TOPIC: GENERAL CHARATERISTICS AND RETROGRASSIVE METAMORPHOSIS OF HERDMANIA

LECTURE NO:05

BSC PART 1-PAPER II-GROUP A

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REPRODUCTIVE SYSTEM

There is a single long gonad. The gut loop encloses the left part of the gonad at the posterior end. It has a long deep orange ovary, overlain by a light orange test . The oviduct and sperm duct are separate, run parallel to the intestine and open into the atrium near the anus. Eggs and sperms travel to the cloaca in small amounts nightly through a process called trickle spawning.

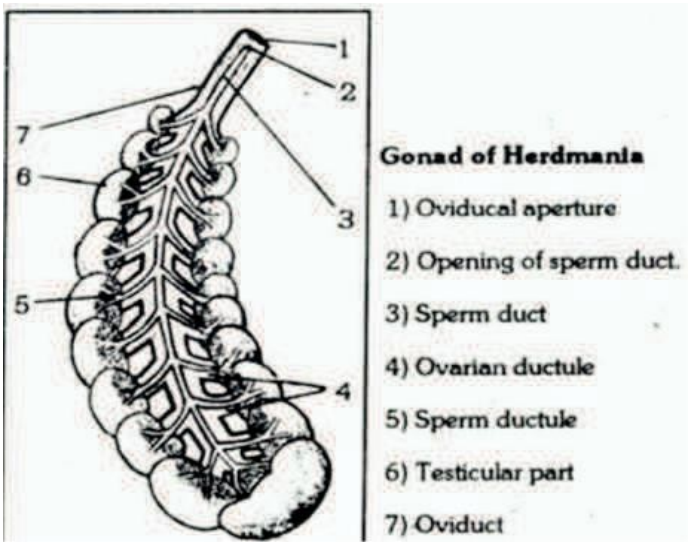

Fig 3.10 Gonad of Hardmania

After fertilization, zygote formation and cleavage of larva known as teadpole larva hatches out of the egg, it becomes an adult after hetrogressive metamophasis.

RETROGRESSIVE METAMORPHOSIS IN HERDMANIA

Metamorphosis is a change from the juvenile to adult stage in which larval stage is quite different from the adult stage. In retrogressive metamorphosis the larva possesses advanced characters which are lost during the development and the adult is either sedentary or degenerated with primitive characters. Urochordate adults, being sedentary show degenerative characters while the free swimming tadpole larva shows advanced chordate characters which are lost during metamorphosis. Parasitic crustaceans, like *Sacculina* and copepod parasites and stylopids and scale insects (Insecta) also show retrogressive metamorphosis.

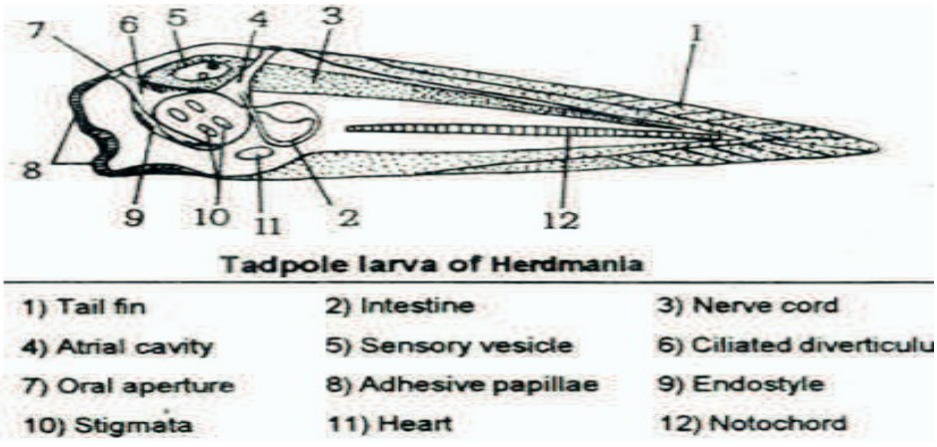

Fig 3.11 Tedpole Larva of Hardmania

TADPOLE LARVA

The tadpole larva of *Herdmania* is only 1-2 mm long when it hatches out of the egg. It does not feed and hence has only 3 hours of survival during which it has to swim about in search of a suitable substratum for attachment. The larva needs advanced features for its free swimming existence, which is so necessary for dispersal of the population to distant places which the sedentary adult has no means to do.

The advanced chordate characters of the larva:

There is a rod-like notochord in the tail to which are attached muscle bands for swimming.

There is a dorsal hollow nerve cord which is enlarged to form brain at the anterior end. A photoreceptor ocellus and a balancing organ, the statocyst are attached to the brain.

There are only two pairs of gill slits in pharynx but the mouth is closed by a membrane and intestine is rudimentary.

Endostyle on the ventral side of pharynx is very well developed which functions like thyroid gland and helps in metamorphosis.

Heart is on the ventral side of gut but is non-functional.

The larva possesses three ectodermal adhesive papillae on the anterior end which help in firm attachment on the substratum.

Changes in larva during metamorphosis:

Larva attaches to the substratum with the help of chin warts, headdownward and tail up.

Rapid growth takes place between the chin warts (adhesive papillae) and mouth and almost no growth on the opposite side of body.

Due to rapid growth on one side, body starts rotating in such a way that mouth gradually migrates to the upper side.

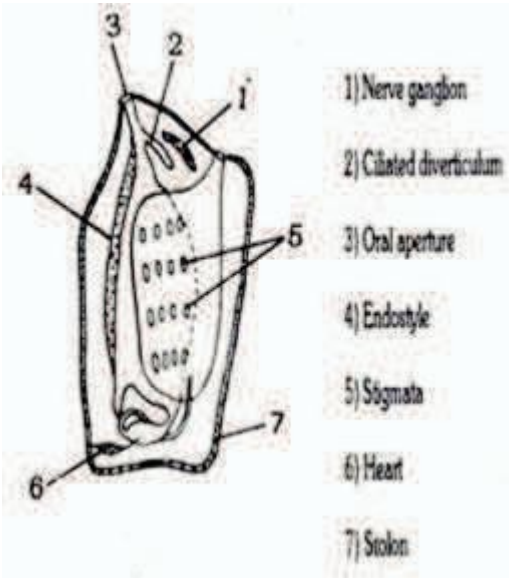

Fig 3.12 Development of young organism

Meanwhile pharynx enlarges and stigmata increase in number.

Intestinebecomes functional and atrial opening is formed on the opposite side of oral aperture.

Both tail and notochord are gradually absorbed in the body during metamorphosis.

The hollow nerve cord is reduced into a solid nerve ganglion on the dorsal side. Sense organs, namely ocellus and statocyst are lost.

When the metamorphosis is over, *Herdmania* is transformed into a bag-like sedentary animal attached to the rock by a foot and having branchial and atrial openings for inlet and outlet of water respectively. Pharynx becomes enormously enlarged with a large number of stigmata for filter feeding and digestive system becomes well developed. However, other advanced chordate characters of the larva are degenerated into simple structures, due to which it is called retrogressive metamorphosis.

AFFINITIES

The typical tunicate looks like a non-chordate animal. If the life history of such animal is studied, the larval form reveals the chordate characters of that animal.

Urochordate's-resemblance with Chordate. :-

Urochordates resemble the chorates owing to the following features-

Presence of dorsal
tubular nerve cord.
Presence of notochord.

Well developed pharynx with gill-slits.

Presence of endostyle on the ventral
side of the pharynx. Presence of
atrium around the pharynx.

Presence of post - anal tail with tail fin.

Because of these chordate features tunicates are included in chordate's group.

Urochordate's-resemblance with Amphioxus (Cephalochordata):

Presence of notochord.Presence of dorsaltubular nerve cord. Presence of large pharynx with gill slits. Presence of atrium and atriopore.Presence of muscle band.Thus, the urochordates show close relation with Cephalochordates.

Urochordates differ from other chordates owing to the following characters:

Presence of retrogressive metamorphosis. Absence of segmentation. Because of these characters zoologists included these animals in a separate sub-phylum Urochordata.

During recent years many zoologists regarded the tunicates as primitive and ancestral forms of chordates as a whole.