Chapter 11: Echinoderms
Spiny-skinned Invertebrates
Kingdom: Animalia
Phylum: Echinodermata ("spiny skin")
- Invertebrates
- Radial symmetry
- No body segmentation
- Includes: sea stars, sea urchin, brittle stars, sea cucumbers
Class Asteroidea: sea stars/starfish
- Live on **bottom** in sub-tidal zone to the deep ocean.
- Have 5 (or multiples of 5) **appendages (arms)**
Limb regeneration: limbs lost in fights can regenerate.

Spines on skin: attached to an endoskeleton (internal structure)
- Made of CaCO₃ (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.
  - **CO₂** and waste exit body through tube feet and skin.
  - Open circulatory system.
36. The Anatomy of a Starfish

- sieve plate
- anus
- reproductive gland
- skin gills
- canals
- stomach
- digestive gland
- tube feet
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.
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](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=nb2KOSTUGs0](https://www.youtube.com/watch?v=nb2KOSTUGs0))
    * 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.
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