

***Branchiostoma floridae*, lancelet, amphioxus**

- **Taxonomy**
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Taxonomy

cellular organisms - Eukaryota - Fungi/Metazoa group - Metazoa - Eumetazoa - Bilateria - Coelomata - Deuterostomia - Chordata - Cephalochordata - Branchiostomidae - Branchiostoma - Branchiostoma floridae

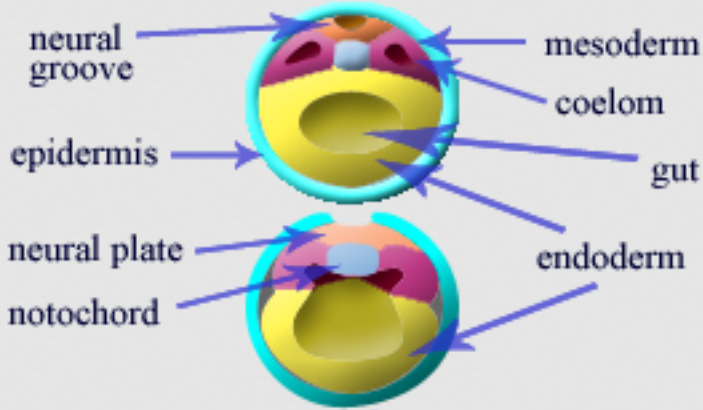
Brief facts

- Lancelets, traditionally known as **amphioxus** (from the Greek for "both ends pointed"), are flattened, about 1-2 inches long, marine organisms usually found in shallow parts of temperate or tropical seas buried in sand with only the head protruding above the sand surface. They are capable of swimming briefly and borrow into sand head first. Lancelets are harvested for human consumption in some parts of Asia.
- There are about 30 lancelet species, most belonging to the genus *Branchiostoma*.
- *B. floridae* is commonly found in shallow water along the southerneastern coasts of the United States. It is dominant benthic organism in Old Tampa Bay, Florida, occuring in population densities of up to 1200 individuals per square meter.
- It is thought that vertebrates evolved from ancestors similar to lancelets.

- Unlike the vertebrates, the lancelet dorsal nerve cord is protected not by bone but by **notochord**, a flexible rodlike structure made of cells that are closely-packed and form a cylinder. The lancelet notochord extends into the head. This gives the subphylum its name (**cephalo-** i.e. "related to the head"). The notochord exists transiently during the life of most vertebrates.
- The amphioxus is the closest living invertebrate relative of the vertebrates. Although, the development of the lancelet embryo is quite similar to development of vertebrate embryos, the amphioxus genome is simpler, smaller, and lacks the extensive gene duplications characteristic of vertebrates. This relative structural and genomic simplicity in a vertebrate-like organism makes amphioxus ideal as a model organism for understanding mechanisms of vertebrate development.
- The lancelet has many homologs of vertebrate organs, such as pituitary gland, pineal organ, striated axial muscles, kidney, liver, thyroid gland, nerve cord, and pancreatic islet cells. These primordial organs share many molecular, developmental, cellular, and physiological parameters with their counterparts in vertebrates.

Development and anatomy of *Branchiostoma floridae*

neurulation



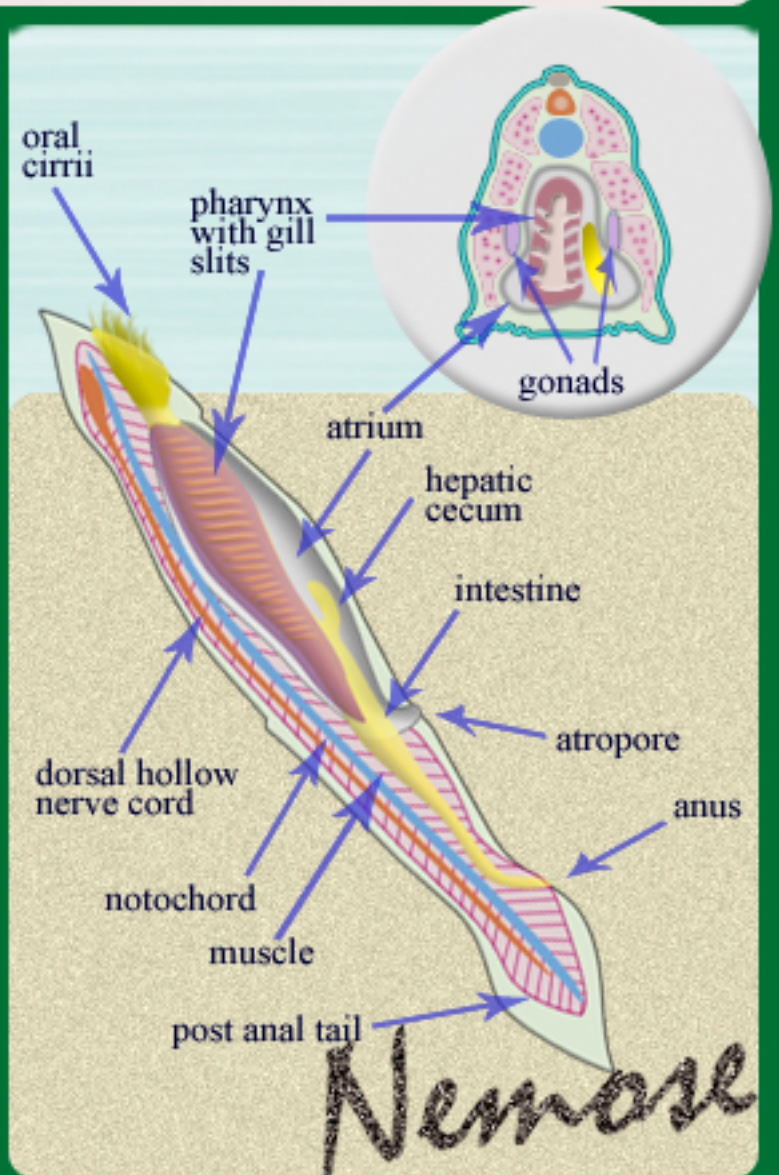
gastrulation



blastula



cleavage



Developmental stages (life cycle)

Life Cycle Stages

Sexes are separate, and each individual breeds at about 12-day interval throughout the summer. In nature spawning is induced by a drop in light level at sundown, in lab settings it can be induced by mild electrical shock.

- egg

- unfertilized egg

gametes (eggs and spermatozooids) are broadcast into the seawater with single female producing 1000-5000 eggs at each spawning; the lancelet egg is **microlethical** i. e. contains little amount of yolk which is uniformly dispersed throughout the egg

- fertilized egg

male and female pronuclei meet at ~16 min after insemination

- embryo

- cleavage MeSH

dividing egg, 2-16-cell embryo; cell division without growth

- morula MeSH

the morula is solid ball of cells; all of the cells of a lancelet morula are approximately the same size because they have little yolk

- blastula MeSH

the morula becomes a blastula when an internal cavity, the **blastocoel**, appears ~5-6 h after fertilization

- gastrula MeSH

gastrulation begins when embryo is approximately 400 cells in size; during

gastrulation cells migrate inward producing a hollow embryo with an opening to the space in the center and two layers of cells (ectoderm and endoderm) surrounding this cavity; the embryo swims about as a ciliated gastrula

- **neurula**

~24-26 h after fertilization; embryo assumes the form of a ciliated flattened cylinder, with both ends alike; notochord now appeared and extends to the front end, beyond the end of the brain

- **larval**

eggs hatch as ciliated neurulae; development proceeds with the perforation of the first gill-slit and a growth period involving an increase in gill-slit and myotome numbers; the subsequent metamorphosis to the bottom living adult involves re-arrangement of the gill apparatus; during their development, lancelet larvae are capable of swimming using either their epidermal cilia or muscular body undulations

- **juvenile**

juveniles look like miniature adults; their gonads are underdeveloped

- **adult**

age of sexual reproductive maturity at about 6 weeks of age; life span is estimated to be about 3 years; all species

References

PubMed articles

- Holland ND, Holland LZ. Stage- and tissue-specific patterns of cell division in embryonic and larval tissues of amphioxus during normal development. *Evol Dev.* 2006 Mar-Apr; 8(2): 142-9. **PMID: 16509893**
- Holland LZ, Laudet V, Schubert M. The chordate amphioxus: an emerging model organism for developmental biology. *Cell Mol Life Sci.* 2004 Sep; 61(18): 2290-308. **PMID: 15378201**
- Gibson-Brown JJ, Osoegawa K. et al. A proposal to sequence the amphioxus genome submitted to the Joint Genome Institute of the US Department of Energy. *J Exp Zool B Mol Dev Evol.* 2003 Dec 15 **PMID: 14984031**
- **PubMed: free full text articles about *Branchiostoma***

Websites

- **Wikipedia: Lancelet**
- **Invetebrate Anatomy OnLine: Branchiostoma**



Last updated 09/11/09
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