

Phylum Echinodermata:

echinos = spiny

derma = skin

ata = to bear



General Characteristics:

1. Calcareous endoskeleton, often bearing visible spines.
2. Adults with pentaradial symmetry, frequently with central disc and 5 (or more) radiating arms or rays.
3. Water-vascular system used in locomotion, attachment, &/or feeding.

Special Note:

- *The larval forms are bilaterally symmetrical. This symmetry is lost during transition to adulthood.*
- *Why transition from bilateral symmetry in larvae to radial symmetry in adults? Unlike a bilateral symmetrical adult, an echinoderm can greet its environment from all sides and respond to it.*



Pentaradial symmetry:

- a form of radial symmetry: parts arranged in fives, or multiples of fives, around an oral-aboral axis (top and bottom of a dinner plate)
- Since the larval stages are bilaterally symmetrical, they are believed to have evolved from bilateral ancestors.



Why 5 arms instead of 6?

- The 5 part organization may be advantageous because joints between skeletal ossicles (joints) are never directly opposite one another, as they would be with an even number of parts.
- Having joints on opposite sides of the body in line with each other could make the skeleton weaker.

Additions to our directional terminology:

- Aboral: upper surface (think of the part of the dinner plate you eat from)
- Oral: lower surface (think of the part of the dinner plate on the table)



Habitat:

- - marine environments
- bottom of deep seas
- bottom of coastal shores

Niche:

- - relatively slow moving
- - feeding
 - *some species feed on animal remains on the ocean floor
 - *some filter plankton through their mouth pore
 - *some scrape food off rocks
 - *others are predaceous on mollusks, arthropods

Classes of Echinodermata:

Class Stelleroidea

examples: sea stars (starfish), brittle stars

sea stars:

- - general characteristics:
- 1. most common echinoderm; central disc and 5 arms (or rays) radiating from disc
- 2. may be various colors of red, purple, green, blue and yellow
- 3. range in size from about 2 cm to nearly a meter
- - found on pier pilings and rocks in tide pools along coasts



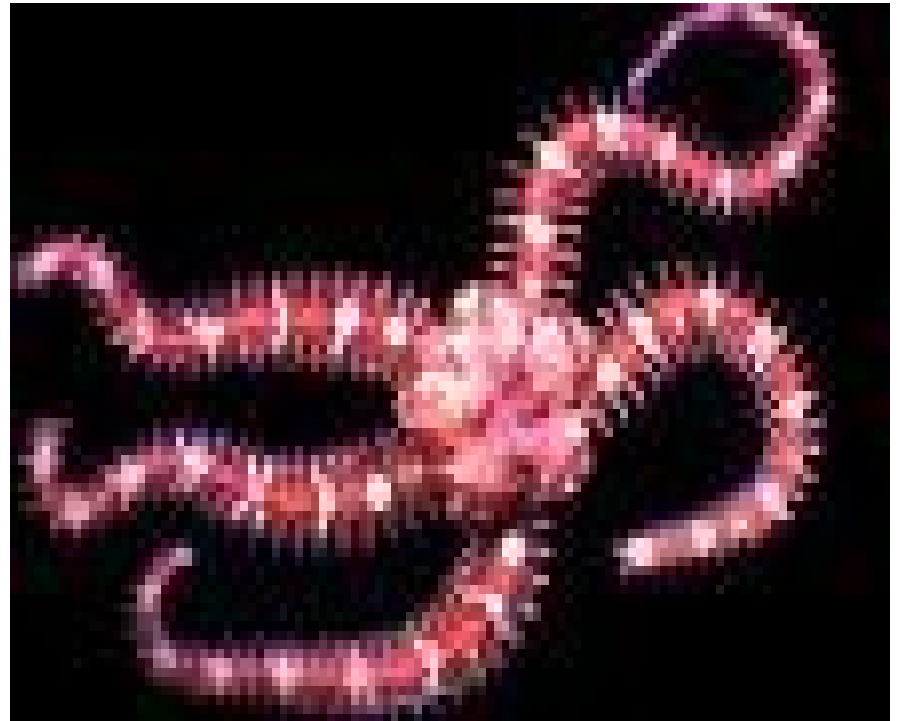
Classes of Echinodermata:

Class Stelleroidea

examples: sea stars (starfish), brittle stars

brittle stars:

- - general characteristics:
- 1. a distinct disc set apart from the arms
- 2. slender, articulating arms
- 3. rapid, serpentine (snakelike) movements
- - found on the seashore, burrowed in sand or
- deep sea sediments or under rocks and kelp



Class Echinoidea

examples: sand dollars, sea urchins



sand dollars

- - general characteristics
- 1. range in size from 1-15 cm
- 2. flattened skeleton (test) covered with a dense thicket of tiny spines
- 3. aboral surface exhibits flower petal-shaped grooves (petaloids) that correspond to the arms of sea stars and brittle stars
- 4. tube feet in the petaloids are used in locomotion

Class Echinoidea

examples: sand dollars, sea urchins



sea urchins

- - general characteristics
- 1. rounded body shape
- 2. long spines on exterior
- 3. the areas corresponding to the rays of the sea stars are fused

Class Holothuroidea

examples: sea cucumbers, feather stars

sea cucumbers

- - general characteristics
- 1. long, cucumberlike body lacking a solid, calcareous skeleton
- 2. oral end has a ring of retractile tentacles that represent highly modified tube feet
- - found on the sea bottom, often partially
- submerged in mud or sand, or
- among intertidal
- rocks



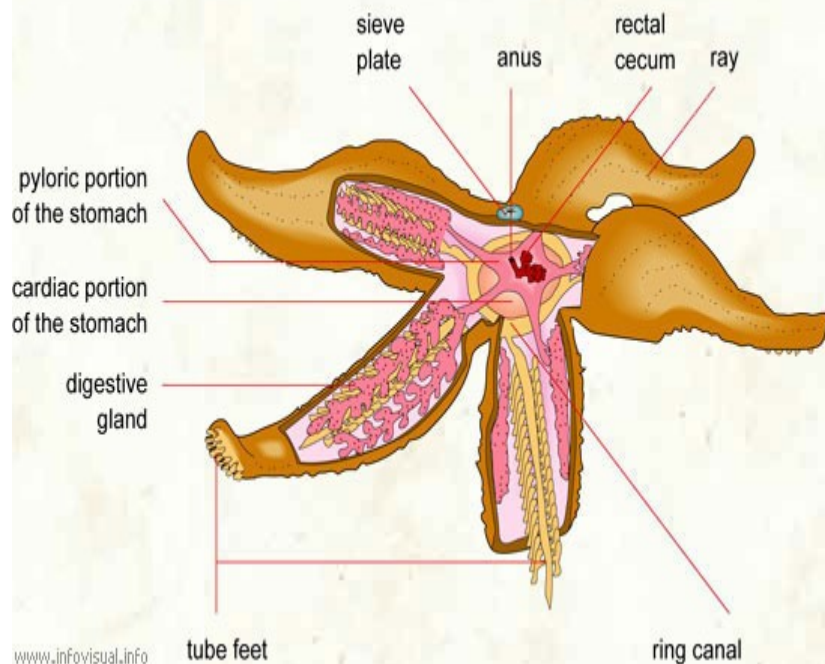
Class Holothruoidea
examples: sea cucumbers, feather stars

feather stars

- - general characteristics
- 1. most primitive of the living echinoderms
- 2. from a small cup or calyx, protrudes five flexible arms (rays) with branches (pinnules) very much like pine needles



Digestive System:

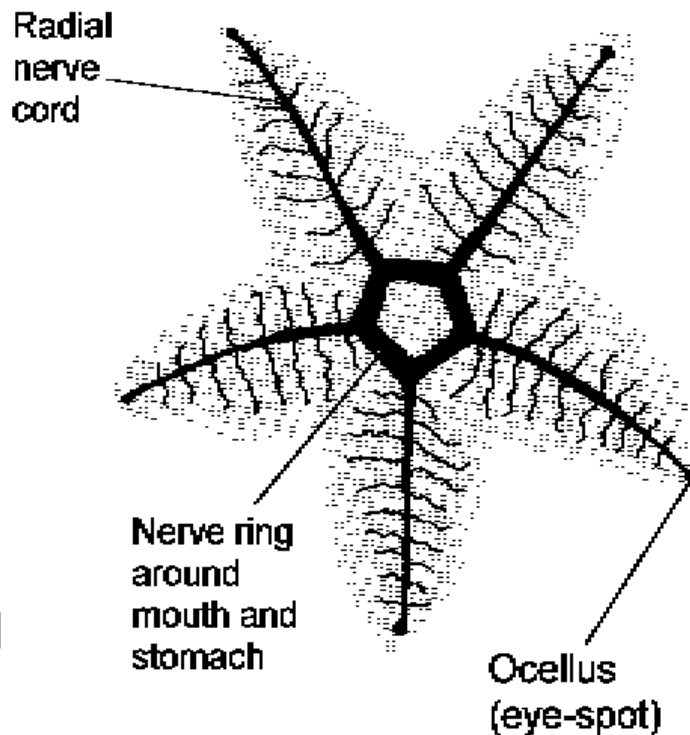


- -have an anus, but it is almost nonfunctional; undigested food is expelled back through the mouth
- -respond to light, chemicals, and various mechanical stimuli

Reproduction:

- dioecious – the two sexes are indistinguishable externally
- gamete release by one individual is accomplished by the release of spawning pheromones, which induce other sea stars in the area to spawn, increasing the likelihood of fertilization

Nervous System:



- ○ nerve ring that encircles the mouth
- ○ radial nerves that extend into each arm (these coordinate the functions of the tube feet)
- other nervous elements are in the form of a nerve net associated with the body wall