

Phylum: Echinodermata (spiny skin), General characteristics:

1. Echinoderms are **marine**, free living, **triploblastic**, **unsegmented** and they are without definite head.
2. The body is **rounded, cylindrical**, or **star shaped** with **five or more radiating areas**.
3. Have two faces **oral** (Mouth and 5 ambulacral groove) and **aboral** (Anus and madreporite).

Body has a system called **Water Vascular System (WVS)** consisted of canals; **ring canal, stone canal, radial canal, lateral canals, madreporite, ampullae, tube feet**. Podia and WVS performs many functions like; **locomotion, feeding, respiration, excretion** and **sensory**.

Endoskeleton is consisted of calcareous plates (**ossicles**) that connected to each other by connective fibers. Ossicles covered with spines, **pedicellariae** used for **locomotion** and **defense**.

3. Digestive system is complete
4. No Respiratory system, but respiratory is via **tube feet, skin, respiratory tree**.
5. Circulatory system is a reduced hemal system consisted of central ring, 5 radial vessels, and amoebic blood cells. The system lacks heart and hemoglobin (except sea cucumber).
6. No Excretory system, but excretion is done via **amoebocytes, tube feet** and **papulae**.
7. Nervous system is simple, lacks brain and consisted of central ring and 5 radial nerves.
8. Sexes are separated; Reproduction is either **asexual by regeneration** or **sexual by gonads** in the arms. Gametes release via genital holes. Fertilization happens externally.
9. Lifecycle includes **indirect growth**, the larval stage undergoes metamorphosis to become adult: **Egg → ciliated Larva (with different names) → Adult**.

Phylum: Echinodermata (spiny skin) is divided into FIVE Classes, are as follow:

1. **Class: Asteroidea**, example; **Asterias sp.** (sea star)
2. **Class: Ophiuroidea**, example; **Ophiura sp.** (sea serpent)
3. **Class: Echinoidea**, example; **Arbacia sp.** (sea urchin)
4. **Class: Holothuroidea**, example; **Cucumaria sp.** (sea cucumber)
5. **Class: Crinoidea**, example; **Antedon sp.** (sea lily)

Kingdom: Animalia

Phylum: Echinodermata (spiny skin)

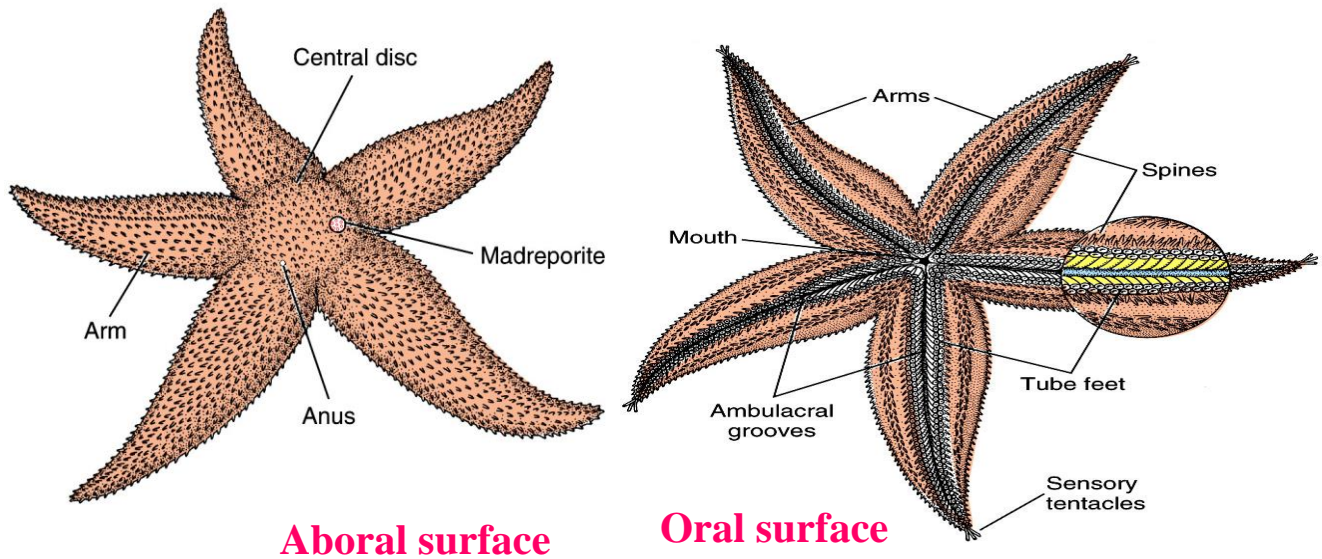
Class: Asteroidea

Order: Asteroiidae

Asterias sp. (Starfishes of sea star)

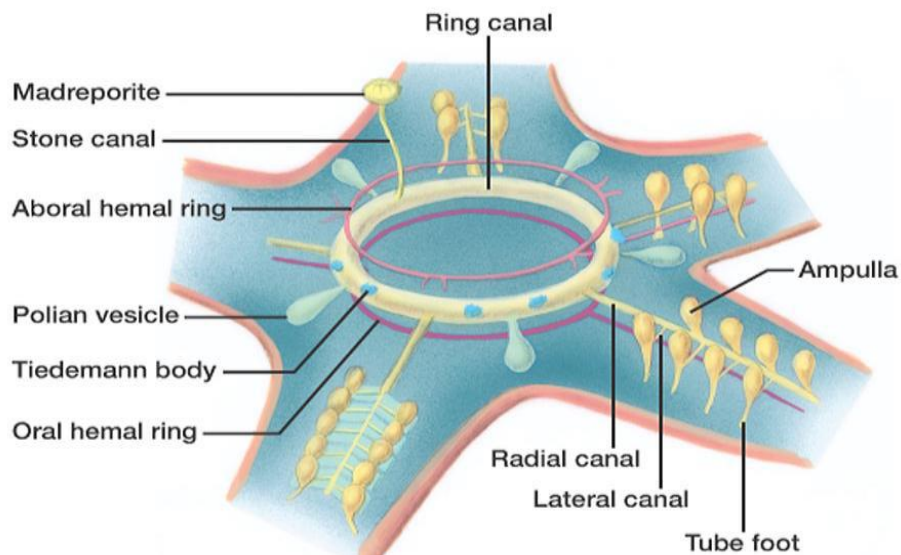
1. Body is flattened, consisted of two regions; central disk and arms. Arms aren't sharply marked off from central disc. Mouth is on oral surface, anus & madreporite are on aboral.
2. Endoskeleton is consisted of ossicles. It is covered by epiderm that bears spines and pedicellariae spine on the aboral surface.
3. Ambulacral groove of arm is found, that contains rows of tube feet ending in suckers.
4. Arms contain pyloric caeca. Stomach can be everted. They feed on molluscs or planktons.
5. Life cycle includes an indirect growth, the larva called Bipinnaria.

Egg → Bipinnaria Larva → Adult



Aboral surface

Oral surface



Kingdom: Animalia

Phylum: Echinodermata (spiny skin)

2. Class: Ophiuroidea

Order: Ophiurida

Genus: Ophiura sp. (sea serpent)

1. Body is flattened, consisted of two regions; central disc and arms. Arms are sharply marked off from central disc. Mouth & madreporite are on oral surface but anus is absent.
2. Endoskeleton is consisted of ossicles. It is covered by epiderm that doesn't bear spines and pedicellariae spine. Ossicles found on arms are fused like vertebrate.
3. Ambulacral groove of arm isn't found, and tube feet lack suckers and ampullae.
4. Arms lack pyloric caeca. Stomach can't be everted. They feed on minute planktons.
5. Life cycle includes an indirect growth, the larva called Pluteus.

Egg → Pluteus Larva → Adult

