

Chapter 29
Echinoderms and
Invertebrate Chordates

Biology II
Mrs. Michaelsen

Section 29.1 - Echinoderms



I. What Is An Echinoderm?

- A. Move by means of hydraulic, suction cup-tipped appendages.
- B. Skin covered by tiny pincers.

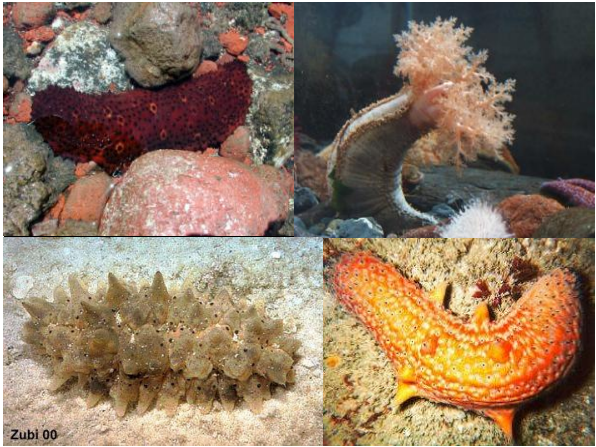




Purple Sea Star found in the Pacific Northwest



Sea Cucumber

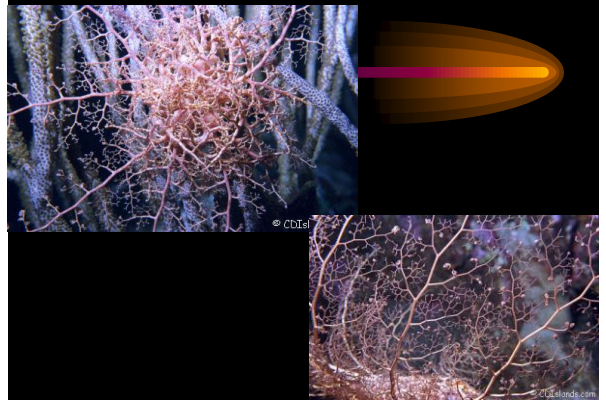


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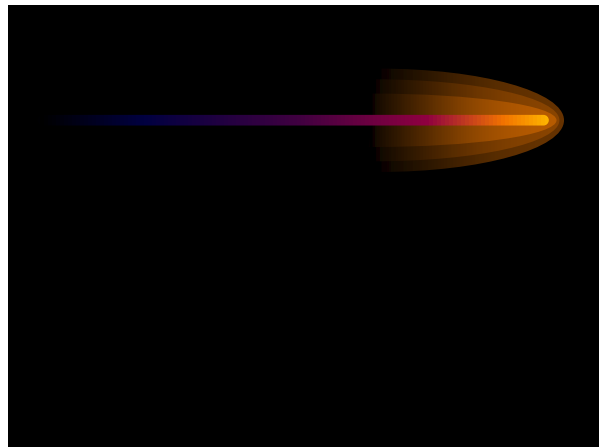
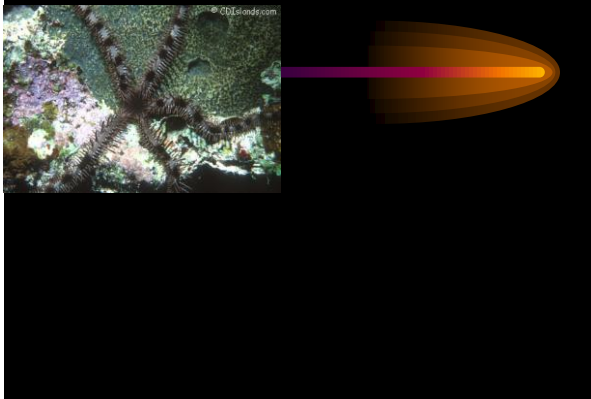
Feather Star or Sea Lily



Basket Star

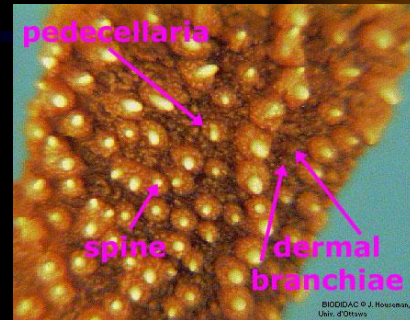


Brittle Star



C. Echinoderms Have Endoskeletons

1. Endoskeleton made of calcium carbonate.
2. Rays of starfish covered with short spines.
3. Some spines are modified into pincerlike appendages called pedicellariae.
 - a. Used for protection and cleaning body.

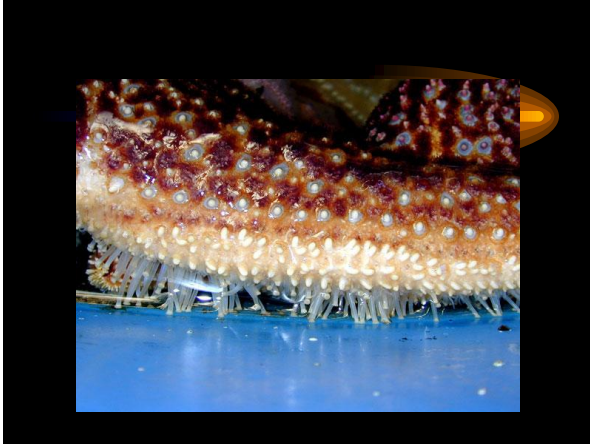


D. Echinoderms Have Radial Symmetry

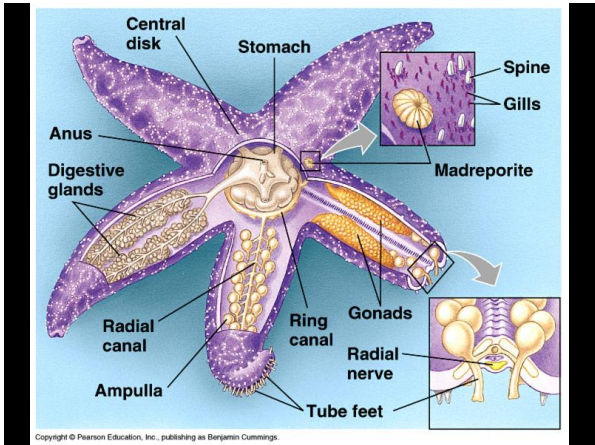
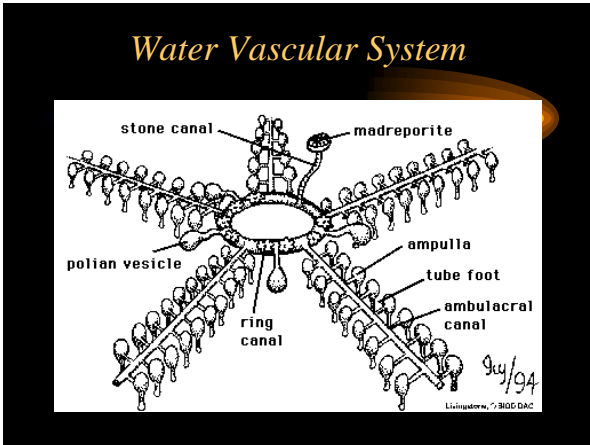
1. Enables animals that are stationary or move slowly to sense food and predators from all directions.

E. The Water Vascular System

1. Enables them to move, exchange gases, capture food, and excrete wastes.
2. Tube feet: Hollow, thin-walled tubes that end in a suction cup.
3. Ampulla: Like the bulb of a dropper.
4. Each tube foot works independently of the others.



5. Water Vascular System: Hydraulic system that operates under water pressure.
6. Madreporite: Sievelike, disk-shaped opening on the upper surface of the echinoderms body. (strainer)
7. Gases and wastes are exchanged by diffusion.



F. Echinoderms Have Varied Nutrition

1. All have mouth, stomach, intestines.
2. Obtain food differently.
3. Sea stars – carnivorous (clam)
4. Sea urchins – herbivores (algae)
5. Brittle stars, sea lilies, sea cucumbers – decaying matter



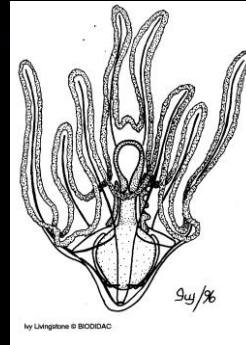
G. Echinoderms Have a Simple Nervous System

1. Have central nerve ring with nerves that go down each ray.
2. Radial nerve branches into a nerve net.
3. Tip of each ray (underside) they have an eyespot to detect light.

H. Echinoderms Have Bilaterally Symmetrical Larvae

1. More common in chordates, but found in echinoderms.
2. Free swimming larvae make dramatic changes through metamorphosis.
3. Suggests close relationship to chordates.

Echinoderm larvae



Section 29.2 – Invertebrate Chordates



Stalked Tunicate




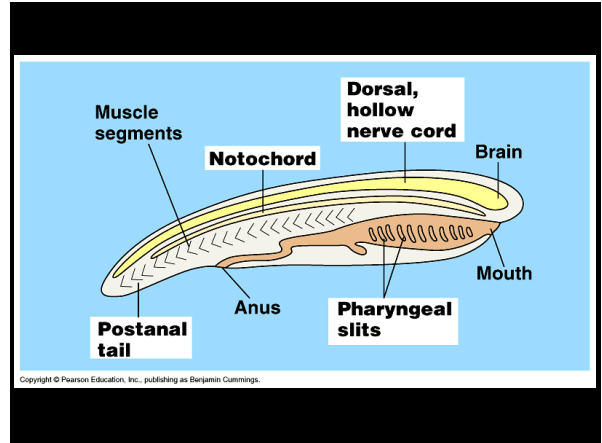

Lancelets

I. What is an Invertebrate Chordate?

- A. Vertebrate Chordates are familiar to you – fishes, amphibians, reptiles, birds, mammals.
- B. Phylum Chordata has three subphyla:
 1. Urochordata (tunicates or sea squirts)
 2. Cephalochordata (lancelets)
 3. Vertebrata (vertebrates)



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- C. All chordates have a notochord, dorsal hollow nerve cord, gill slits, and muscle blocks at some time in their development.
 - D. Also have bilateral symmetry, coelom, and segmentation.

E. All Chordates have a Notochord

1. **Notochord:** Long, semi-rigid, rodlike structure located between digestive system and dorsal hollow nerve cord.
2. Replaced by backbone (vertebrae) in vertebrates.
3. Develops after formation of gastrula from mesoderm.
4. Allows invertebrate chordates to make powerful side-to-side movements of the body.



F. All Chordates have a Dorsal Hollow Nerve Cord

1. Develops from a plate of ectoderm that rolls into hollow tube.
2. In most chordates, posterior portion develops into spinal cord.
3. Anterior portion develops into brain.

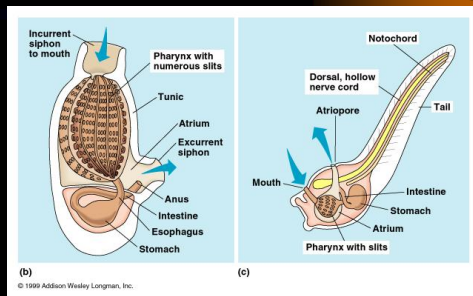
G. All Chordates have Gill Slits

1. Gill slits: Located in pharynx behind mouth.
2. Some only have during embryonic development.

H. All Chordates have Muscle Blocks

1. Stacked muscle layers (cooked fish).
2. Tends to make chordates more muscular than other phyla.
3. Aid in movement of tail (all have tail in development).

Adult and Larvae Tunicate



II. Diversity of Invertebrate Chordates

A. Tunicates are Sea Squirts

1. Subphylum Urochordata.
2. Larval stage has chordate features (tail like tadpole).
3. Tunicate larvae do not feed and are free swimming for a short time before attaching with a sucker to boats, rocks and the ocean bottom.
4. Adult tunicates secrete tunic around their bodies.
5. Adults have gills.
6. Will squirt jet of water if removed from its sea home.



Tunicates



Painted Tunicate

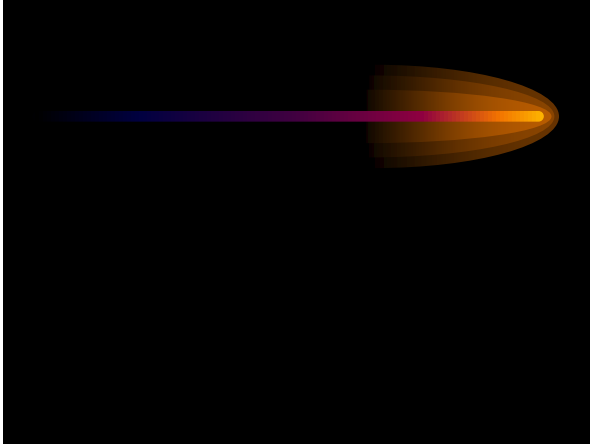


Sea Squirt Larvae



B. Lancelets are Similar to Fishes

1. Subphylum Cephalochordata
2. Small, streamlined and common marine organisms.
3. Bury in sand with head sticking out.
4. Filter feeders.
5. Retain all their chordate features throughout life.
6. Look like fishes, but one layer of skin, no pigment, and no scales.
7. Have light sensitive cells on anterior end (no head).



III. Origins of Invertebrate Chordates

- A. No bones in sea squirts and lancelets, so fossil record is incomplete.
- B. One hypothesis: echinoderms, invertebrate chordates, and vertebrates all arose from ancestral sessile animals that fed by capturing food with their tentacles.
- C. Modern vertebrates probably arose from invertebrate chordates.