

# Chapter 11: Echinoderms

## Spiny-skinned Invertebrates

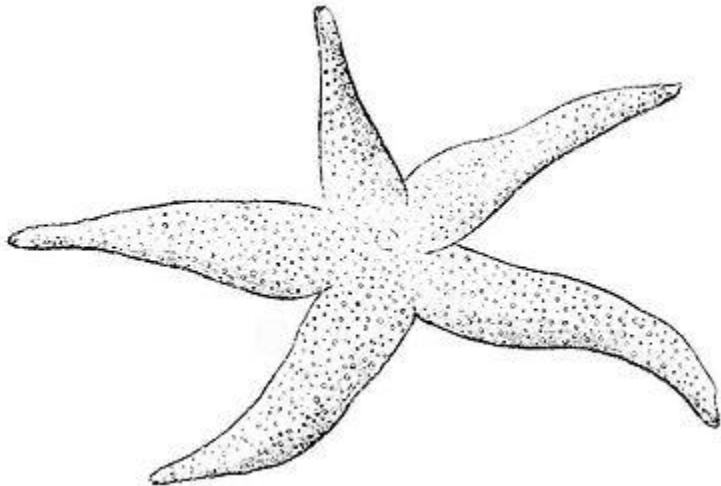
# Echinoderms

- Kingdom: Animalia
  - Phylum: Echinodermata (“spiny skin”)
    - Invertebrates
    - Radial symmetry
    - No body segmentation
    - Includes: sea stars, sea urchin, brittle stars, sea cucumbers



# Asteroidea: Sea Stars

- Class Asteroidea: sea stars/starfish
- Live on **bottom** in sub-tidal zone to the deep ocean.
- Have **5 (or multiples of 5) appendages (arms)**



# Sea Stars: Adaptations

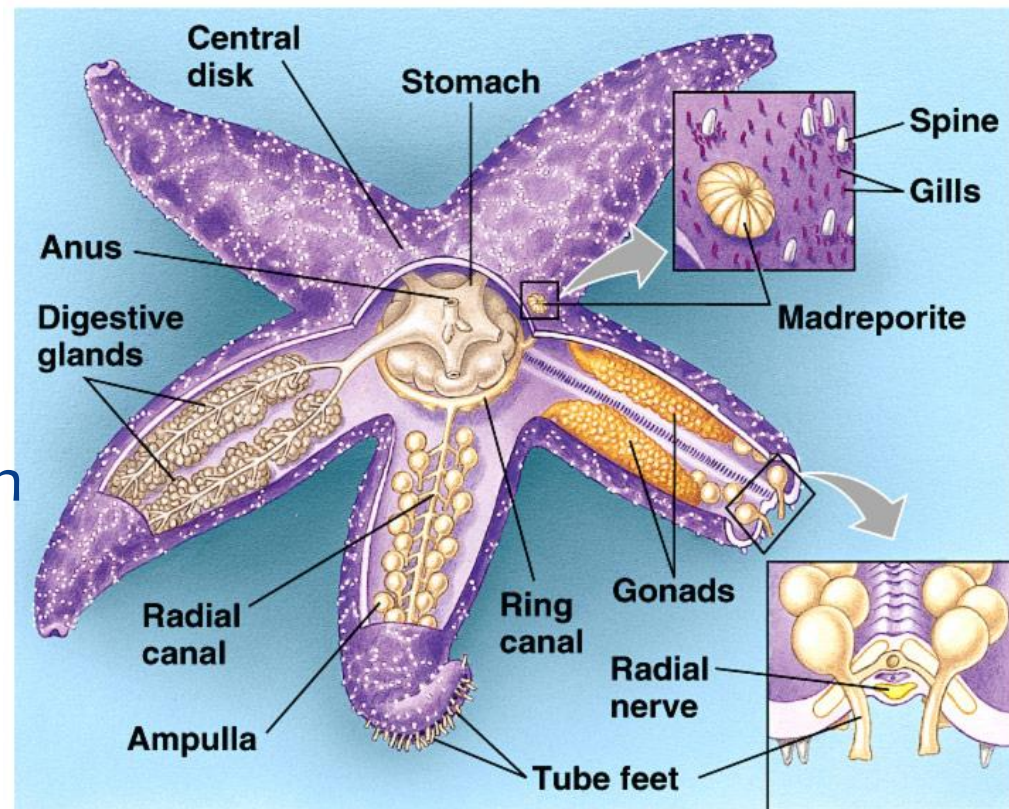
- **Limb regeneration:** limbs lost in fights can regenerate.
- **Spines on skin:** attached to an endoskeleton (internal structure)
  - Made of  $\text{CaCO}_3$  (calcium carbonate)
  - Protection & support



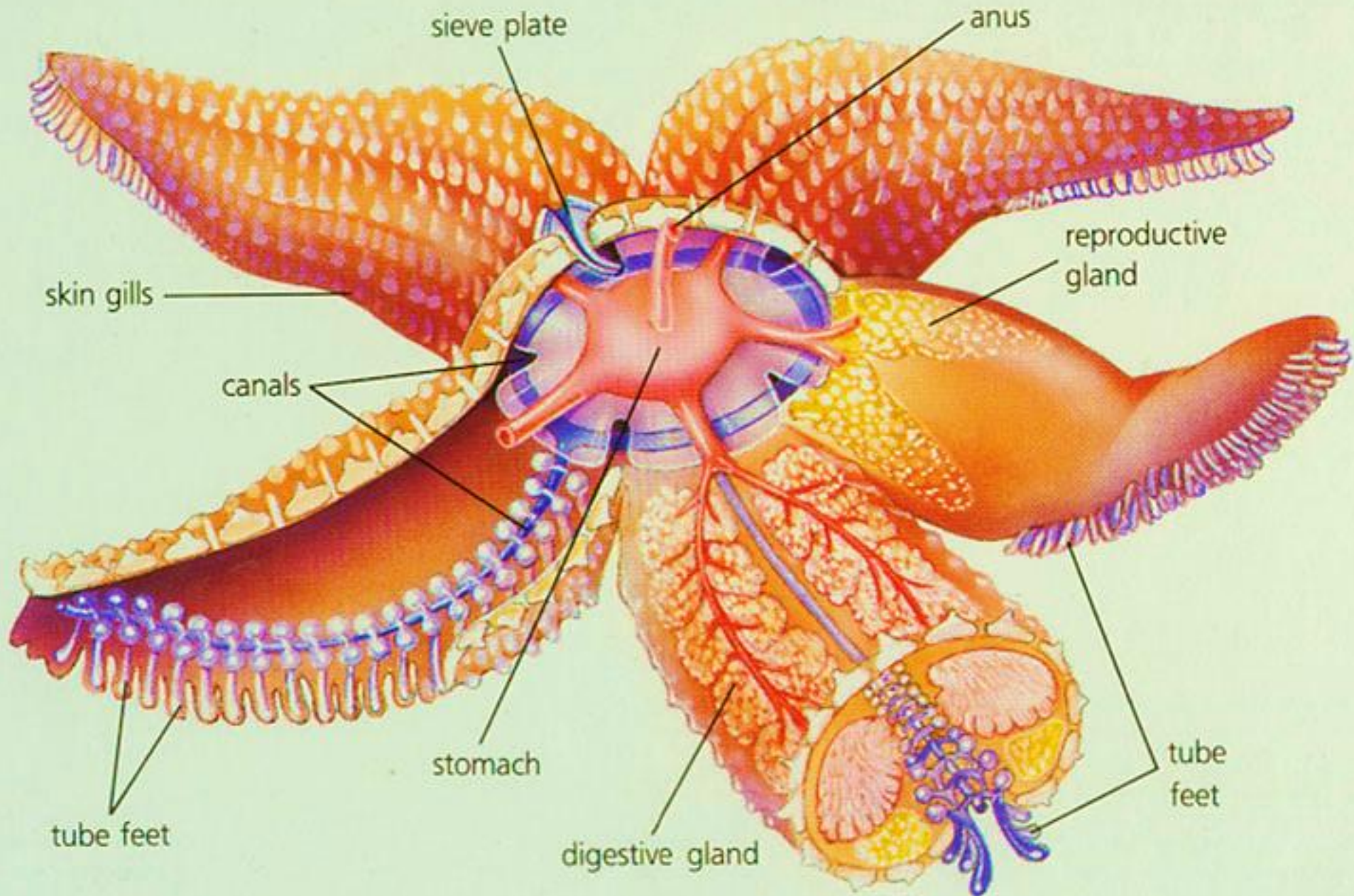


# Sea Stars: Respiration

- **Skin gills & tube feet:** breathe through skin and tube feet
  - Oxygen in water enters through membrane of feet and skin
  - **Coelom** (fluid-filled cavity) collects oxygenated water
  - **Ciliated cells** circulate oxygen to body.
  - CO<sub>2</sub> and waste exit body through tube feet and skin.
  - Open circulatory system.



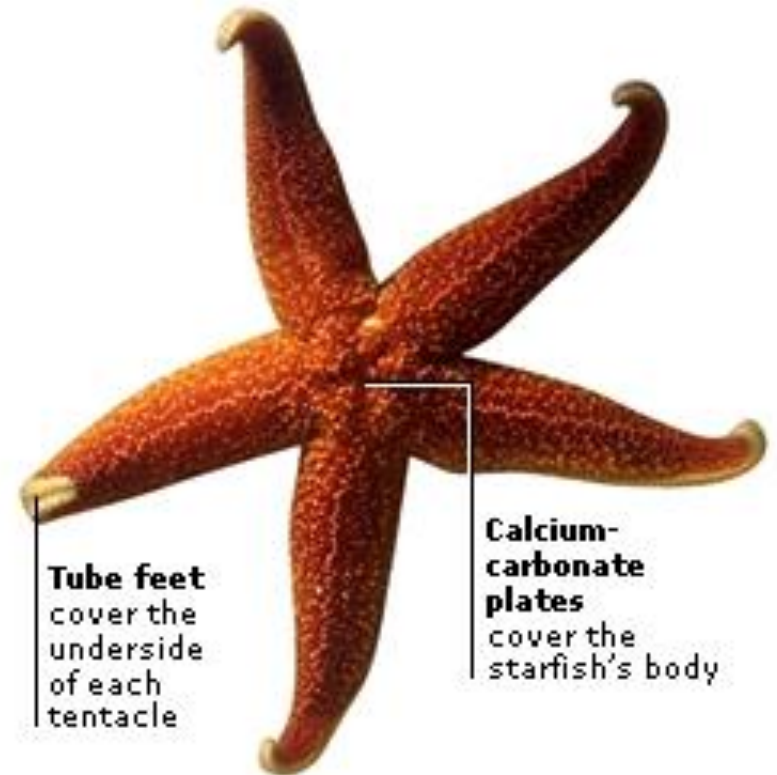
### 36. The Anatomy of a Starfish





# Sea Stars: Feeding & Locomotion

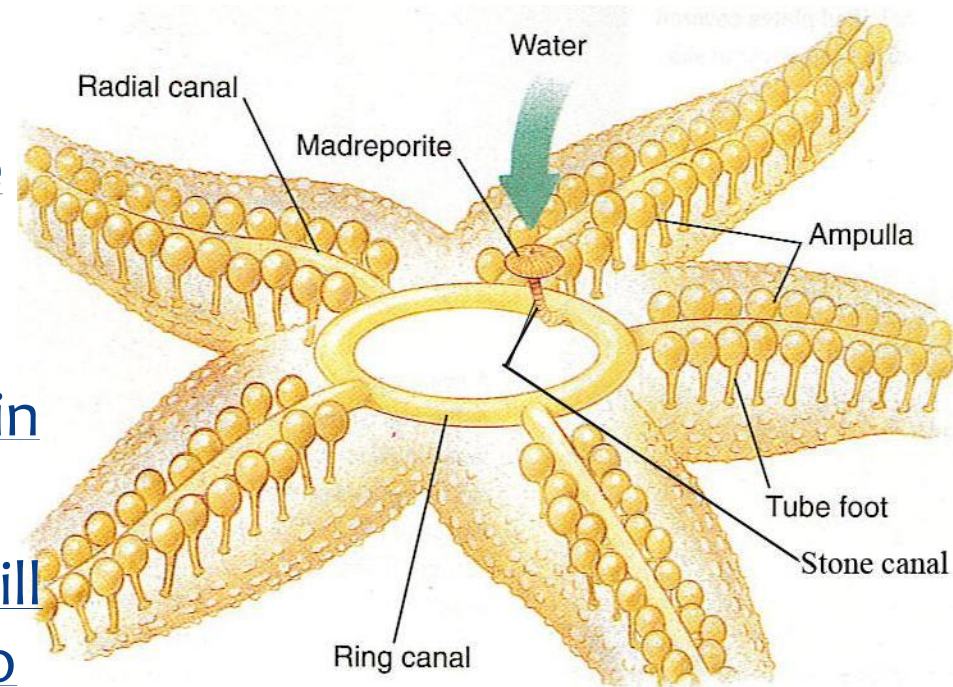
- **Arms:** used for movement and to get food.
  - Tube feet on ventral side have suction disks to cling to surfaces.
  - Muscles in tube feet contract to control movements.
- **Tube feet** can be used to open bivalves.
  - Feet will hold onto each shell of a clam and pull until adductor muscles tire out and open.



# Sea Stars: Feeding & Locomotion

## ■ Water vascular System:

- Network of water-filled tubes/canals
- Water enters at the **sieve plate** (on dorsal side) - *madreporite*
- Water passes down to circular ring and radiates out to canals in each arm
- Tube feet have **ampullae** that fill with water and contract foot to suction/cling for movement.





# Sea Stars: Feeding & Locomotion

- **Mouth:** located on ventral side
  - Stomach is pushed out through mouth to engulf food
  - Digestive enzymes break down the food
  - Digested food is brought back into mouth
  - Nutrients are absorbed in sea star
  - **Waste** is sent out through anus



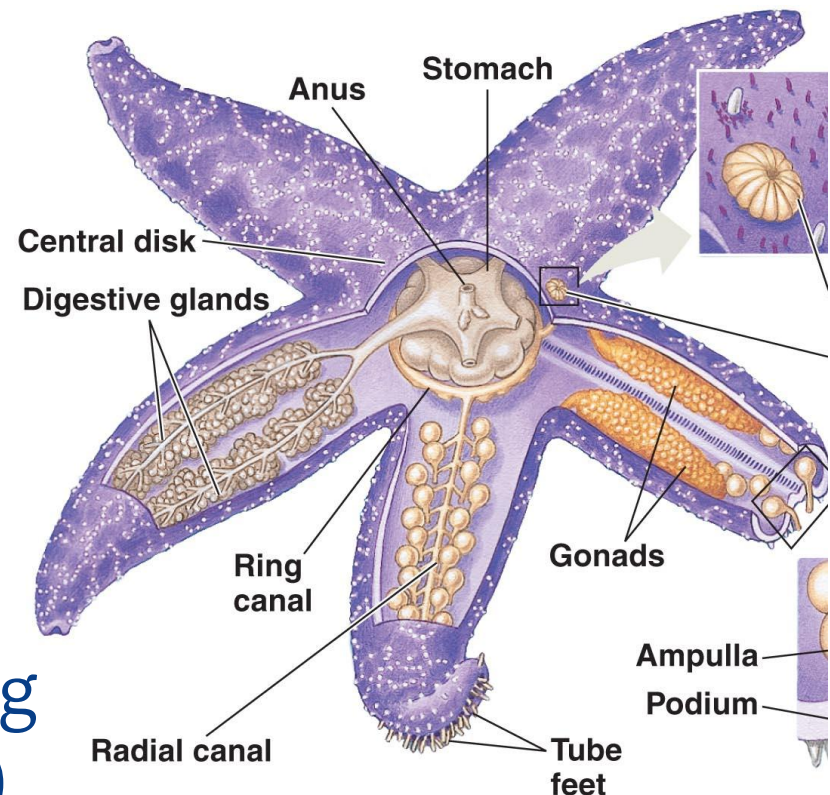
# Sea Stars: Response & Regeneration

- Sea stars are **slow movers**.
  - <https://www.youtube.com/watch?v=HPhAGyDceLo>
- Have **slow response** to stimuli.
- Eye spots: on each arm
  - Detect light
  - Electrical impulse is sent to nervous system and controls movement of arms



# Sea Stars: Reproduction

- Sea stars have 2 sexes
  - Look identical from outside
  - Gonads are internal (in arms)
- Eggs, sperm are released into water
- **External fertilization & development.**
- Entire organism can grow from a severed limb (as long as the central disk remains)





# Sea Star Wasting Syndrome

- \* **You will be writing a SUMMARY of a video.**
  - \* During the video: Make brief notes on IMPORTANT POINTS of the news story. (<https://www.youtube.com/watch?v=nb2KOSTUGso>)
    - \* Include important people and names, locations.
    - \* Write down any data that is mentioned.
  - \* After the video: review your list of IMPORTANT POINTS and make sure you don't have any repeats.
  - \* Put all of your IMPORTANT POINTS together into sentences and form a paragraph.
  - \* Read through your summary and make sure it is coherent (makes sense).
- \* **The summary should provide enough detail and information to fill someone in that is NOT going to watch the news story.**

# Echinoidea: Sea Urchins

- Found in intertidal, sub-tidal zones – rocky coasts.
- Grazes on algae
- Spines are attached to the endoskeleton; protection from predators
- Endoskeleton is left behind after it dies – common to find.



# Echinoidea: Sand Dollar

- Looks like a large coin.
- Covered by thin, spiny skin.
- Oval disc left behind after it dies.
- Catches plankton in sticky strings beneath the spines.



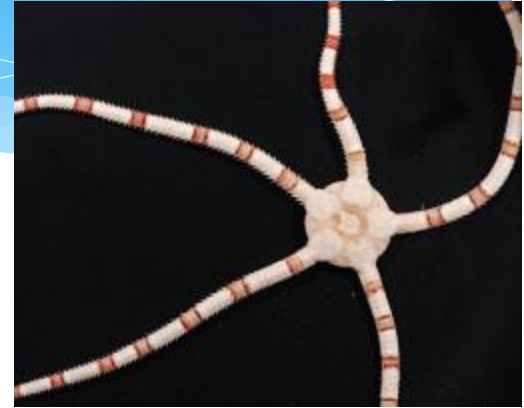




\* <http://echinoblog.blogspot.com/2012/03/sand-dollars-are-sea-urchins-please.html>

# Ophiuroidea: Brittle Star

- Solitary
- Lives under rocks in the intertidal zone
  - Found from the arctic to the tropics
- Also found on the deep sea floor (up to 800m deep)
- Long, flexible arms with muscles in them.
- Moves along sea floor quickly – catches bits of food.
- Can regenerate missing limbs.



# Holothuroidea: Sea Cucumber

- No endoskeleton
- No spines
  - Small bony pieces in skin
- Tube feet are arranged in 5 rows
  - Movement and feeding
- Sandy and rocky sea floors
  - Intertidal, sub-tidal and deep areas.
- Sticky, branching tentacles around the mouth
  - Used to trap bits of food; Retract (pull in) when disturbed
  - <http://video.nationalgeographic.com/video/weir>

