Phylum Echinodermata
Meaning ‘Spiny Skin’

Examples: Sea Stars, Sea Urchins,
Sea Cucumbers, Sand Dollars,
Sea Lilies
Phylum Echinodermata
Learning Outcomes

• Describe the unifying characteristics of members of phylum echinodermata
• Describe how echinoderms carry out their life functions
• Describe the ecological roles of echinoderms
General Characteristics

- Radial symmetry
- 3 cell layers
- Extensive coelom
- No head region or anterior end
- Have a water vascular system
Sea Star Ingestion

- Sea stars have 2 stomachs (upper & lower)
- Suckers on tube feet separate the valves of a clam, mussel...
- Turns lower stomach inside out through mouth
Sea Star Digestion

• Enzymes are secreted to digest the clam inside its shell
• Partially digested material is moved to the upper stomach
• Sea stars have 5 pairs of digestive glands (1 pair in each arm)
Sea Star Elimination

• Undigested food wastes exit through the anus on the aboral (top) surface
Respiration & Circulation

• Gas exchange takes place on the skin gills and tube feet

• Gases and nutrients are distributed in the coelom where the fluid bathes the organs
Pedicellariae

- Sea stars have pedicellariae (like little pinchers) which help to clean debris from the surface of their skin gills
Sea Star Excretion

- Nitrogenous wastes are diffused out the skin gills and out the tube feet
Sea Star Reproduction

Asexual Reproduction
• Sea stars are able to regenerate missing parts as long as there is a portion of the central disk present

Sexual Reproduction
• Sea stars have separate sexes
• Each arm contains 2 pairs of gonads
• Sperm/eggs are released into water
• Fertilization is external
Sea Star Nervous System

- No cephalization
- Sea stars do have sense organs and a nerve net
- Sea stars have an eyespot at the end of each arm
Sea Star Movement
Water Vascular System

• The water vascular system is a fluid hydraulic system used in locomotion and capturing prey
• Water enters through holes in the sieve plate located on the aboral surface
• Cilia draw water into the stone canal where it moves into the ring canal and then the 5 radial canals
Water Vascular System (2)

- Water is carried to the pairs of tube feet
- The ampulla fills with water
- Muscles around the ampulla contract forcing water into the stalk
- Due to the hydrostatic (water) pressure the stalk lengthens and the suction cup attaches to the surface
Water Vascular System (3)

• When muscles of the ampulla relax the stalk shortens and water is forced back into the ampulla
• The suction cup detached from the surface
Water Vascular System

- Madreporite
- Stone canal
- Ring Canal
- Radial canal
- Tiedmann's body
- Tube feet
- Ampulla
- Polian vesicle
- Podia/Sucker
- Lateral canal
$ Economic Importance $

• Sea stars are predators to many things that people like to eat (crabs, bivalves…)
• Some are also used as a food source for people
Ecological Importance

• Sea urchins play a large role in the functioning of kelp forest ecosystems – help to control kelp populations
• Food source for marine & terrestrial animals (sea urchins are food for sea otters)
• Sea stars are important carnivores – control populations of marine animals