

## Reproductive sys :

Herdmania = hermaphrodite / Bisexual,  
but protogynous so that self-fertilization  
is ruled out.

gonads :- 2 large gonads embedded into  
sternal cavity

- Right gonad situated just parallel to dorsal  
to pericardium
- Left gonad lies within the intestinal loop.

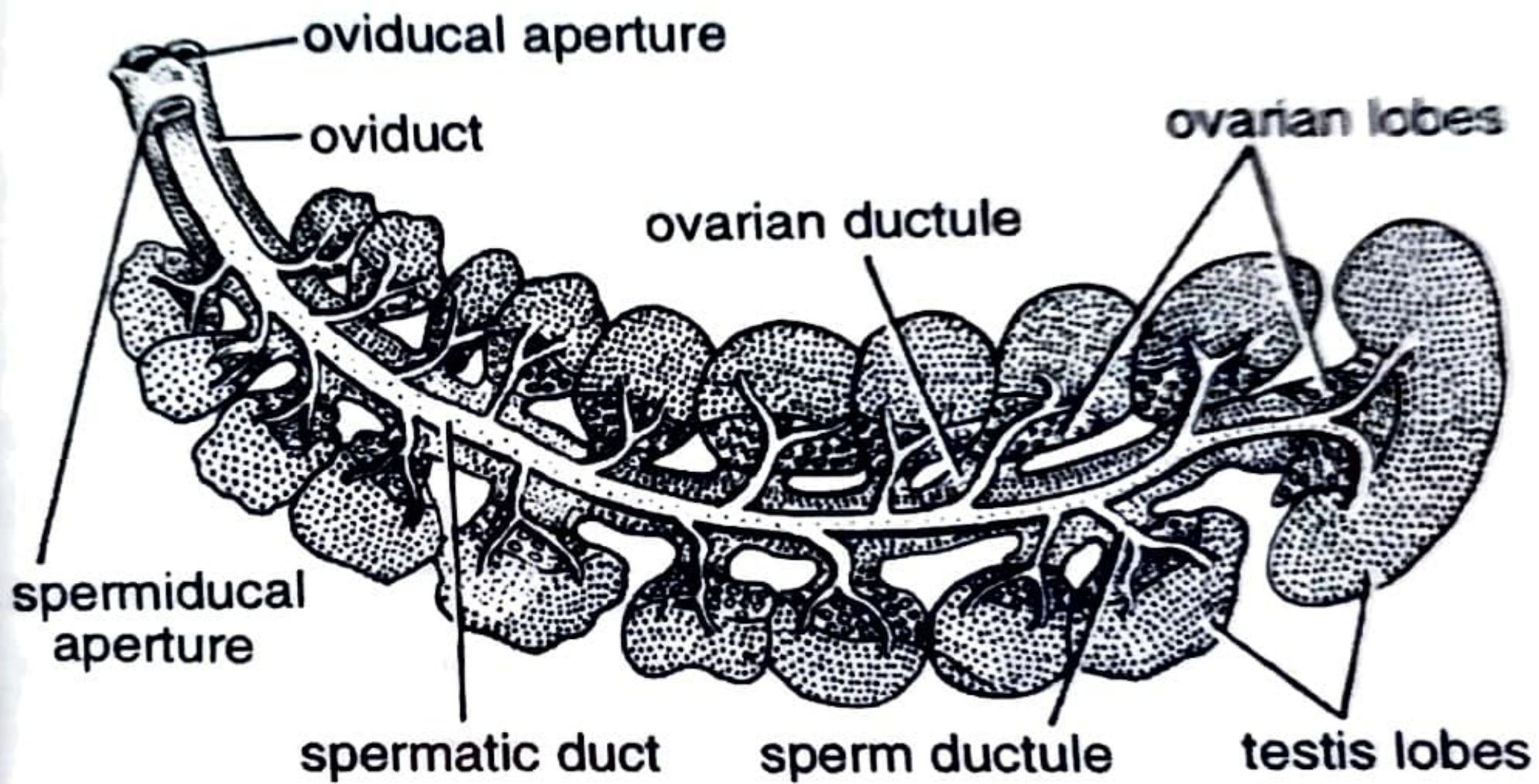
structure of gonad :- → 10 - 25 distinct oval,  
arranged in 2 rows

- The median lobe present at the proximal  
end is the largest, unpaired & bean shaped
- Each ~~lob~~ ~~lob~~ lobe is made up of
  - ① Outer - testicular region
  - ② inner - ovarian region

① The testicular zone is made up of spermatic tubules lined by germinal epithelium, forming spermatogonia, spermatocytes, and spermatozoa.

② The Ovarian zone has a lobulated surface due to formation of ovarian follicles, containing ova in various stages of development.

⇒ Each lobe of gonad is thus an ovotestis.



(Figs. 28 and 29).

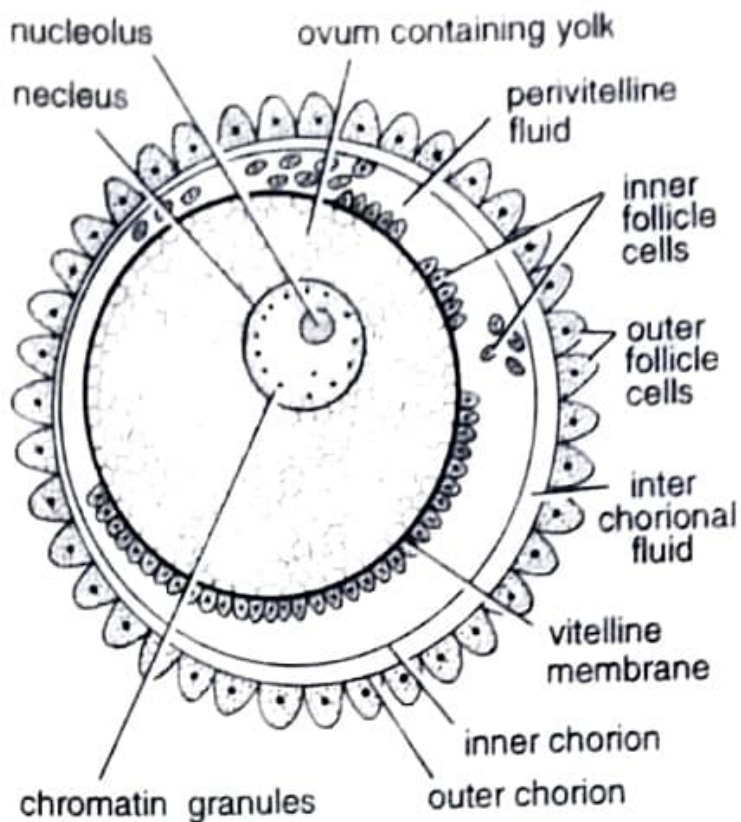
**Gonoducts.** Each gonad has two gonoducts, **oviduct** and **spermatic duct**, running along the central axis. The **oviduct** is a wider tube formed by the union of **ovarian ductules** one from ovarian zone of each lobe. It extends beyond the gonad for

a short distance and opens into cloaca or dorsal atrial cavity, a little behind the anus, by an **oviducal aperture** bordered by four thick **lips**.

The **spermatic duct** or **vas deferens** is a much narrower duct formed by the union of **spermatic ductules** one from testicular zone of each lobe. It runs along the inner (branchial) side of the oviduct and opens independently into cloaca by a **spermiducal aperture** a little behind the oviducal aperture. Both the gonoducts are lined by cilia internally.

**Gametes.** The testicular lobes produce spermatozoa. A mature **spermatozoon** or **sperm** is microscopic, about 4 micra in length. Each has an anterior broad and nucleated **head** capped by a beak-like **acrosome** in front, a middle piece or **neck** and a very long straight **tail**. The sperms are polymorphic with at least three types having acrosome shorter, equal or longer than head.

The ovarian lobes produce ova or eggs. A mature **ovum** is large about 0.3 mm in diameter. Considerable amount of yellowish granulated **yolk** is distributed in its cytoplasm. The large **nucleus**, situated on one side, contains a conspicuous eccentric **nucleolus** and a dense layer of **chromatin granules** beneath the nuclear membrane. Three membranes surround the ovum; (i) **vitelline membrane**, (ii) **inner chorion**, and (iii) **outer chorion**. The thin **vitelline membrane** is secreted by the ovum itself and closely applied forming its wall. The follicular cells of the ovary



**Fig. 31.** *Herdmania*. A mature ovum.

secrete the two **chorion membranes**. The ovum lies eccentrically in the **perivitelline fluid** enclosed by the space between the vitelline membrane and the **inner chorion**. The space also contains a large number of small sized **inner follicle cells**, some floating in the fluid but mostly attached to vitelline membrane. These cells nourish the ovum and secrete an enzyme which digests the chorions to facilitate hatching. The narrow space between the two chorions is filled with an **inter-chorial fluid**. Attached to the outer surface of outer chorion are many vacuolated large-sized **outer follicle cells** which serve to keep the ovum floating in water (Fig. 31).

### Fertilization

Although *Herdmania* is hermaphroditic but self fertilization is rare because the ovarian region mature earlier (protogynous condition), when gametes become mature, they are expelled out in sea water through atrial current. External fertilization takes place in sea water.

## EMBRYONIC OR PRELARVAL DEVELOPMENT

Cleavage or segmentation begins about half an hour after fertilization. It is holoblastic (complete), somewhat unequal and determinate, *i.e.*, the fate of blastomeres is predetermined. The first cleavage is vertical, meridional and divides the gray crescent into two equal parts. Second cleavage is also vertical but at right angle to the first. The resultant four blastomeres are different. Two smaller blastomeres are at posterior side and two larger blastomeres are at front. Only two of these four contain parts of gray crescent. The third cleavage is horizontal and passes little above the equator which divides the blastomeres into 8 cells arranged in two tiers. Fourth cleavage results into 16 blastomeres. Subsequently, cleavage becomes irregular and finally result into a solid ball of

cells called morula. A single-layered flat coeloblastula with an internal fluid filled segmentation cavity or blastocoel is formed at 64-cell stage. In all it takes about 110 minutes. Gastrulation follows by emboly or invagination forming archenteron opening by blastopore.

## LARVAL DEVELOPMENT

The blastopore closes and develops a rudimental tail. The embryo elongates and forms a tailed larva. The presumptive notochordal cells separated from roof of archenteron, occupy the central core of larval tail. Archenteron produces presumptive mesoderm as solid bands and not as hollow coelomic sacs as in *Balanoglossus* or *Branchiostoma*. About 8 hours after fertilization, the chorions rupture, probably dissolved by an enzyme secreted by the inner follicle cells.

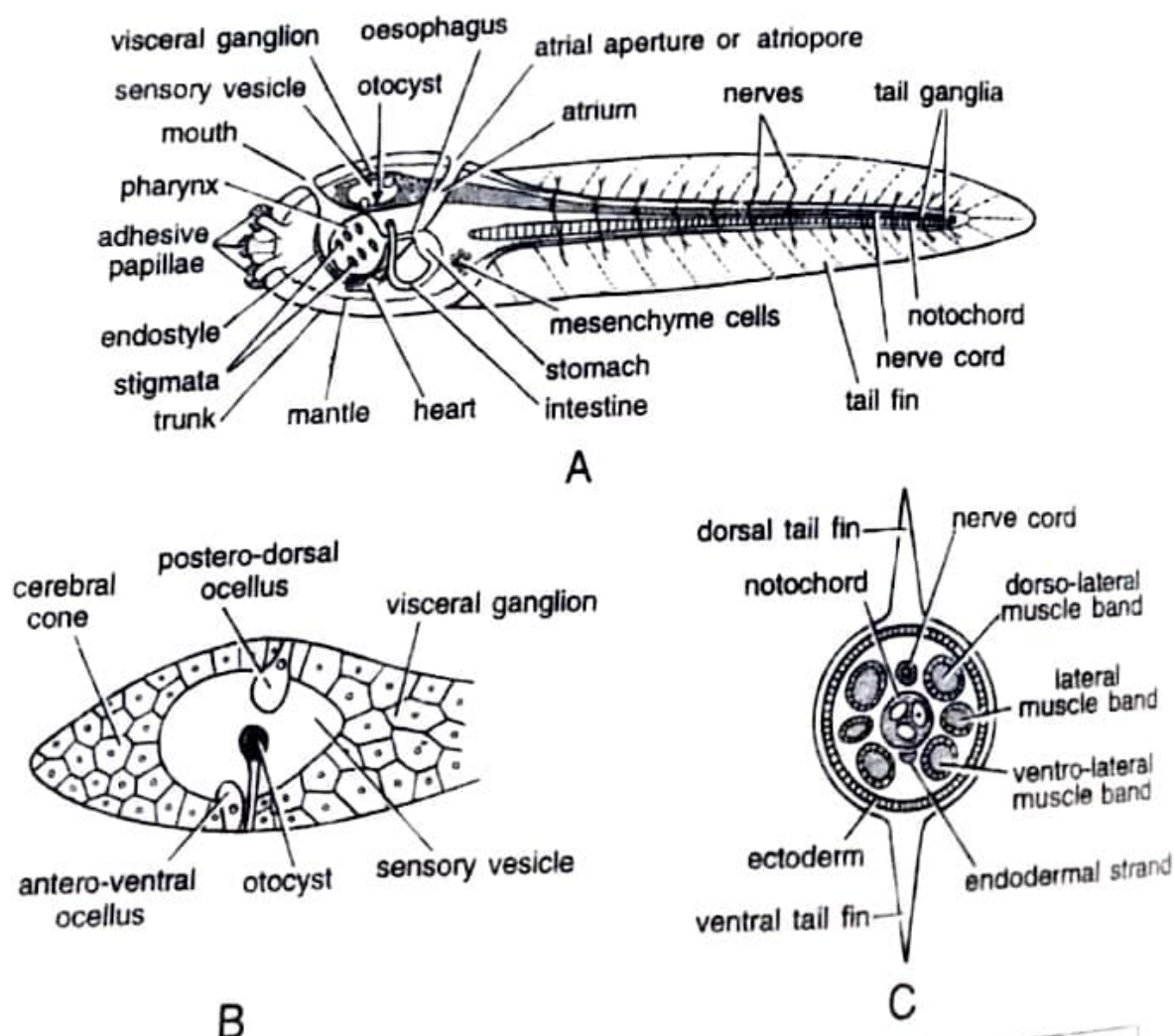


Fig. 1. *Herdmania*. A. Tadpole in left lateral view. B. Sensory vesicle enlarged. C. Tail of tadpole in T.S.

## *Development of Herdmania*

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the fully formed larva hatches out to become free-swimming.