Amphioxus larvae - Branchiostoma lanceolata

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Sometimes, randomly reading biology books (about marine biology for me!) we come across intriguing species and we would like to be able to find some of them in our samples. For me it was the amphioxus (AKA : lancelet) whose form I knew but of which I had never encountered a specimen in 20 years of marine samples...

And now, last year, when a plankton net was launched at a shallow depth, less than 2m, it dragged near the seaweed-covered bottom and brought back 2 amphioxus larvae. At first sight, while observing and sorting the sample with a low magnification objective, I noticed what I took at first sight for a fish larva... A few seconds later I realized my mistake: I was in the presence of an amphioxus larva which must not have been more than 48 hours old... An examination of the whole sample made it possible to find a second one. Let's first see how the lancelet has a special place in the classification and is used a lot as a subject in studies of the evolution of organisms in the animal kingdom.

It is therefore at the level of the classification of the first presence of a “chordate” organism more precisely of a cephalochordate, which has a dorsal cord which distinguishes it from invertebrates; we have the classification succinctly below:

Phylum Chordata
- Subphylum : Cephalochordata….example Lancelet
- Subphylum Urochordata ….example : Tunicates
- Subphylum Vertebrata
  - Classes fishes Agnata…example : lamprey
    Cartilaginous fishes example : sharks
    Fishes with bones ….
  - Class Amphibia….
  - Class Reptilia…..
  - ……
  - Class Mammalia

I am not a classification specialist (taxonomy changes over time with the use of molecular biology and DNA analysis, which reveal other family ties), but this table makes it possible to position amphioxus as one of the first ancestors of vertebrates... Although their conservation is difficult in the sediments because of their soft structure, fossils dating between 500 and 600 million years have been found...

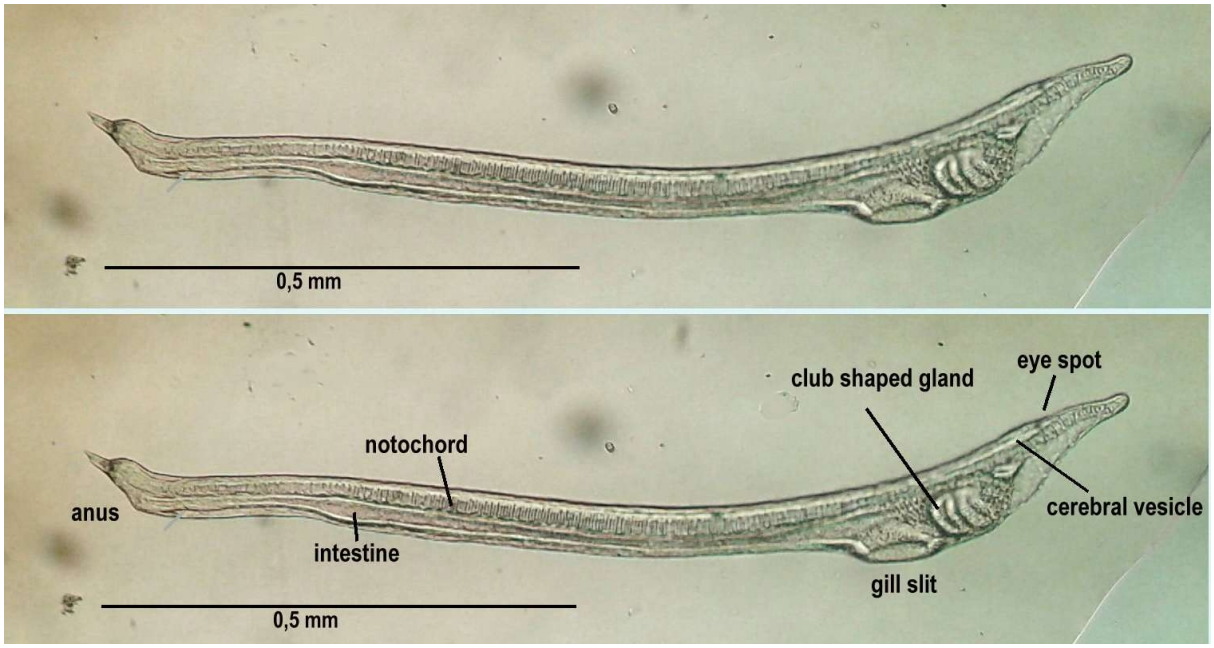
It is understandable why a creature that has hardly evolved for such a long time arouses the interest of scientists. Just search the web with the keywords amphioxus or lancelet to find many studies and images of adult individuals...

The adult, which measures 5 to 6 cm in length, burrows halfway into the sand and feeds by filtering marine plankton. Its name comes from the Greek ὀξύς: pointed and ἀμφίς: on both sides.

It has many gill slits: the water enters through the mouth on the left side of the body and comes out through the slits located on the right side of the body along the pharynx. Nutrient particles are captured by an endostyle and carried by mucus through the digestive system. The adult body is translucent enough to show the internal organs.

But back to the observation of these larvae, which did not seem quite the same age. Note that the specimens are alive which gives the advantage of taking images from various angles, for example top view, ¾ view and the disadvantage of having blurred images because of their movements!

Here is the first specimen in lateral view and below its commented anatomy: We notice the "cord" formed of stacked discs that we see from the edge, the other organs are very visible including the first brachial gill. The nervous system consists of the cerebral vesicle and the neural tube above the notochord



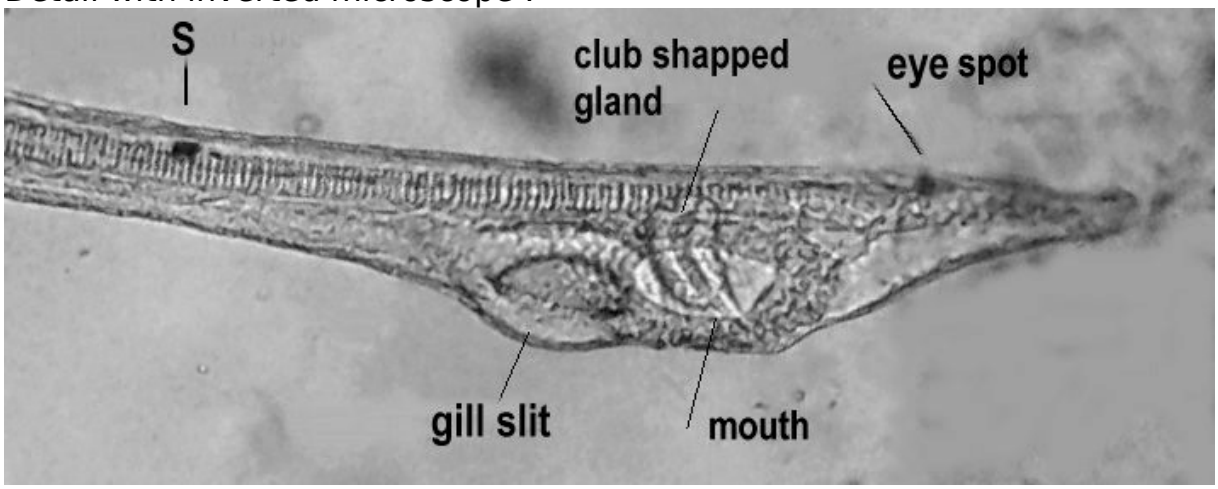
Club shaped gland (function is not clearly known) disappears in the adult stage.

A bottom view image (taken under an inverted microscope with the X 10 objective) with enlarged details (the specimen is mobile because there is no coverslip used) :

Note the presence of the cirri (3) in front of the mouth which separate the too large particles. Some images can be misleading as they are made with an inverted microscope which makes right/left appear swapped, but this bottom view is rare!

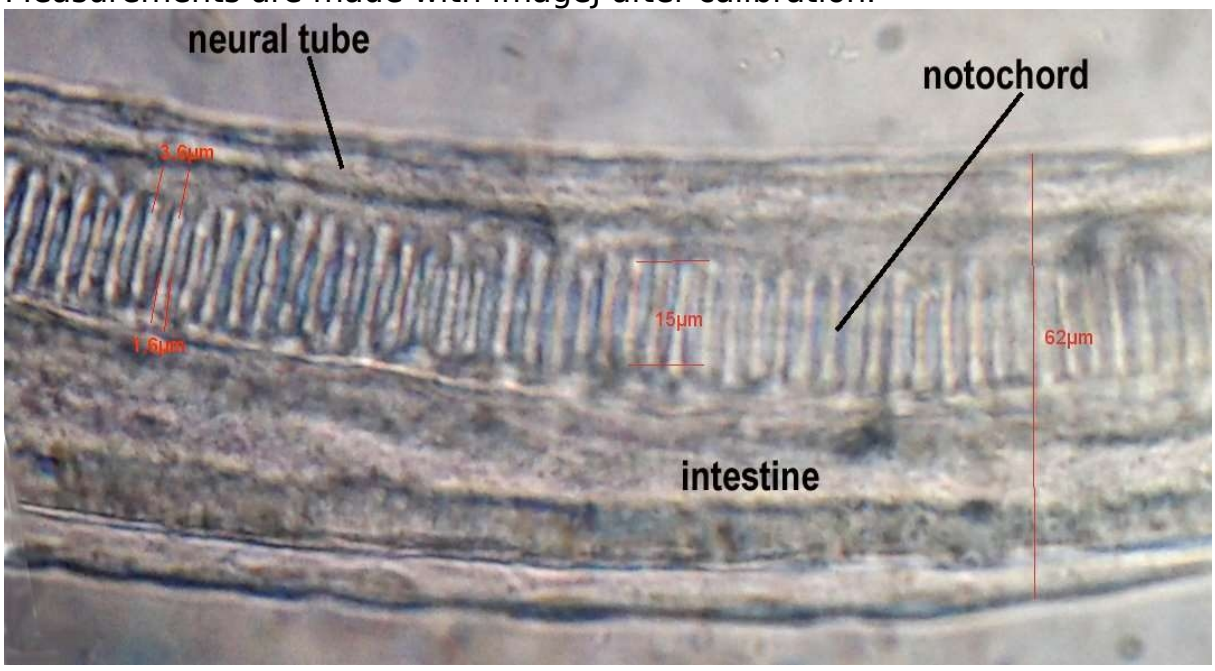
The mouth is well located on the left side of the body (in top view) Note a second spot S, probably photosensitive , in the view below:

Detail with inverted microscope :



Below is a detail of the anterior part with x 40 objective, this time under coverslip. A few fuzzy dark spots are due to the presence of impurities and are not parts of the specimen, which was slightly compressed. We can clearly see the cerebral vesicle V which extends through the nerve tube above the notochord:

And an image with x 40 objective showing the flexible notochord and the dimensions of the muscular discs (about 1.6 µm thick), which allow swimming in undulations. Measurements are made with ImageJ after calibration.



To learn more :

Adult description (lab observation):

https://lanwebs.lander.edu/faculty/rsfox/invertebrates/branchiostoma.html

Some pictures of larval development :

https://cob.silverchair-cdn.com/cob/content_public/journal/dev/138/22/10.1242_dev.066720/3/4819.pdf?Expires=1668250033&Signature=QXF7dDF3ZkIxis9bf9D9VIMdxWnwQMDMjk8qU0LfEPk0THMGQxU~9sUroO5y1DXsnLTUYbS7epiGXJiwRhJ1ojSVjyyxcBb5jjFYwNphRT8m-qCXkNRg-NZ1knutOfBmDTA4KDwuPZxKcUUxMrlS6Mgb2P4emllTK4Z7GY~7vpxvdS23M7b0-aTG9kC5ddjsZhHAcU8zTVFptaZUA7fRBlZf7sMYzyWniprs8aY6~qXhuli0GMq0JJdB3KoRHltJTrGg8ill7Y7OhxZewn33Y0rAzP0oEJdtGKS2x7Y3h4qvr-V0-QR-NhunBpa-HB9dTQpSM4CDCTCgQldCY8P8Jw__&Key-Pair-Id=APKAIE5G5CRDK6RD3PGA

Others studies and pictures :

https://www.researchgate.net/publication/273146471_Hybrids_Between_the_Florida_Amphioxus_Branchiostoma_floridae_and_the_Bahamas_Lancelet_Asymmetron_lucayanum_Developmental_Morphology_and_Chromosome_Counts

https://www.researchgate.net/publication/5635212_Larval_Development_of_the_Oriental_Lancelet_Branchiostoma_belcheri_in_Laboratory_Mass_Culture

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