

## CLASSIFICATION OF PHYLUM ECHINODERMATA

*Echinoderms are bilaterally symmetrical ( in larval stage) or pentamerous radially symmetrical (in adult) having calcareous exoskeleton as ossicle, enterocoelom and water vascular system and without distinct head.*

### Characteristic Features of Echinoderms

1. The echinoderms are exclusively marine, non-colonial and largely bottom dwellers.
2. The body exhibits radial and pentamerous symmetry in adult, but the larvae are bilaterally symmetrical.
3. Distinct head is lacking.
4. The body is distinguishable into oral and aboral surface.
5. Body covered by calcareous ossicles.
6. The oral surface of the body is marked by five equidistant radiating ambulacra.
8. A spacious coelom lined by ciliated peritoneum of mesodermal origin.
9. water vascular system present.
11. The nervous system consists of radially arranged diffused nerve cords.
13. Haemal system is present.
14. The sexes are separate or hermaphrodites.
15. Fertilization is usually external.
16. Cleavage is radial and indeterminate.
17. Development involves free-swimming larval forms.

**Scheme of classification** : The scheme of classification is based on E. E. Ruppert and R. D. Barnes ( 6th ed.).

Phylum	Subphylum	Class
Echinodermata	Homalozoa	-----
	Crinozoa	Eocrinoidea
		Cystidea
		Blastoidea
		Crinoidea
	Asterozoa	Asteroidea
		Ophiuroidea
		Concentricycloida
	Echinozoa	Echinoidea
		Holothuroidea

### Classification with Characters:

#### A. Subphylum Homalozoa (Mid- Cambrian —Devonian):

1. Extinct, irregular, palaeozoic.
2. Carpoids (resembling crinoids but laterally compressed giving the evidence of a bilateral symmetry).

**Example:** *Enoploura*.

#### B. Subphylum Crinozoa:

1. Radially symmetrical echinoderms with a globoid or cup-shaped theca and brachioles or arms.
2. Mostly attached, with oral surface directed upward.

##### I. Class Eocrinoidea ( extinct)

1. The oldest extinct crinoids.
2. They were stalked or stalk-less, with an enclosed theca.

**Example:** *Mimocystites*.

##### II. Class Cystidea (extinct)

2. vase-like bodies with a stalk.
3. The theca is composed of many rigid polygonal plates.
5. The food-grooves extend over the surface of the theca.

**Examples:** *Cystoblastus*, *Proteroblastus*

### III. Class Blastoidea (extinct)

1. Pentamerous, radially symmetrical theca with 13 plates
2. Ambulacra petaloid
3. Respiratory structure is hydrosphere.

Examples: *Codaster*

### IV. Class Crinoidea (Cambrian—Recent):

2. Body exhibits pentamerous symmetry.
3. Well-developed movable arms with pinnules.
4. Oral surface is directed upwards.
5. Mouth is centrally placed and anus on the oral surface of the body.
7. Madreporite, spines and pedicellariae are wanting.
8. Doliolaria larva present.

Examples: *Forbesiocrinus*, *Reteocrinus*, *Xenocrinus*, *Hyocrinus*, *Calamocrinus*, *Antedon*, *Florometra*, *Heliometra*

### C. Subphylum Asterozoa:

1. Radially symmetrical body with a flattened central disc and radially arranged arms or rays.
3. Oral surface directed downward.
4. Anus, when present, is placed aborally.

#### I. Class Asteroidea (Cambrian—Present):

1. Body star-shaped.
3. Number of the arms usually 5 which may increase in some forms.
5. Ambulacra restricted to the oral surface of the body.
7. Madreporite situated on the aboral surface.
9. The larval forms are bipinnaria and/or brachiolaria.

#### II. Class Ophiuroidea (Carboniferous—Recent):

2. Body pentamerous and star-shaped.
3. It has a distinct central disc with 5 elongated flexible arms.
6. Body flattened with distinct oral and aboral surfaces.
8. Mouth and madreporite are situated on the oral surface of the body, anus is lacking.
11. Larva is Ophiopluteus.

Examples: *Amphiura*, *Ophiopholis*, *Ophiothrix*, *Ophioderma*, *Ophiocoma*, *Ophiolepis*, *Ophiostigma*, *Ophiactis*, *Ophiura*, *Sigsbeia*.

### III. Class Concentricycloidea:

1. Minute medusa-like bodies.
3. Coelom spacious.
4. Ambulacral system is absent.
5. No larval stage.

Example: (single genus) *Xyloplax*.

### D. Subphylum Echinozoa:

1. Globoid or discoid without radiating arms.
2. Mouth and anus lie at opposite poles in earliest members.

#### I. Class Echinoidea

1. Body may be globular, heart-shaped, oval or disc-shaped.
2. Body orally and aborally flattened and without arms.
3. Body enclosed by a skeleton in the form of a test, shell of closely set of calcareous plates.
7. Tube-feet highly extensible, provided with suckers and locomotory in function.
8. Mouth and anus surrounded by membranous peristome and periproct respectively.
9. Larva is Echinopluteus.

Echinoids may be divided into regular or irregular urchins.

#### The regular urchins are characterised by:

1. The test or corona is globular and shows pentamerous symmetry.
2. Spines are long and unusually thick and cylindrical (e.g., *Eucidaris*, *Echinus*, *Strongylocentrotus*).
3. Each inter-ambulacrum has two rows of plates.
4. The lantern of Aristotle is well developed.
5. Centric anus.

Examples: Sea urchins (*Cidaris*, *Diadema*, *Arbacia*, *Salmacis*, *Echinus*, *Echinometra*, etc.).

#### The irregular urchins or irregularia are characterised by:

1. The test or corona is mostly flattened and the shape is either oval or round.
2. The spines are relatively shorter.
3. The ambulacral areas on the aboral surface form a five-pointed petaloid condition like the petals of a flower.

4. The tube-feet are mostly non-locomotory.

5. Anus eccentric (exocyclic).

**Examples:** Sea biscuits (*Clypeaster*); Sand dollar (*Encope*, *Mellita*, *Dendraster*); Heart urchins (*Echinocardium*, *Lovenia*,)

## **II. Class Holothuroidea**

2. Body cylindrical and exhibits bilateral symmetry.

3. Mouth and anus located at the opposite extremities of the body.

4. Skin without spines and pedicellariae.

6. Skeleton reduced to microscopic ossicles.

7. Surface of the body may exhibit five ambulacral areas.

9. Tube-feet locomotory in function and restricted to the five ambulacral areas.

10. Larva is auricularia.

Examples: *Echinocucumis*, *Cucumaria*, *Thyone*, *Holothuria*