

PHYLUM ECHINODERMATA

- **Meaning** 'spiny skin'
- **Examples:** sea stars, sea urchin, sea cucumber, sand dollars, serpent star, sea lilies
- **Characteristics:**
 - Radial symmetry
 - Water vascular system
 - 3 cell layers, extensive coelom
 - separate sexes
 - external fertilization
 - no head region or anterior end
 - complete digestive system
 - no excretory system
 - no cephalization, but they do have sense organs and a nerve net
 - sea star has eyespot at end of arm
 - no respiratory system. Respiration occurs through skin gills and tube feet
 - pedicellariae- look like pincers which help to clean the surface of skin gills from debris and predators
 - have the ability to regenerate, provided they have a section of the central disk.
- **H₂O vascular system:**
 - Fluid hydraulic system used in locomotion and capturing prey
 - H₂O enters through holes in the sieve plate located on the aboral surface
 - Cilia draw H₂O → stone canal → H₂O enters ring canal → 5 radial canals located in each arm
 - H₂O is carried to pairs of tube feet
 - Ampulla fills with H₂O
 - Muscles around ampulla contract forcing H₂O into the stalk
 - Due to hydrostatic pressure stalk lengthens and suction cup attaches to surface
 - Muscles of ampulla relax → stalk shortens → forcing H₂O back into ampulla
- **Ingestion, Digestion, and Elimination:**
 - Sea stars have 2 stomachs: upper and lower
 - Suckers on tube feet separate the valves of a clam, mussel, or oyster
 - Turns the lower stomach inside out through mouth
 - Enzymes are secreted to digest the clam
 - Partly digested material → upper stomach → 5 pairs of digestive glands for further digestion in each arm
 - Solid wastes exit the anus on the aboral surface

- **Respiration and Circulation:**
 - Gas exchange takes place on the skin gills and tube feet
 - Pedicellariae help to clean debris from the skin gills and are protected by CaCO₂ spines
 - Gases and nutrients are distributed in the coelom, where the fluid bathes the organs

- **Excretion:**
 - N-wastes are diffused out the skin gills and tube feet

- **Reproduction:**
 - Asexual – regeneration (central disk must be present)
 - Sexual – separate sexes
 - each arm contains 2 pairs of gonads → release egg/sperm → external fertilization → zygote → larva → adult

- **Ecological Importance:**
 - Sea urchins control populations of kelp or marine algae
 - Food source for marine/terrestrial animals (eg sea urchins are food for otters)
 - Sea stars are important carnivores, controlling populations of marine animals (keystone predator)