

# MARINE VERTEBRATES

Amphibians, Reptiles, and Mammals

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# A TAXONOMIC OVERVIEW OF VERTEBRATES

Kingdom  
Animalia

Phylum  
Chordata

Subphylum  
Vertebrata

**Class**  
**Agnatha**  
(jawless  
fishes)

**Class**  
**Chondrichthes**  
(cartilaginous  
fishes)

**Class**  
**Osteochondrichthes**  
(bony fishes)

**Class**  
**Amphibia**  
(amphibians)

**Class**  
**Reptilia**  
(reptiles)

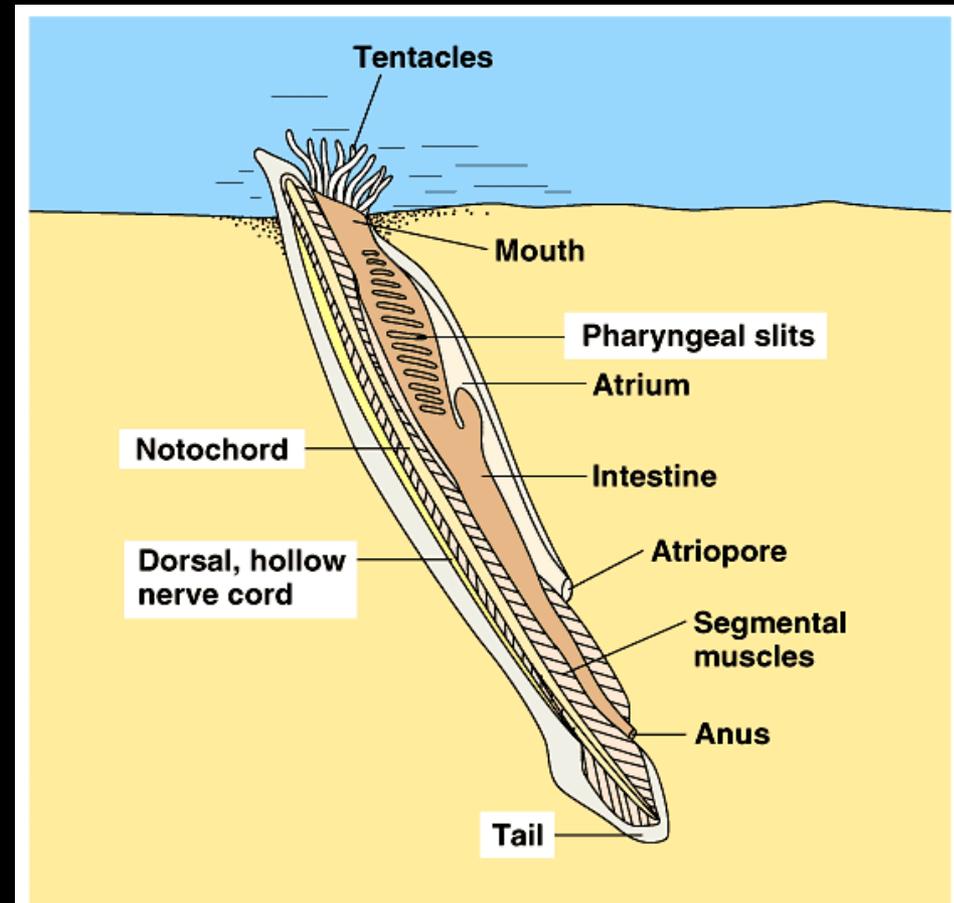
**Class**  
**Mamalia**  
(mammals)

# CHARACTERISTICS OF VERTEBRATES

At some point in their lives, all organisms in the phylum **Chordata** have three basic characteristics:

1. A dorsal supporting rod called a **notochord**, which *is replaced by the vertebral column* in the adult vertebrates.
2. A dorsal hollow **nerve cord**, in contrast to invertebrates, which have a ventral solid nerve cord.
3. Pharyngeal pouches or **gill clefts (slits)**, *which are seen only during embryological development in most vertebrate groups*, although they persist in adult fishes.

# THE LANCELET – A NON-VERTEBRATE CHORDATE



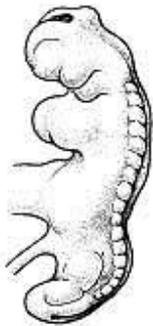
(a)

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# CHORDATE CHARACTERISTICS IN HUMAN EMBRYOS



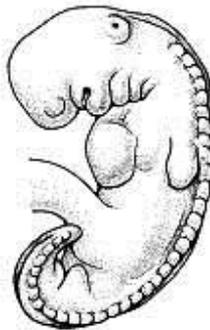
A 22 ± 1 day



B 24 ± 1 day



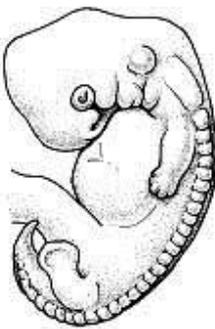
C 26 days



D 28 days



E 31 days



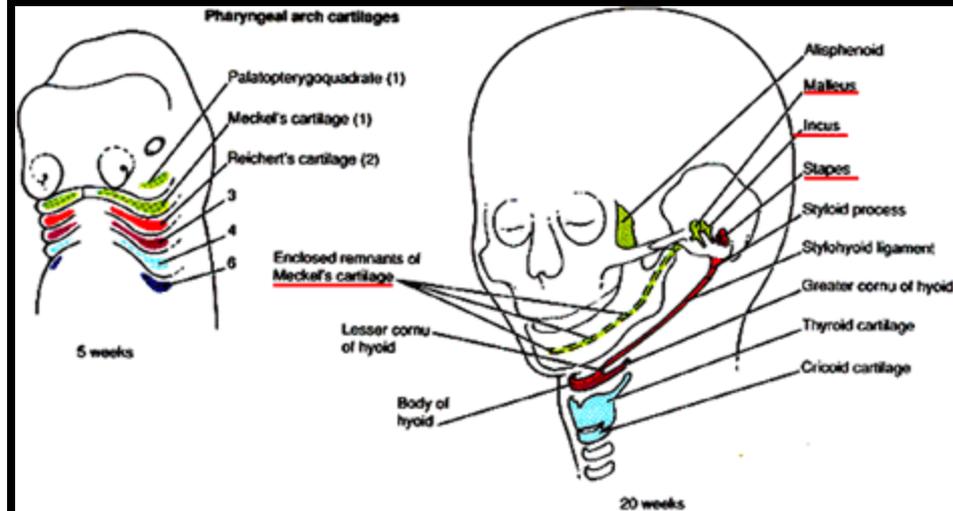
F 35 days



G 42 days



H 56 days



# CLASS AMPHIBIA – THE AMPHIBIANS

The name Amphibian comes from Amphi- meaning "on both sides" and -bios meaning "life"

This refers to the difference in their water-breathing juvenile and air-breathing adult forms.

This class includes **frogs, toads, salamanders,** and the limbless **caecilians.**



# AMPHIBIAN GENERAL CHARACTERISTICS AND ANATOMY

**Are Ectothermic (cold-blooded):** cannot maintain a stable internal temperature.

**Moist, scale less skin:** absorb water and oxygen through skin, but vulnerable to drying out and absorbing pollutants.

Skin contains mucus glands and often poison glands

**Have four limbs** (except the caecilians which have none)

**Start life underwater and move to land as adults** (in most cases)

**Have a three-chambered heart**

# AMPHIBIAN REPRODUCTION



Amphibians have separate sexes, and have **external fertilization** in frogs and toads, and **internal fertilization** in salamanders and caecilians.

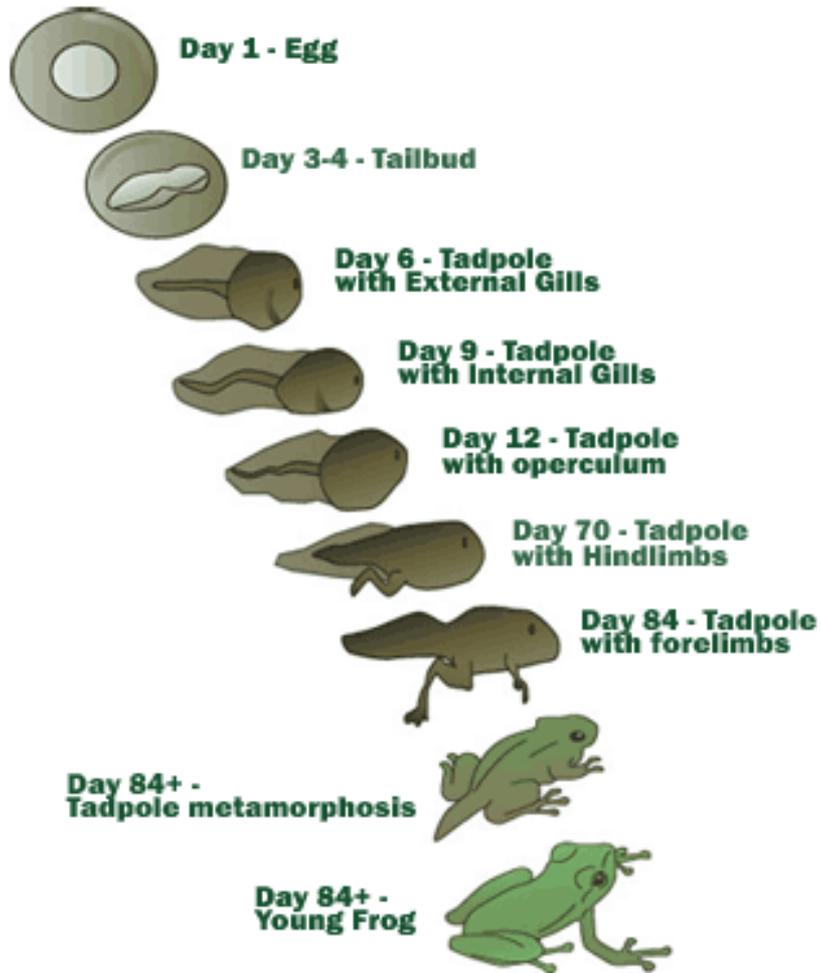
Lay eggs in the water or moist areas on land.

**Larvae develop** in the water or in very moist areas on land.

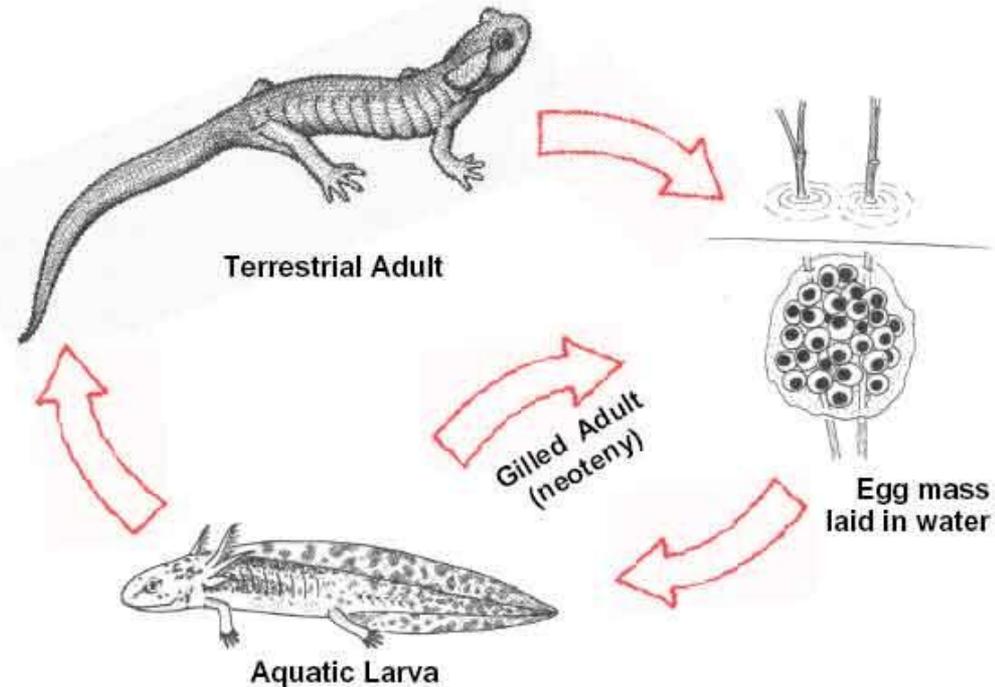
Are the only vertebrate to undergo complete metamorphosis.



# AMPHIBIAN METAMORPHOSIS



## Life Cycle of the Northwestern Salamander



## AMPHIBIAN DECLINE

In recent years, the number of amphibians worldwide has dropped dramatically, even to the point of localized extinctions.

There are many causes for this decline, although they are often not very well understood.

Probable causes include habitat destruction, over collecting, pollution, climate change, invasive species, and an increase in UV radiation due to a thinning of the ozone layer.

# AMPHIBIAN DIETS



Most amphibians are **carnivorous** in both larval and adult form. Aquatic larvae feed on **fish, worms, and aquatic insects**, while adults usually feed on **worms and insects**.



# CLASS REPTILIA – GENERAL CHARACTERISTICS AND ANATOMY

**Ectothermic** (cold-blooded)

**Tough**, scaly skin

Breathe air

Lay eggs that are covered by a  
**thick, hard shell**

Have **four limbs** (except for  
snakes)

This group includes **snakes,**  
**lizards, turtle, and crocodilians**



# REPTILE REPRODUCTION/LIFE CYCLE

Sexes are **separate**, with **sexual reproduction** (although some lizards and one species of snake can reproduce asexually)

Fertilization is **internal**, with males usually having a penis.

Most reptiles are **oviparous** (egg-laying), although some snakes give live birth (like rattlesnakes, ex [1](#),[2](#),[3](#)).

Eggs are covered by a **calcareous or leathery shell**.

In some reptiles like crocodiles and alligators, the sex of the offspring is determined by the temperature at which the eggs incubate.

# REPTILE FEEDING

Most reptiles are **carnivorous**, often feeding primarily on other reptiles.

Some turtles and lizards are **herbivores**.

Herbivorous reptiles often swallow round stones to help grind up the vegetative matter they eat.



# GROUPS OF AQUATIC REPTILES

**Crocodylians:** Alligators, crocodiles, and caimans

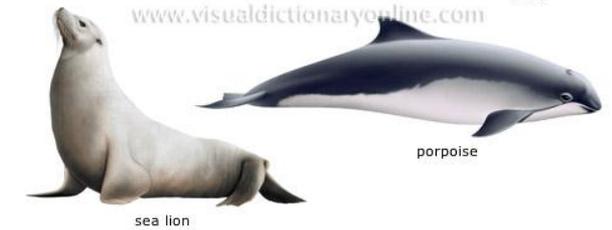
**Turtles:** freshwater and sea turtles

**Snakes**

**Marine Iguanas**



# MARINE MAMMALS



All mammals originally evolved on land, but some have re-adapted for life in the oceans. There are 130 species of marine mammals that include **whales and dolphins, manatees, seals, otters, and polar bears.**



# GENERAL CHARACTERISTICS OF MAMMALS

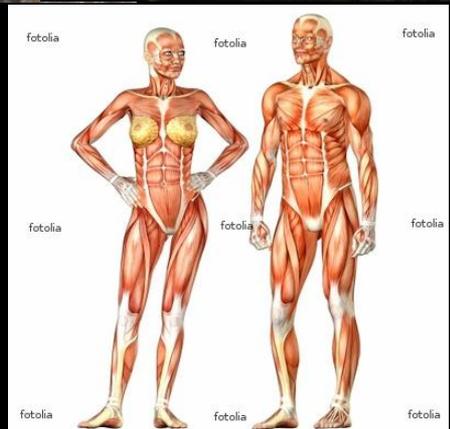
Have hair

Give live birth

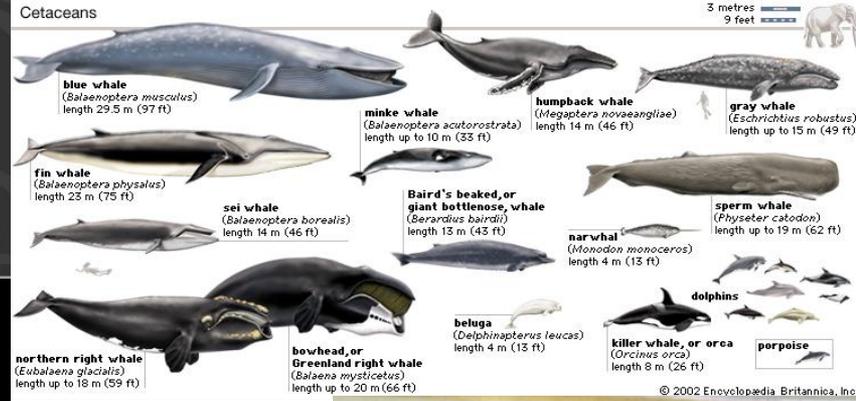
Are endothermic (warm-blooded)

Are tetrapods (have four limbs)

Nurse young with milk from specialized mammary glands



# GROUPS OF MARINE MAMMALS



**Cetaceans:** whales, dolphins, and porpoises

**Pinipeds:** seals, sea lions, and walrus

**Sirenians:** manatees and dugongs

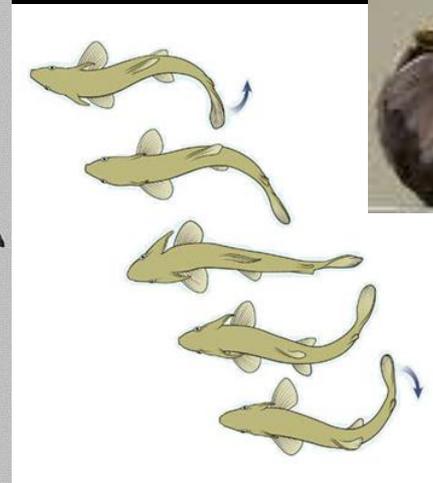
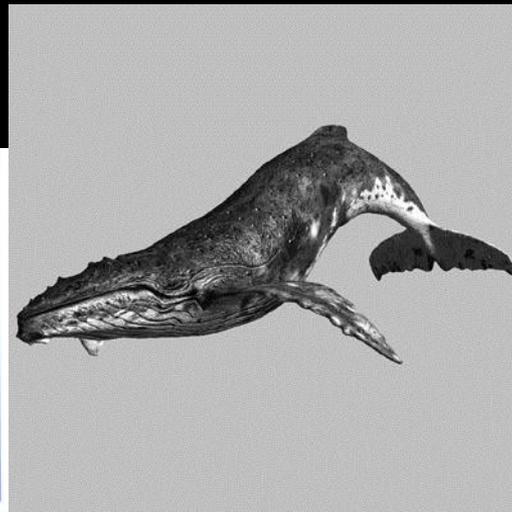
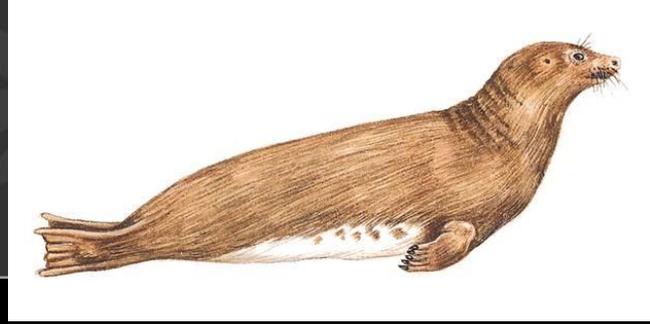
**Mustelids:** weasels and otters

**Ursids:** polar bears



# ADAPTATIONS FOR MARINE LIFE

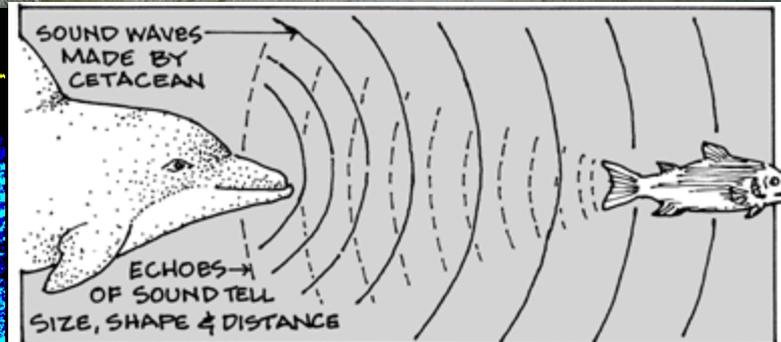
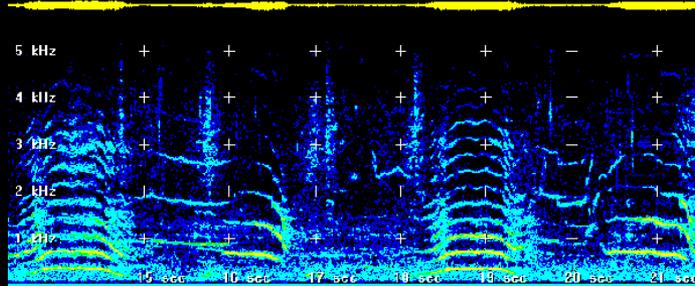
**Streamlined bodies** for swimming.  
**Limbs adapted into fins or flippers.**  
**Swim by moving their bodies up and down** and have a **horizontal tail**  
(fish move theirs side-to-side).



# ADAPTATIONS FOR MARINE LIFE

To keep warm in cold water, marine mammals have either a **thick layer of blubber (fat)** or **thick fur**.

Ability to communicate long distances underwater using **sound** (also **echolocation** in some species)



## MARINE MAMMAL PROTECTION

Whales and other marine mammals were hunted intensively during the 18<sup>th</sup>, 19<sup>th</sup>, and early 20<sup>th</sup> century

Whales were hunted for blubber to make oil, spermacetti (a wax in the head of sperm whales) for cosmetics and lubricants

Seals were hunted for their fur

Many of these were hunted almost to extinction

In 1972, the Marine Mammal Protection Act was passed to protect these animals.

**ANY QUESTIONS ?**