

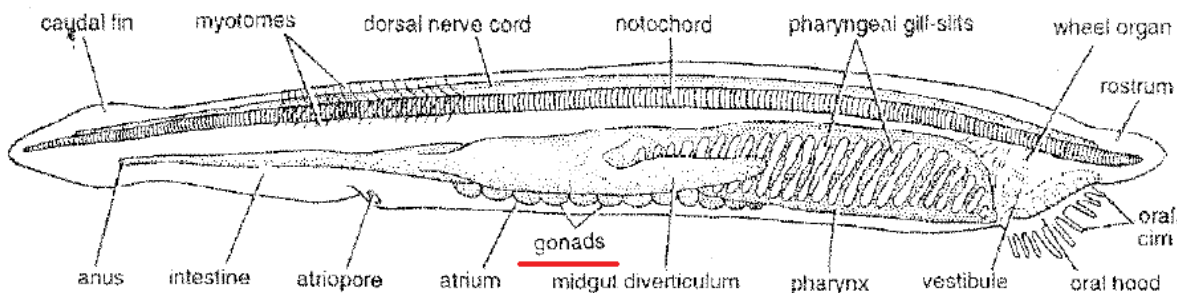


Reproduction in *Branchiostoma* (=Amphioxus)

by Dr. Rahul Ranjan

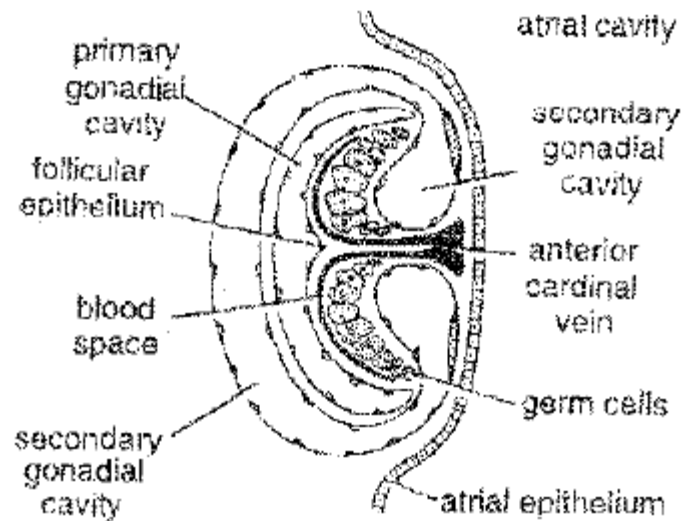
Reproduction in *Branchiostoma* (=Amphioxus)

The reproductive system of *Branchiostoma*, commonly known as *Amphioxus* or Lancelets, is relatively simple compared to more advanced vertebrates. Here's a detailed breakdown of its reproductive anatomy and processes. In *Amphioxus*, the two sexes are separate but there is no sexual dimorphism as 'male and female individuals look identical.



Gonads:

Branchiostoma (=Amphioxus) possesses paired gonads, which are the primary reproductive organs responsible for producing gametes (sperm and eggs). In males, the gonads are called testes, while in females, they are called ovaries. The gonads are located within the coelom (body cavity) near the pharynx, in the posterior region of the body.



Branchiostoma. V.S. mature gonad.

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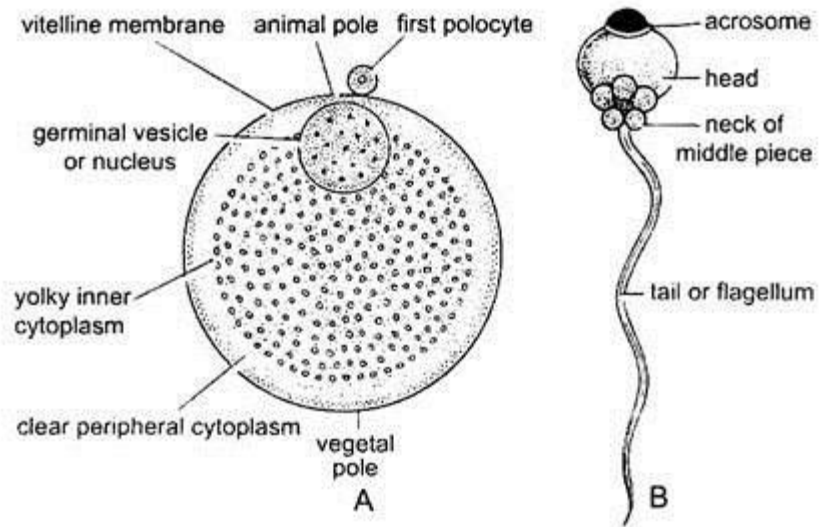
SRAP College, Bara Chakia

The adult has 26 to 27 pairs of similar gonads, arranged metamerically in two rows, one pair in each segment from 25 to 51. The gonads are situated ventro-laterally from middle of pharyngeal region upto the atriopore. They are clearly visible through the transparent bodywall arranged in a linear series on either ventro-lateral side beneath the myotomes. Gonads are simple hollow sacs, mesodermal in origin and bulging conspicuously into the atrial cavity. They are covered on the outer side by the bodywall and on the inner side by the atrial epithelium. Each gonad contains an outer secondary gonadial cavity or gonocoel around and an inner primary gonadial cavity surrounding a group of germ cells which arise from its wall.

Germ Cells:

Germ cells are the precursor cells that give rise to gametes. These cells undergo a process called gametogenesis within the gonads to produce mature sperm and eggs. In males, spermatogenesis occurs within the testes, resulting in the production of sperm cells. In females, oogenesis takes place within the ovaries, leading to the formation of egg cells. Mature ovaries or testes can be

identified only in sections because of the different structure of spermatozoa and ova they contain. A testis presents a streaky appearance due to presence of spermatozoa. The mature sperm of *Branchiostoma*, one of the smallest among chordates, is about 18 μ in length. It consists of the usual nucleated head with acrosome, a



Amphioxus. A–Unfertilised ovum; B–Sperm.

middle piece and long tail. The ovary contains ova which are large and somewhat "rounded cells each 0.1 mm in diameter and having a large nucleus. They are microlecithal or poor in yolk content, Gonoducts are absent. Mature gametes are discharged into the atrium by rupture or dehiscence of gonadial wall along certain weaker spots called cicatrices which afterwards close. The gametes so liberated, escape through atriopore with the outgoing water current.

Gamete Release:

During the breeding season, mature sperm and eggs are released into the surrounding water. Each amphioxus individual has one or two genital pores through which gametes are discharged. The release of gametes is often synchronized with environmental cues, such as changes in temperature or daylight duration.

Fertilization:

Fertilization in amphioxus is external, occurring outside the body in the aquatic environment. Sperm released by males swim actively toward eggs released by females. Upon encountering an egg, sperm cells penetrate the egg membrane, resulting in fertilization. The fertilized egg, or zygote, develops into a free-swimming larva through subsequent embryonic development stages.

Larval Development:

The fertilized egg develops into a free-swimming larval stage known as a "leptochordate larva." The larva possesses characteristic chordate features, including a notochord, a dorsal nerve cord, and pharyngeal slits. Leptochordate larvae are transparent and undergo a brief period of swimming in the water column. After swimming for a period, the larva settles on the ocean floor and undergoes metamorphosis into a juvenile amphioxus.

Sexual Maturation:

Amphioxus typically reaches sexual maturity within a few years after metamorphosing into a juvenile. Once sexually mature, adult *amphioxus* individuals are capable of reproducing. Reproduction occurs repeatedly during the breeding season, with gamete release and fertilization taking place in the surrounding water. Overall, the reproductive system of *Branchiostoma* is adapted for external fertilization in the aquatic environment, reflecting its evolutionary position as a basal chordate.