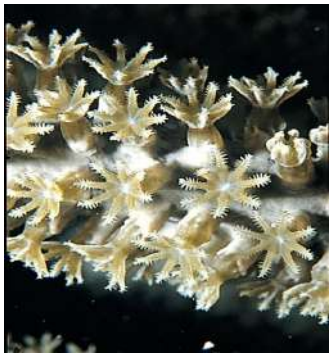
- **Atolls** – reefs that encircle a lagoon but not an island

CNIDARIA - CLASS ANTHOZOA

Sub Class Octocorallia

Sea anemones, hard corals, and others

- **8-fold symmetry**
- Complete septa
- All colonial
- Gastrovascular cavities of the polyps communicate through a system of gastrodermal tubes called **solenia**
- The solenia run through an extensive mesoglea (coenenchyme)
- The skeleton is secreted in the coenenchyme and contains limy spicules, fused spicules, or a horny protein (endoskeleton)



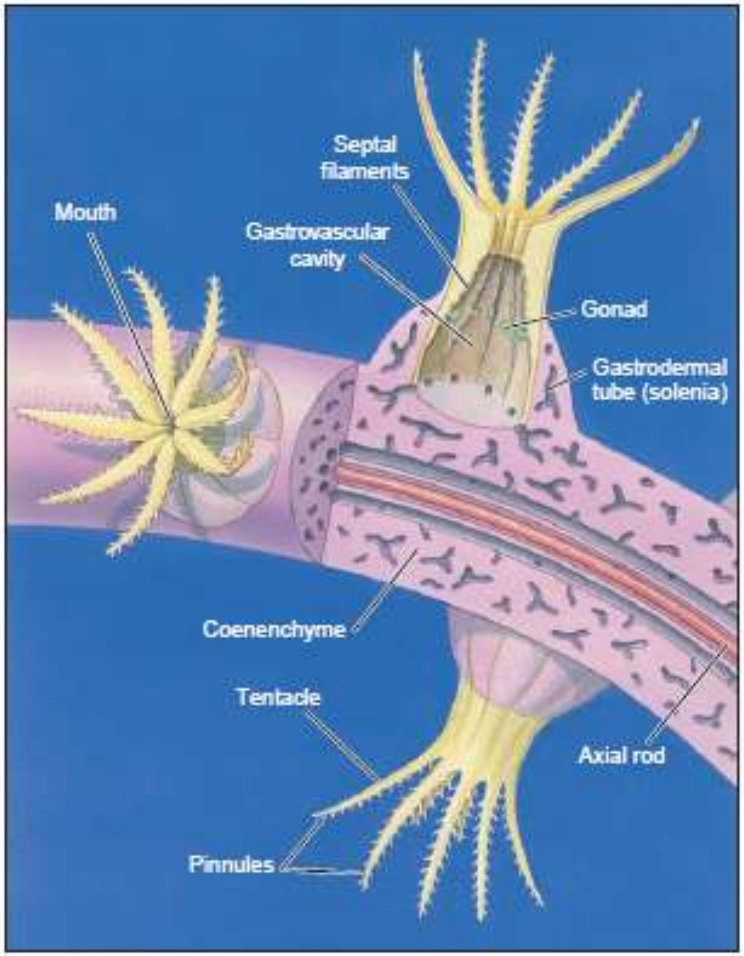
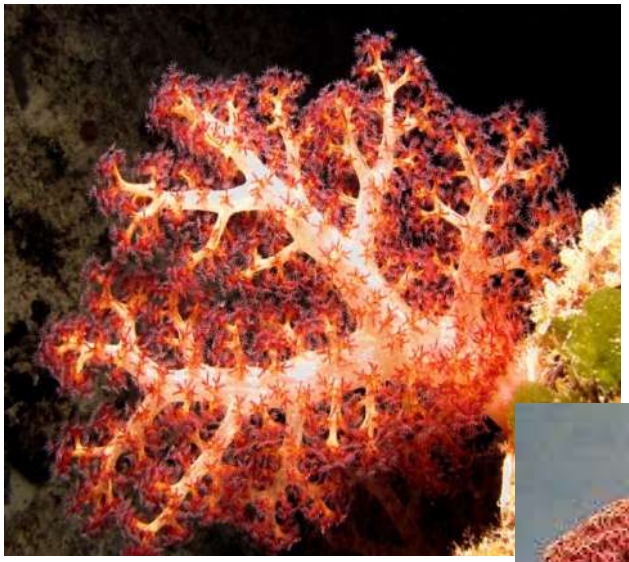
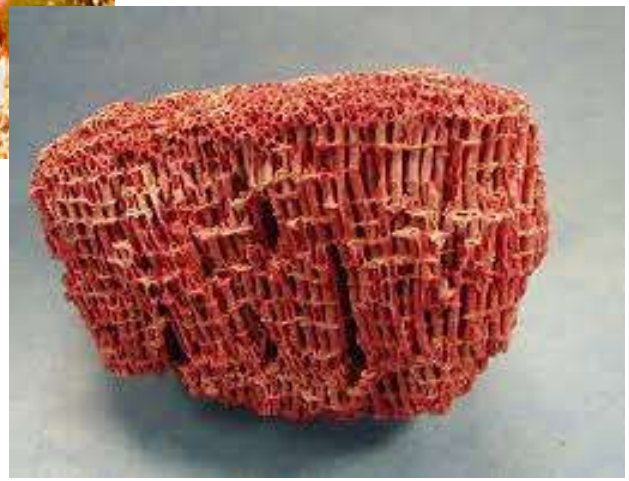


Figure 13.32

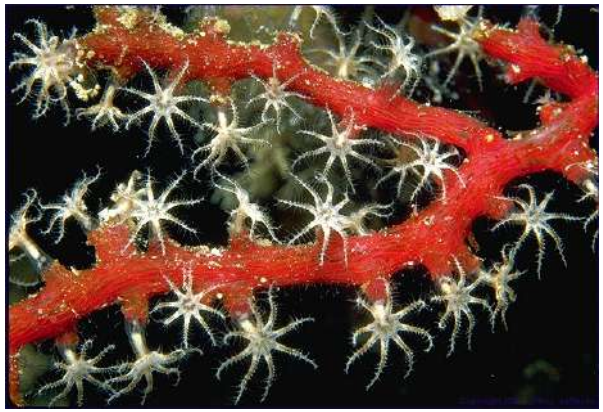
Polyps of an octocorallian coral. Note the eight pinnate tentacles, coenenchyme, and solenia. They have an endoskeleton of limy spicules often with a horny protein, which may be in the form of an axial rod.

Dendronephthya sp.

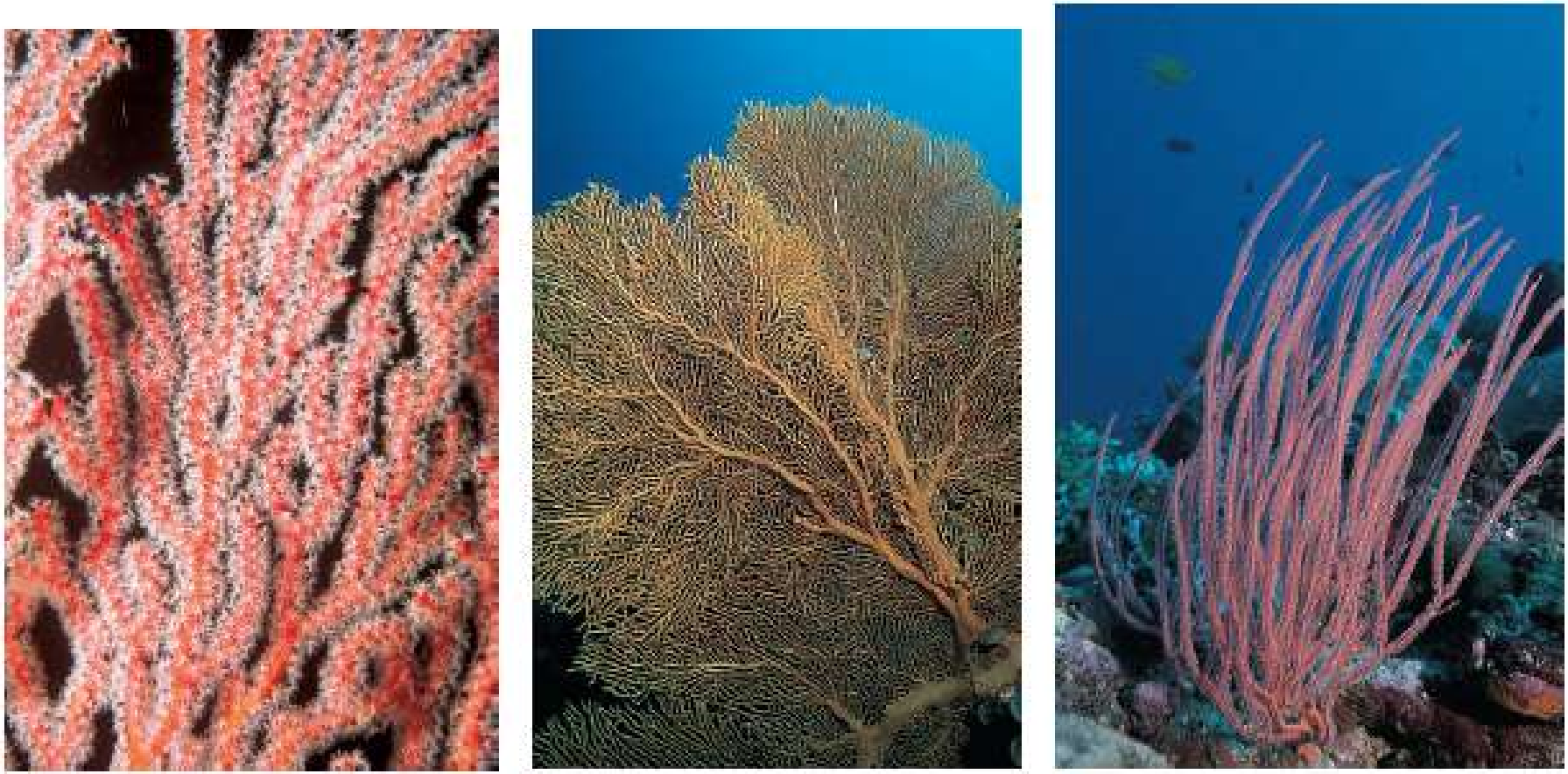




Colonial Gorgonian Coral



Tubipora musica



A B C

Figure 13.34

Colonial gorgonian, or horny, corals (order Gorgonacea, subclass Octocorallia, class Anthozoa) are conspicuous components of reef faunas. These examples are from the western Pacific. **A,** Red gorgonian *Melithaea* sp. **B,** A sea fan, *Subergorgia mollis*. **C,** Red whip coral, *Ellisella* sp.

CNIDARIA - CLASS HYDROZOA

- Includes the solitary freshwater hydra; most are colonial and marine
- Typical life cycle includes **both asexual polyps and sexual medusa stages**; however, freshwater hydras and some marine hydroids do not have a medusa stage

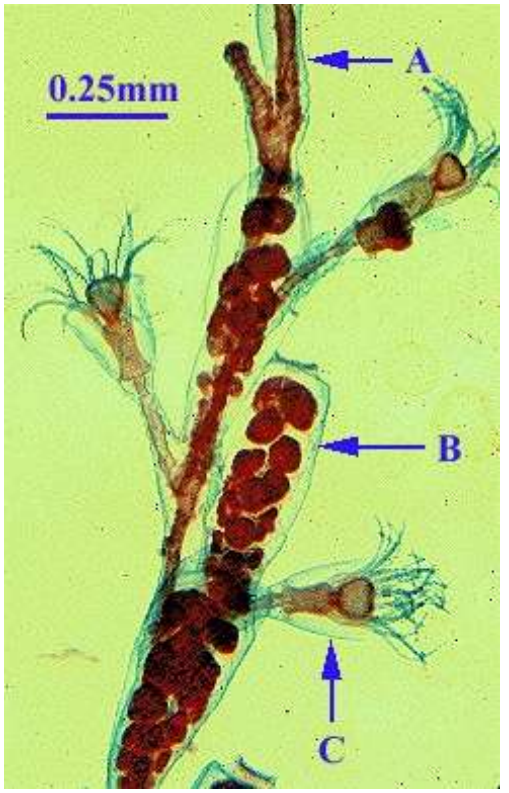
SOLITARY HYDRAS

- Freshwater hydras are found in ponds and streams occurring on the underside of vegetation
- Most possess a pedal disc, mouth, hypostome surrounded by 6-10 tenetacles
- Mouth opens to the gastrovascular cavity
- The life cycle is simple: eggs and sperm are shed into the water and form fertilized eggs; planula is by passed with eggs hatching into young hydras
- Asexual reproduction via budding

CNIDARIA - CLASS HYDROZOA

COLONIAL HYDROZOANS - *e.g., Obelia*

- Possess a skeleton of chiton that is secreted by the epidermis
- All polyps in the colony are usually interconnected
- Two different kinds of individuals that comprise the colony: feeding polyps or **gastrozooids (C)** and reproductive polyps or **gonozooids (B)**



Life Cycle of *Obelia*

- Gonozooids release free swimming medusae
- Zygotes become planula larvae, which eventually settle to become polyp colonies

- The medusae of hydroids are smaller than those of jellyfishes (C. Scyphozoa)
- Also, the margin of the bell projects inward forming a shelf-like (seperti rak) **velum**

Order : *Leptothecata*
Family: Campanulariidae
Genus: *Obelia*

CNIDARIA - CLASS HYDROZOA

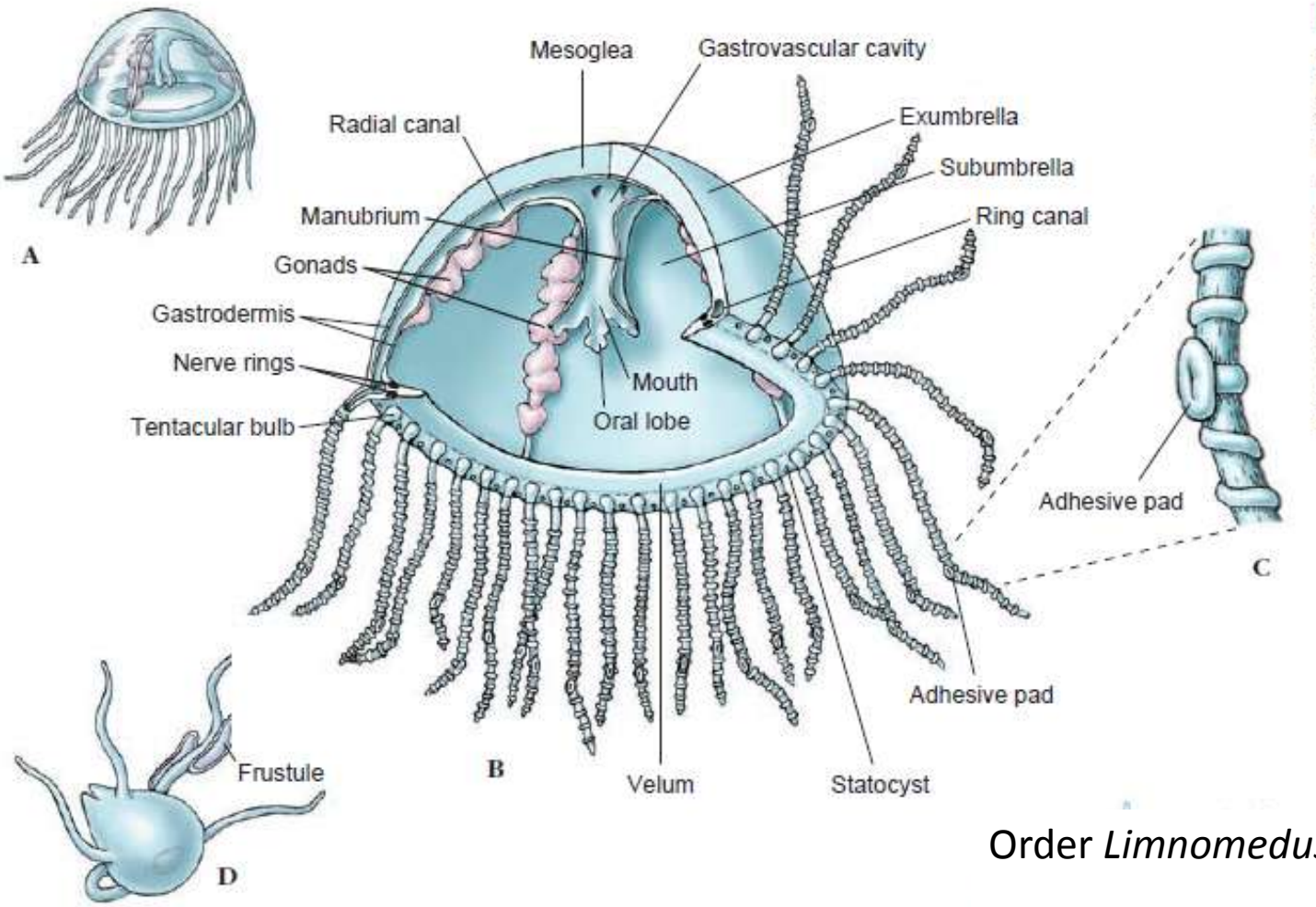
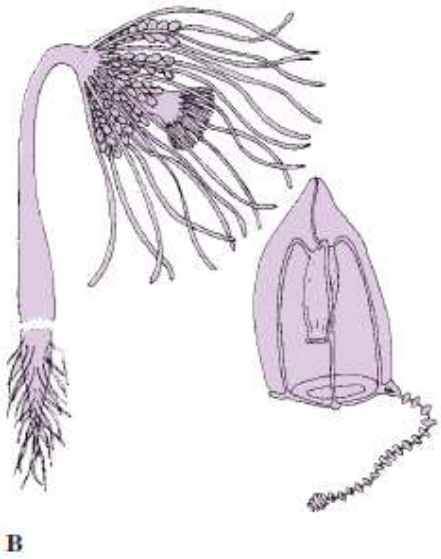


Figure 13.11
Structure of *Gonionemus*. **A,** Medusa with typical tetramerous arrangement. **B,** Cutaway view showing morphology. **C,** Portion of a tentacle with its adhesive pad and ridges of nematocysts. **D,** Tiny polyp, or hydroid stage, that develops from the planula larva. It can produce more polyps by budding (frustules) or produce medusa buds.

Order *Limnomedusae*

CNIDARIA - CLASS HYDROZOA

A



B

Figure 13.8
Athecate hydroids. **A,** *Ectopleura integra,* a solitary polyp with naked hydranths and gonophores. **B,** *Corymorpha* is a solitary hydroid that produces free-swimming medusae, each with a single trailing tentacle.

Anthoathecata (Order); Aplanulata (Suborder); Tubulariidae (Family); *Ectopleura* (Genus)

Order *Limnomedusae*

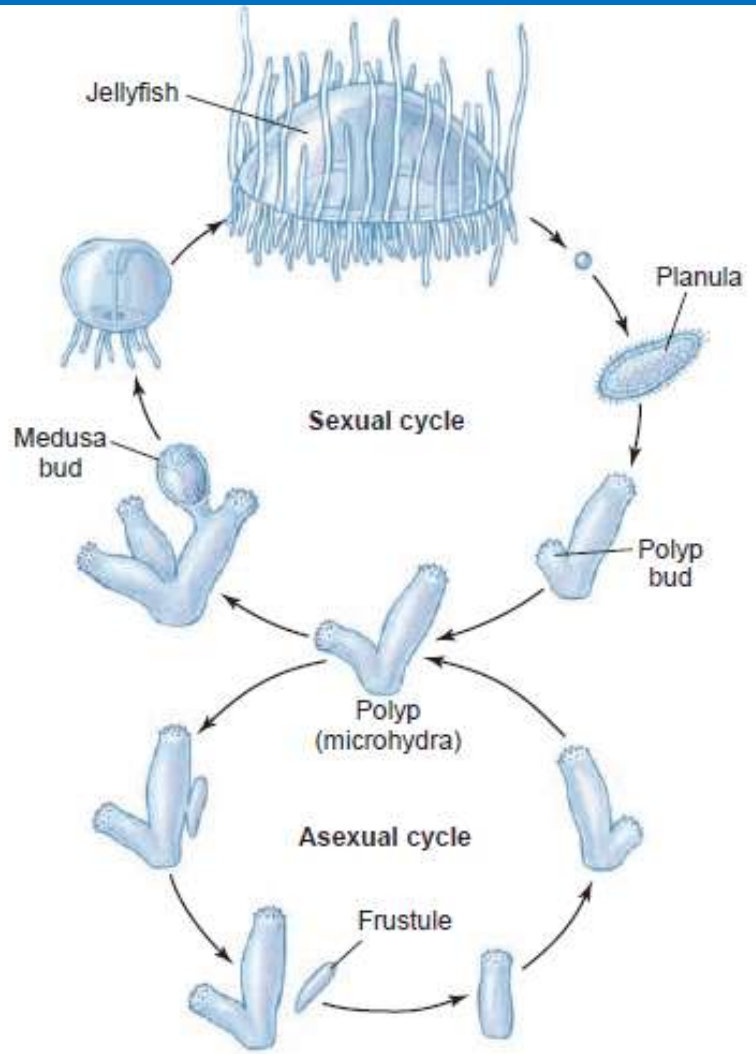


Figure 13.12
Life cycle of *Craspedacusta,* a freshwater hydrozoan. The polyp has three methods of asexual reproduction: by budding off new individuals, which may remain attached to the parent (colony formation); by constricting off nonciliated planula-like larvae (frustules), which can move around and give rise to new polyps; and by producing medusa buds, which develop into sexual jellyfish.

CNIDARIA - CLASS HYDROZOA

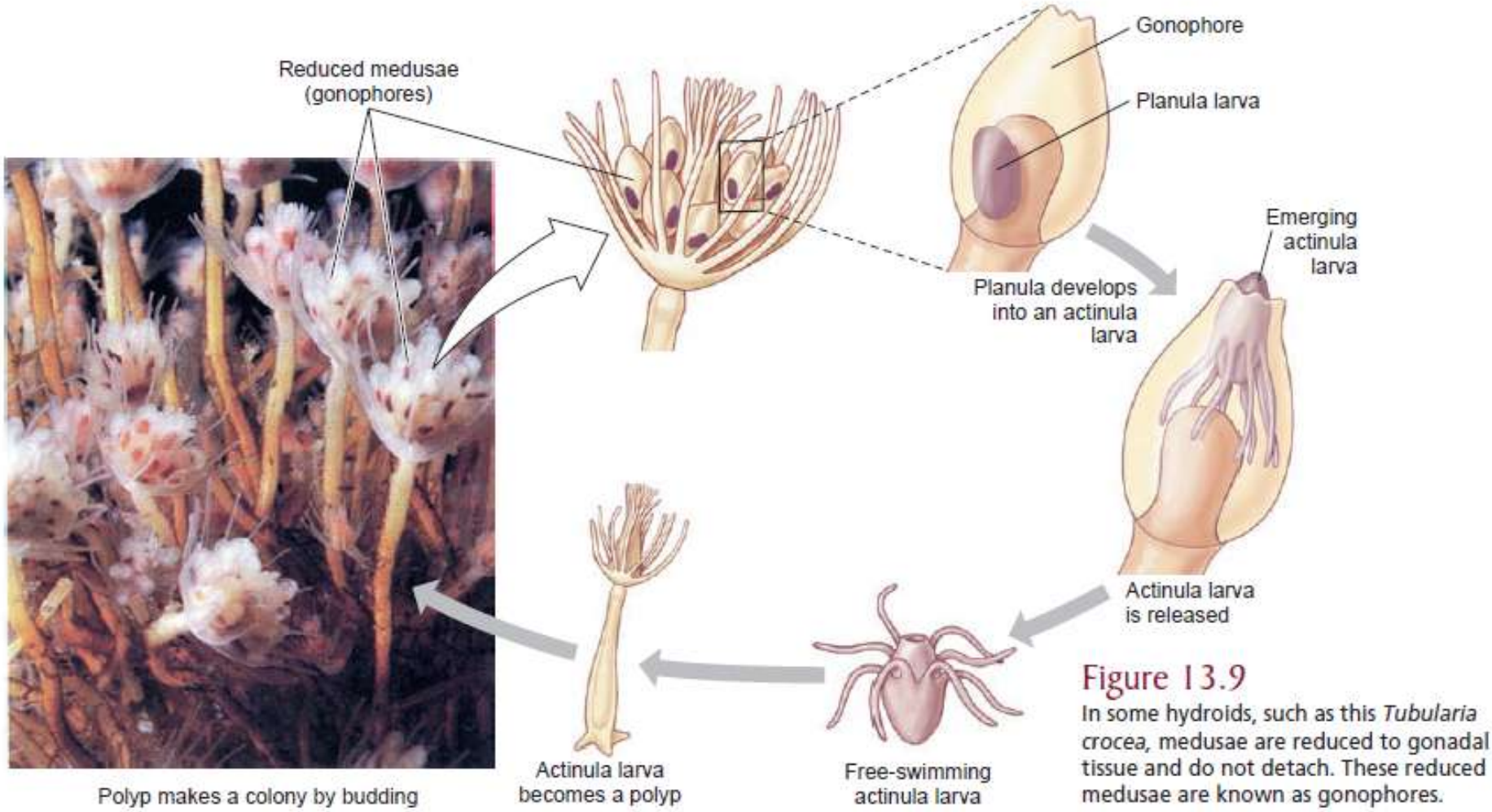


Figure 13.9
In some hydroids, such as this *Tubularia crocea*, medusae are reduced to gonadal tissue and do not detach. These reduced medusae are known as gonophores.

Anthoathecata (Order); Aplanulata (Suborder); Tubulariidae (Family)

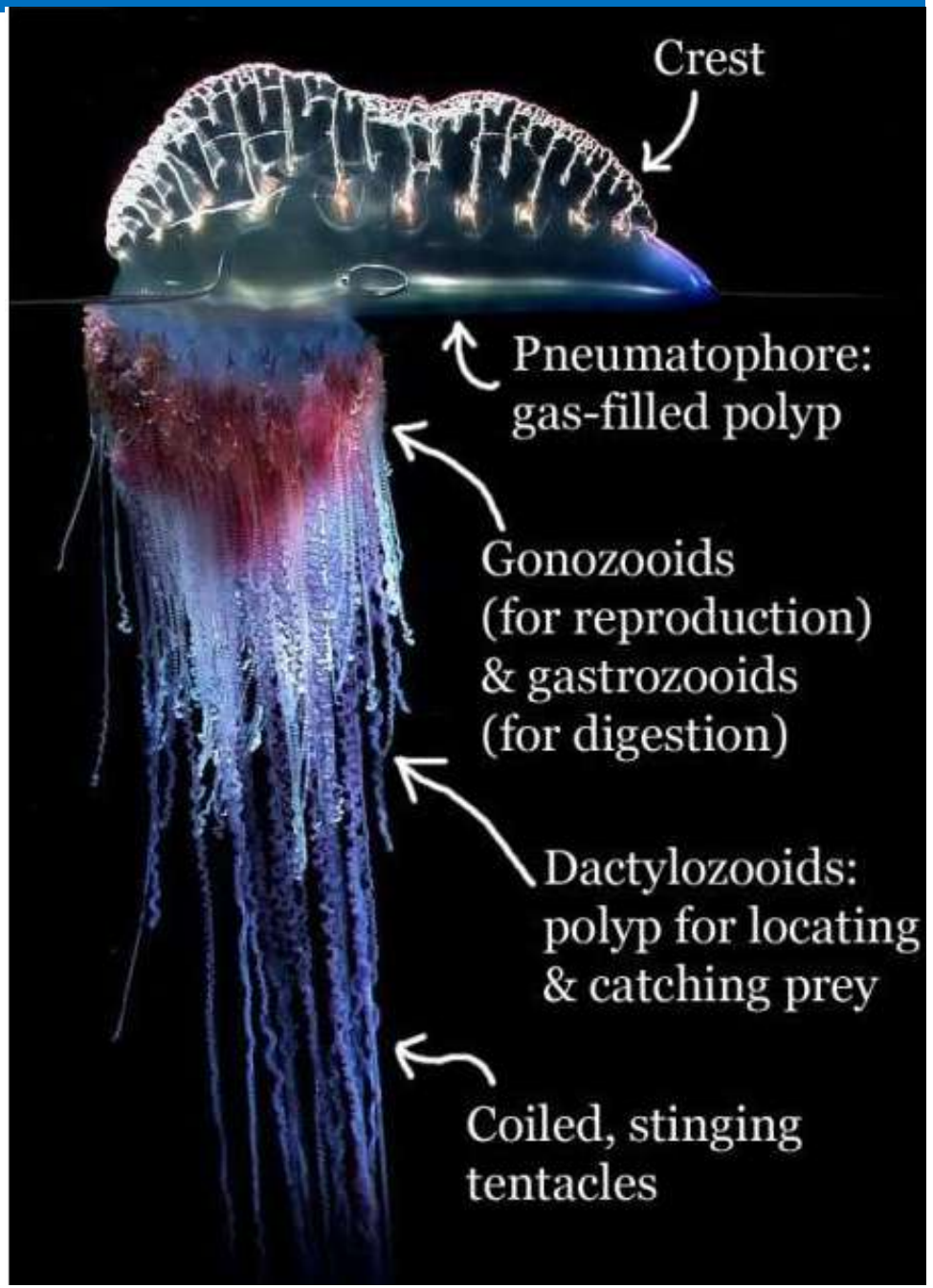
CNIDARIA - CLASS HYDROZOA

Portuguese Man-O'-War
(*Physalia physalis)*

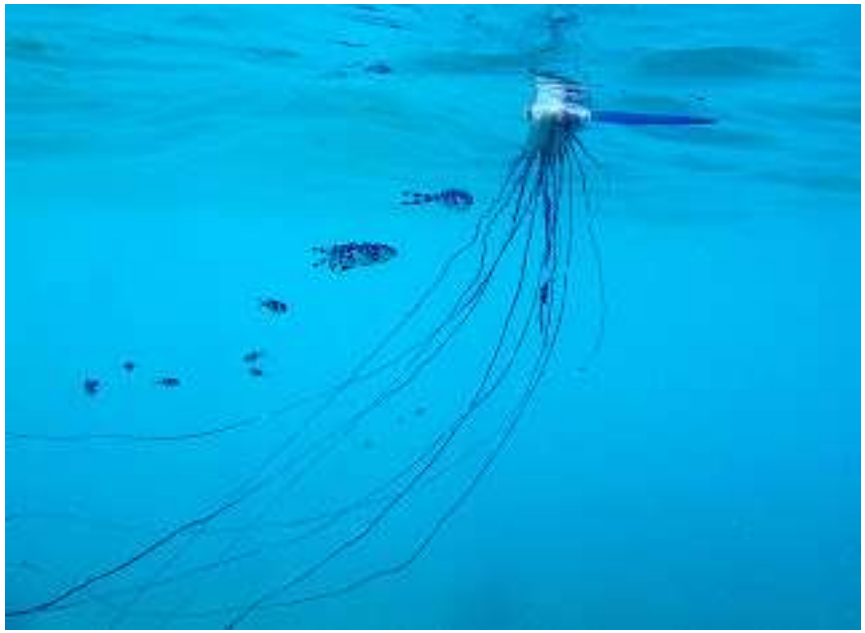
Order: Siphonophora
Family: Physaliidae

Looks like a jellyfish but is actually a colony of specialized polyps and medusas

Physalia physalis does not have head, brain, gills or skeleton. It consists of 4 zooids: **pneumatophore** (float) filled with gas (carbon monoxide, oxygen and argon, **dactylozooids** (tentacles), **gastrozooids** (stomach) and **gonozooids** (sex organs) The sperm of a colony will join with the egg of another subsequently giving rise to new organisms. It is also able to reproduce via asexual reproduction, budding and mitotic division



CNIDARIA - CLASS HYDROZOA



Portuguese Man-of-War
(*Physalia physalis)*

CNIDARIA - CLASS CUBOZOA

- The medusoid is the predominant form
- the polypoid is inconspicuous and in most cases unknown.
- Some cubozoan medusae may range up to 25 cm tall, most 2 to 3 cm.
- In transverse section the bells are almost square
- A tentacle or group of tentacles is found at each corner of the square at the umbrella margin.
- The base of each tentacle is differentiated
- into a fl attened, tough blade called a **pedalium**
- **Rhopalia** are present, each housing **six eyes** in addition to other sense organs.
- There are two copies of each of three kinds of eyes: two forms of ocelli, and a sophisticated camera-type eye with a cornea and cellular lens.
- Subumbrella edge turns inward to form a **velarium.**
- **Velarium** → increasing swimming effi ciency.
- Strong swimmers and voracious predators, feeding mostly on fi sh in near-shore areas, such as mangrove swamps.
- Stings of some species can be fatal to humans.

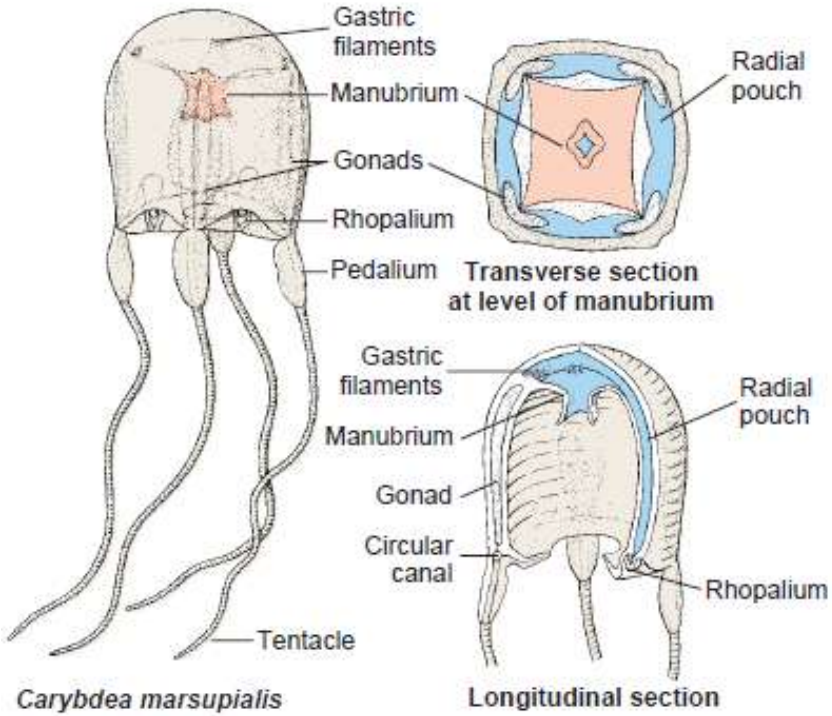


Figure 13.21
Carybdea, a cubozoan medusa.

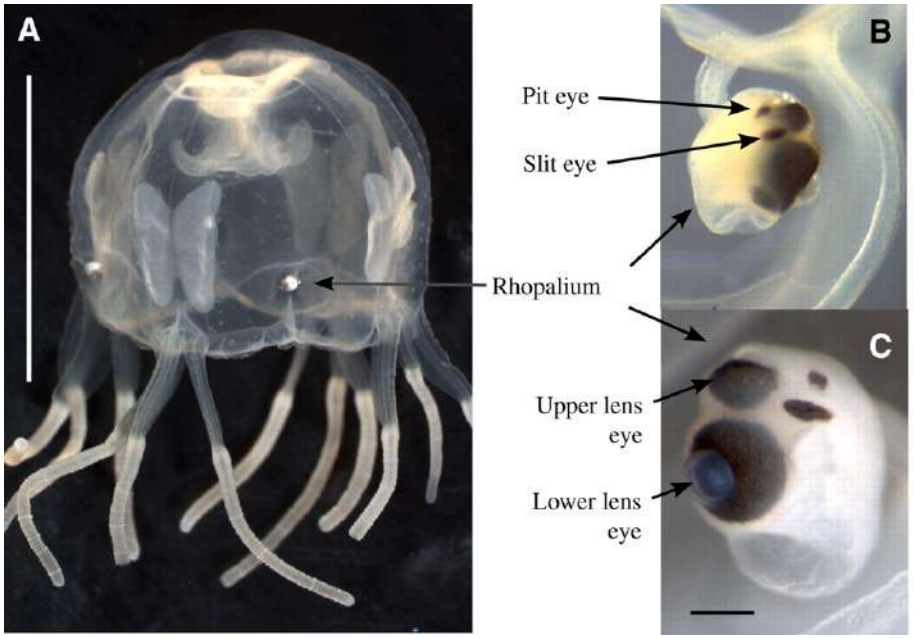
Ordo *Carybdeidae* ***Carybdea sivickisi***

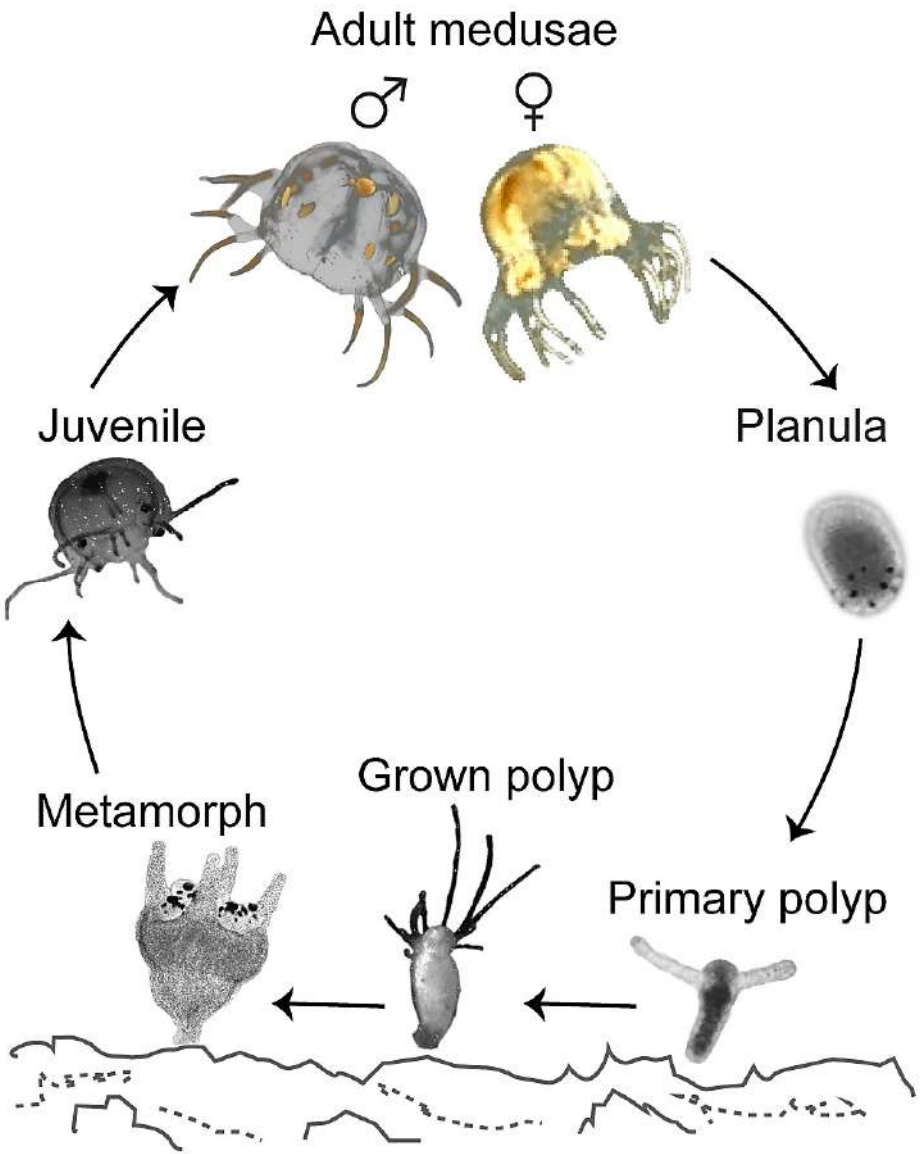
CNIDARIA - CLASS CUBOZOA

The complete life cycle is known for only one species,

Tripedalia cystophora

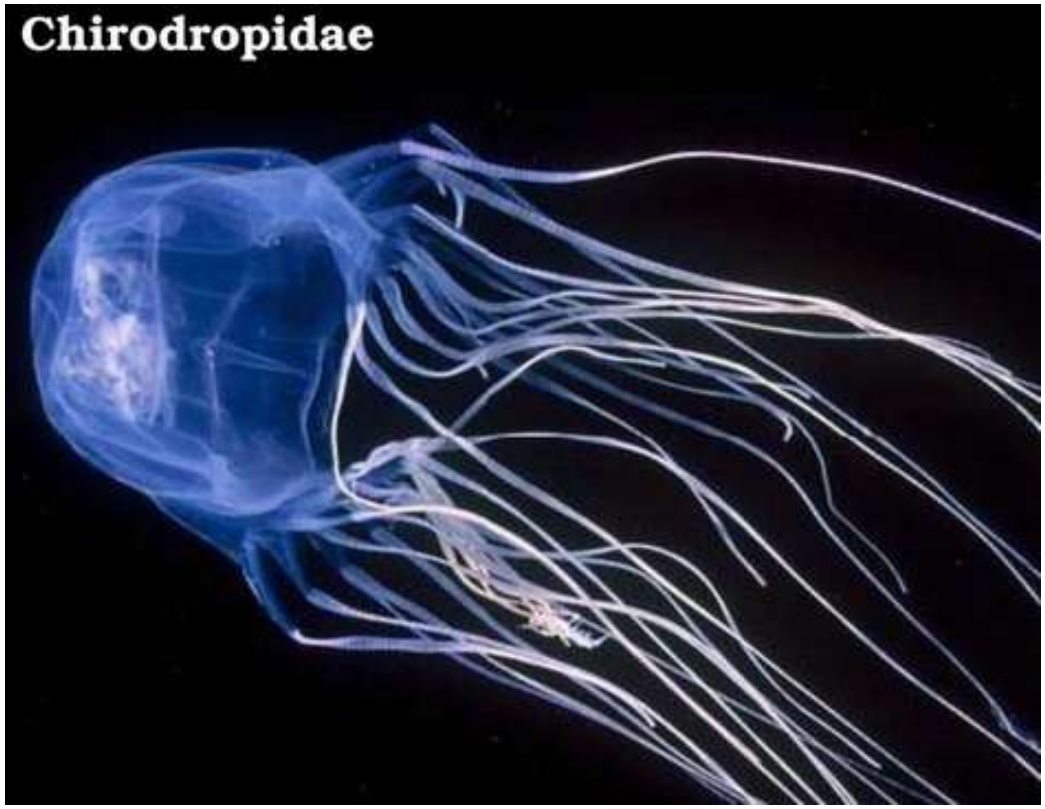
The polyp is tiny (1 mm tall), solitary, and sessile. New polyps bud laterally, detach, and creep away. Polyps do not produce ephyrae but metamorphose directly into medusae.

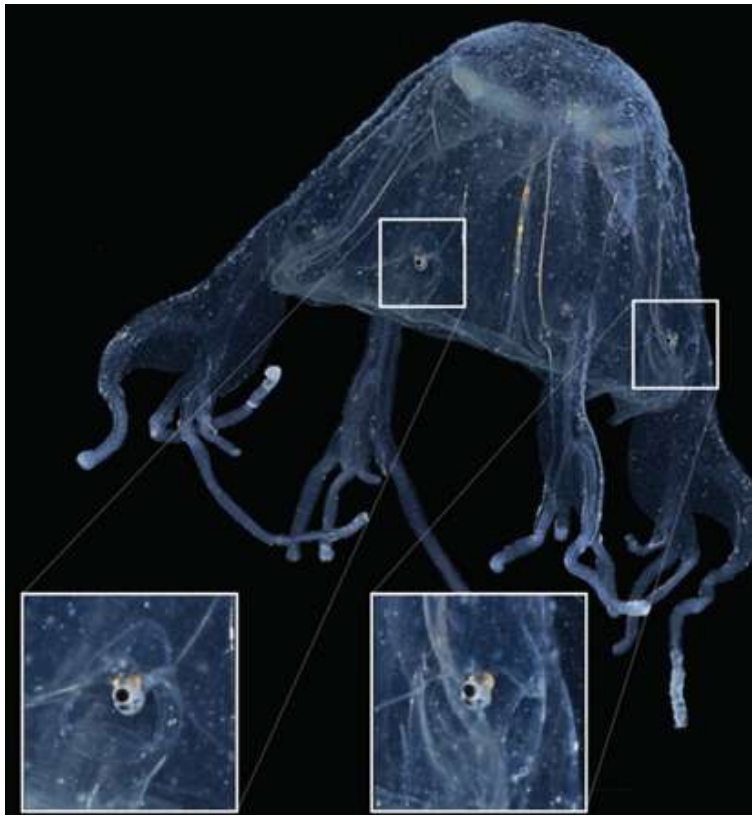




Ordo *Carybdeidae*

CNIDARIA - CLASS CUBOZOA





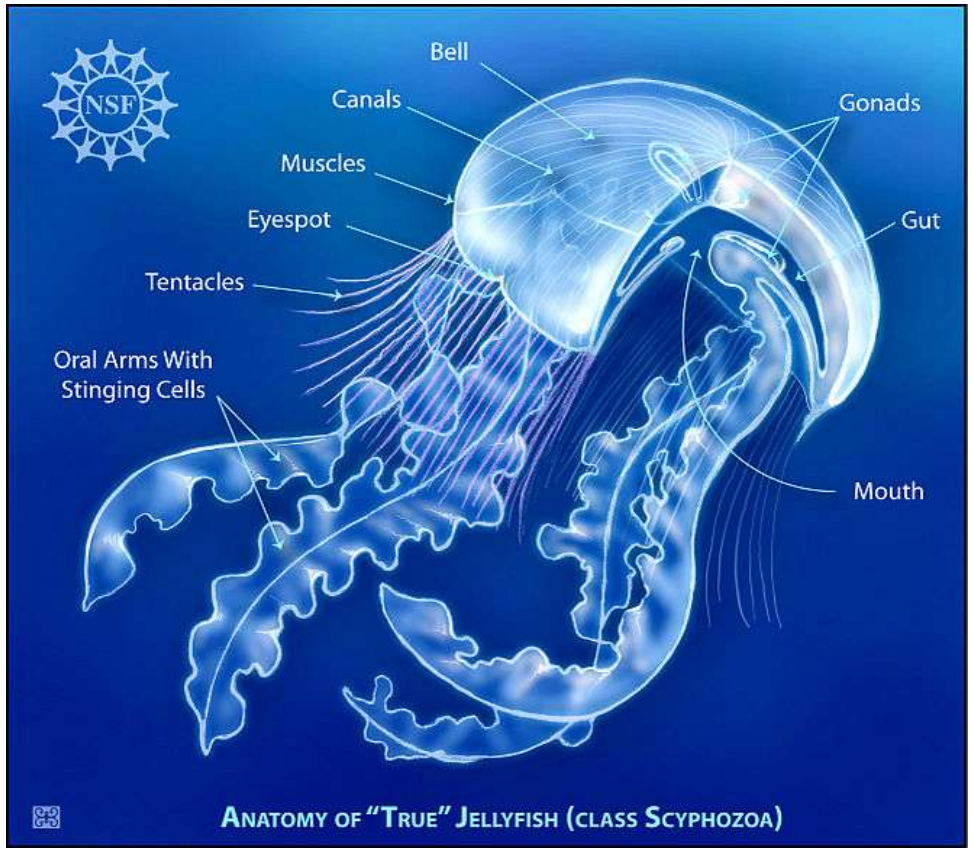
Tentacles in 4 clusters, each cluster on one palmate pedalium, several tentacles in each cluster (except in youngest individuals); stomach pouches 4, each with two diverticula

Chiropsalmus quadrumanus

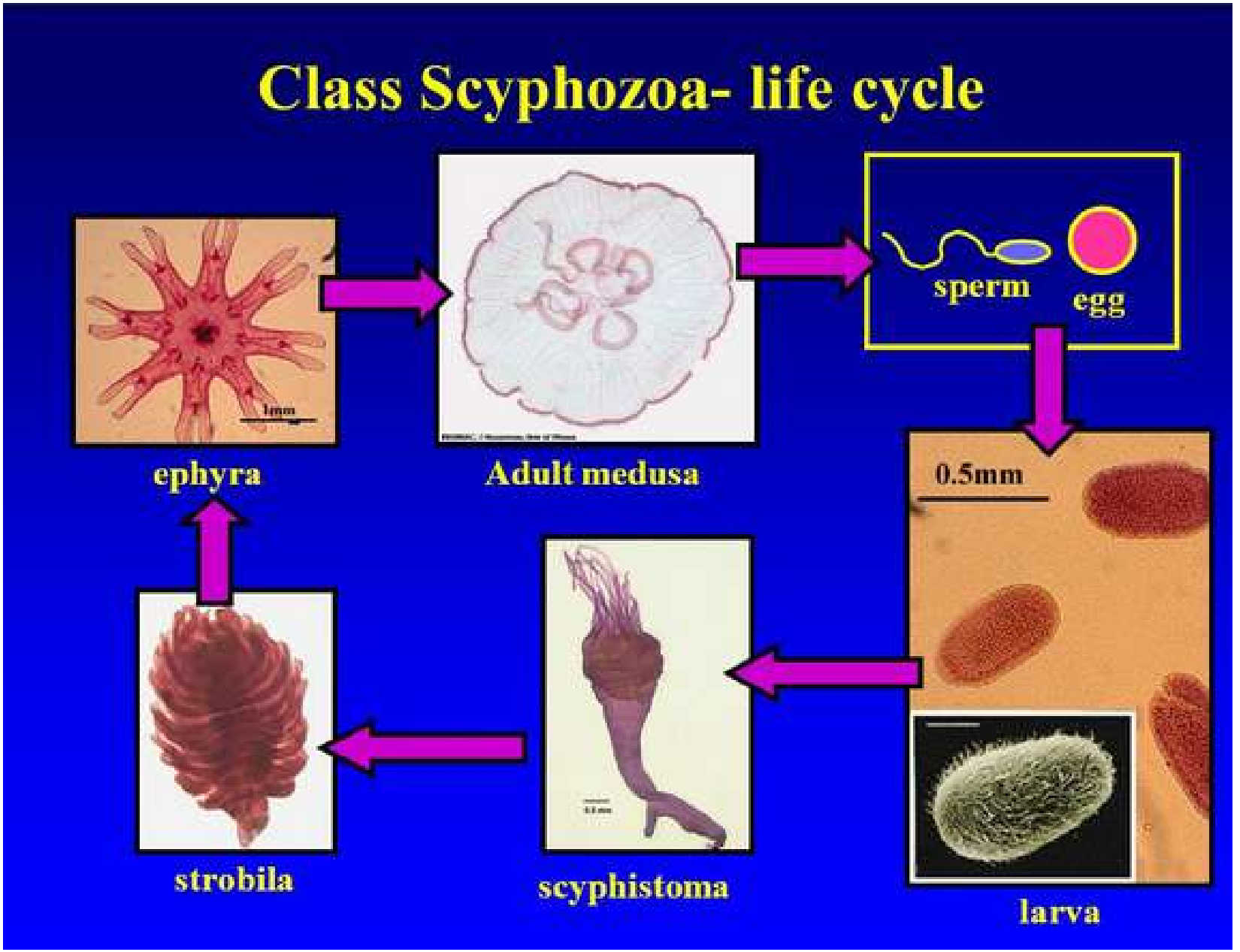
CNIDARIA - CLASS SCYPHOZOA

Jellyfish

- The medusae are large and contain massive amounts of mesoglea
- Majority of life cycle spent in medusa form
- The differ from the hydrozoan medusa in that **the lack a velum**
- Possess four **gastric pouches** lined with nematocysts; these are connected with the mouth an the gastrovascular system
- Most range from 2 to 40 cm in diameter
- Most drift or swim in the open sea, even at depths up to 3000m
- Movement is by rhythmical pulsations of the bell
- Size of the bell and number of tentacles varies by species
- Tentacles, manubrium, and often the entire body surface are well supplied with nematocysts
- The job of the nematocysts is to paralyze prey animals which is then conveyed to the mouth



CNIDARIA - CLASS SCYPHOZOA



CNIDARIA - CLASS SCYPHOZOA

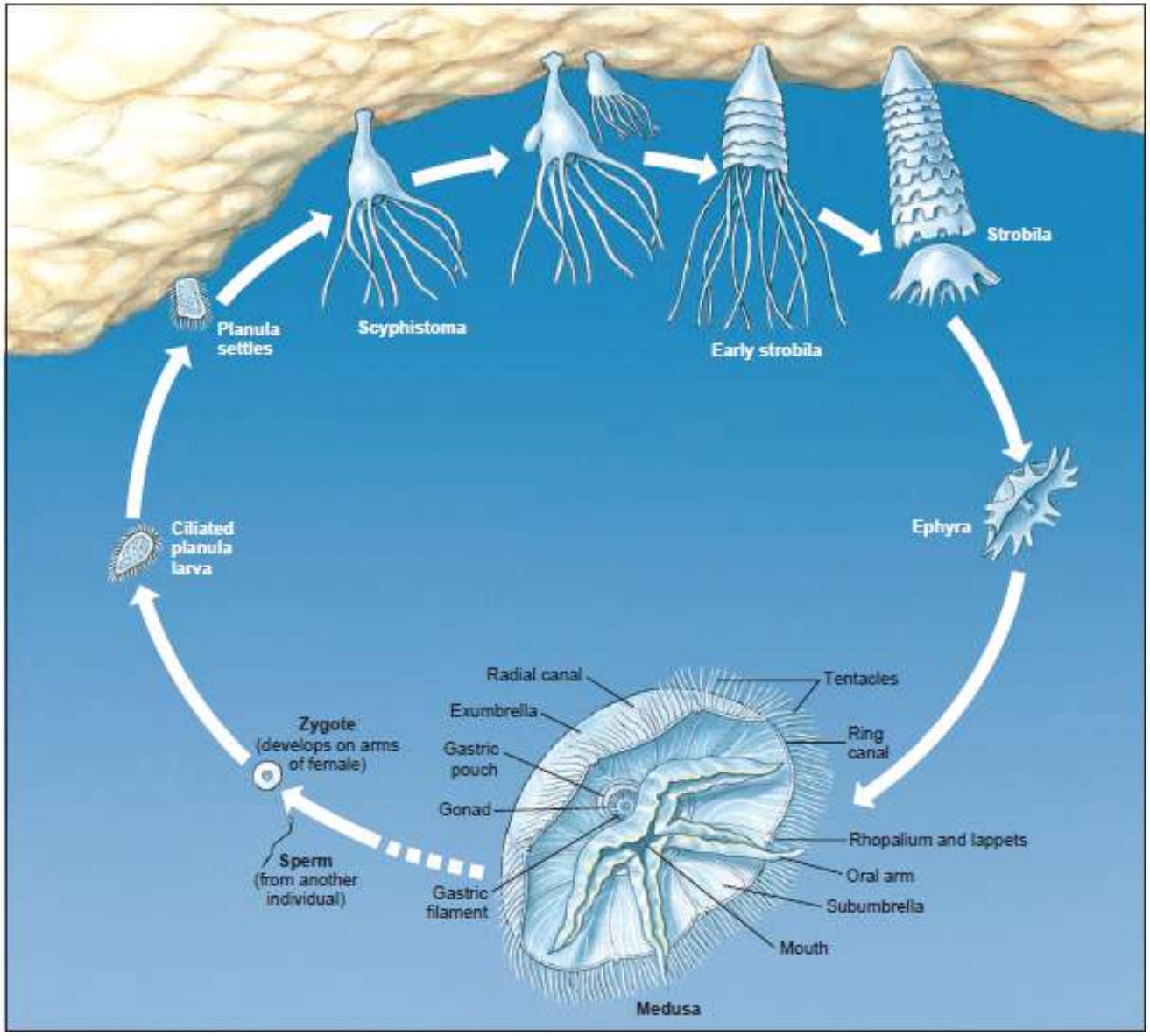


Figure 13.19
Life cycle of *Aurelia*, a marine scyphozoan medusa.

CNIDARIA - CLASS SCYPHOZOA

Aurelia **jellyfish (moon jelly)**

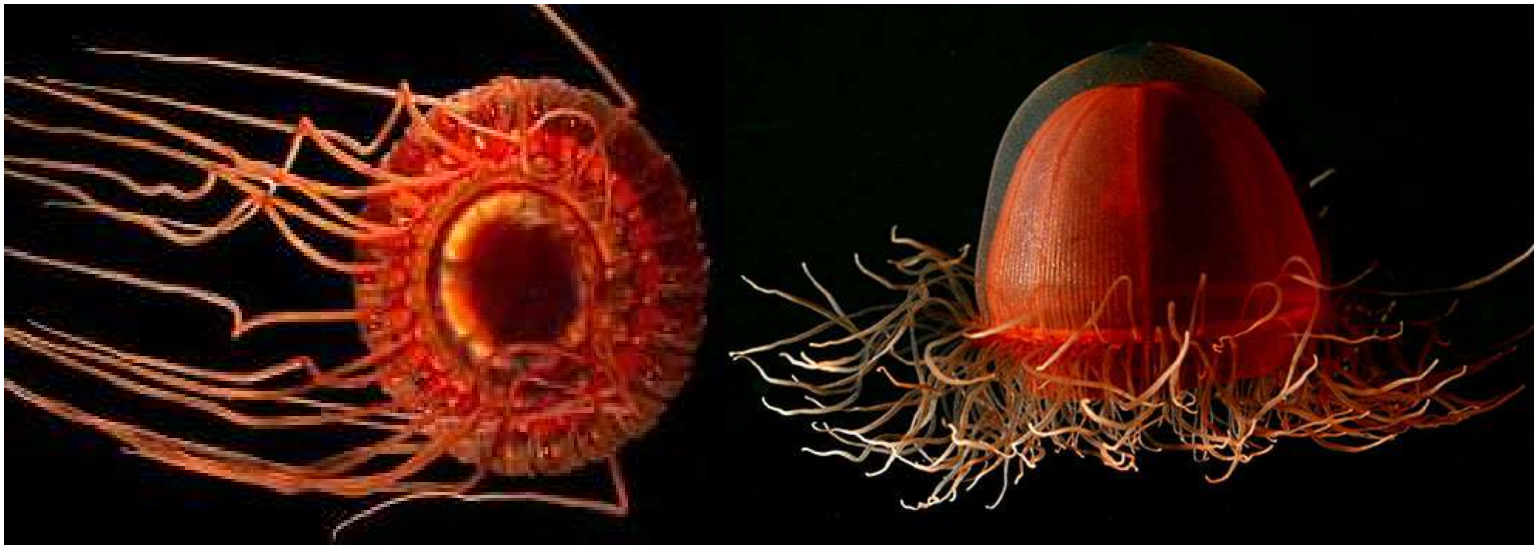
Chrysaora colorata
"Purple-Stripe Jellyfish"

***Chrysaora* sp.**

Order Semaeostomeae

CNIDARIA - CLASS SCYPHOZOA

Order Coronatae
“Crown Jelly”



Atolla wyvillei

CNIDARIA - CLASS SCYPHOZOA

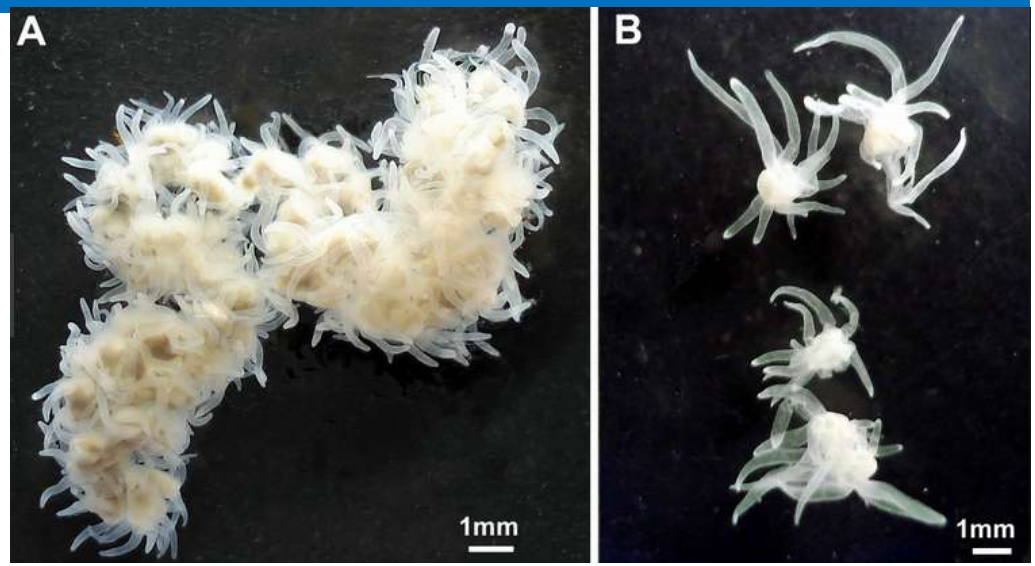
Phyllorhiza punctata

Order Rhizostomeae

CNIDARIA - CLASS POLYPODIOZOA

Polypodium hydriforme is a species of parasite attacking the eggs of sturgeon and similar fishes (Acipenseridae and Polyodontidae). It is one of few metazoans living inside the cells of other animals.

Polypodium hydriforme is the **only species in the monotypic genus Polypodium. It is also the only species and genus within the whole family Polypodiidae.**



Stolon stage

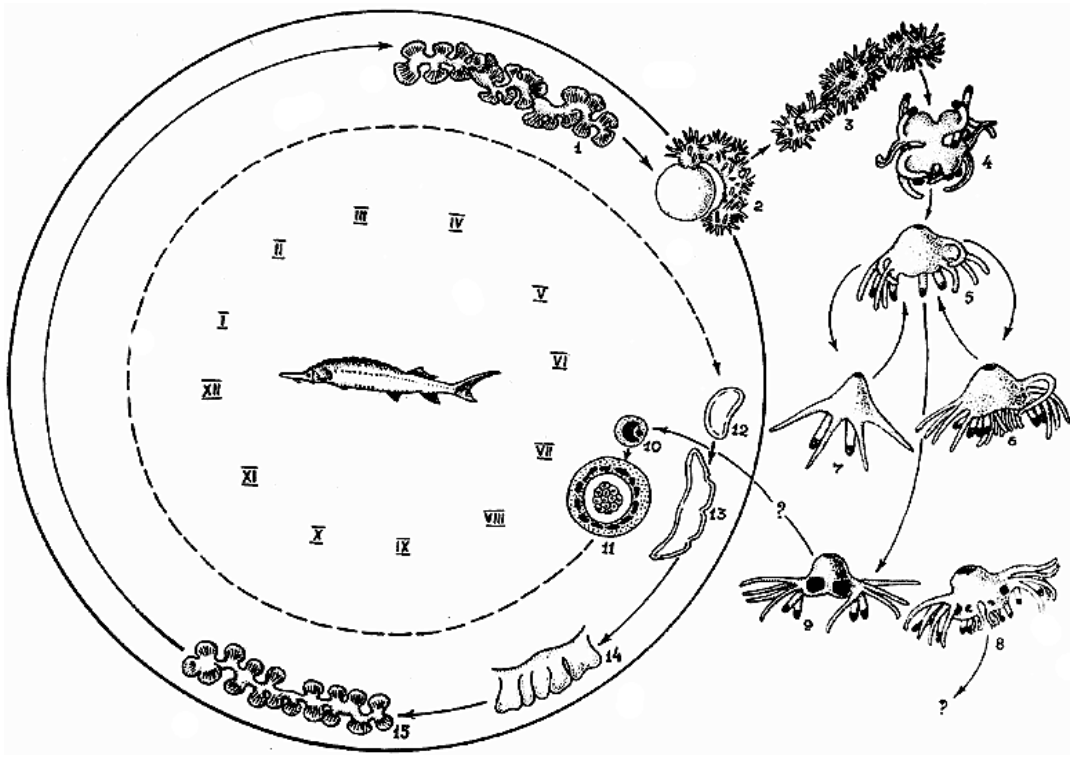
4 individual free living with 12 tentacles

Polypodium hydriforme

- *Polypodium* possesses nematocysts, freshwater living
- *Polypodium hydriforme* is an endocellular parasite with unusual life cycle, peculiar morphology, and high rates of DNA evolution

Single Order Polypodidea

CNIDARIA - CLASS POLYPODIOZOA



***Polypodium hydriforme* Life Cycle**

Polypodium spends most of its life inside the **oocytes of acipenseriform fishes** (sturgeons and paddlefish).

Hosts include *Acipenser ruthenus*, *Polyodon spathula* and *Scaphirhynchus platorynchus*.

During this time, Polypodium develops from a **binucleate cell** into an inside-out **planuliform larva** and then into an **elongate inside-out stolon**; the epidermal cell layer is located internal to the body and the gastrodermis is located externally.
The embryo, larva and stolon are surrounded by a protective polyploid cell, which also functions in digestion

CNIDARIA - CLASS STAUROZOA

- Commonly called stauromedusans and were previously considered unusual scyphozoans
- Life cycle does not include a medusa phase.
- The solitary polyp body is stalked and uses an adhesive disc to attach to seaweeds and other objects on the sea bottom.
- The top of the polyp resembles a medusa, although previous interpretations have noted that the bottom of the “medusa” resembles a polyp.
- The top of the polyp has **eight extensions (“arms”)**, ending in tentacle clusters, surrounding the mouth.
- Polyps reproduce sexually. **The nonswimming planula** develops directly into a new polyp.

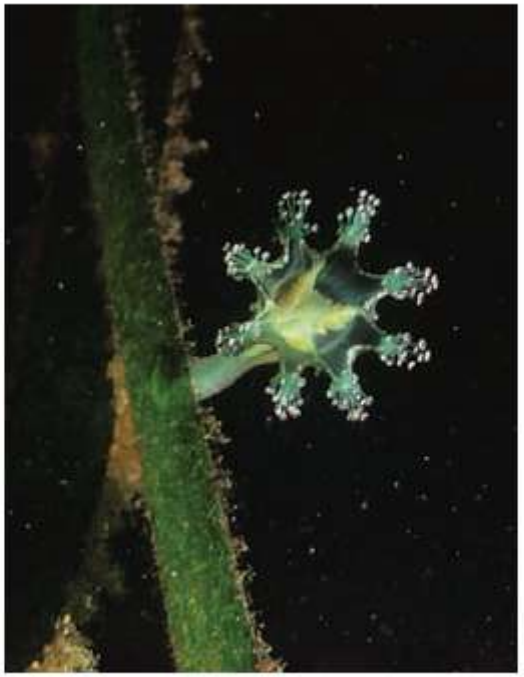
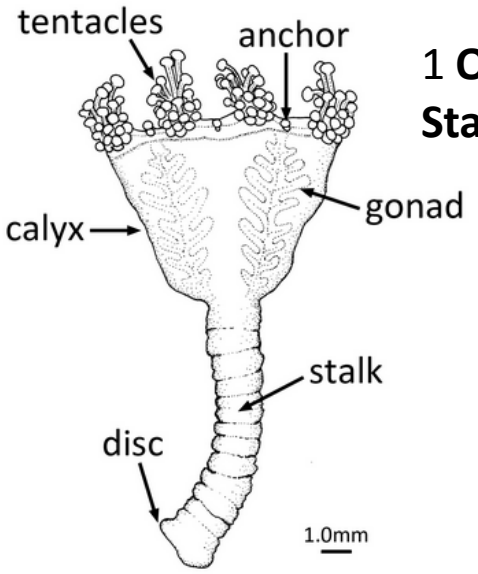
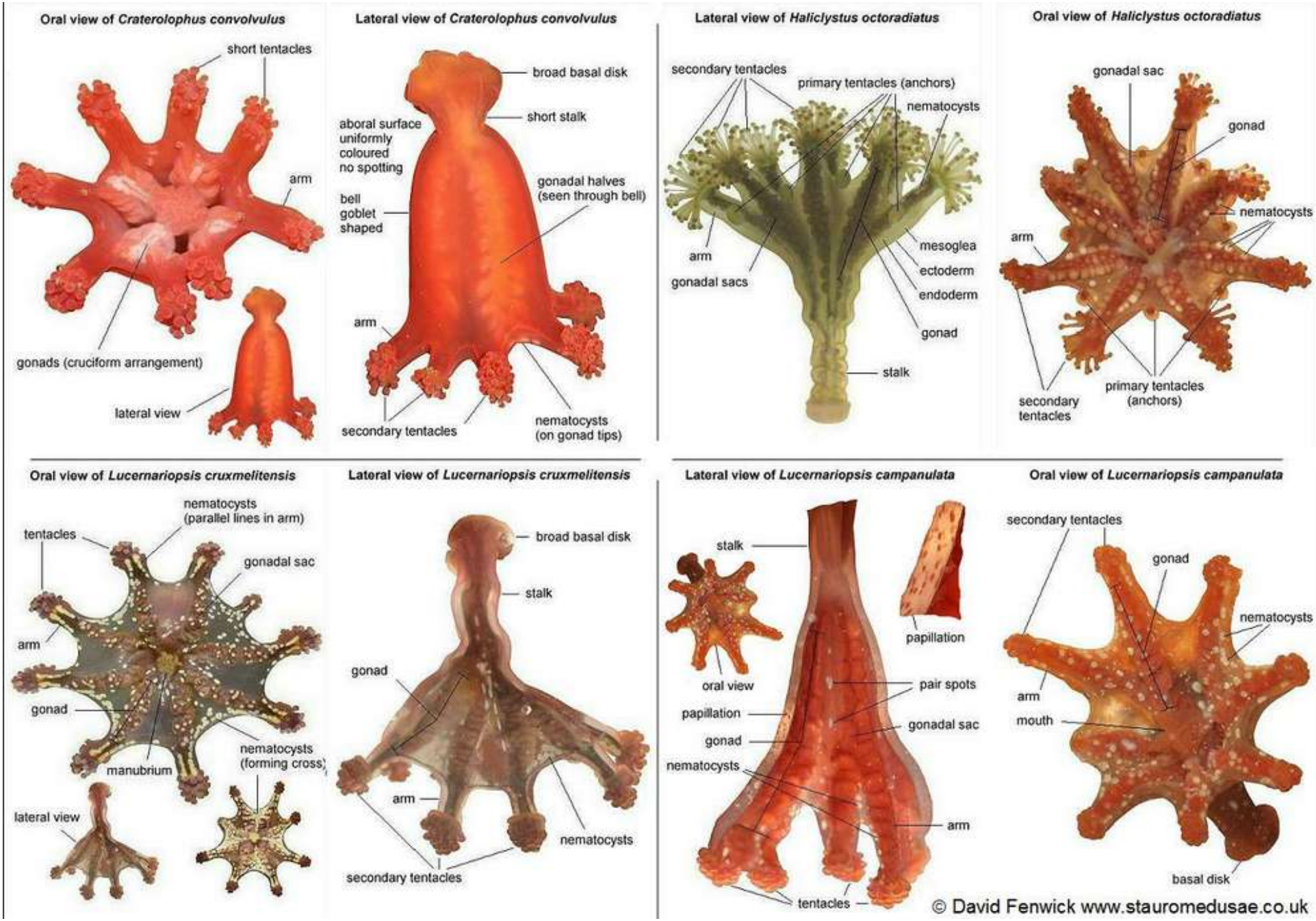


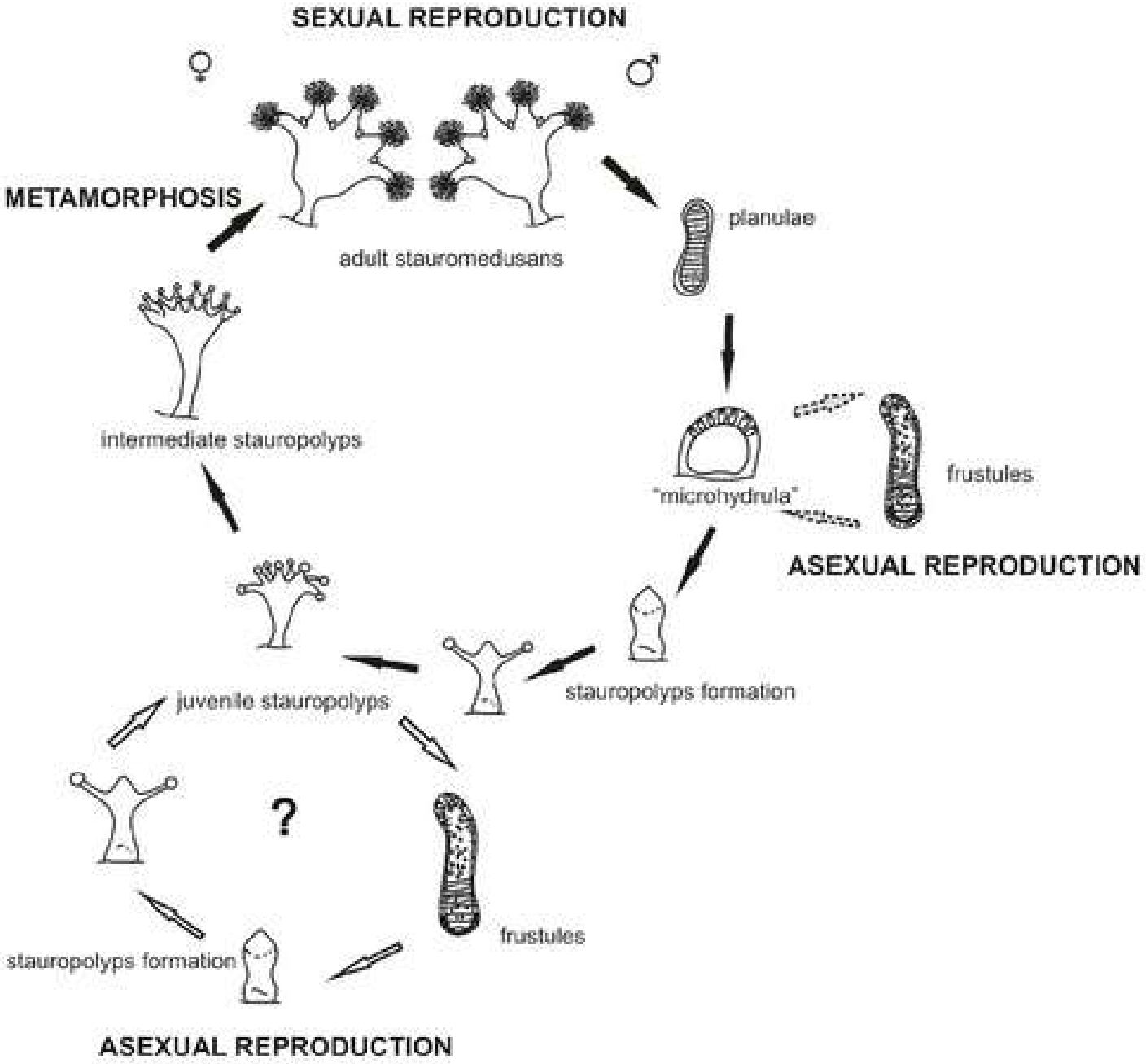
Figure 13.20
Thaumatoscyphus hexaradiatus are an example of class Staurozoa.



1 **Order Stauromedusae**

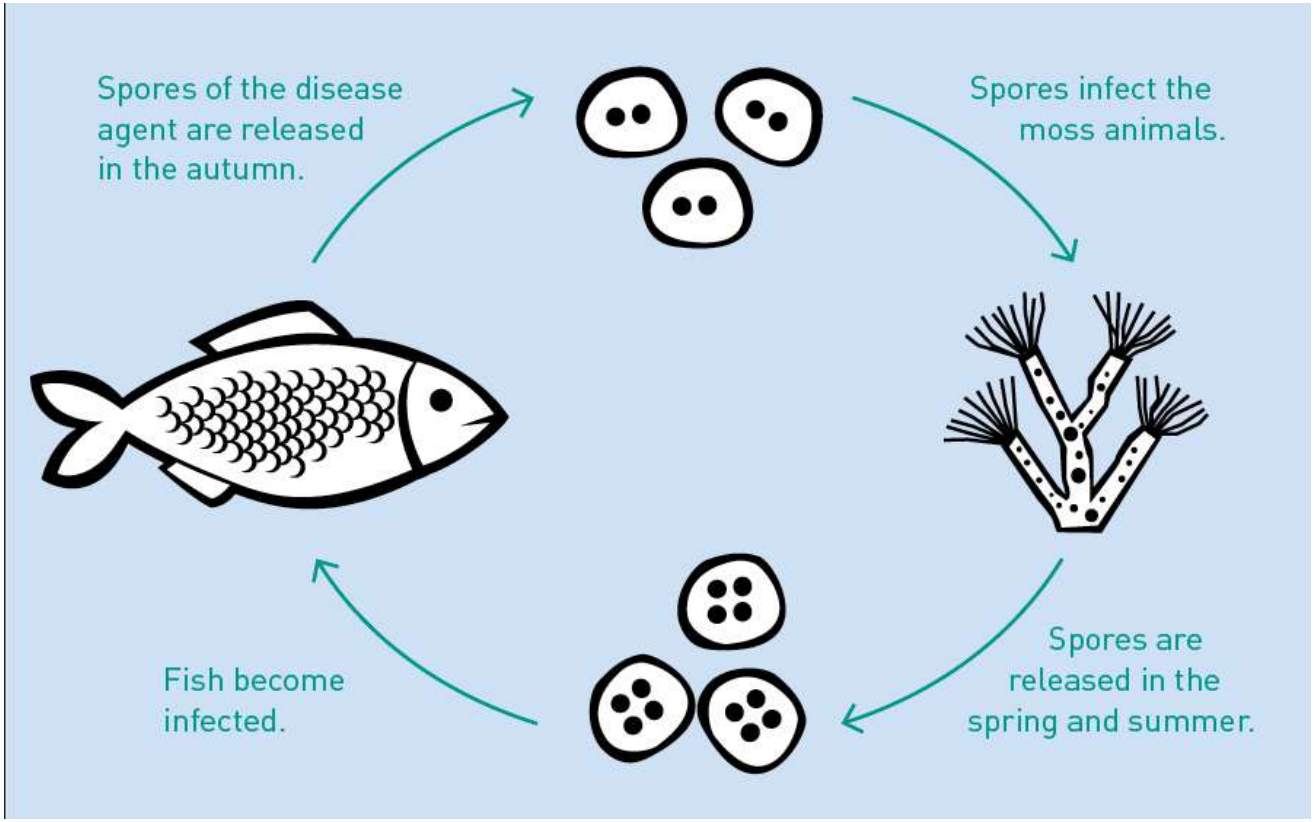

Oral view of *Craterolophus convolvulus*
short tentacles
arm
gonads (cruciform arrangement)
lateral view
Lateral view of *Craterolophus convolvulus*
broad basal disk
short stalk
aboral surface uniformly coloured no spotting
gonadal halves (seen through bell)
bell goblet shaped
arm
secondary tentacles
nematocysts (on gonad tips)
Lateral view of *Haliclystus octoradiatus*
secondary tentacles
primary tentacles (anchors)
nematocysts
arm
gonadal sacs
mesoglea
ectoderm
endoderm
gonad
stalk
Oral view of *Haliclystus octoradiatus*
gonadal sac
gonad
nematocysts
arm
secondary tentacles
primary tentacles (anchors)
Oral view of *Lucernariopsis cruxmelitensis*
nematocysts (parallel lines in arm)
tentacles
gonadal sac
arm
gonad
nematocysts (forming cross)
manubrium
lateral view
Lateral view of *Lucernariopsis cruxmelitensis*
broad basal disk
stalk
gonad
arm
nematocysts
secondary tentacles
Lateral view of *Lucernariopsis campanulata*
stalk
papillation
oral view
pair spots
papillation
gonadal sac
gonad
nematocysts
arm
tentacles
Oral view of *Lucernariopsis campanulata*
secondary tentacles
gonad
nematocysts
arm
mouth
basal disk
© David Fenwick www.stauromedusae.co.uk

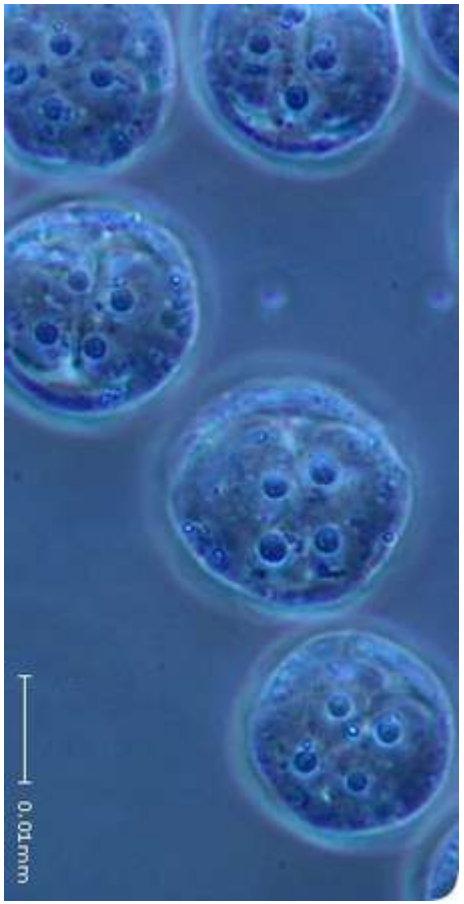
CNIDARIA - CLASS STAUROZOA



CNIDARIA - CLASS MALACOSPOREA

The Malacosporea, with the single order *Malacovalvulida* and single family Saccosporidae, were **characterized by soft-walled spores**, special sporoplasmosomes with a bar-like invagination, bryozoans as invertebrate hosts, and spore formation within a sac-like body form.





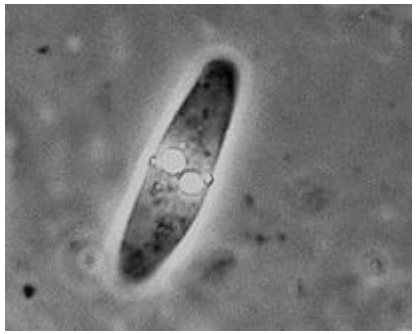
Tetracapsuloides bryosalmonae

CNIDARIA - CLASS MYXOSPOREA

The Myxosporea are a class of microscopic parasites, belonging to the Myxozoa clade within Cnidaria.

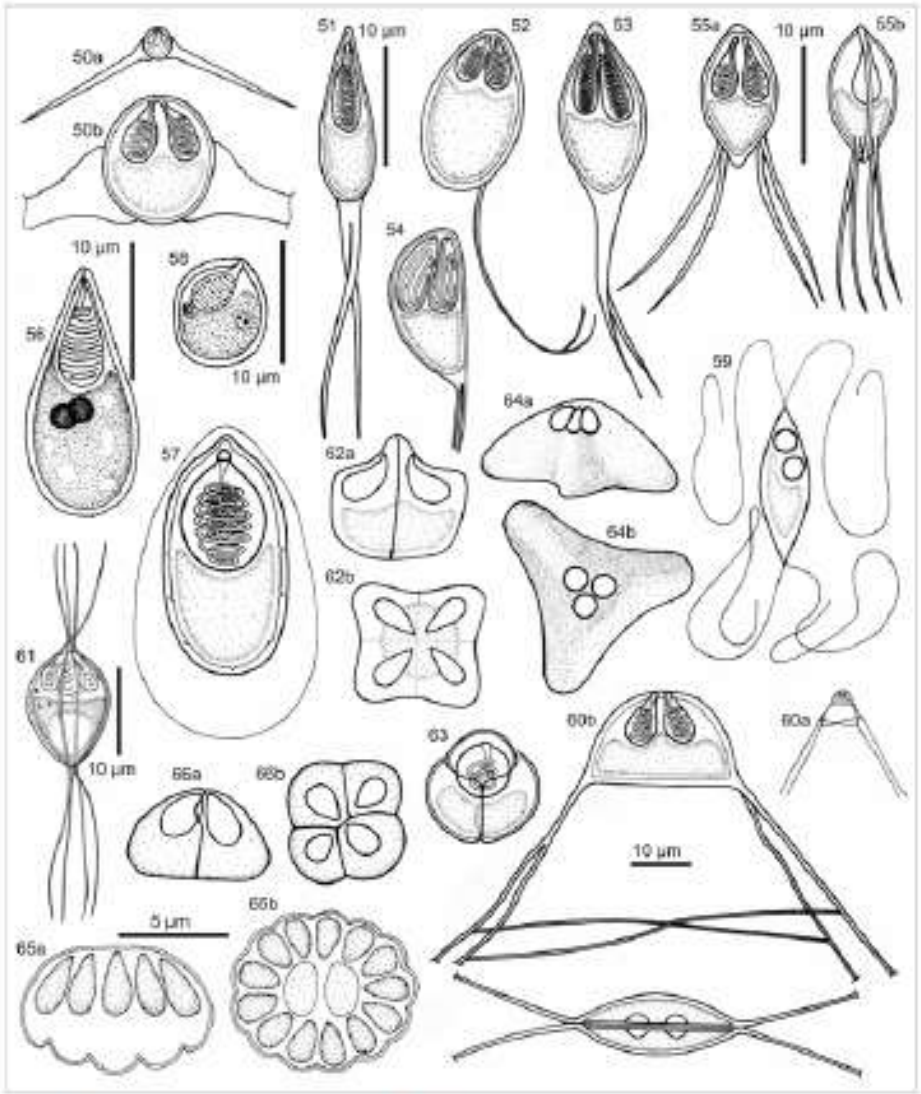
They have a complex life cycle which comprises vegetative forms in two hosts, an aquatic invertebrate and an ectothermic vertebrate, usually a fish

spore valves



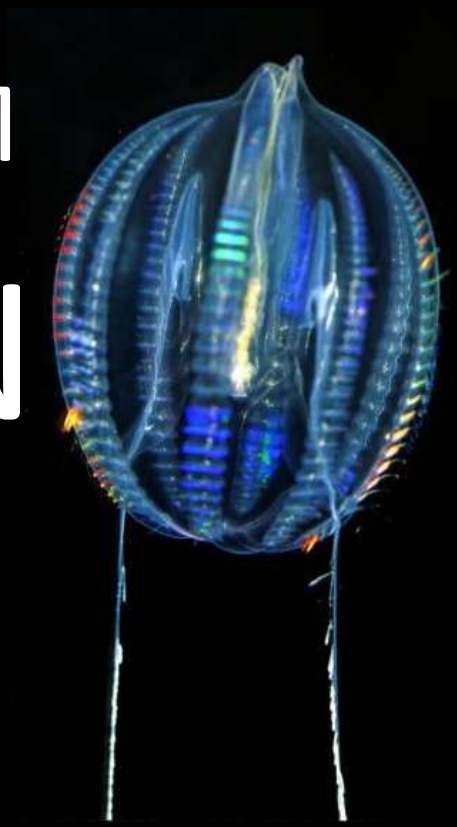
Order Bivalvulida

Order Multivalvulida



Figs. 50–66. Line drawings of myxosporean spores. **Fig. 50.** *Dicauda atherinoidi*, aspect of the whole spore (a), spore body in frontal view (b). **Fig. 51.** *Phlogospora mirri*. **Fig. 52.** *Latericaudata mariacambali*. **Fig. 53.** *Hennegoya psorospermica*. **Fig. 54.** *Hennegoides longitudinalis*. **Fig. 55.** *Tetrauronema macropodes* in frontal (a) and natural view (b). **Fig. 56.** *Thelohanellus pyriformis* (modified from Sołtysińska 1967). **Fig. 57.** *Thelohanellus hovorkai*. **Fig. 58.** *Neothelohanellus catlae* (modified from Das and Haldar 1986). **Fig. 59.** *Neohennegoya tetraradiata*. **Fig. 60.** *Trigonosporus acanthogobii*. **Fig. 61.** *Octospina longevasis* (modified from Hsieh and Xiao 1993). **Fig. 62.** *Trilospora californica* in side (a) and apical view (b). **Fig. 63.** *Unicapsula seriolae*. **Fig. 64.** *Kudoa clupeidae* in side (a) and apical view (b). **Fig. 65.** *Kudoa permulticapsula* in side (a) and apical view (b) (courtesy of Dr. M.L. Kent and J. Parasitol.). **Fig. 66.** *Kudoa paniformis* in side (a) and apical view (b).

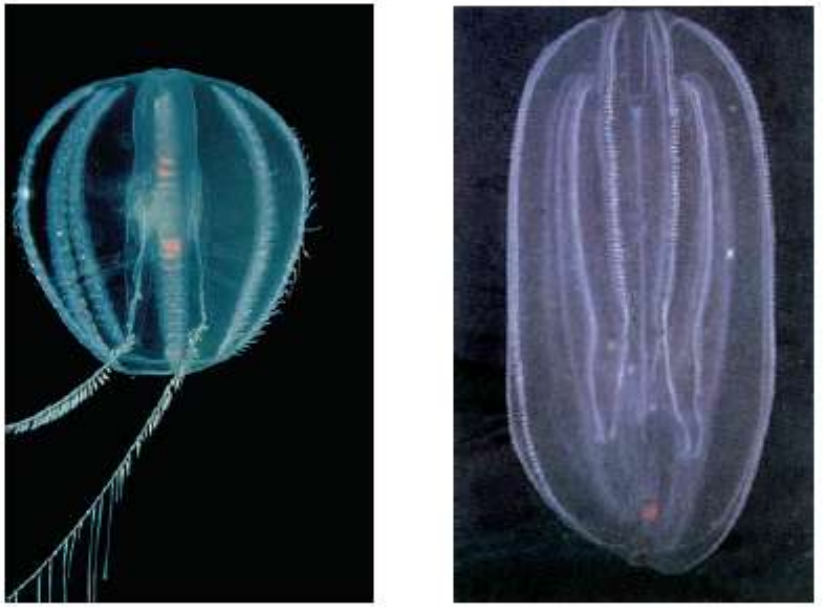
PHYLUM

CTEN  PHORA

CTENOPHORA

Characteristics of Phylum Ctenophora

1. Eight rows of combs (ctenes) arranged radially around body
2. **Colloblasts,** adhesive cells used in prey capture, present in most
3. Entirely marine
4. Symmetry **biradial;** arrangement of internal canals and position of the paired tentacles change the radial symmetry into a combination of radial and bilateral
5. Body ellipsoidal or spherical in shape with oral and aboral ends; no definite head
6. Adult body with gelatinous middle layer containing muscle cells; derivation of middle cellular layer controversial (ectodermal vs. endodermal) affecting status as diploblastic or triploblastic
7. Complete gut; mouth opens into pharynx; gut with a series of branching **gastrovascular canals;** gut terminates at **anal pore;** wastes exit via anal pore and mouth
8. **Extracellular digestion** in pharynx
9. Two extensible tentacles occur in most
10. Muscular contractions via **muscle fibers (cells),** not epitheliomuscular cells
11. Nervous system consisting of a subepidermal plexus concentrated around the mouth and beneath the comb plate rows; an **aboral sense organ** (statocyst)
12. Reproduction monoecious in most; gonads (endodermal origin) on the walls of the digestive canals, which are under the rows of comb plates; mosaic or regulative cleavage within embryos; cydippid larva
13. No respiratory system
14. No coelomic cavity



A *Pleurobrachia* **B** *Mnemiopsis*

Figure 13.36

A, Comb jelly *Pleurobrachia* sp. (order Cydippida). Its fragile beauty is especially evident at night when it luminesces from its comb rows. **B,** *Mnemiopsis* sp. (order Lobata).

- The body of a comb jelly is divided into 8 equal sections.
- Each section is separated by bands of hair-like cilia called comb rows.
- Tentacles are covered in sticky mucus
- Can be Bioluminescent

CTENOPHORA - BODY FORM

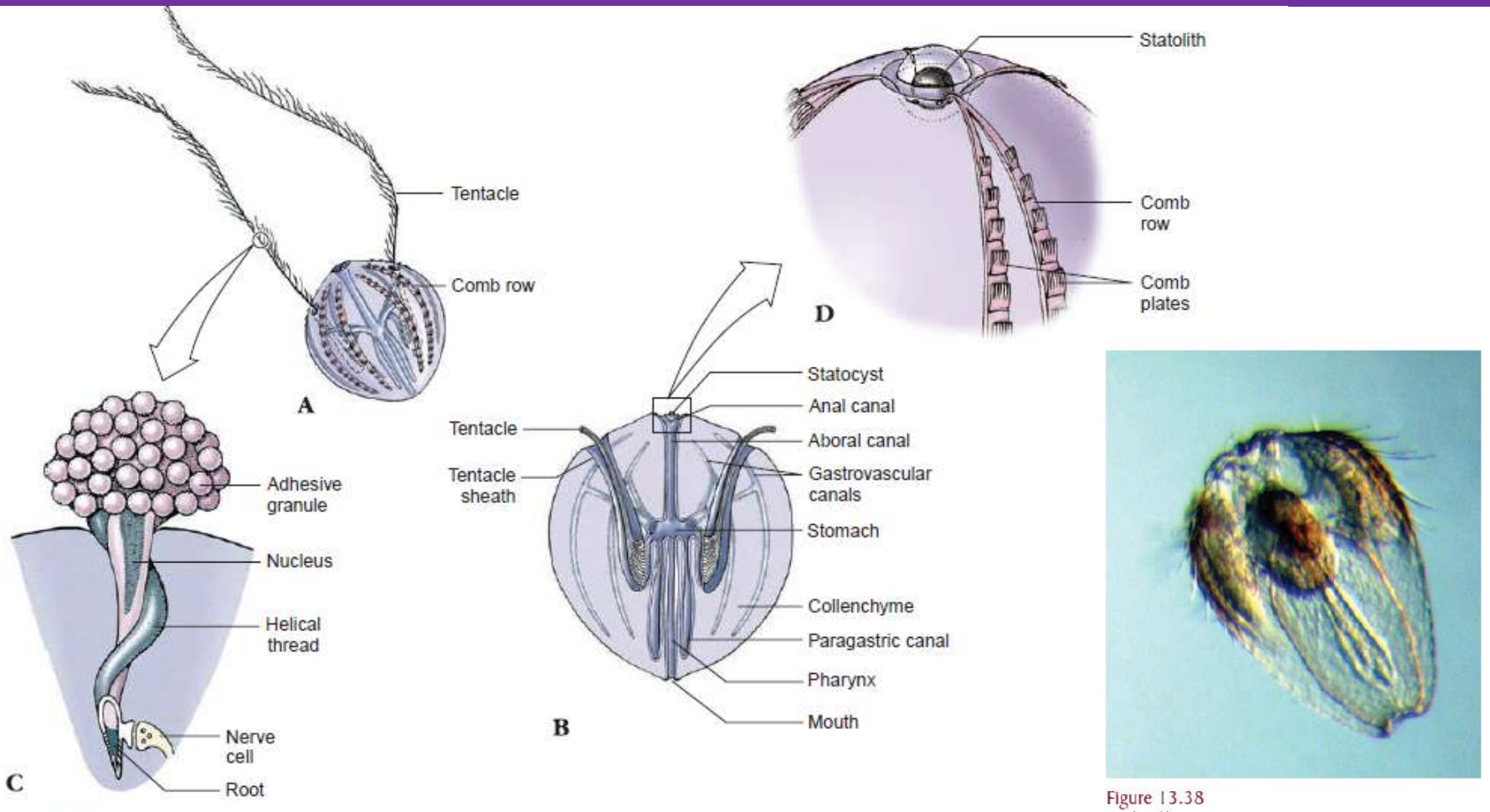


Figure 13.37

Comb jelly *Pleurobrachia*, a ctenophore. **A,** External view. **B,** Hemisection. **C,** Colloblast, an adhesive cell characteristic of ctenophores. **D,** Portion of comb rows showing comb plates, each composed of transverse rows of long fused cilia.

Figure 13.38

A cydippid larva.

CTENOPHORA - BODY FORM

Class Nuda

- A type of comb jellyfish.
- Another name for Nuda is the "mother of comb jellyfish".
- This class has no tentacles.
- They swim with plankton and can be found in all parts of the ocean.
- The longest the species can be is around 12 inches long with sac like bodies and large mouths.

CTENOPHORA - BODY FORM

Class Tentaculata

- The body is spherical or slightly oval.
- It has two long tentacles. On each tentacle there is a lateral row of fine filaments.
- It inhabits shallow waters.

CTENOPHORA

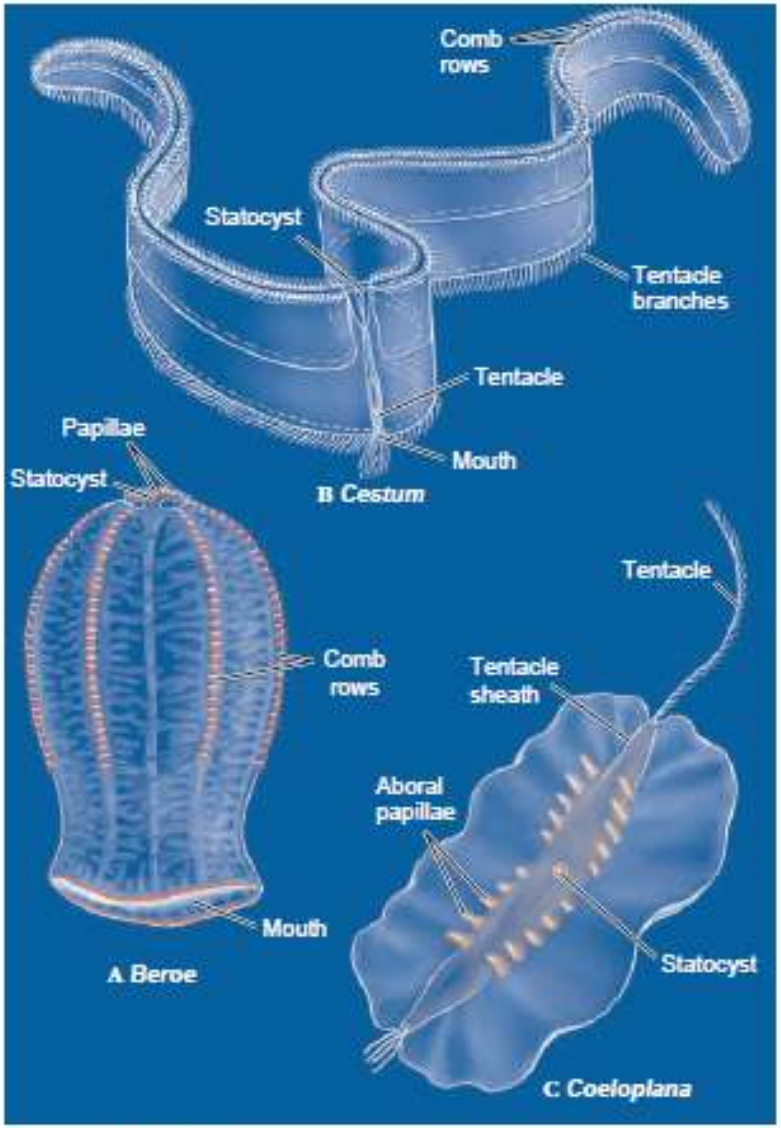
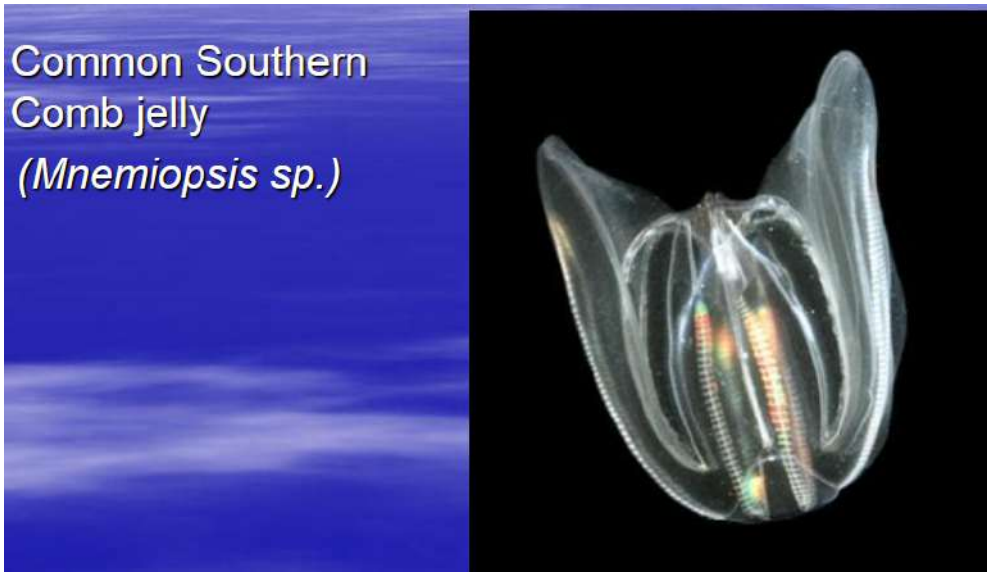
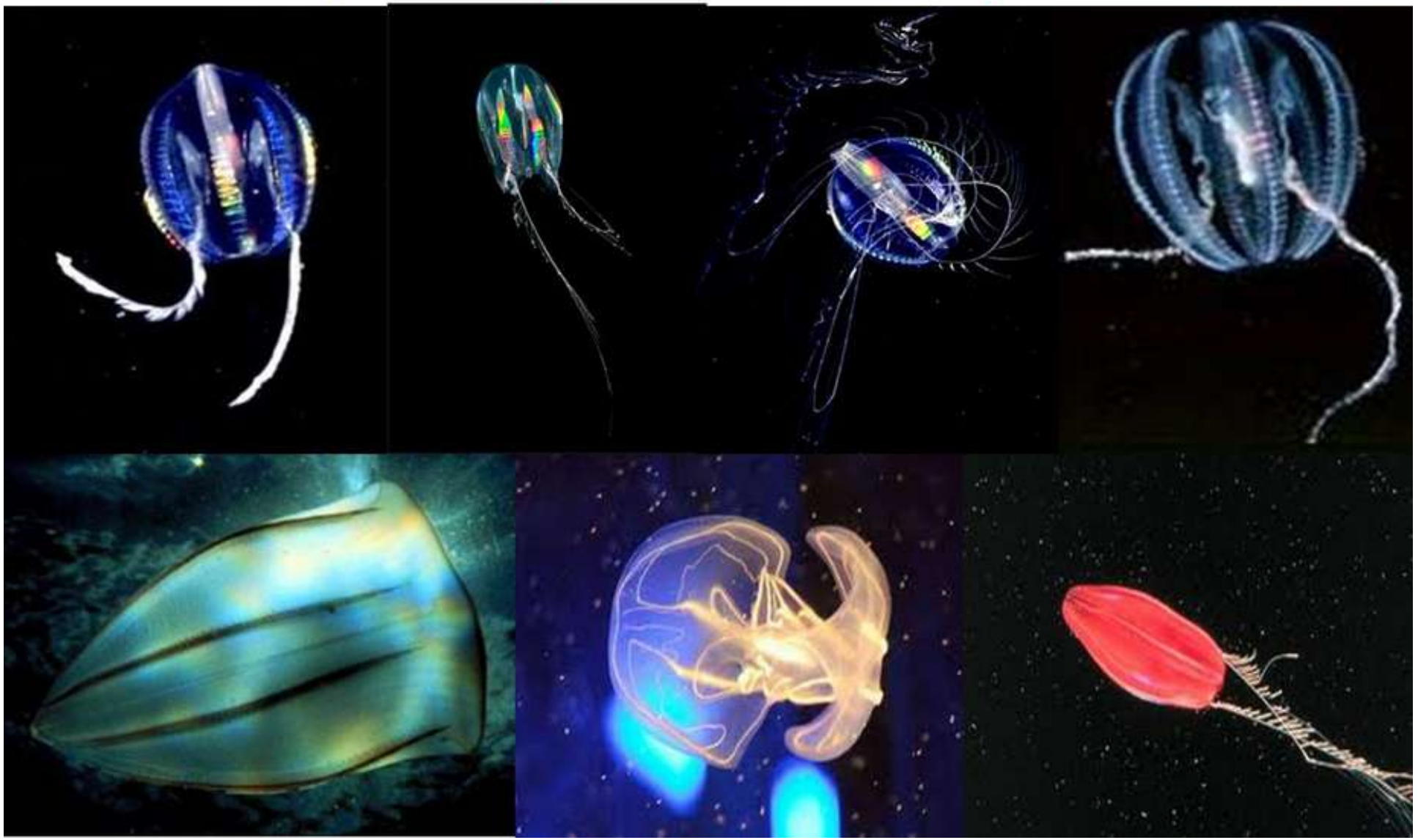


Figure 13.39
Diversity among phylum Ctenophora. **A,** *Beroe* sp. (order Beroida). **B,** *Cestum* sp. (order Cestida). **C,** *Coeloplana* sp. (order Platyctenea).



Ctenophora (Comb Jellies)



Dalam sebuah studi ekstensif tentang ubur-ubur laut, sebanyak 200 ribu orang lebih di negara bagian Florida terkena racunnya setiap tahunnya. Dan 10 ribu orang di Australia terkena ubur-ubur laut Portugal yang mematikan. Dan industri perikanan dan pariwisata kehilangan 350 juta dolar AS akibat perkembangbiakan ubur-ubur sisir.

Laporan tersebut mengatakan ditemukan lebih dari 1.000 ubur-ubur sisir ukuran kepalan tangan di setiap meter kubik di perairan Laut Hitam pada beberapa hari saat menguatnya aktivitas ubur-ubur. Disebutkan bahwa ubur-ubur memakan telur ikan dan bersaing dengan mereka untuk mendapatkan makanan dan menghilangkan mata pencaharian para nelayan.

Lihatlah pada dunia yang penuh misteri ini, hewan seukuran kepalan tangan atau lebih kecil dari itu memberikan ancaman besar bagi manusia, bahkan juga menimbulkan ancaman bagi ikan dan makhluk-makhluk laut lainnya.

Allah Yang Maha Kuasa berfirman, *"Dan tidak yang mengetahui jumlah tentara Tuhanmu melainkan Dia."* (QS. Al-Mudatstsir: 31).

Ini merupakan sunnatullah (hukum Allah) yang terdapat di dunia laut, dan setiap makhluk telah dijamin oleh Allah rezekinya, dan memudahkan untuknya berbagai cara dalam mendapatkan rezeki.

Allah SWT berfirman, *"Dan tidak ada suatu binatang melata pun di bumi melainkan Allah-lah yang memberi rezkinya, dan Dia mengetahui tempat berdiam binatang itu dan tempat penyimpanannya. Semuanya tertulis dalam kitab yang nyata (Lauh Mahfuzh)."* (QS. Hud: 6).

Sumber : www.kaheel7.com


PHYLUM
PLACOZOA

PLACOZOA

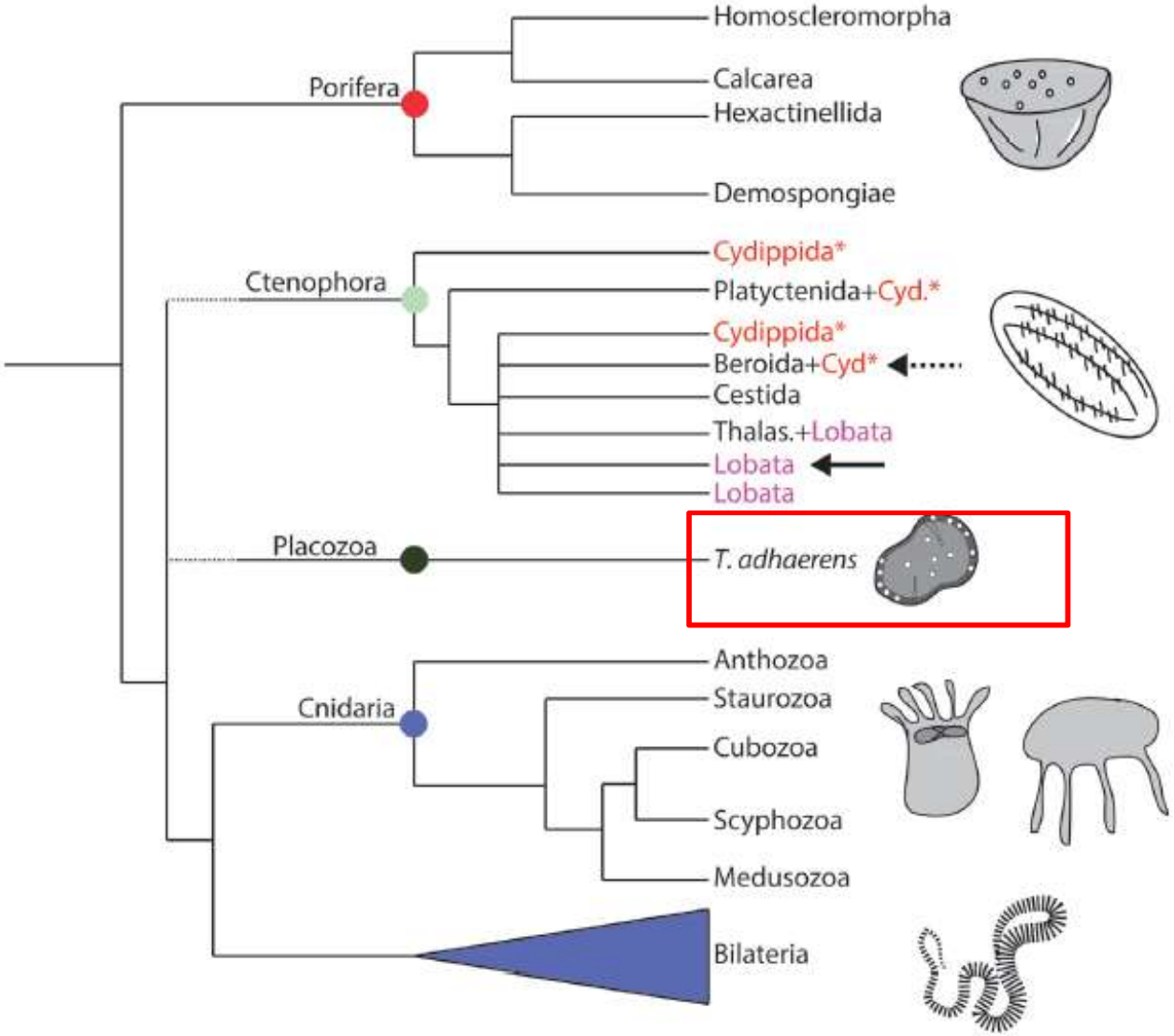
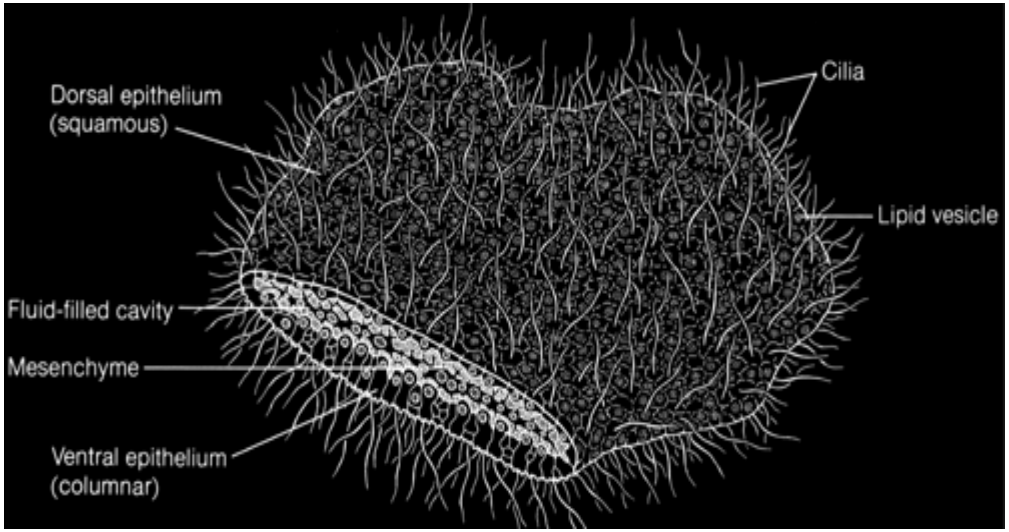
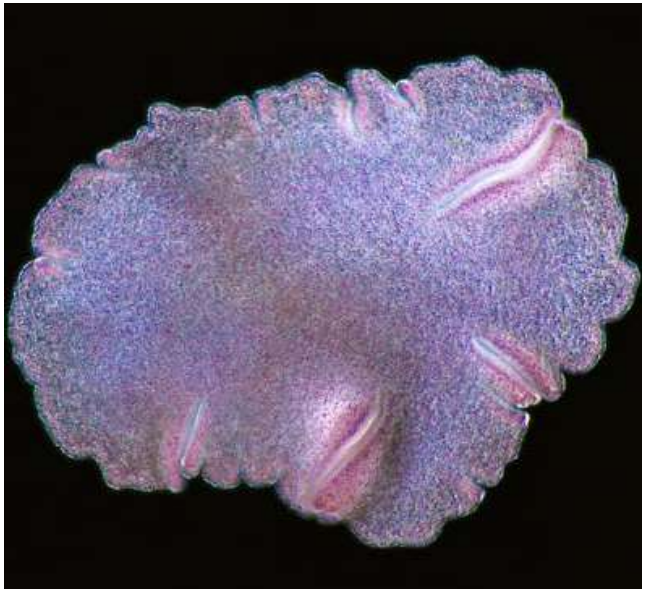


Figure 1 - Phylogenetic relationship among the non-bilaterians phyla and their respective subclasses. Dashed lines indicate uncertain locations of the branches. Many of the orders of Ctenophora are not monophyletic (Cyd* = Cydippida). Solid arrow points to phylogenetic position of *M. leidyi* and dashed arrow points to the phylogenetic position of *P. pileus*. See 'Phylogenetic relationship of non-bilaterian animals' for references.

PLACOZOA

- Represented by a small platelike marine organism
- no symmetry
- no organs, and no muscular or nervous system.
- It also lacks both a basal lamina beneath the epidermis and an extracellular matrix
- Only two cell layers with a **fibrous syncytial** layer between them
- Some workers hypothesize that these layers are homologous to **ectoderm and endoderm** of more complex metazoans.
- Genetic studies indicate that there are **eight species of placozoans**.





Trichoplax adhaerens

PLACOZOA

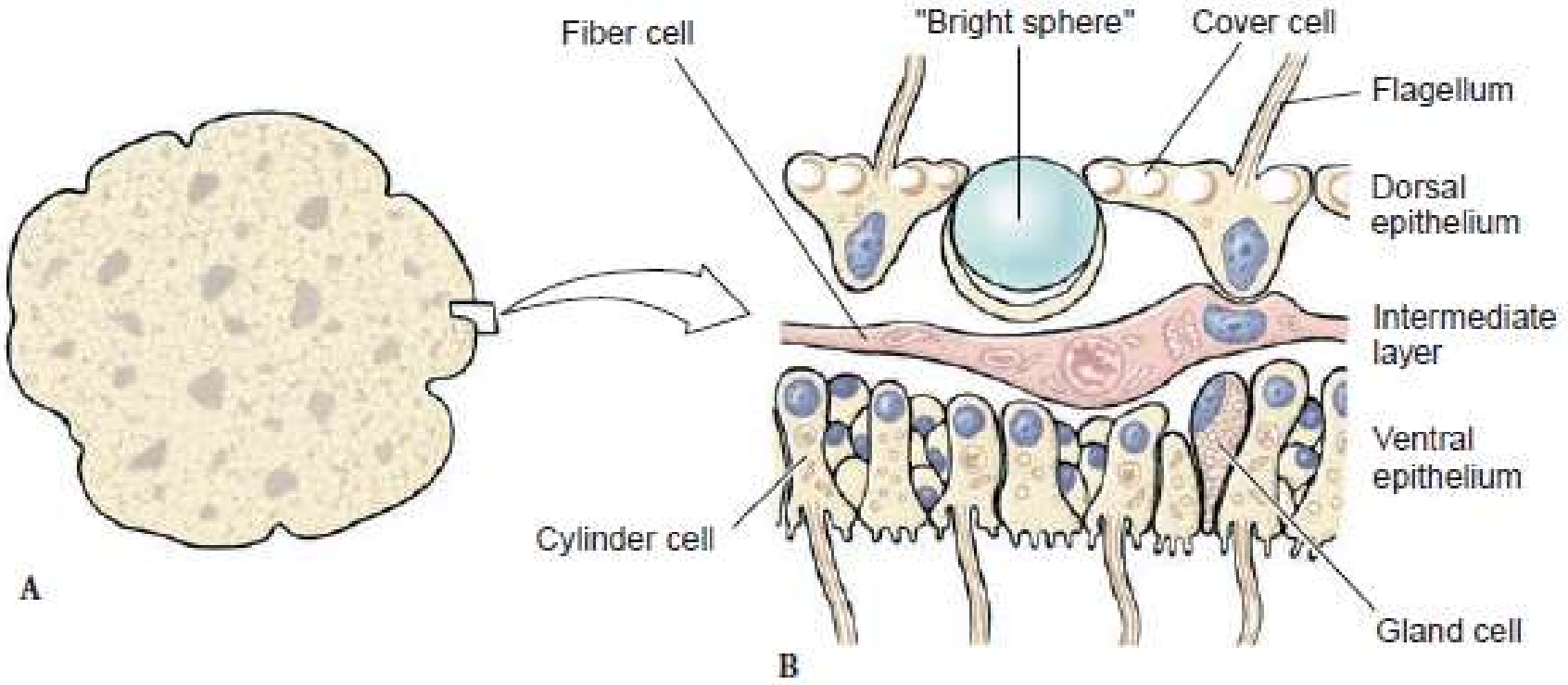
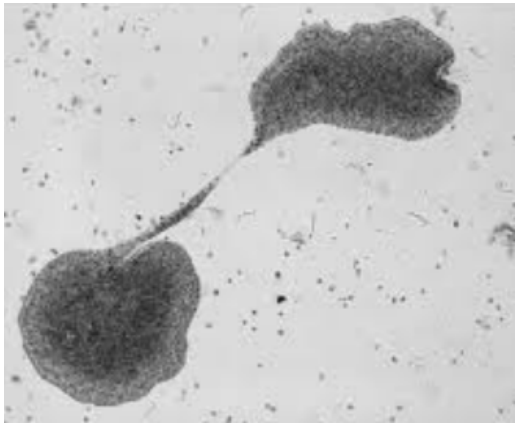


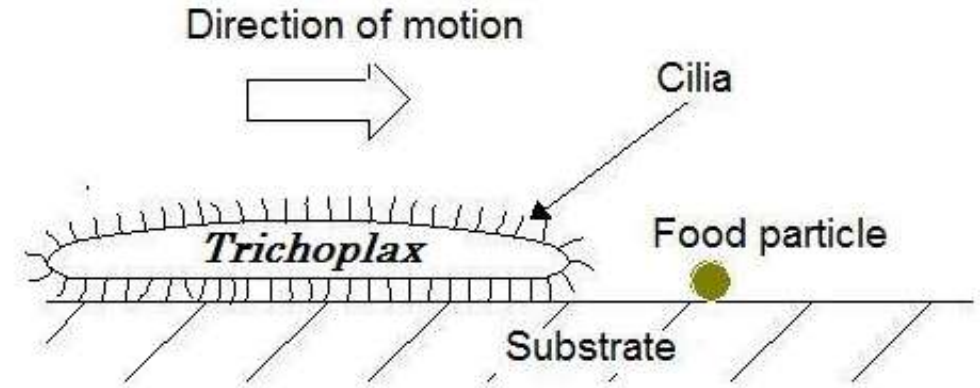
Figure 12.16

A, *Trichoplax adhaerens* is a marine, platelike animal only 2 to 3 mm in diameter. **B,** Section through *Trichoplax adhaerens,* showing histological structure.

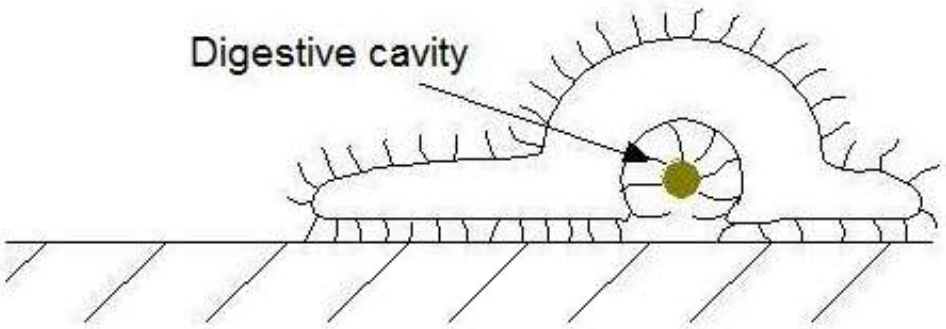
PLACOZOA

- The life cycle of placozoans is not completely known. They divide asexually and produce “swarmer” stages by budding
- Placozoans glide over their food, secrete digestive enzymes on it, and then absorb the products. In the laboratory, they feed on organic matter and small algae.





1. Moving toward a nutrient particle



2. Forming a digestive cavity around the nutrient particle and digesting it externally

“ Kadang yang Indah dan Lembut,
justru malah mematikan“

TUGAS

TULIS DI BUKU TUGAS

1. Peranan Cnidaria bagi manusia