

PHYLUM ECHINODERMATA ("spiny skin", 6,000 spp)

1. Marine
2. Secondary radial symmetry, pentagon-based
3. Body wall support by a calcareous skeleton of OSSICLES - can have external spines
4. Water vascular system - internal canal system & external TUBE FEET - locomotion, feeding, sensory, gas exchange
5. Mouth in ventral center of body
6. Coelomic fluid has circulatory function - internal transport, excretory exchange, & gas exchange (DERMAL BRANCHIAE, PAPULAE)
7. Nervous system is pentamerous
8. Dioecious, external fertilization  
bilateral larvae (BIPINNARIA larvae)

(Taxonomic "line up")

Phylum ECHINODERMATA

Subphylum ASTEROZOA (arms)

Class STELLEROIDEA

Subclass ASTEROIDEA (1,600 spp)

starfish - tube feet in grooves under arms

- arms grade into central disc

Subclass OPHIUROIDEA (2,000 spp)

brittle stars - no grooves in arms

- arms set off from central disc

- fast moving

Subphylum ECHINOZOA (no arms)

Class HOLOTHUROIDEA (1,100 spp)

sea cucumbers

Class ECHINOIDEA (900 spp)

sea urchins & sand dollars

Subphylum CRINOZOA (arms, branched filter feeders)

Class CRINOIDEA

feather stars, sea lillies

## Subphylum Asterozoa

### Class Stellerioidea

Subclass Asteroidea ("star form") 12 - 24 cm to 1 m

Ambulacral Groove - contains mouth & tube feet

Tube feet in rows of 2's or 4's - outer most feet of a row have sensory duty (red eye spot)

Madreporite - outside opening to water vascular system:

Stone

Ring                      Canals

Radial

Lateral

Ampulla - generate force for tube foot activity

Forces fluid into PODIUM, podium extends and swings forward.

SUCKER provides adhesion. Longitudinal muscles of podium contract, forcing fluid back into ampulla. Pulls body forward by hydraulic action

Soft-bottom spp. have double the # of tube feet (4 rows/ ambulacral groove)

Nutrition - short GI Tract - long gastric caecae,

everting stomach over prey

Carnivorous forms eat crustacea, moluscans, &  
other echinoderms

Scavengers too

Respiration - tube feet, dermal branchiae (papulae)

Skeletal support from ossicles - mostly external

Ossicles form a flexible lattice

Pedicellaria defenses outer surface from ectoparasites

Nervous system - nerve ring & radial nerves -

coordinate tube feet

Sensory - photoreceptors on end tube feet

- tactile & chemoreceptors on tube feet,  
especially end feet

## Subphylum Asterozoa

### Class Stellerioidea

#### Subclass Ophiuroidea ("serpent form") brittle stars

- Tube feet for feeding (not locomotion)
- Long articulated arms
- No Papulae (Bursae instead)
- No ambulacral Grooves
- Madreporite on oral side (aboral in star fish)
- Well developed muscles
- Spines for traction

#### Nutrition

- Scavengers, deposit feeders, filter feeders  
(arms move and trap micro organisms w/mucous)

## Subphylum Echinozoa

### Class Holothuroidea (1,100 spp) sea cucumbers

- No arms
- Body lengthened
- Tube feet modified into tentacles
- Plankton & detritus feeders (conspicuous casts)
- Long GI tract
- Cloaca modified for gas exchange
  - Respiratory Tree - rectum pumps O<sub>2</sub>

Class Echinoidea (900 spp) sand dollars & sea urchins

Ossicles fused to form a rigid internal shell -

"Aristotle's Lantern" - functions to scrape algae & encrusted animals

No arms - still have 5 ambulacral grooves & tube feet for locomotion

Long spines in sea urchins

Pedicellaria (some with poison glands)

Bushy gills

Lunules in sand dollars - indicate points of fusion between arms

Subphylum Crinozoa

Class Crinoidea (625 spp) sea lillies

All living species with oral surface upward (unique)

Arms with lateral Pinnules

Ciliated ambulacral grooves flanked w/suckerless podia - toss plankton into groove

which contains mucous - plankton transported to mouth via cilia

Stalked & sessile (some detached)

Most primitive of echinoderms