LARVAL FORMS OF ECHINODERMATA

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INTRODUCTION

- Echinoderms are unisexual animal with no sexual dimorphism.
- Fertilization external
- Echinoderms are deuterostomes and hence cleavage is radial, holoblastic and indeterminate.
- Development is mostly indirect having larval stage in between.

LARVA

- The larvae hatch in water, feed and grow through successive larval stages to become adults.
- Larvae of Echinoderms are bilaterally symmetrical but lose symmetry during metamorphosis.
- Different classes of Echinoderms show structurally different larval stages.
- Comparison of the larval stages of different classes can reveal their evolutionary ancestry.

LARVAL FORMS OF DIFFERENT CLASSES

CLASS	LARVAL FORMS
Asteroidea	Bipinnaria
	Branchiolaria
Ophiuroidea	Ophiopluteus
Echinoidea	Echinopluteus
Holothuroidea	Auricularia
	Doliolaria
Crinoidea	Doliolaria

BIPINNARIA LARVA

- It is the first larval form of Asteroidea.
- It is a bilaterally symmertrical, free swimming, pelagic larva.
- The pre oral region is elongated, postoral region is broad.
- It possesses two ciliated bands, the pre oral and post oral bands

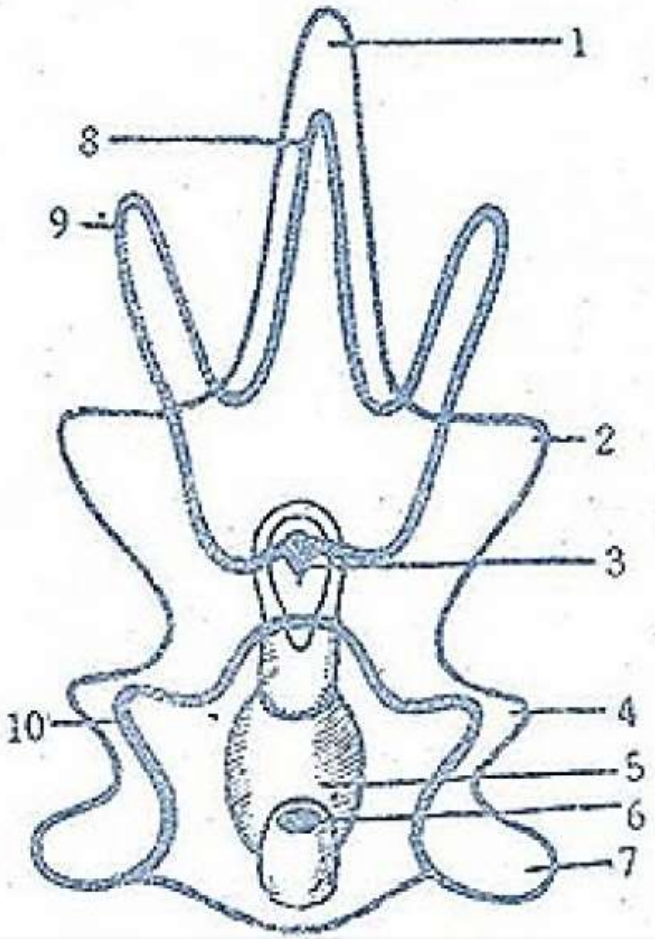
- The anterior end of the archenteron develop as mouth whereas the blastopore becomes the anus.

- The pre oral and post oral ciliated bands are continued over a series of prolongation called arms.

The following are the names and the number of arms developing from pre oral and post oral ciliated bands :

- Postero lateral arm - two
- Post oral arm - two
- Postero dorsal arm - two
- Antero dorsal arm - two
- Pre oral arm - two
- Ventero median arm - one
- Dorso median arm - one

- The bipinnaria larva is free swimming and free feeding form.
- After a short period of time, it transforms into branchiolaria larva.



1. Dorso-Median arm
2. Dorso-lateral arm
3. Mouth
4. Postero-dorsal arm
5. Stomach
6. Anus
7. Postero-lateral arm
8. Ventro-median arm
9. Pre-oral arm
10. Post oral arm

BIPINNARIA LARVA

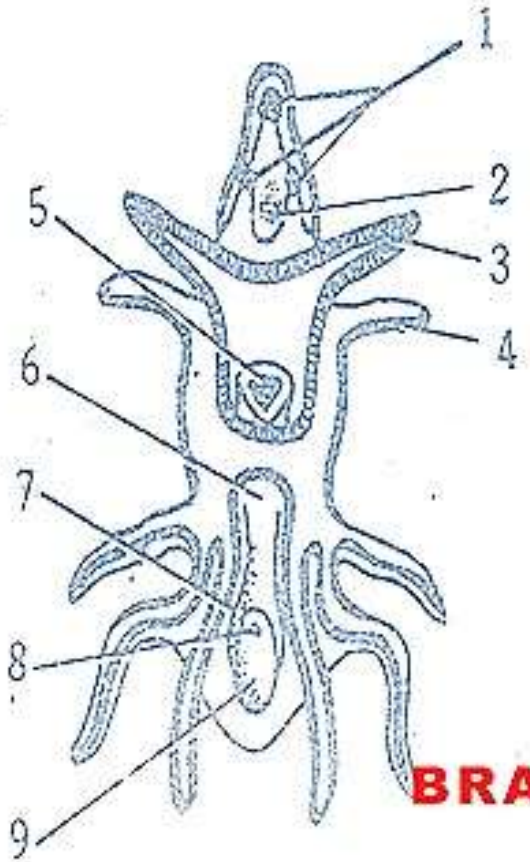
BRANCHOLARIA LARVA

- Three additional arms are present on this larval form known as branchiolarian arms.
- These help the larva to adhere with the substratum.
- These arms are neither ciliated nor have calcareous rods and the coelomic cavity extends into these arms

- The three short arms are at pre oral lobe, one median and two lateral arms.
- They contain adhesive cells at their tips which act as a sucker.
- The rest arms degenerate and become long, narrow and slender.

METAMORPHOSIS OF BRANCHIOLARIA

- With the help of adhesive structures, it attaches to some object.
- Anterior portion acts as stalk for some time while posterior part having gut and coelomic chambers convert into a young starfish.
- This detaches itself and starts leading a free life.



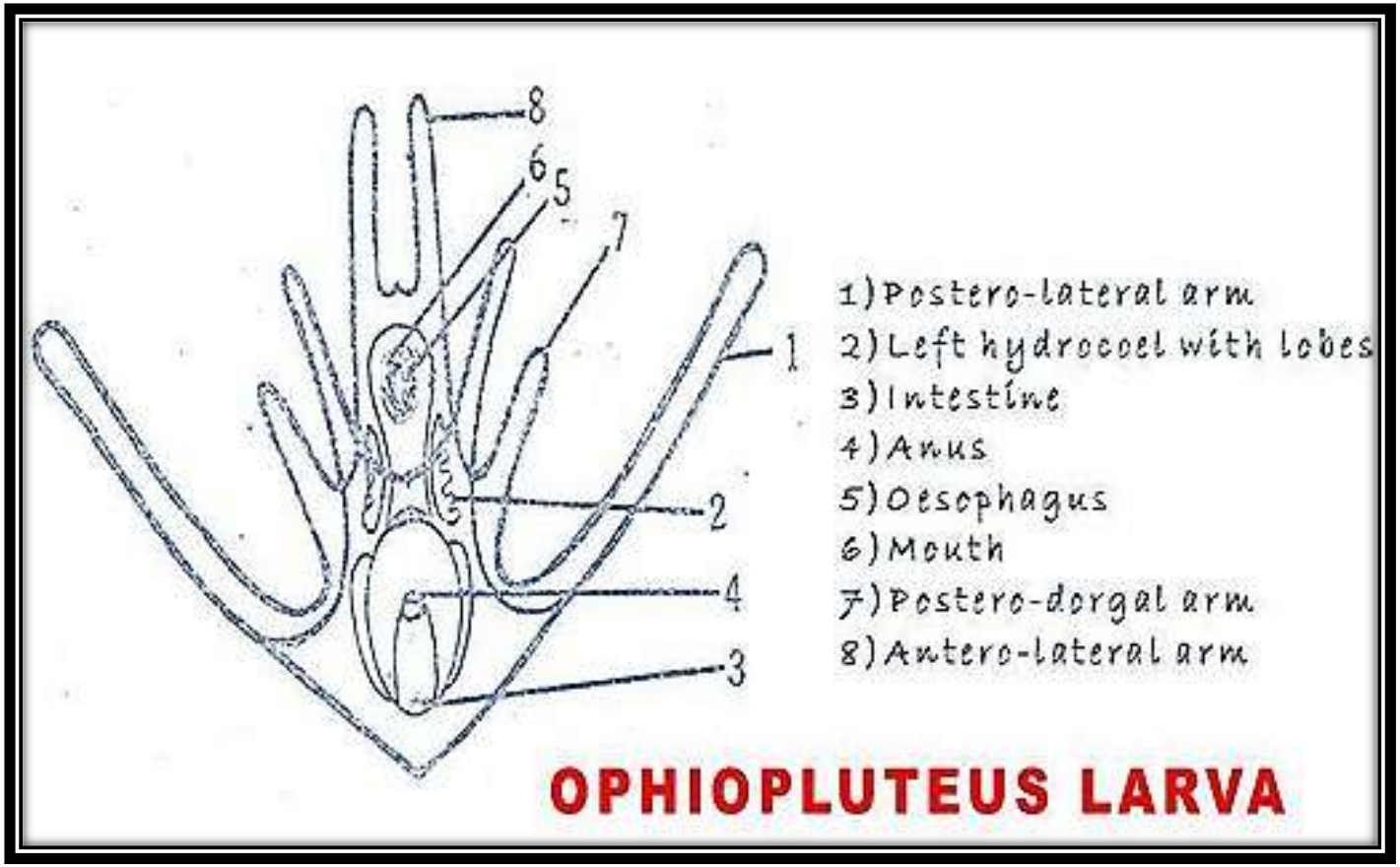
1) Brachiolar arms
2) Adhesive disc
3) Pre oral arm
4) Antero-dorsal arm
5) Mouth
6) Oesophagus
7) Stomach
8) Anus
9) Intestine

BRACHIOLARIA LARVA

OPHIOPLUTEUS LARVA

- This is the larval form of class Ophiuroidea
- This is free swimming, bilateral symmetrical form having a single ciliated band.
- It possesses long arms with ciliated bands at the margin.
- It has two anterio lateral, two post oral, two posterio dorsal and two posterio lateral arms.
- Out of these, posterio lateral arms are the longest and directed forward

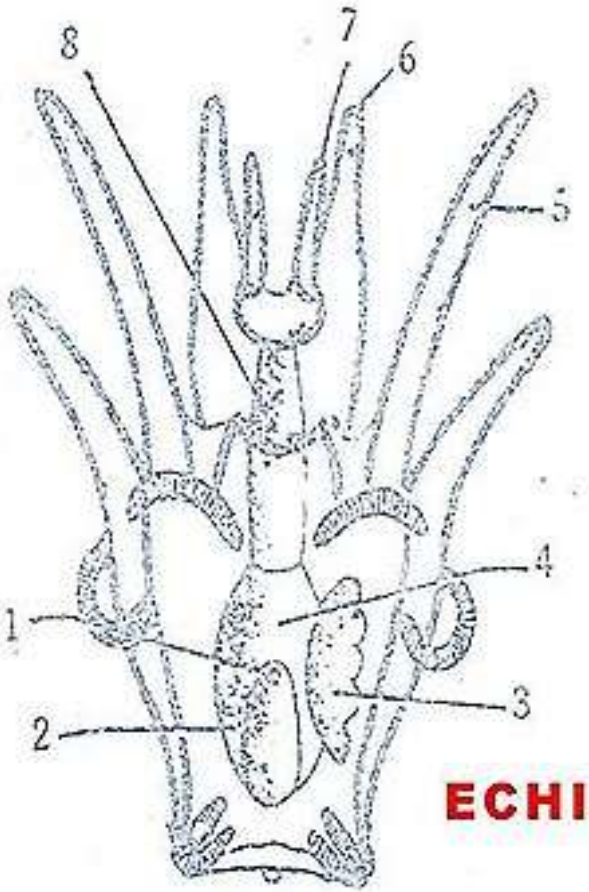
- It has comparitively smaller, pre oral lobe.
- The post anal part of the body is quite well developed.
- Larva consists of coelomic chambers and archenteron.
- There being no attachment stage.
- Free swimming larva, metamorphose into tiny serpent star, which sinks to the bottom to begin its adult existence.


8
6
5
7
1
2
4
3
1) Postero-lateral arm
2) Left hydrocoel with lobes
3) Intestine
4) Anus
5) Oesophagus
6) Mouth
7) Postero-dorsal arm
8) Antero-lateral arm
OPHIOPLUTEUS LARVA

ECHINOPULTEUS LARVA

- It is a microscopic, free swimming larva of Echinoidea.
- It resembles the Ophiopluteus larva where the only difference is that it has more arms.
- This larva shows ciliated bands which are developed into arms.
- Fully developed larva consists of six arms supported by calcareous rods and its tips are pigmented.

- Postero lateral arms are very short and directed outwards or backwards.
- Locomotion is by ciliated bands, which in some cases become thickened and called Epaulettes
- There is no attachment stage.
- Metamorphosis is extremely rapid taking place in about an hour.

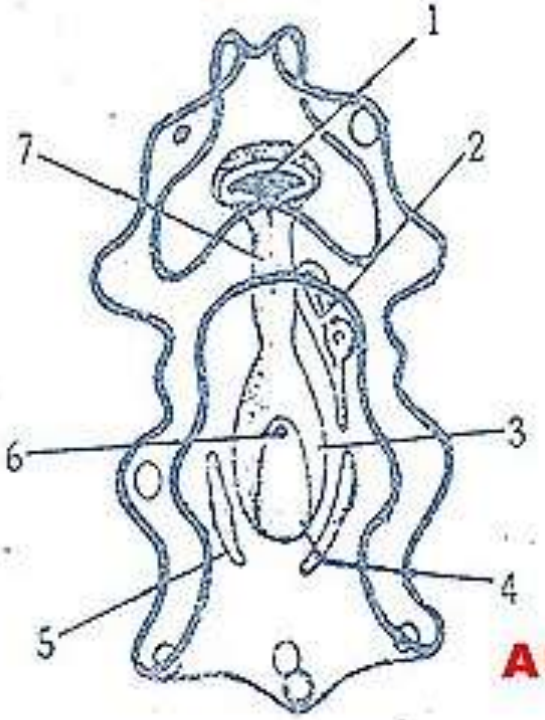


1) Anus
2) Intestine
3) Echinus rudiment
4) Stomach
5) Postoral arm
6) Anterolateral arm ,
7) Preoral arm.
8) Oesophagus

ECHINOPLUTEUS LARVA

AURICULARIA LARVA

- It is the first larval form of Holothuroidea.
- It is transparent, free swimming, pelagic larva of about 0.5-1 mm in length.
- Arms are absent. Ciliated bands are well developed.
- It swims about by a ciliated band which forms pre oral loop and an anal loop.
- Alimentary canal is developed which opens with mouth and ends with anus.
- Internally the larva has a curved intestine with sacciform stomach



1) Mouth
2) Hydrocoel
3) Stomach
4) Intestine
5) Right ematocoel
6) Anus
7) Pharynx

AURICULARIA LARVA

DOLIOLARIA LARVA

- It is the second larval form of Holothuroidea.
- It is a transitional stage from Auricularia larva.
- It is barrel shaped with continuous ciliated band which breaks into three to five flagellated rings.
- Mouth is shifted to anterior and anus to posterior pole.
- Metamorphosis is gradual, during which it acquires five tentacles and one to two functional podia.
- As such it is sometimes called Pentacula.

- After appearance of more tentacles and podia, sea cucumber settles to the sea bottom and leads an adult mode of life.
- In some cases, there is no Auricularia stage, the embryo directly develops into Doliolaria larva.

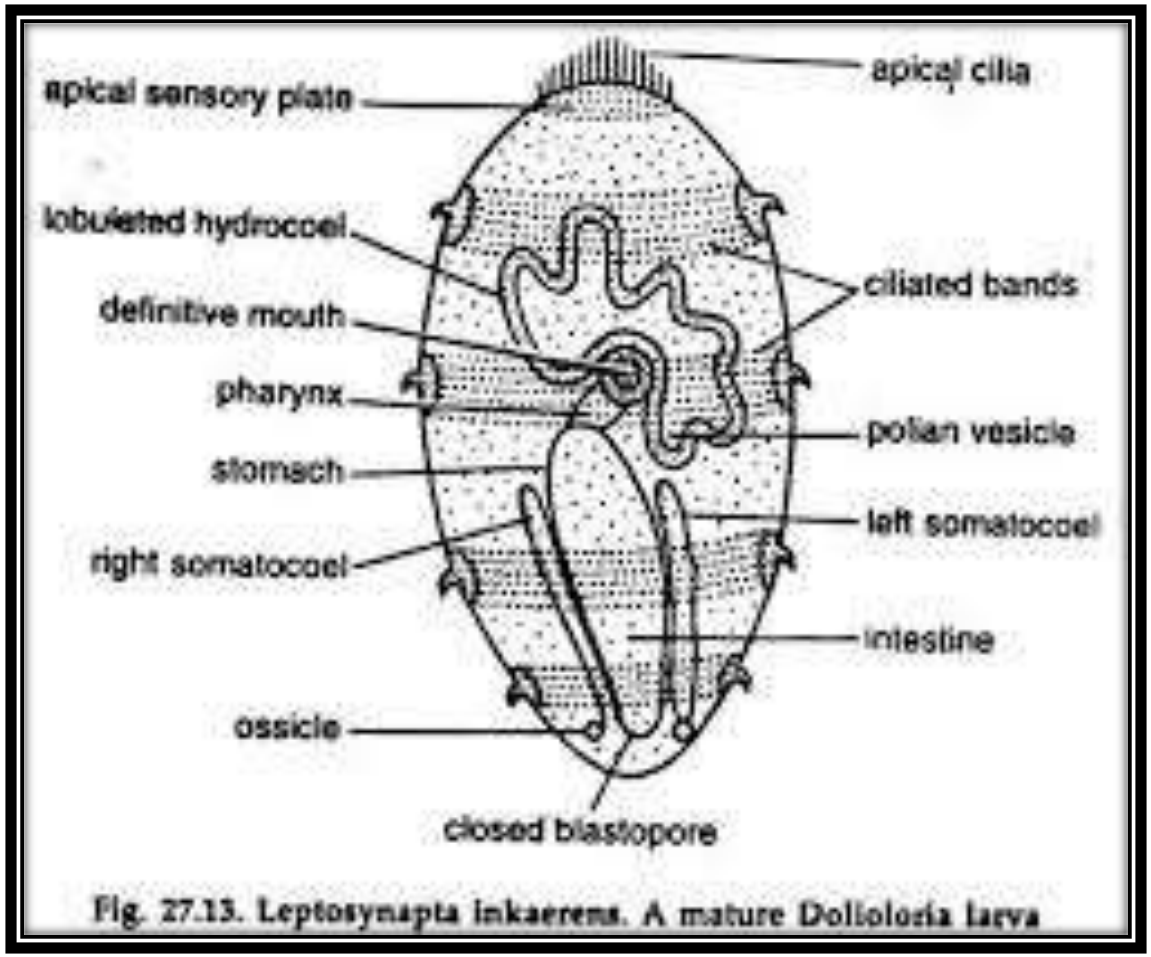
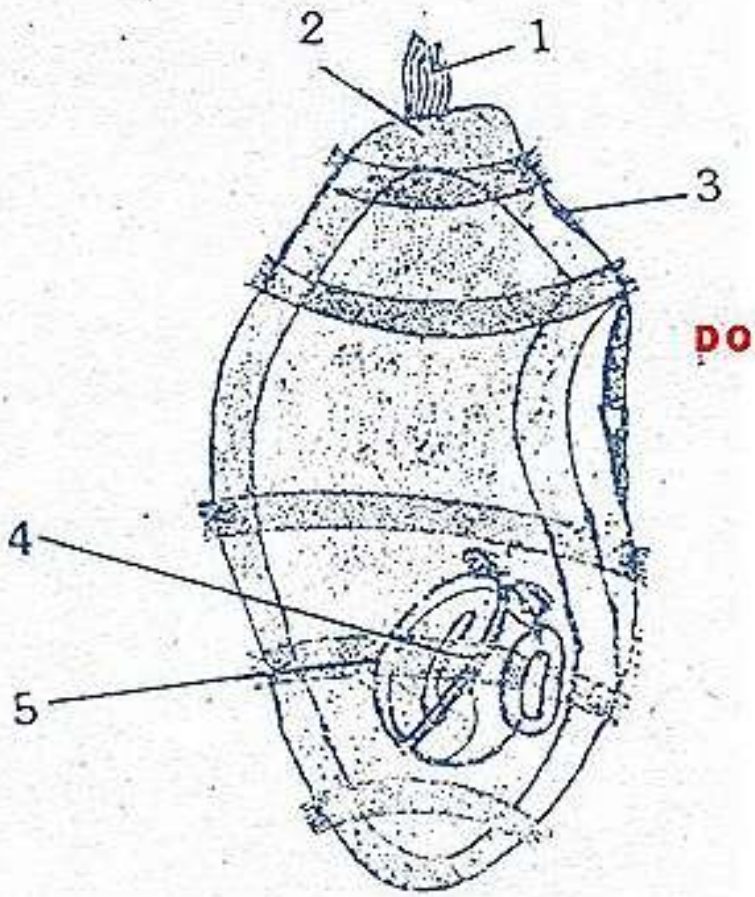


Fig. 27.13. Leptosynapta inkaerens. A mature Dolioloria larva

DOLIOLARIA LARVA

- It is the larval form of Crinoidea.
- It is a free swimming larva having four to five ciliated bands.
- It contains an apical tuft of cilia which will be sensory.
- On the mid ventral line, near apical plate, adhesive pit will be present over the first ciliated band.
- Between second and third ciliated band lies stomodeum or vestibule

- Skeleton also develops at this larval stage.
- After swimming for some time, it will develop a stalk.
- It is called Pentacrinoid larva.
- Larva now attaches itself and internal organs rotate to 90 degree from ventral to posterior position.
- Larva forms a stalk and is now called as Cystidean or Pentacrinoid larva.
- This after somtime metamorphoses into an adult.



DOLIOLARIA LARVA

1) Apical sensory tuft

2) Apical plate
3) Adhesive pit
4) Primary mesenteron
5) Enteric sac

HOMOLOGY AND PHYLOGENY OF ECHINODERM LARVAE

Except for the Crinoids, a sedentary group, the larvae of Asteroidea, Holothuroidea, Echinoidea and Ophiuroidea exhibit some fundamental resemblances:

- Having Pre-oral and Post-oral loops.
- Having V-shaped ciliated bands.
- Presence of gut with its divisions and openings.
- Coelom enterocoelic.

These are some common features indicating that they had a common ancestor.

THANK YOU!