

The Chordates

Chapter 30: Nonvertebrate Chordates, Fishes and Amphibians

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Phylum - Chordata

Four Characteristics

A chordate is an animal that has for at least some stage of its life,

- a dorsal, hollow nerve cord;
- a notochord;
- pharyngeal pouches;
- a tail that extends beyond the anus.

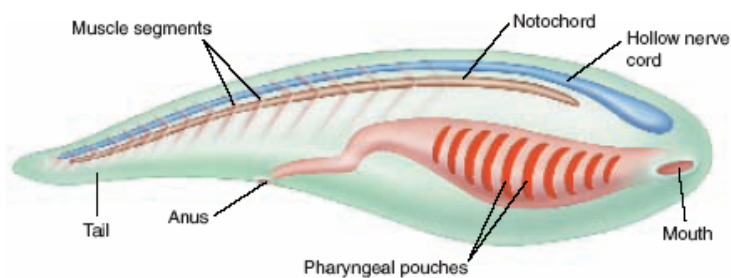


Figure 30-1 All chordates share four characteristics: a dorsal, hollow nerve cord; a notochord; pharyngeal pouches; and a tail that extends beyond the anus. Some chordates possess all these characteristics as adults; others possess them only as embryos.

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Nerves branch from the nerve cord at regular intervals and connect to organs, muscles and sense organs.

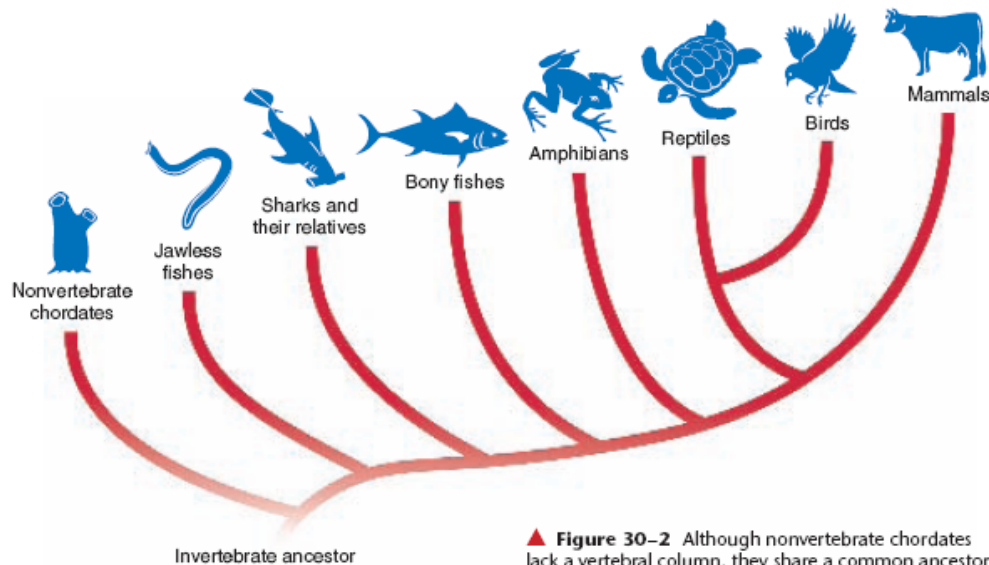
The notochord is a long supporting rod that runs through the body just below the nerve cord. Most chordates have a notochord only when they are embryos.

Pharyngeal pouches are paired structures in the throat (pharynx) region.

The tail can contain bone and muscle and is used in swimming in many aquatic species.

Phylogeny of Chordates

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▲ **Figure 30-2** Although nonvertebrate chordates lack a vertebral column, they share a common ancestor with vertebrates. **Interpreting Graphics** To which other vertebrate group are birds most closely related?

About 96% of all chordate species are placed in the subphylum Vertebrata and are called vertebrates. Most vertebrates have a strong supporting structure known as a vertebral column or backbone.

dorsal, hollow nerve cord -> the spinal cord

As the vertebrate embryo develops, the front end of the spinal cord develops into a brain.

notochord -> replaced by the backbone in most developing vertebrates

-> the backbone is made of individual segments called vertebrae

-> the backbone is part of an endoskeleton that supports and protects an animal's body and gives a place for muscles to attach

-> the backbone grows as the animal grows

There are two subphyla of chordates that do not have backbones.

Tunicates (subphylum Urochordata) and lancelets (subphylum Cephalochordata) are soft-bodied marine organisms.

They have a hollow nerve cord, a notochord, pharyngeal pouches and a tail at some point in their life cycle.



▲ **Figure 30-4** Tunicates get their name from the adult's body covering—the tough, nonliving tunic. Most tunicates are commonly known as sea squirts, because of the stream of water they sometimes eject. **Inferring** In what kind of ecosystem are you likely to find tunicates?

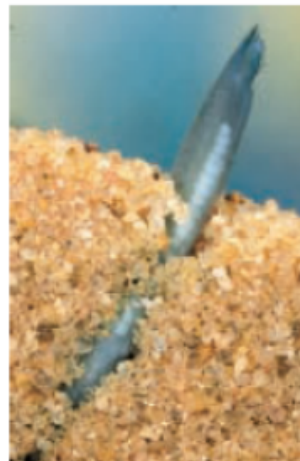


Figure 30-5 Lancelets are small nonvertebrate chordates that often live with their bodies half buried in sand. Because lancelets do not have fins or legs, they can move only by contracting the paired muscles on their bodies. **Interpreting Graphics** Which chordate characteristics do lancelets have?

Chapter 33: Comparing Chordates

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Evolutionary Trends in Vertebrates ✓

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Over the course of evolution, the appearance of new adaptations (ie/ jaws, paired appendages) has launched adaptive radiations in chordate groups.

adaptive radiation - the rapid diversification of species as they adapt to new conditions

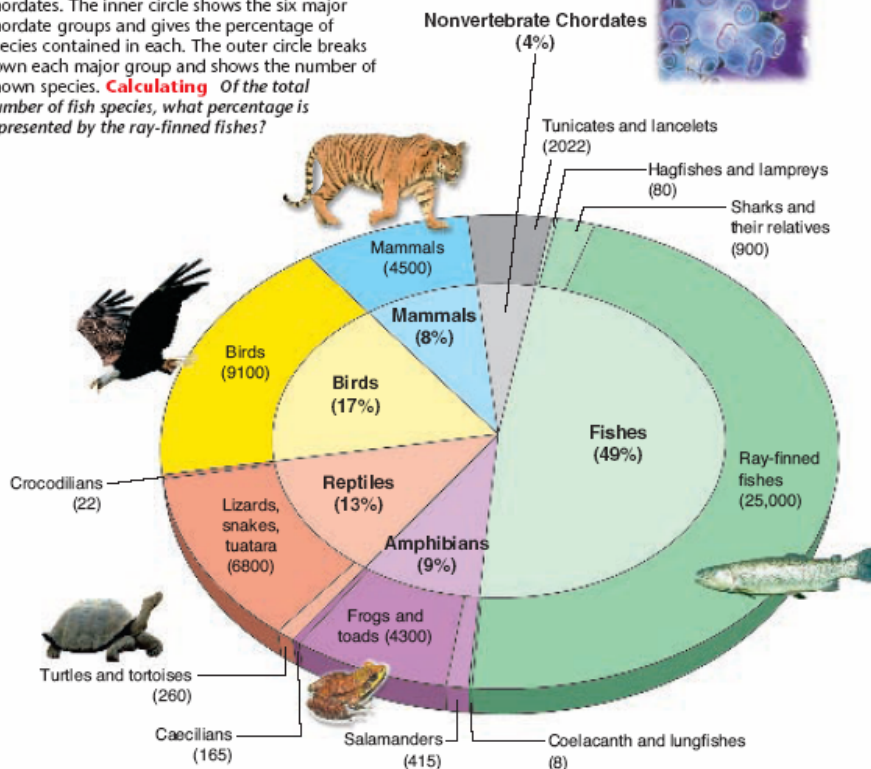
Convergent evolution is the process by which unrelated organisms independently evolve similarities when adapting to similar environments.

The six living groups of chordates are the

- nonvertebrate chordates (tunicates and lancelets),
- fishes,
- amphibians,
- reptiles,
- birds
- mammals.

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Figure 33-4 This pie chart shows the diversity of chordates. The area of each slice represents the relative number of living species in each group of chordates. The inner circle shows the six major chordate groups and gives the percentage of species contained in each. The outer circle breaks down each major group and shows the number of known species. **Calculating** Of the total number of fish species, what percentage is represented by the ray-finned fishes?



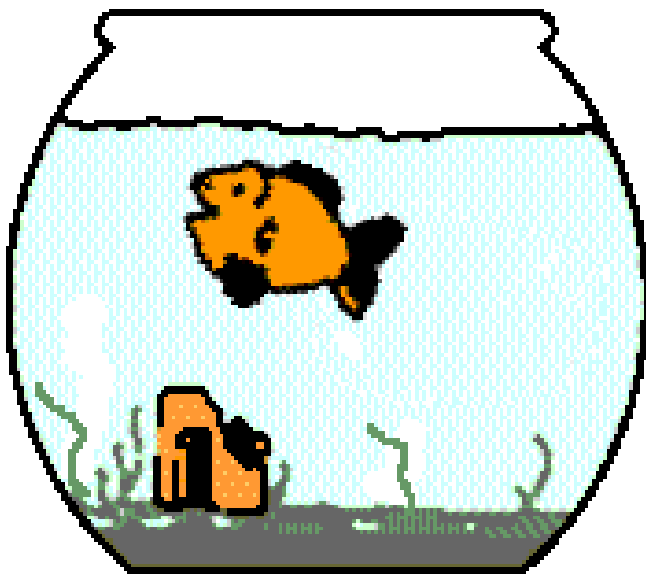
Fishes are aquatic vertebrates; most fishes have paired fins, scales and gills.

An amphibian is a vertebrate that, with some exceptions, lives in water as a larva and on land as an adult, breathes with lungs as an adult, has moist skin that contains mucous glands, and lacks scales and claws.

A reptile is a vertebrate that has dry scaly skin, lungs and terrestrial eggs with several membranes.

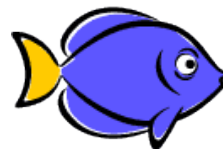
Birds are reptile-like animals that maintain a constant internal body temperature. They have an outer covering of feathers; two legs that are covered with scales and are used for walking or perching; and front limbs modified into wings.

In addition to having hair and the ability to nourish their young with milk, all mammals breathe air, have four-chambered hearts, and are endotherms that generate their body heat internally.



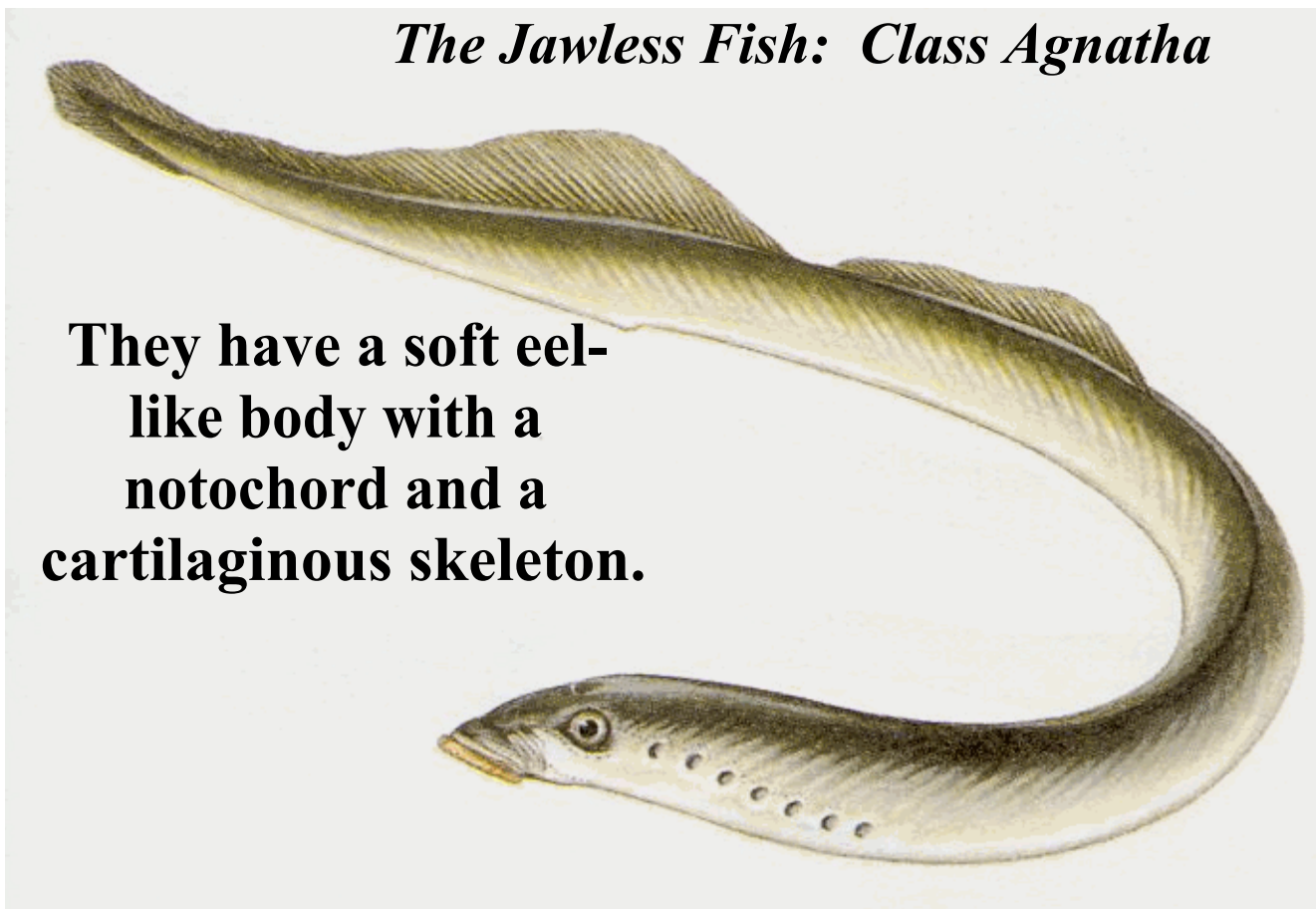
Fish

All fish possess gills for exchange of O_2 and CO_2 with the water. Fish are divided into jawless fish, cartilaginous fish and bony fish.



The Jawless Fish: Class Agnatha

They have a soft eel-like body with a notochord and a cartilaginous skeleton.





Examples include lampreys and hagfish. Their mouths may be suckerlike and lined with hard teeth.



***The Cartilaginous Fish:
Class Chondrichthyes***

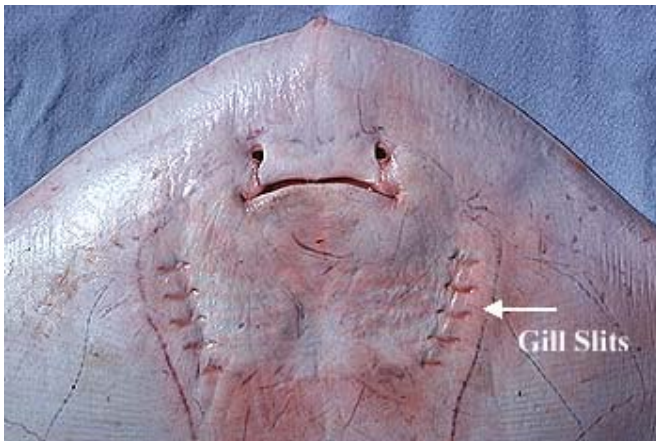
- They have cartilage and not bones.
- Examples are sharks, skates, rays.





Sanctuary research coordinator and juvenile manta ray

Kaile Tsapis
sanctuaries.nos.noaa.gov



- They have biting jaws and large fins.
- They also have paired gills (up to 7 pairs-side).
- They have lateral lines along the side that sense movement.
- Their bodies are lined with conelike scales.

The Bony Fish: ***Class Osteichthyes***



- Examples include trout, salmon, cod, perch etc..
 - Most belong to subclass ray finned fishes.
 - All have a gill covering called an operculum.
 - They also have a two chambered heart.
 - Fertilization is external.
- They also have a swim bladder which fills with oxygen, nitrogen and CO₂, that helps the fish maintain buoyancy and permits it to change depth with ease. They do this by adding or removing gas.

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