

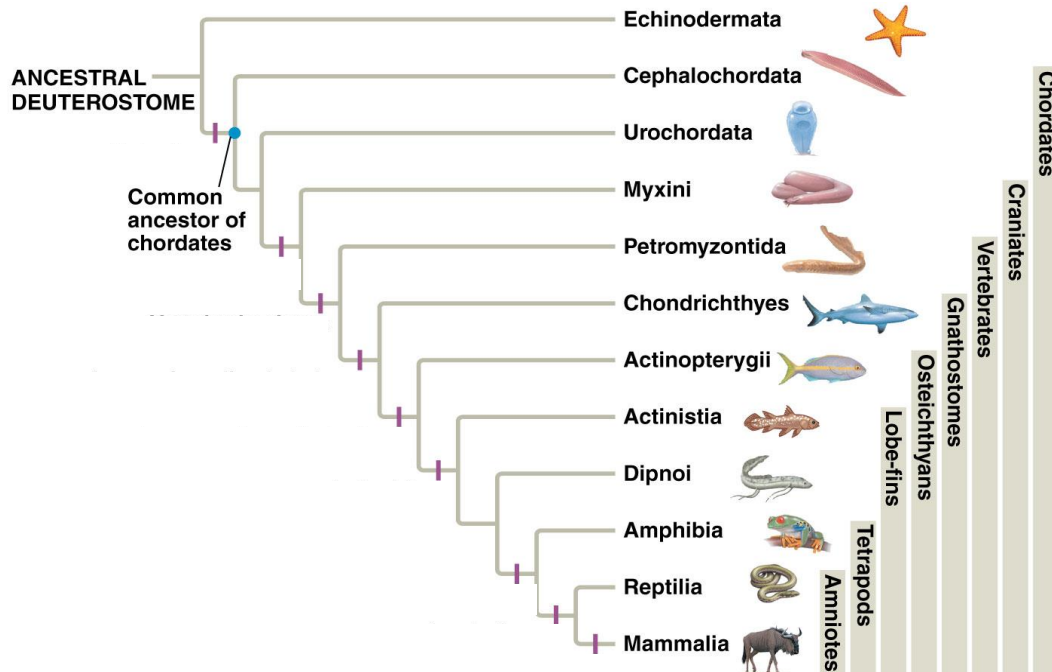
Chordate Animals

Objectives:

- Be able to identify the four traits shared by chordates: **notochord, dorsal hollow nerve cord, pharyngeal gill slits/pouches, post-anal tail.**
- Be able to map the following traits on a phylogeny of the chordates: **Notochord, head (cranium), vertebral column, jaws, lungs, lobed fins, limbs with digits, amniotic egg, and milk.**
- Be able to identify to which of the major taxonomic groups an animal belongs (all **taxa** indicated in the phylogenetic trees included in this lab).
- Be able to describe important features of the animal taxa covered in this lab

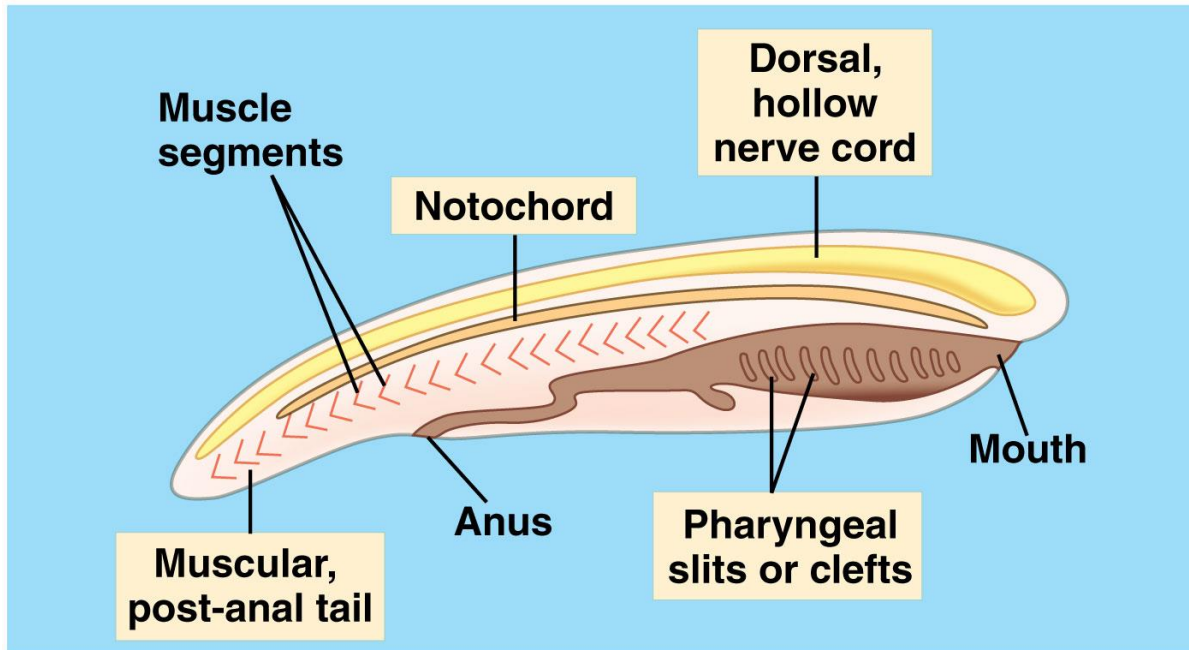
Chordate Phylogeny

In the following phylogeny label the following traits: **lungs, limbs with digits, vertebral column, amniotic egg, notochord, jaws, lobed fins, and mammary glands.**



Identifying Chordate Features

The figure below illustrates the 4 traits that chordates have in common: **notochord**, **dorsal hollow nerve cord**, **pharyngeal gill slits**, and a **post-anal tail**. They do not necessarily possess all of these traits at all stages of their life cycle, but all chordates have these four traits at some point during their life cycle.



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- Observe *Amphioxus* (a Cephalochordate). Draw *Amphioxus* in the space below, and label the notochord, dorsal hollow nerve cord, pharyngeal gill slits, and post-anal tail.

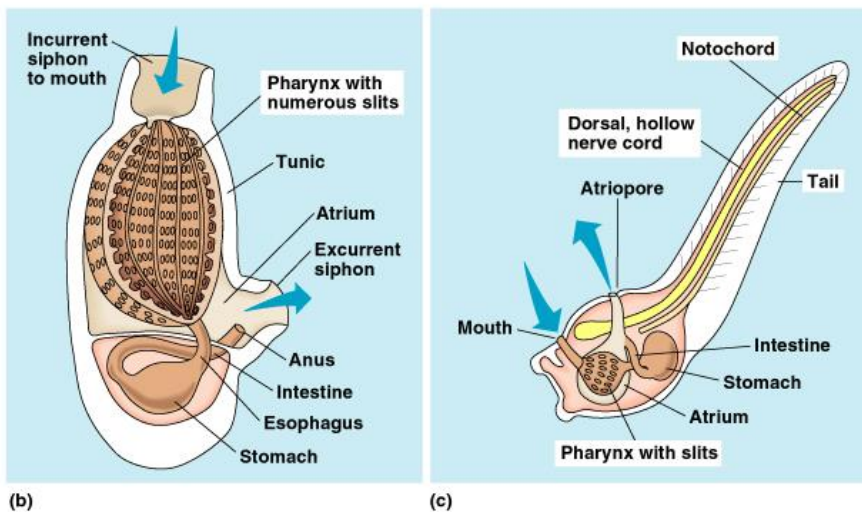
Identifying the major chordate taxonomic groups

Phylum Chordata

Subphylum Urochordata

Tunicates or sea squirts

Tunicates are deuterostomes and chordates, despite looking like a sponge. Even sponge biologists get confused when looking at pictures or while diving and looking at a urochordate colony from a distance! But once you cut them open, you can see tissues and organs. As adults they do not have a notochord, but only briefly during their larval stage. The specimens we have in our lab today are not very well preserved, so look at the images your instructor puts on the screen and look at the diagram in your textbook. Draw a generalized urochordate and at least label the tunic and the siphons.



Phylum Chordata

Subphylum Hemichordata

Acorn worms

Acorn worms diverged early from the rest of the chordates, but most interestingly, the latest data seems to point to them being the sister group to the echinoderms (starfish and sea cucumbers) that we saw during our last lab. Draw the preserved specimen, paying

Phylum Chordata
Subphylum Vertebrata
Class Agnatha
The jawless fish

The Agnatha is a paraphyletic group that contains the “jawless fish”. Draw a specimen from those in the big jar in the lab, and pay special attention to the structure of the mouth. Compare them against the Gnathostomata (the jawed fish, which include us the mammals) when you get to those in this lab.

Phylum Chordata

Subphylum Vertebrata

Class Chondrichthyes

The sharks, skates and rays. This group sits at the base of the Gnathostomata, the jawed animals. Observe and draw a few specimens. Then look at the phylogeny and answer this question: are Chondrichthyes lobe-finned fish or are they ray-finned fish? (hint: it's a trick question, look at the phylogeny!)

Phylum Chordata

Subphylum Vertebrata

Class Osteichthyes

The bony fish are part of the ray-finned fish, the **Actinopterygii**. Observe and draw some of the specimens on display, taking special note of the fact that they have jaws.

Phylum Chordata**Subphylum Vertebrata****Class Amphibia****Order Caudata**

The salamanders. Amphibians are lobe-finned fish (look at the phylogeny). Although they are also tetrapods, and thus adapted to the land environment, they are also tied to the water, and unlike reptiles and mammals, cannot be completely separated from the water. What is that adaptation that they lack, and which reptiles and mammals have, that does not allow them to completely move to an environment without water? Draw at least one salamander, and notice how much they look like a lizard, although they are not closely related.

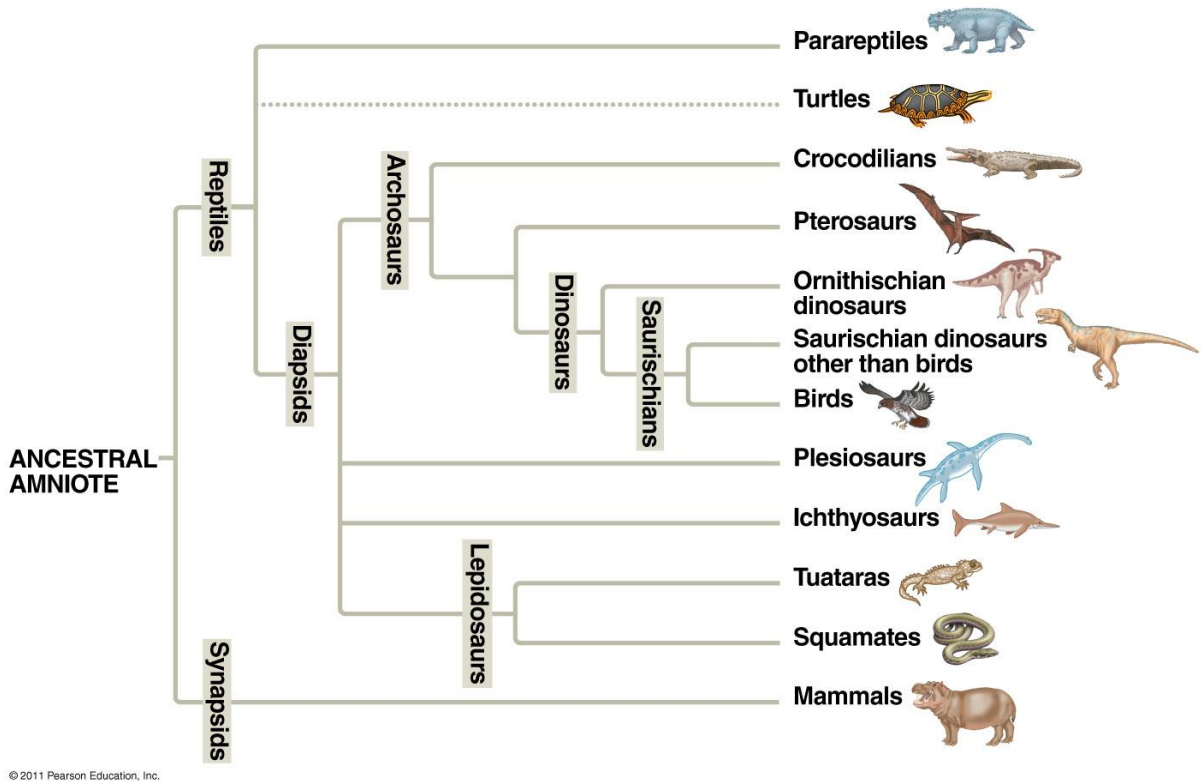
Family Caeciliidae

Look and draw the caecilian, another important amphibian. Can you see any legs? How come it's still classified as a tetrapod?

Order Anura

Frogs. Draw a frog, and a tadpole. Are frogs lobe- or ray-finned? Are frogs tetrapods? Are frogs reptiles? You can answer all of these questions by looking at the chordate phylogeny.

The amniotes



Phylum Chordata

Class Reptilia

Order Crocodylia

Crocs and alligators. Observe and draw the skulls on display.

Phylum Chordata

Class Reptilia

Order Squamata

Lizards and snakes. This group has scales covering their bodies. Look at the snakes. How can they be tetrapods when they have no legs? Aren't tetrapods the animals with four limbs? Draw a few specimens.

Phylum Chordata

Class Reptilia

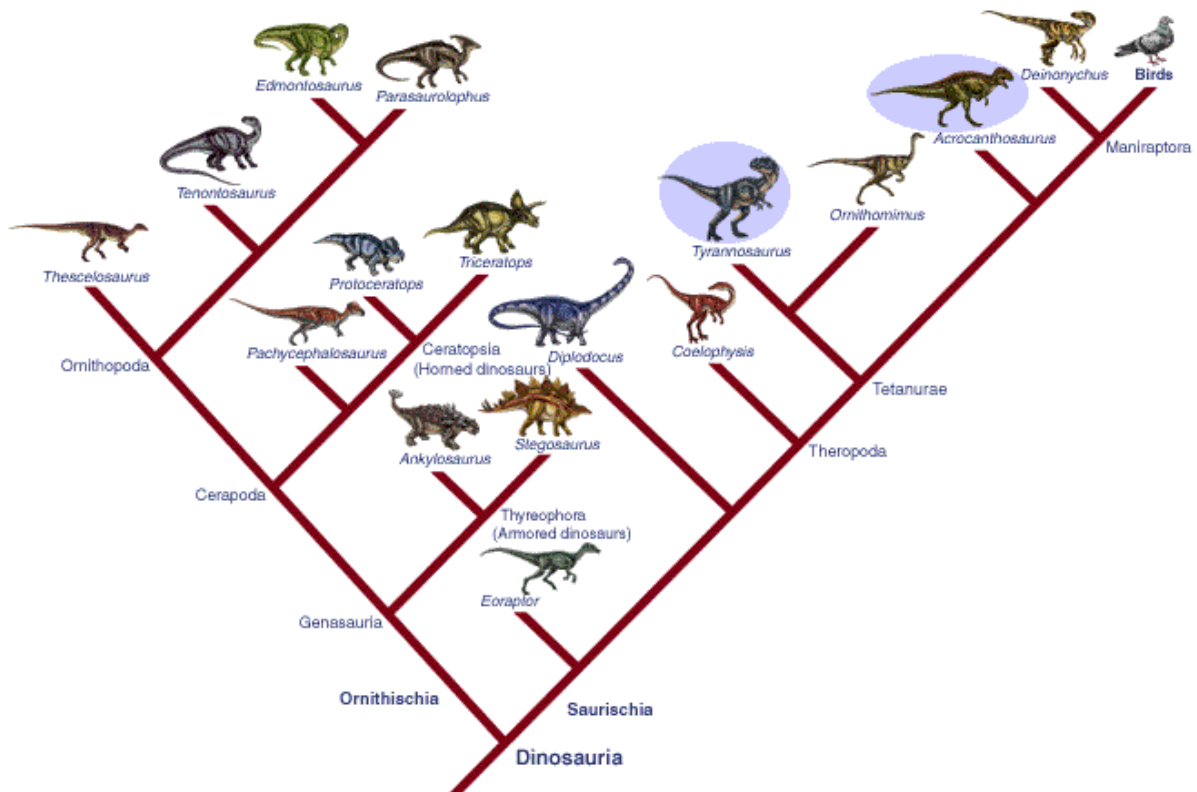
Order Testudines

The turtles. All turtles have shells. Their placement in the phylogeny of the reptiles is still debated. Draw a few specimens.

Dinosaurs

Dinosaurs can be confusing at first because the monophyly of the group depends on how broad of a definition you use. For example, if you only call dinosaurs those animals inside the Dinosauria group (within the reptiles, look at the phylogeny of the amniotes above), and **also** call birds dinosaurs, then they do form a clade or monophyletic group. If you exclude birds, then they become paraphyletic. On the other extreme, if you call a dinosaur any extinct animal for which we find fossilized big bones, then they are polyphyletic. Look at the phylogeny of the amniotes above. Using the strict definition of dinosaurs, i.e. only those that are inside the Dinosauria clade, are the following prehistoric, big-boned animals also dinosaurs: Pterosaurs, Plesiosaurs, Ichthyosaurs and extinct Crocodilians?

We have on display a large collection of dinosaur models. Using the following phylogeny, try to find as many as you can. From lecture, remember that there are two main groups of dinosaurs: the saurischians (the lizard-hipped dinosaurs) and the ornithischians (the bird-hipped dinosaurs). Look at the phylogeny. Are birds lizard-hipped or are they bird-hipped?



Notes: