

What are Echinoderms?

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5 extant classes of Echinoderms



Echinoidea



Asteroidea



Crinoidea



Ophiuroidea



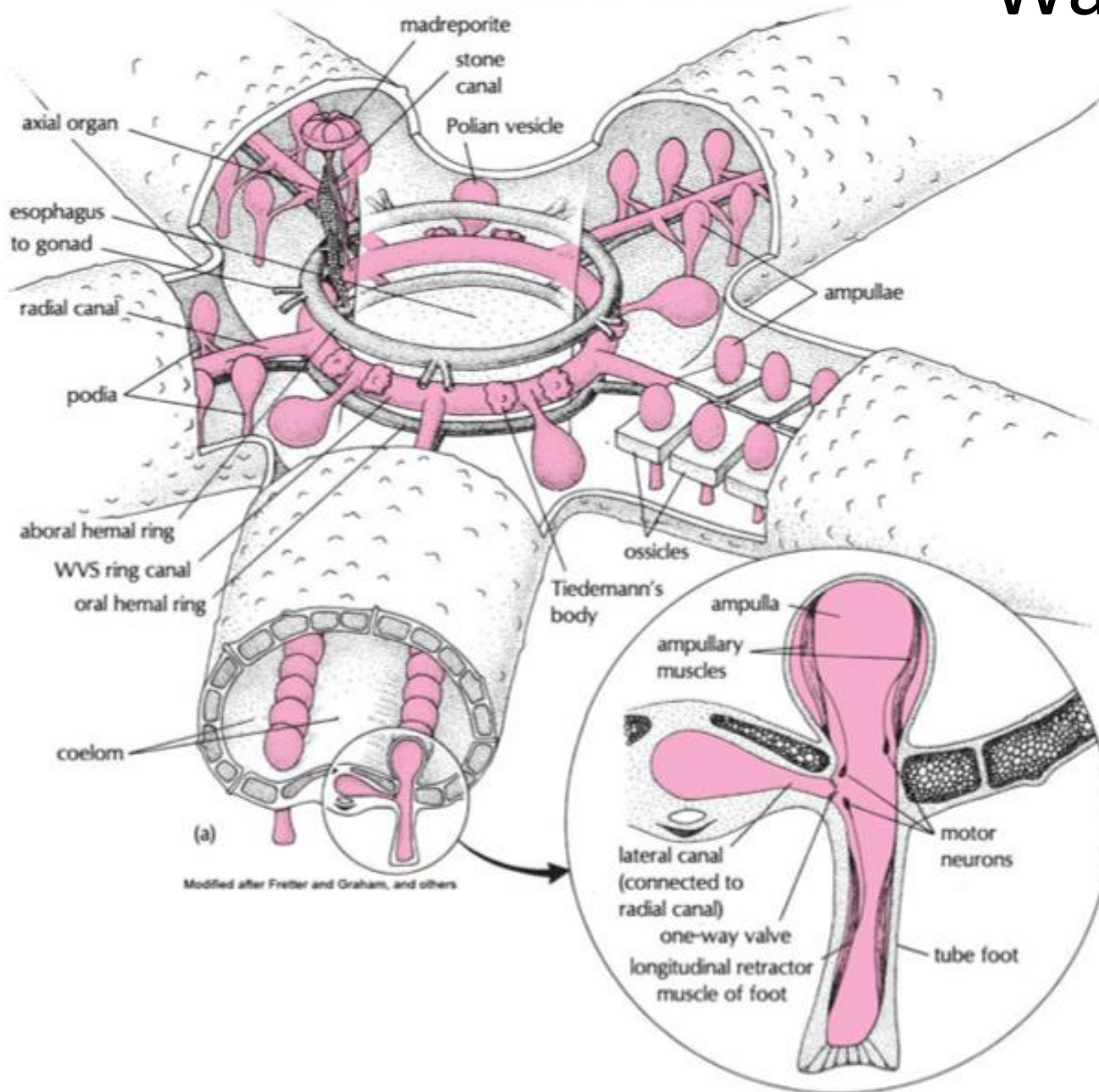
Holothuroidea

Phylum Echinodermata

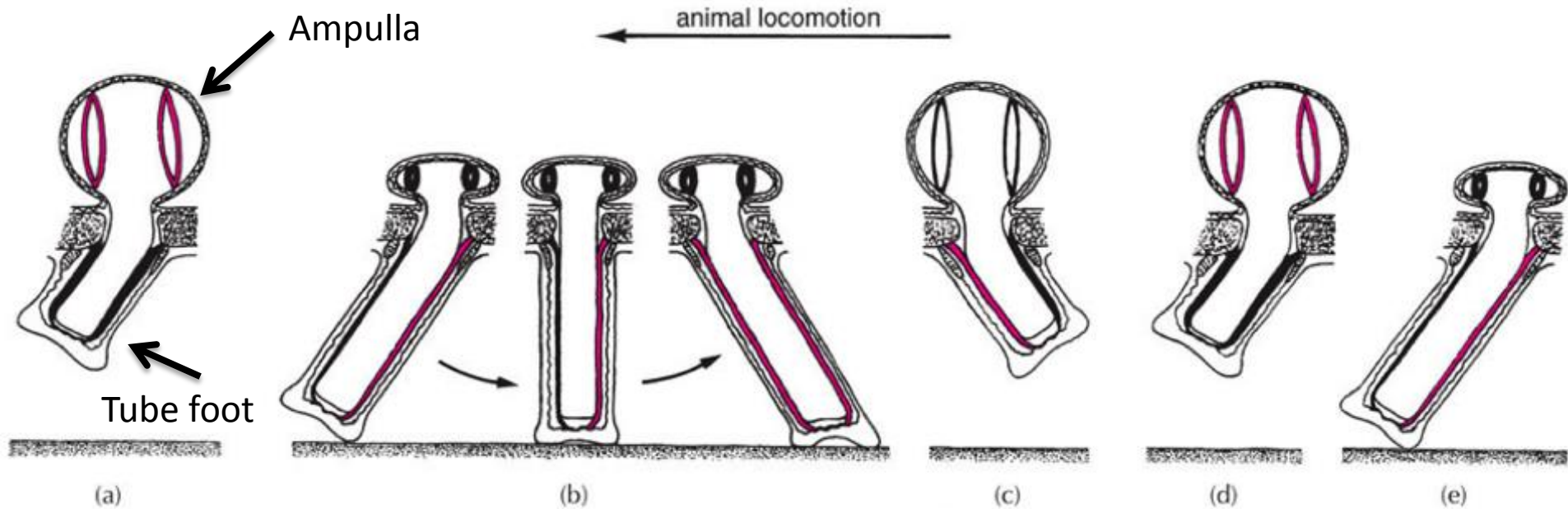
- General Characteristics
- Water Vascular System
- Pentamerous (five part) Symmetry as adults
- Bilateral Symmetry as larvae
- Calcareous ossicles form internal skeleton
- Mutable connective tissue



Water Vascular System



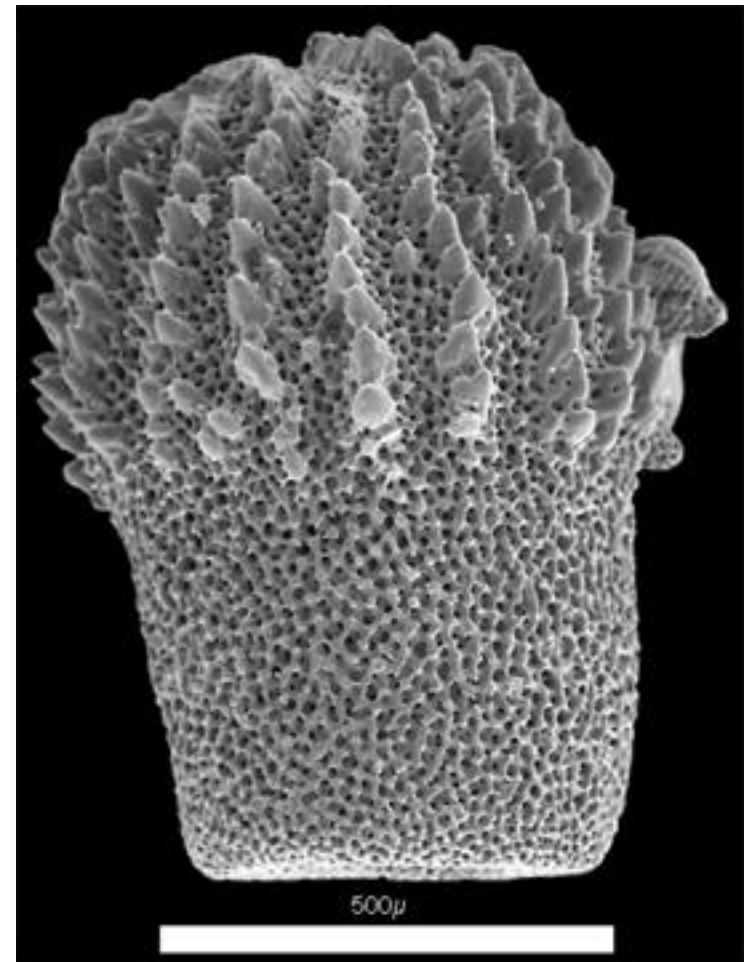
WVS Used for Locomotion



- **RED** indicates muscular contraction

Echinoderm Ossicles

- CaCO_3 ossicles form internal skeleton
- Vary widely across classes (cf urchin test with sea cucumbers)
- Unique stereom structure: porous structure filled with living tissue



Mutable Connective (Collagenous) Tissue

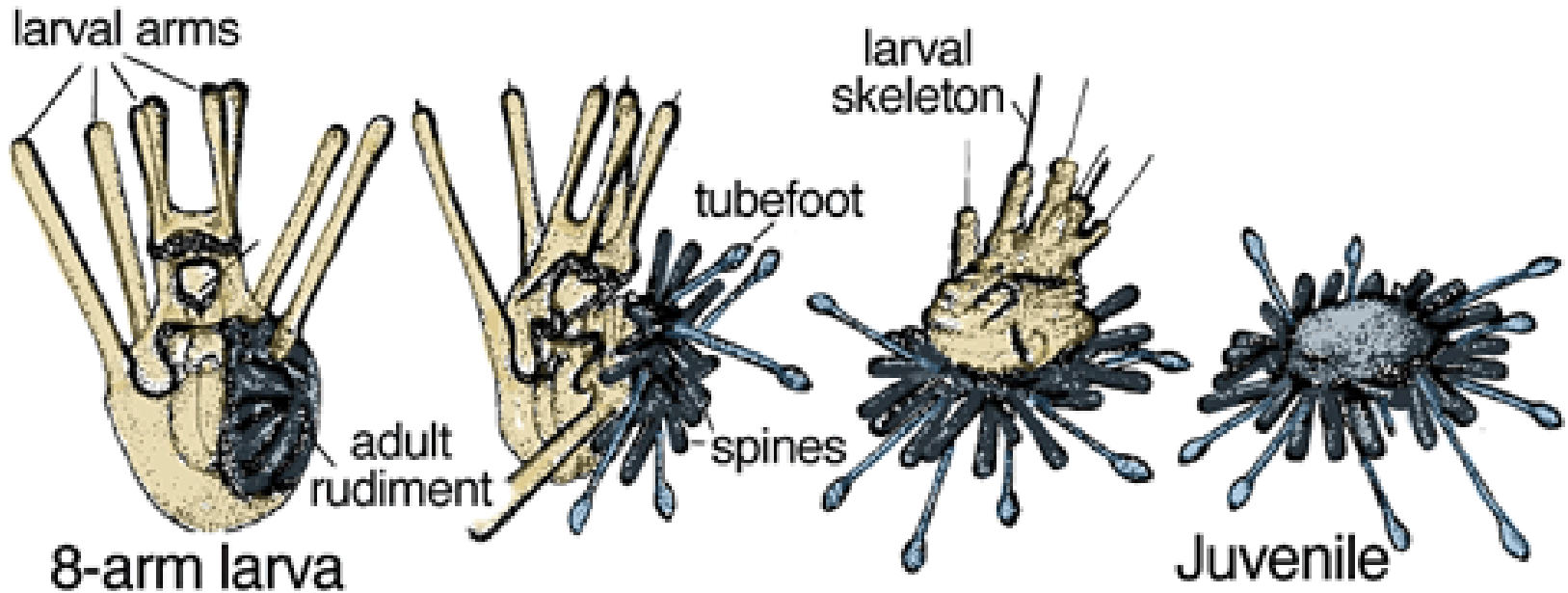
- MCT used for feeding in seastars
- MCT allows autotomy in Seastars and Bstars
- Changes in MCT are under nervous control
- Two nerve types present in extracellular matrix: one softens, one hardens
- Mechanism unknown: related to $[Ca^{2+}]$



Development and Symmetry Switch in Echinoderms



Metamorphosis in *Dendraster excentricus*



5 extant classes of Echinoderms



Echinoidea



Asteroidea



Crinoidea



Ophiuroidea



Holothuroidea

Crinoidea



- Sea lilies (deep sea) and feather stars (shallow tropical waters)
- 625 species
- Filter feeders
- Generally sessile but can move when agitated
- Generally considered primitive among the classes
- Far more numerous in fossil record than today

Crinoidea

- Amazing mobility for such delicate creatures
- Most echinoderms are light-averse



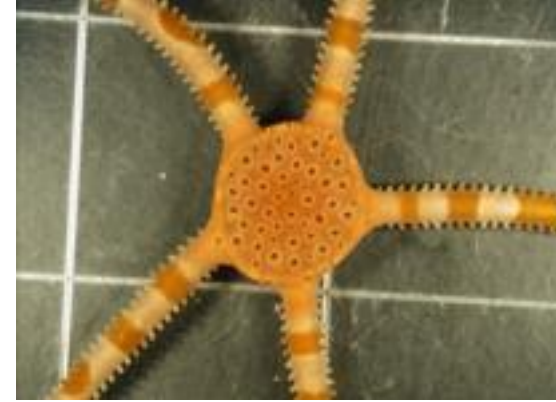
Phylum Echinodermata: Class Ophiuroidea

- Defining Characteristics:
 - Highly developed arm ossicles form ‘vertebrae’
 - 5 pairs of bursal slits for gas exchange and brood chambers



Ophiuroidea

- Brittlestars and basketstars
- Most speciose class (> 2000 species)
- Arms slender and distinct from central disc
- No suckers or ampullae on tube feet
- No intestine/anus



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- Basket Star



Bizarre Sea Creature Caught In Singapore Looks Like Kraken Come To Life

The Huffington Post | By Dominique Mosbergen   

Posted: 10/18/2014 10:26 am EDT | Updated: 10/18/2014 10:59 am EDT

Bizarre 'alien' sea creature caught off Singapore



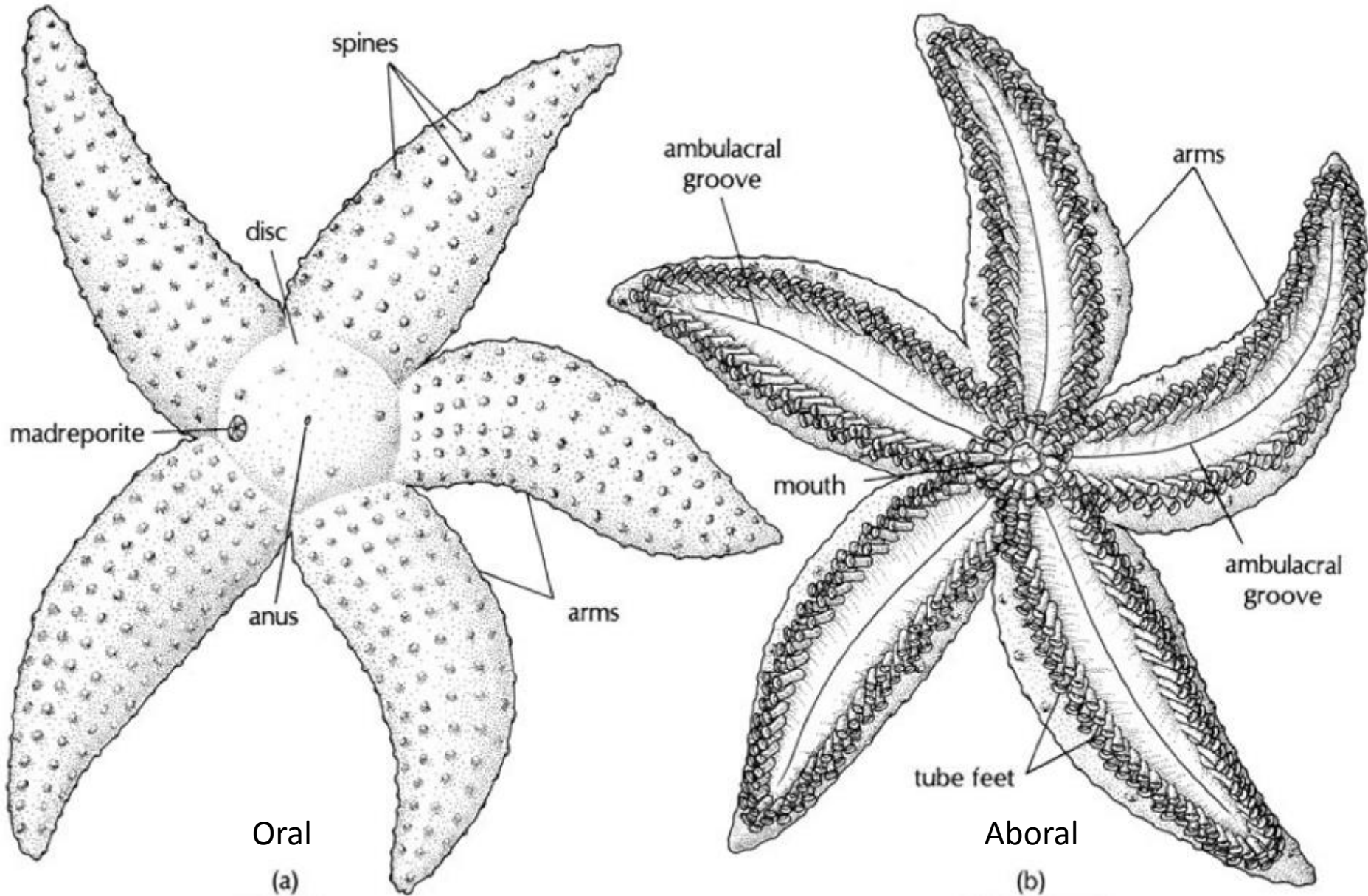
Asteroidea



- 1500 species
- Common intertidal and subtidal predators
- Mouth located on underside of body
- Ambulacrum runs from mouth to tip of each arm and bordered by tube feet
- Typically 5 arms (or multiples of 5; like Ophiuroidea)



Class Asteroidea: External Anatomy



Class Asterozoa: Top Predators



- [Seastars scare bivalves](#)
- [Why the bivalves are scared](#)

Visic

- Asteroi at arm
- Compo cup oce
- Act as a can det (but no

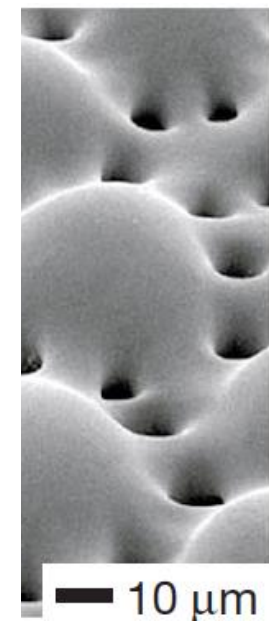


Chromatophore cells move up and down within stereom during day/night transitions



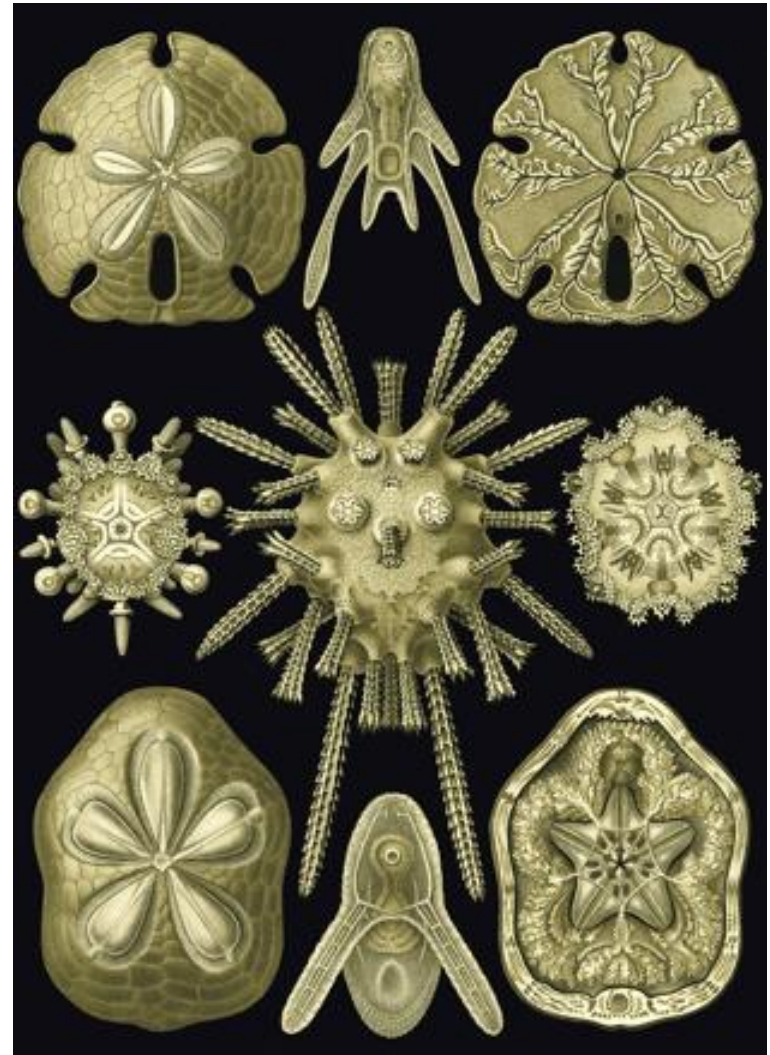
roids

individual) as a
phores of light; ds to ie lenses

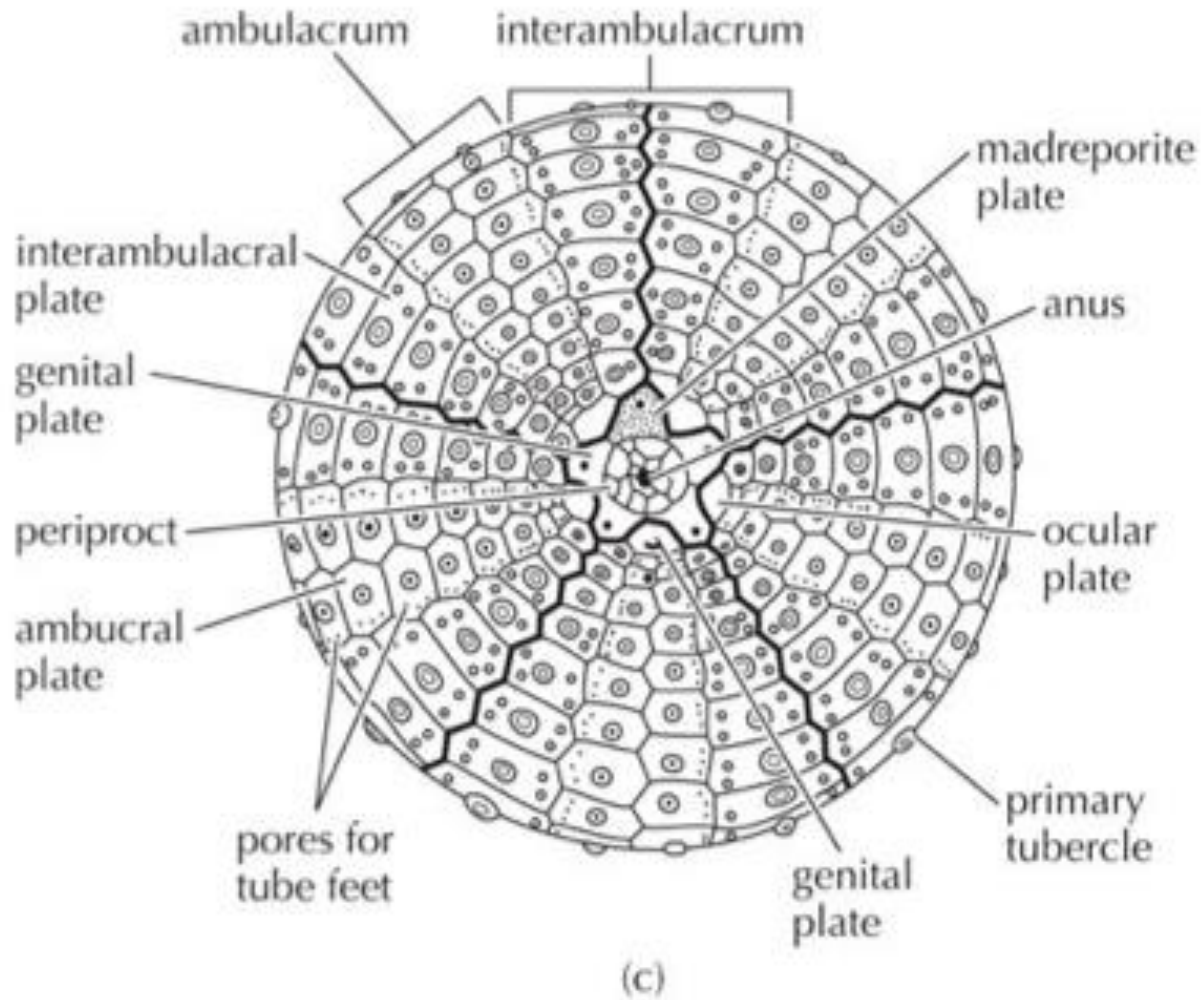


Phylum Echinodermata: Class Echinoidea

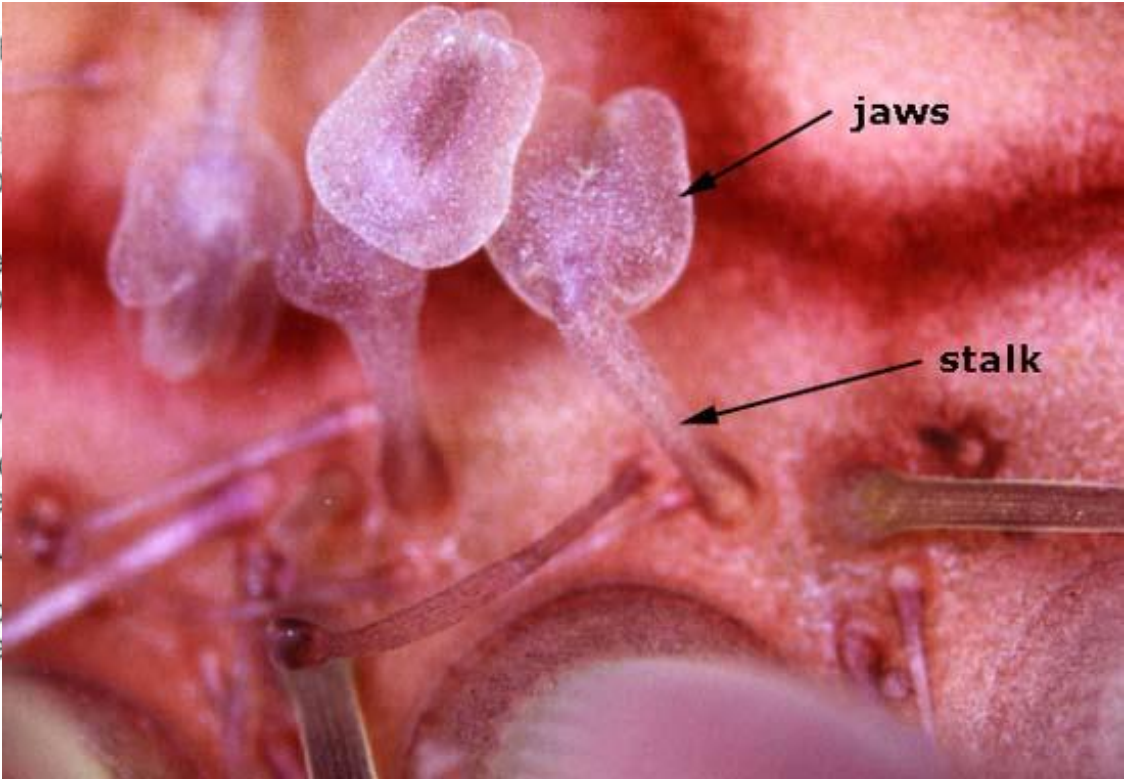
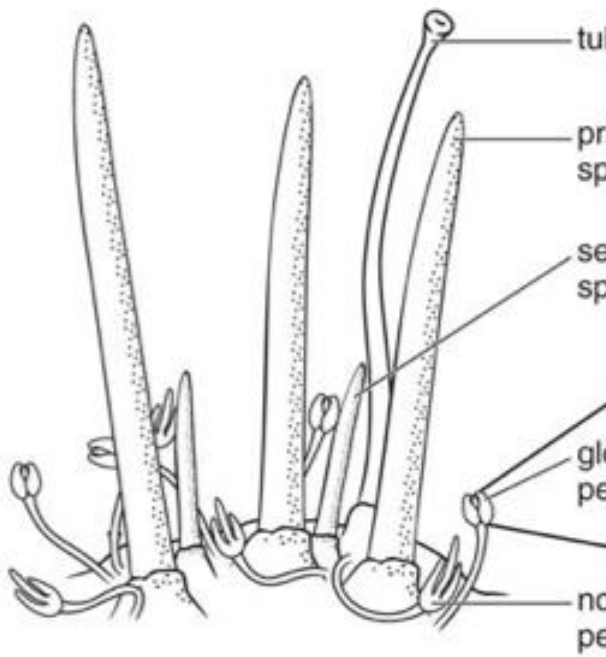
- ~1000 spp.
- Exclusively marine
- Ossicles joined to form a rigid test
- Unique set of ossicles and muscles for feeding: Aristotle's lantern



Class Echinoidea: External anatomy (aboral)



Class Echinoidea: External Anatomy



- Close-up of body

Sea Urchins in the Headlines



Don't be scared of *Diadema*
Taylor...but these can be trouble



Class Echinoidea: Irregular vs Regular

- Regular Echinoids
 - Sea urchins
 - Nearly spherical symmetry
 - Anus and mouth on opposite sides of body
- Irregular echinoids
 - Sand dollars, sea biscuits, heart urchins
 - Bilateral symmetry
 - Anus posterior to mouth on the edge of the test

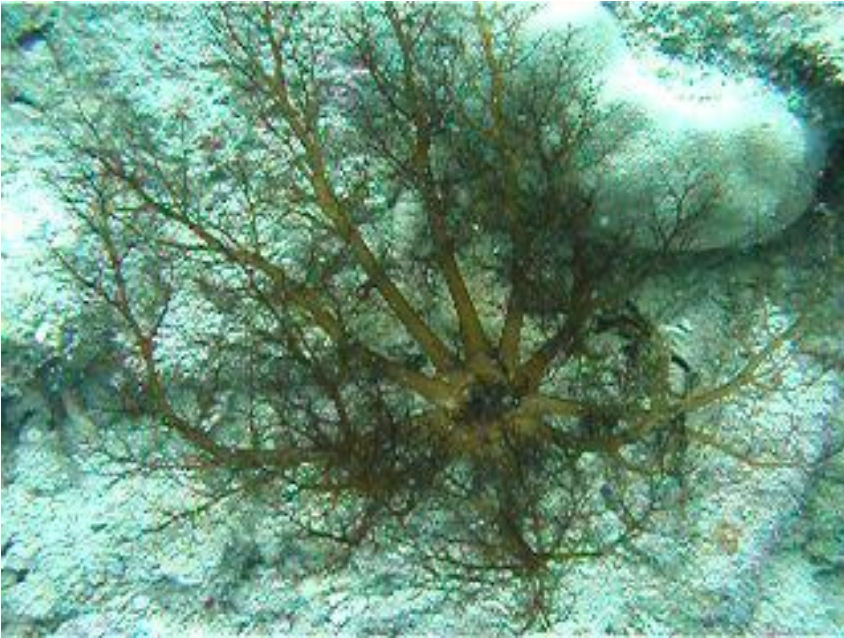


Phylum Echinodermata: Class Holothuroidea

- 1200 spp.
- Soft bodied and vermiform
- Ossicles highly reduced
- Highly branched respiratory trees connected to anus (ugh)
- Oral-aboral axis elongated



Class Holothuroidea



- Feeding in sea cucumbers
- Note maintenance of pentameral symmetry
- Note coordination of inner and outer tentacles
- How else do sea cucumbers feed?

Sea Cucumbers as Habitat

- Pearlfish use sea cucumbers as a home to live in
- Recall animals living in sponges etc.
- [But pearlfish are a bit unusual...](#)



Holothuroidea

- One last trick:
evisceration and
regeneration of internal
anatomy
- [Sea Cucumber's Bad
Day](#)

