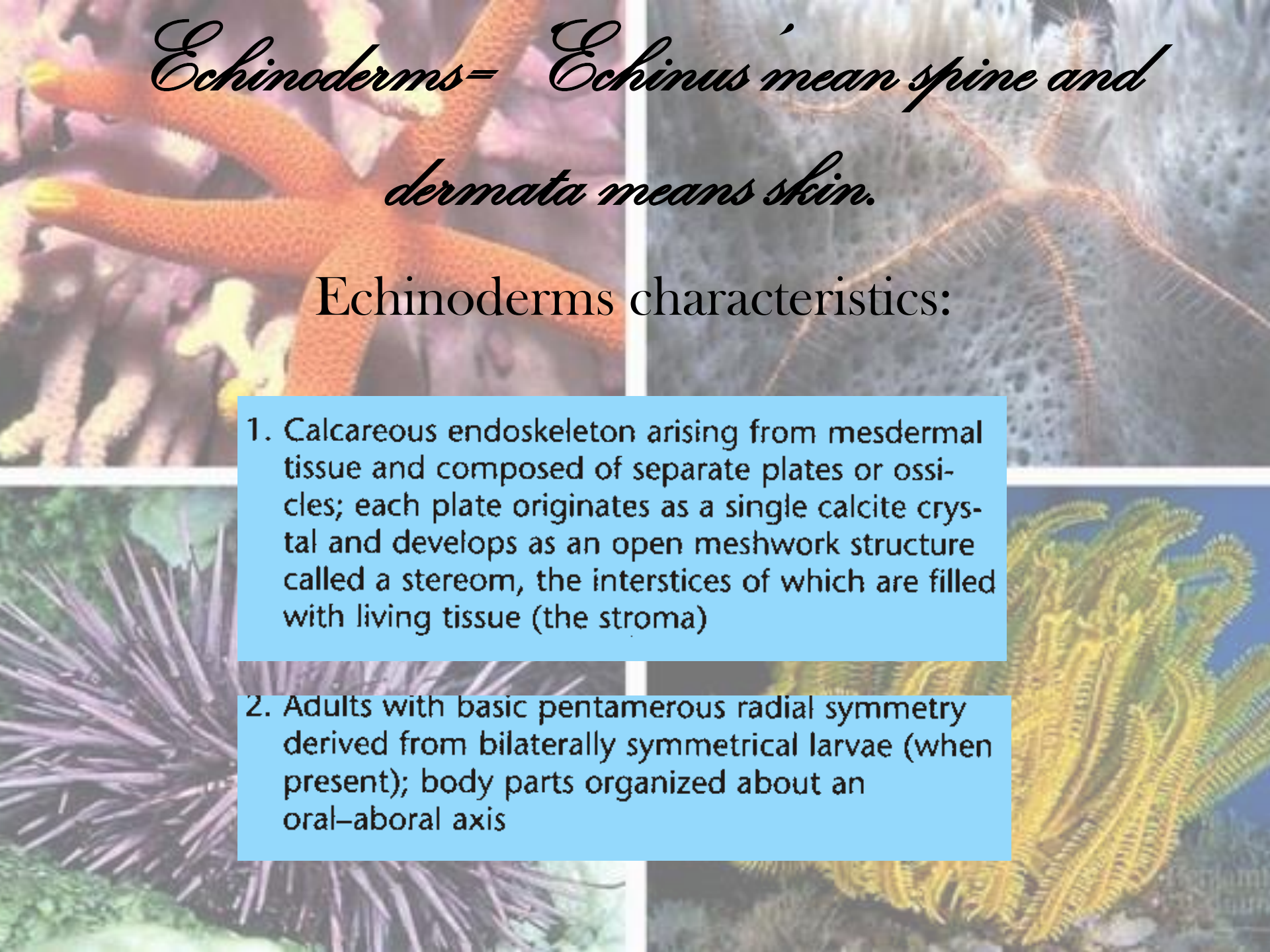


The background of the slide is a photograph of fossilized crinoid stems. The stems are dark grey or black, showing a segmented, ribbed structure. They are embedded in a light-colored, sandy matrix. The stems are arranged in a fan-like pattern, with some extending upwards and others downwards. The overall appearance is that of ancient, mineralized plant-like structures.

**ZOOACOR03T: Unit-06**  
**Echinodermata: General Classification**  
**and Salient features**

**WHAT'S THESE SPINY SANDY  
CREATURES LOOKING LIKE AN ALIEN?**

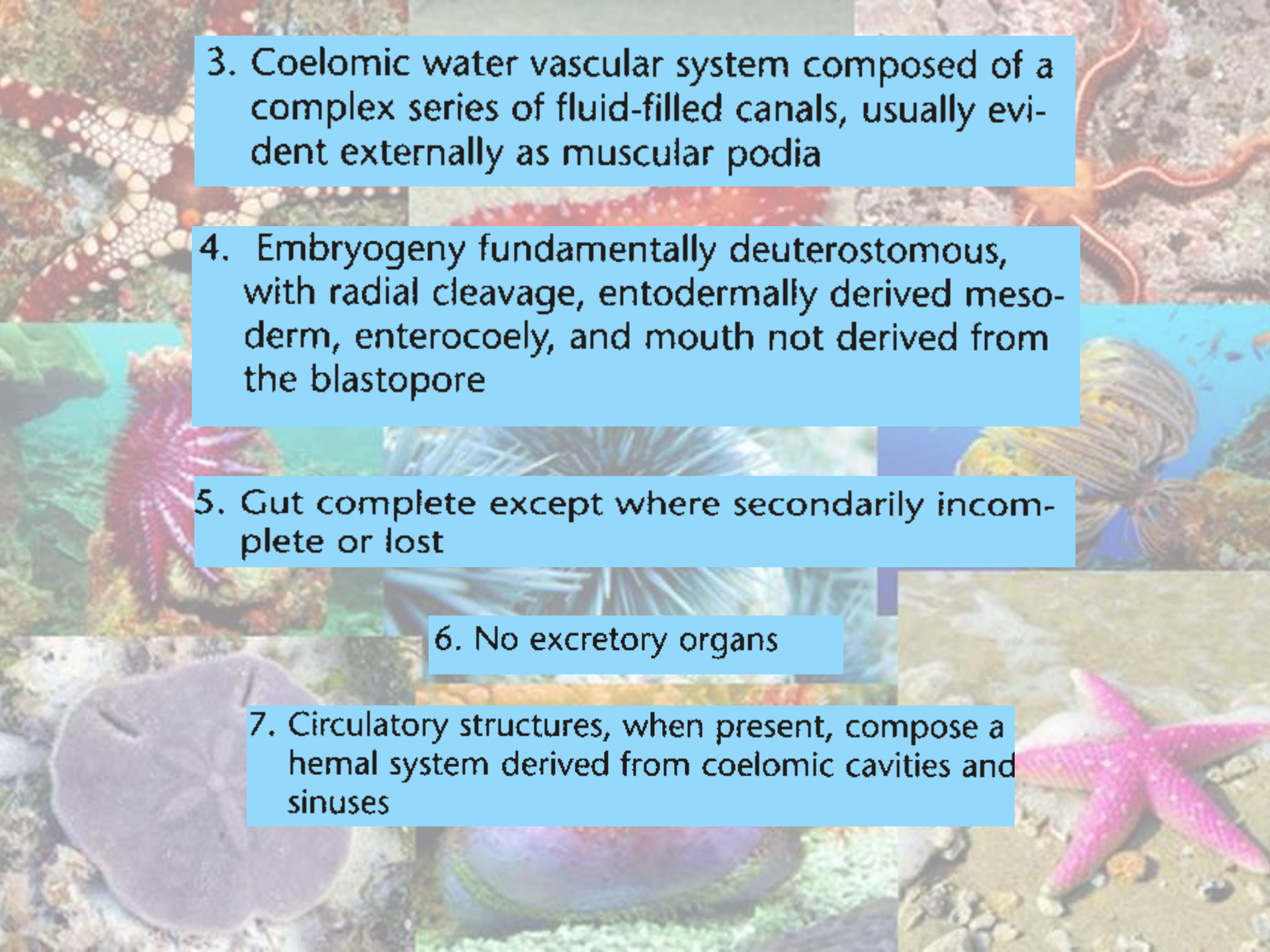
RituparnaMaity  
HMMCW  
rituparnamaityz@gmail.com



*Echinoderms = Echinus mean spine and  
dermata means skin.*

## Echinoderms characteristics:

1. Calcareous endoskeleton arising from mesodermal tissue and composed of separate plates or ossicles; each plate originates as a single calcite crystal and develops as an open meshwork structure called a stereom, the interstices of which are filled with living tissue (the stroma)
2. Adults with basic pentamerous radial symmetry derived from bilaterally symmetrical larvae (when present); body parts organized about an oral-aboral axis



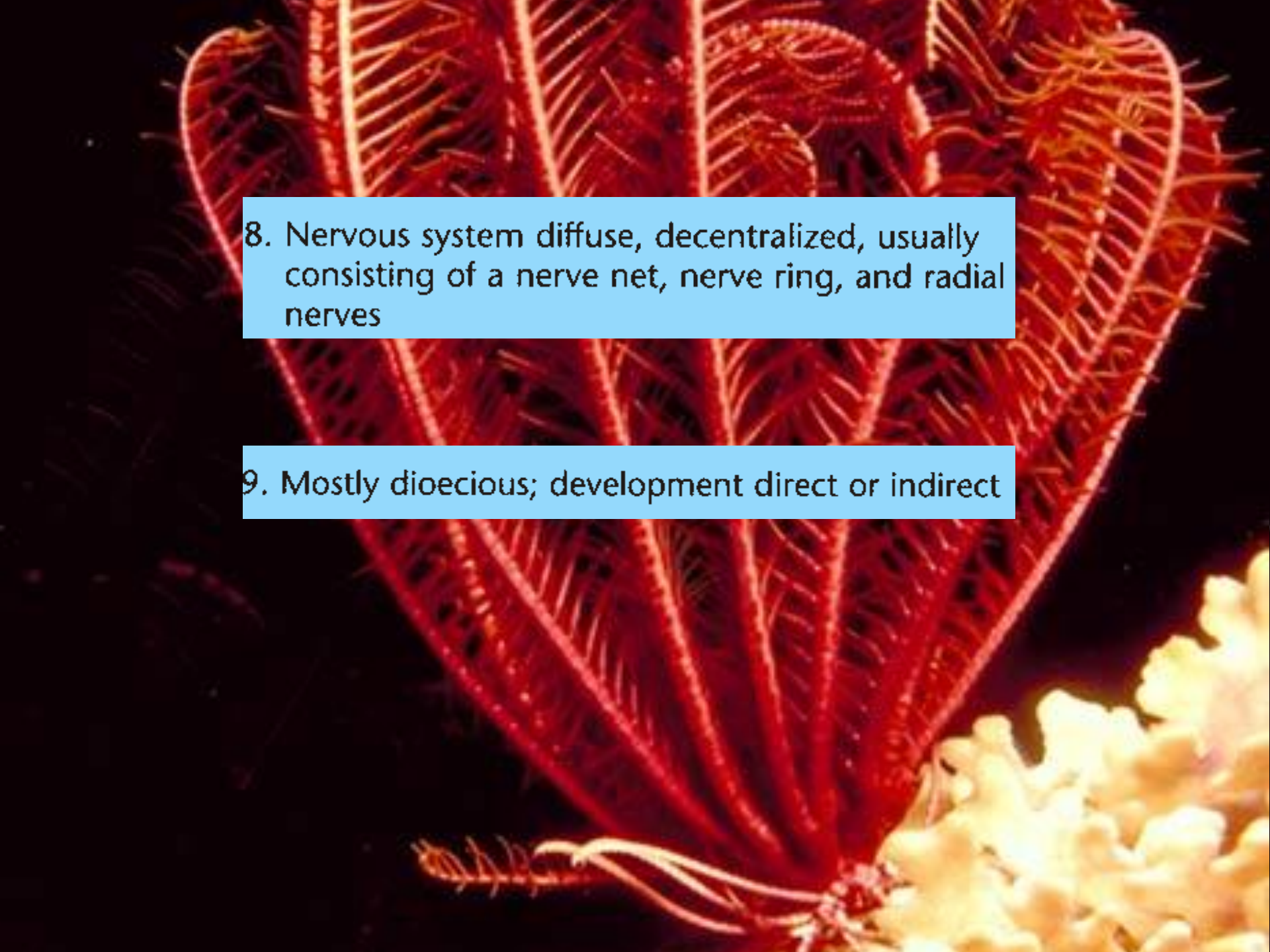
3. Coelomic water vascular system composed of a complex series of fluid-filled canals, usually evident externally as muscular podia

4. Embryogeny fundamentally deuterostomous, with radial cleavage, entodermally derived mesoderm, enterocoely, and mouth not derived from the blastopore

5. Gut complete except where secondarily incomplete or lost

6. No excretory organs

7. Circulatory structures, when present, compose a hemal system derived from coelomic cavities and sinuses



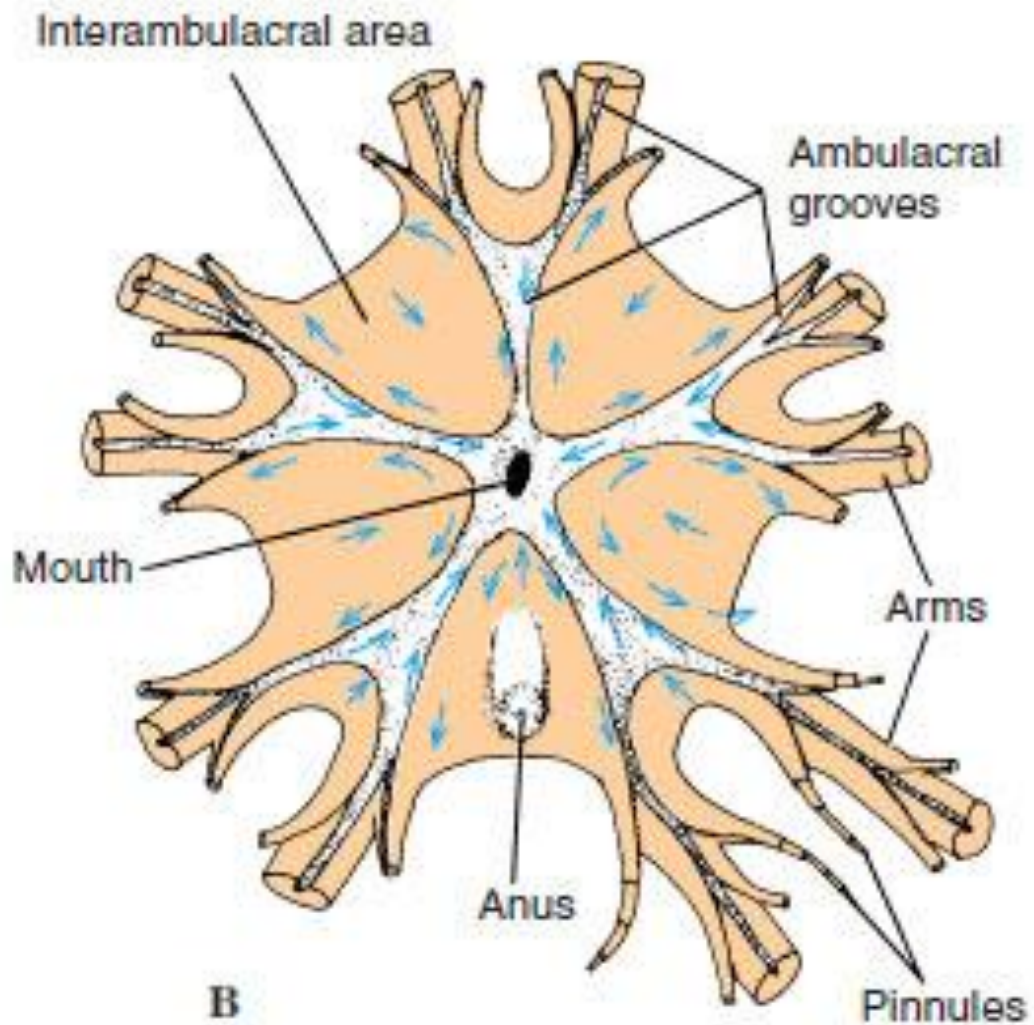
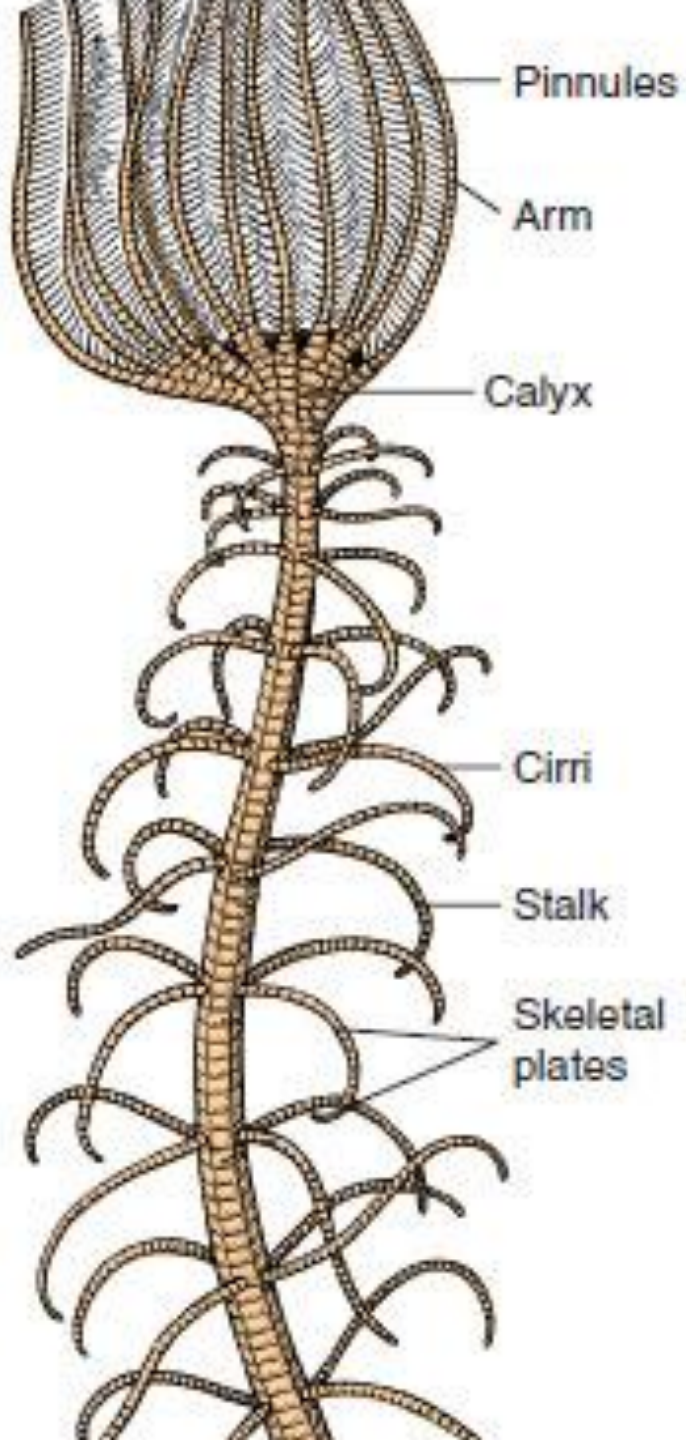
8. Nervous system diffuse, decentralized, usually consisting of a nerve net, nerve ring, and radial nerves

9. Mostly dioecious; development direct or indirect

Class Crinoidea= most primitive, body forms cup or calyx, attached or stalked aborally, arms arising from calyx, skeletal plate fused with calyx; ambulacral groove open, mouth and anus at oral surface; commonly known feather stars and sea lillies.

- Calyx and tegmen: cup like oral wall, more or less membranous
- Cirri: Small, slender, jointed appendages, displayed in whorls around the stalk
- Anal cone: anus opens at oral surface, located in one of the inter-ambulacral areas at the top of a prominence named anal cone.
- Pinnules: on each side of arms present a row of appendages.
- Lappets: margins of the grooves bordered by movable flaps.

# Class Crinoidea



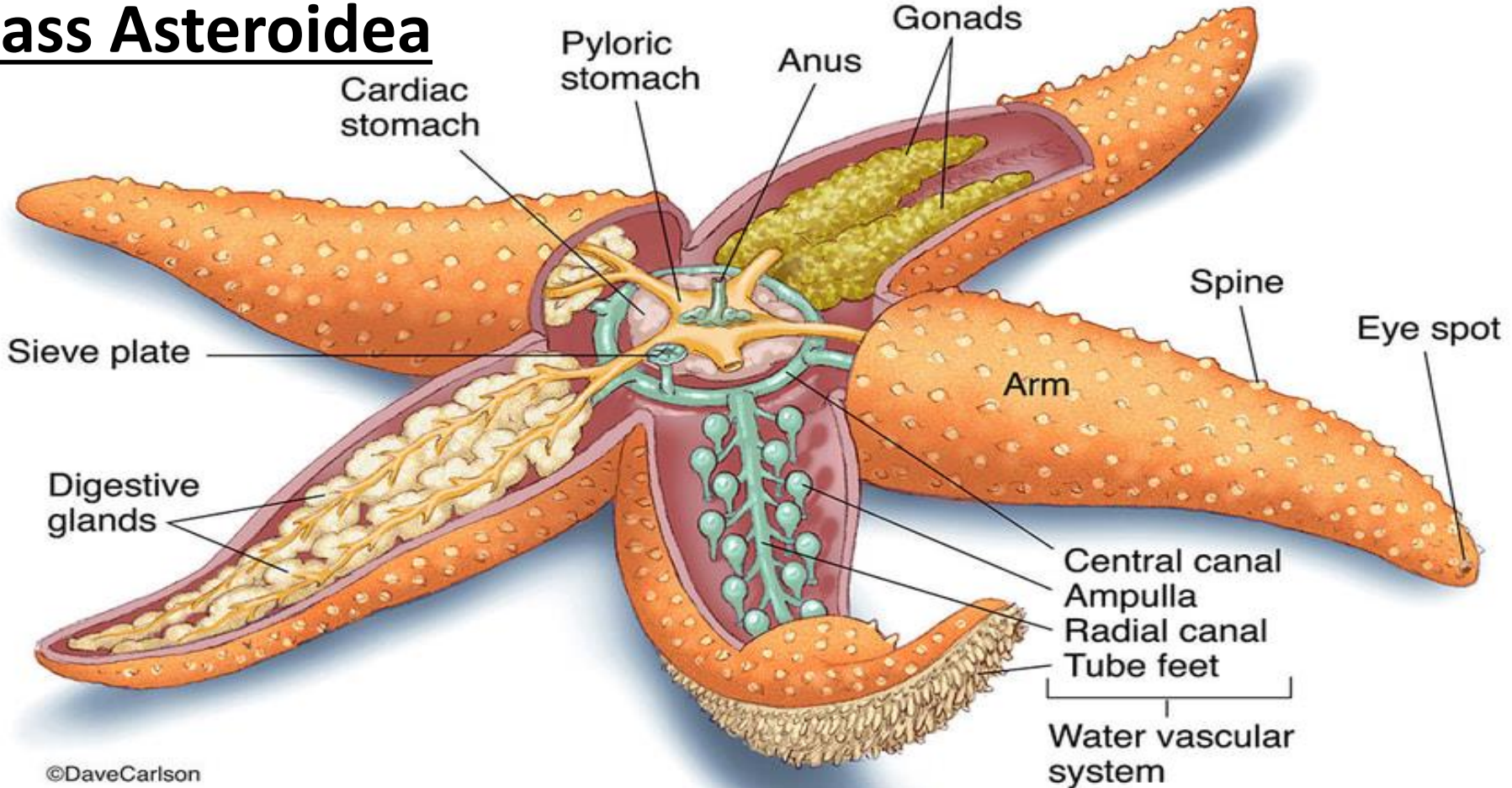
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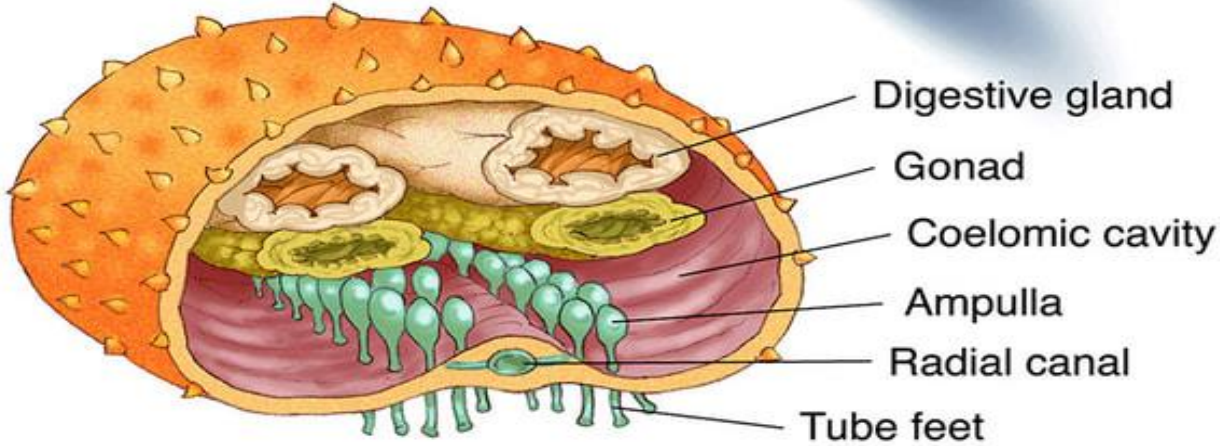
Class Asteroidea = star shaped free moving echinoderm; body composed of rays or arms projecting from a central disc

- Spines are modified for adaption to several environments.
- Paxilla: ossicles crowned with small, movable spines; adaptation for burrowing existence of many sea stars and make their appearance of smooth aboral surface.
- Pedicellariae: specialized jaw-like appendages, used for protection, are of two types: stalked and sessile; each unit consists of a short fleshy stalk surmounted by a jaw like apparatus with three movable ossicles (two in case of sessile pedicellariae).
- Papulae: numerous evaginations of the body wall scattered over the aboral body surface.

# Class Asteroidea



©DaveCarlson

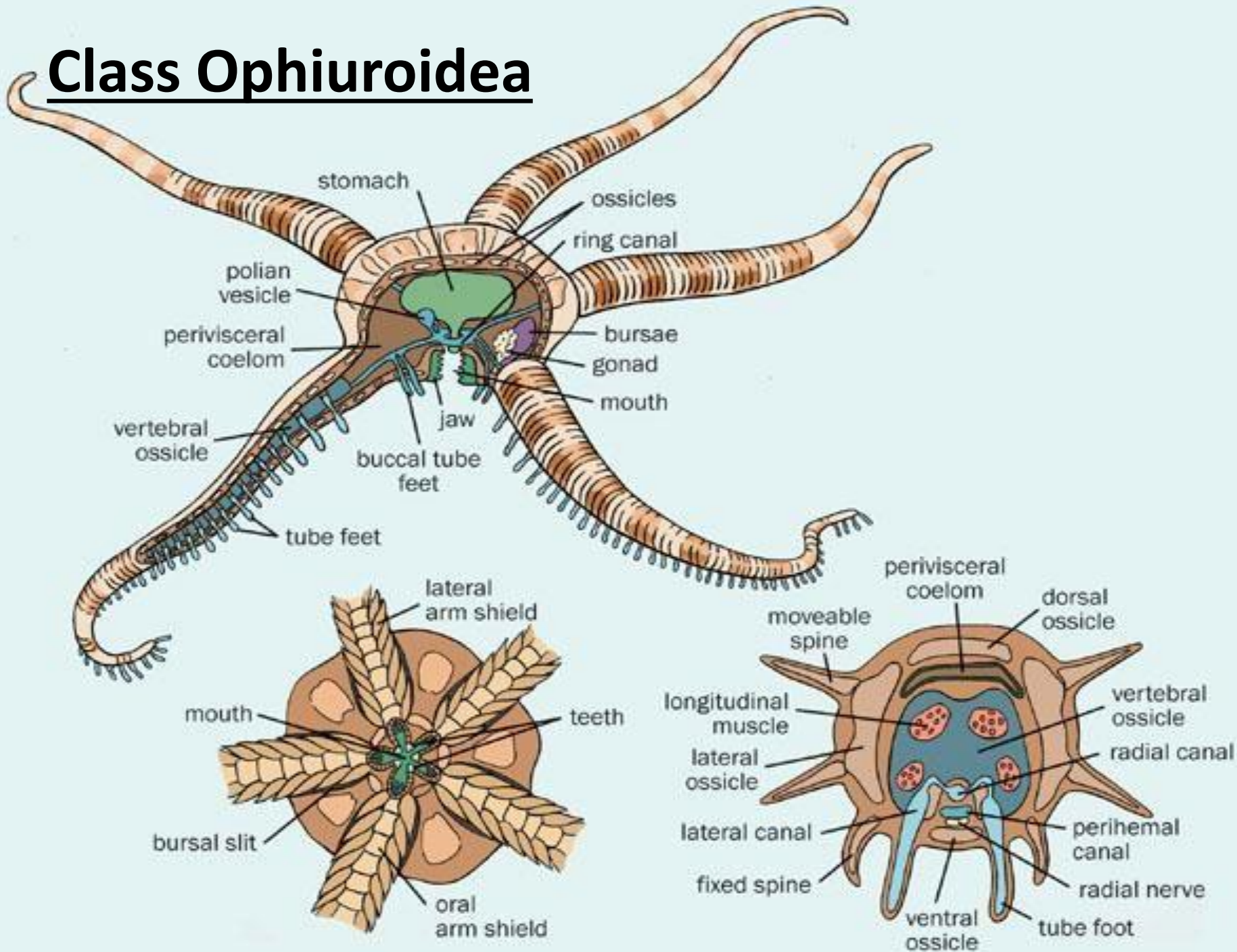




Class Ophiuroidea = sharp elongated arms without any ambulacral groove due to vertebra; anus absent, named basket stars, serpent stars or brittle stars.

- **Shields:** all three types are present; oral, aboral and lateral and also lateral armed shields.
- **Presence of Vertebra:** A single set of one aboral, one oral and two lateral shields completely surrounded the arm and corresponds in position to an internal skeletal ossicles; created from sunken ambulacral ossicles as in case of absence of ambulacral groove.

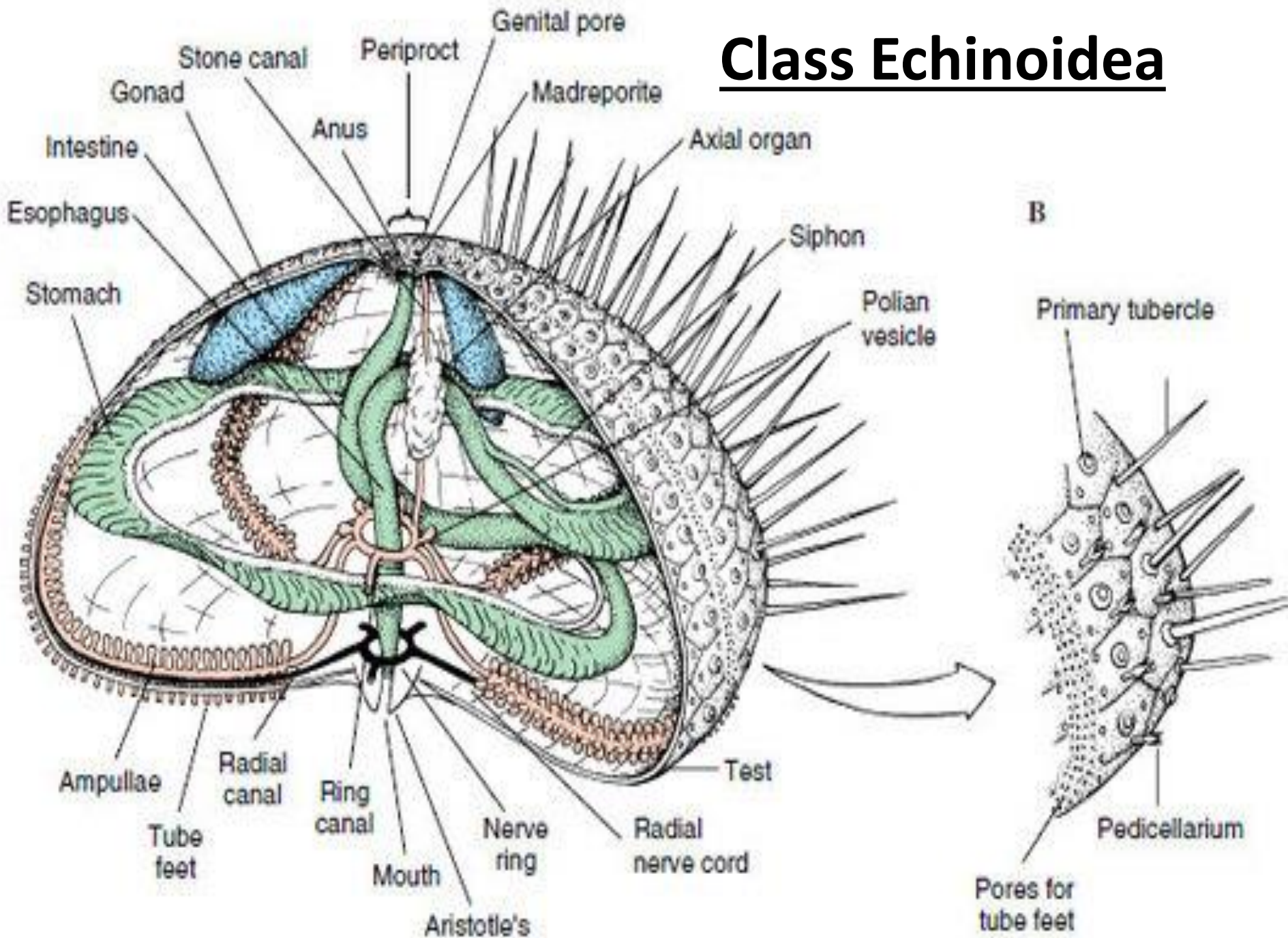
# Class Ophiuroidea



Class Echinoidea = free moving 'porcupine-like' armless globose echinoderms commonly called sea-urchin and sand-dollars; oval, spherical shaped with movable spine, presence of test with closed ambulacral groove.

- Test: flattening and suturing together of the skeletal ossicles into a solid case as skeletal plates joined collagen matrix with calcite interdigitations.
- Periproct: Anal region at aboral pole, small circular membrane with variable number of embedded plates, encircled with five genital plates one of which is madreporite.
- Pedicellariae: characteristics of all echinoids, located over body surface, long stalk surmounted by jaws; some are equipped with one or two poison glands for defense; otherwise they are for cleaning or biting or breaking small particles.
- Aristotle's lantern: apparatus composed of five large, radially arranged calcareous plates called pyramids, connected by muscle fibres with adjacent pyramid; each of which shaped somewhat like an arrowhead with points projecting towards the mouth.

# Class Echinoidea



# Differentiate between regular and irregular urchins:

## **REGULAR URCHIN**

- Body divided into oral and aboral hemisphere having oral-aboral axis
- Periproct present
- Five ambulacral areas bearing tube feet
- Pedicellariae with mainly poison gland
- Habitat: intertidal rocks

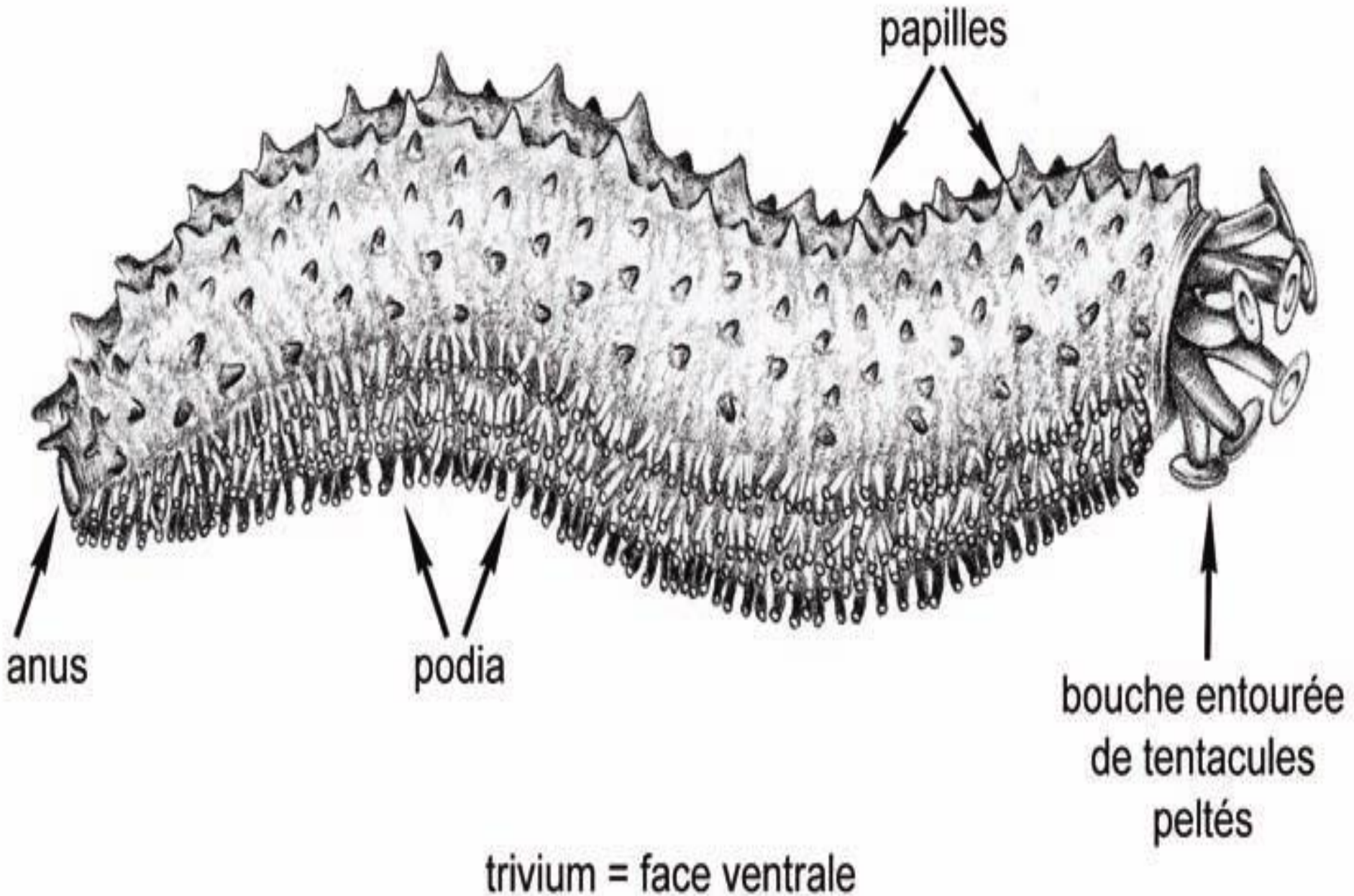
## **IRREGULAR URCHIN**

- Long axis representing antero-posterior axis.
- Periproct absent
- Irregularity in ambulacral areas
- Pedicellariae modified for burrowing
- Habitat: oceanic desert

Class *Holothuroidea* = fleshy, sausage type of body, elongated at oral-aboral axis, skeleton reduced to isolated microscopic ossicles, pentamerous symmetrical secondarily bilaterally symmetrical, ambulacral groove closed, modification of buccal podia into a circle of tentacles around the mouth; commonly known as sea-cucumber

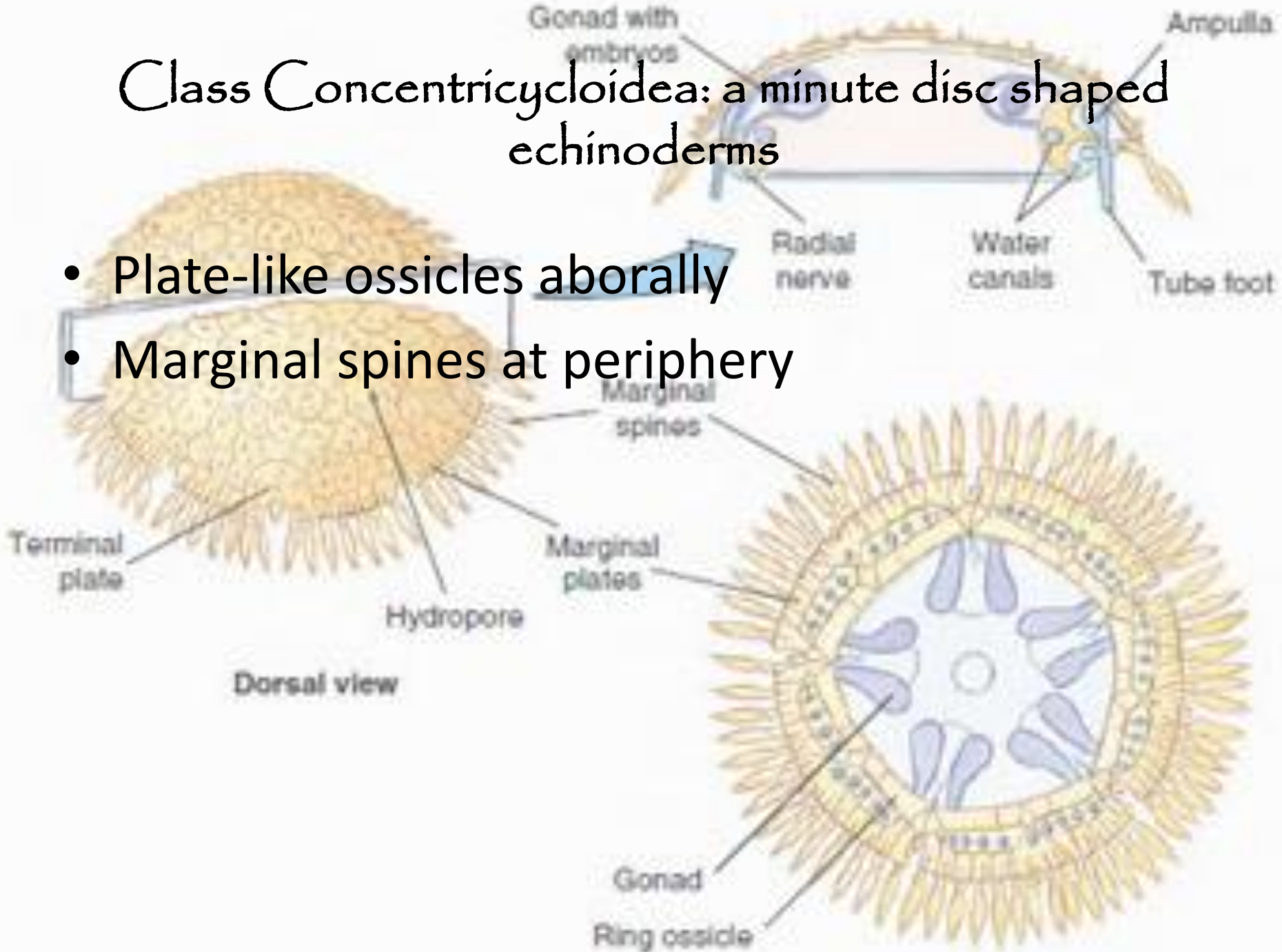
- Trivium or sole and bivium: holothuroids lie with one side of the body against the substratum, and this ventral surface composed of three ambulacral areas (A, B, E) are trivium or commonly sole; loss of dorsal tube feet along the ambulacra C and D called bivium.
- Tubules of Cuvier: a few to a large mass of white, pink, or red blind tubules attached to the base of one (frequently on the left side) or both respiratory trees or to the common trunk of the two trees. When these creatures are irritated or attacked by some predator, the anus directed towards intruder and body wall contracts rupturing of the cloaca the tubules are shot out of anus. The tubules contain adhesive or in some species a toxicant named **holothurin** (a saponin).
- Sometimes confused sea-cucumber discharged of the tubules of Cuvier is a common phenomenon named **evisceration**, as in case either anterior or posterior part of the gut and associated organs are expelled.

**Class Holothuroidea** bivium = face dorsal



# Class Concentricycloidea: a minute disc shaped echinoderms

- Plate-like ossicles aborally
- Marginal spines at periphery





**Autotomy:** refers to ability to cast off or discard one or more body part(s) generally for defensive purpose; self-amputation, and then regenerate the missing body parts from the rest; observed in many species of phylum mollusca, echinodermata, arthropoda, amphibia, reptilia and mammalia.

- In class asterozoa: a mode of Asexual reproduction, casting off the arms near central disc, autotomize arm named 'comet' , full animal regenerate from it at infavourable conditions; as one starfish can reproduce six at a time.
- In class crinozoa: as asteroids; cast off arms can regenerate a full animal at crisis such as fish predation.
- In class ophiurozoa: as asteroids
- In class holothurozoa: process of regeneration occur at a specific time of year during scarcity of food or eliminating waste stored in internal tissue, a seasonal phenomena. Evisceration followed by regeneration of the lost parts.

