

**Class Amphibia:**  
Salamanders, frogs, and caecilians = extant orders

- Today about 4,800 species
- 3 Orders: (KPCOFGS)
  - Salamanders (**order Urodela**, “tailed ones”)
  - Frogs (**order Anura**, tail-less ones”)
  - Caecilians (**order Apoda**, “legless ones”)

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## Transition to Land

- What do they need to be able to pull this off?
  - Brainstorm....

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## General characteristics

- smooth, moist skin
- 3 chambered heart
- External fertilization
- Cold blooded – ectothermic
- Metamorphosis
- Respire with gills ( young ), lung and/or skin in adults



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What about the walk of an amphibian tells you they are one of the first organisms to walk on land?

• Write in: \_\_\_\_\_

• \_\_\_\_\_


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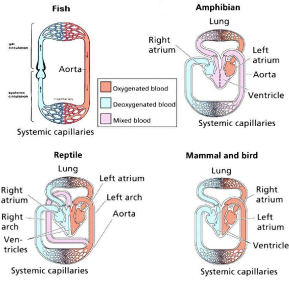
## 1) Deal with gravity



- Lateral Undulation:
  - On land, most salamanders walk with a side-to-side bending of the body
  - May resemble the **swagger** of the early terrestrial tetrapods

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## Heart



- What is the effect of a 3 chambered heart?
- How can they get away with only 3 chambers?

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### 2) Breathe Air

Amphibian lungs are ventral outpocketings of the gut, though they lie dorsal to it

- Most amphibians rely heavily on their moist skin to carry out gas exchange with the environment.
  - Some terrestrial species lack lungs entirely and breathe exclusively through their skin and oral cavity.
  - Lungs: out pocketings of gut
  - External Gills

### Gills and Paedomorphosis

- Paedomorphosis, the retention of some larval features in a sexually mature adult, is common among some groups of salamanders.
  - For example, the mudpuppy (*Necturus*) retains gills and other larval features when sexually mature.

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### 3) Don't Desiccate (dry out)

- by developing watertight skin
- by secreting a waxy waterproof substance through glands in the skin
- by inhabiting moist terrestrial habitats.

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### 4) Changes to Senses

- Modifications in the anatomy of the
  - Eye: necessary to compensate for the differences in light
  - Ear: sound transmission through air instead of water.
- Lost such as the lateral-line system which in water enables animals to sense vibration

### 5) Reproduction

*This is the main area Amphibians are still tied to water*

#### Sex

- External Fertilization
  - Not as Fancy:
  - Why:
- **Amplexus** - male clasps female
- Sheds sperm onto her eggs
  - A little more directed than “spray and hope”

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### 5) Reproduction

*This is the main area Amphibians are still tied to water*

#### Eggs

- Eggs must be laid in moist environment
- Eggs are jelly-like = desiccate on land

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## Metamorphosis

- Amphibian means “two lives,” a reference to the **metamorphosis** of many frogs from an aquatic stage, the tadpole, to the terrestrial adult.



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## Metamorphosis

- \_\_\_\_\_ Development:
- Tadpoles are usually aquatic herbivores with gills, a lateral line system, and swim by undulating its tail.
- During metamorphosis:
  - The tadpole develops legs,
  - The lateral line disappears,
  - Gills are replaced by lungs.
- Adult frogs are carnivorous hunters.

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## THE BIG DEAL

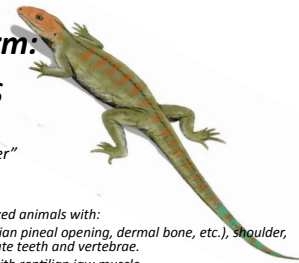
Amphibians live on land but are still tied to the water for reproduction

Triadobatrachus



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## Transitional Form: Hylonomus



- hylō- "forest" + nomos "dweller"
- 312 MYA
- Primitive reptiles
  - They were quite little, lizard-sized animals with:
  - **Amphibian-like** skulls (amphibian pineal opening, dermal bone, etc.), shoulder, pelvis, & limbs, and intermediate teeth and vertebrae.
  - **Reptile-like** Rest of skeleton, with reptilian jaw muscle
  - Probably no eardrum yet (still developing sense for land)
- Earliest known **amniote**
- About 30 centimetres long, this tiny creature and others of its kind, would over the next 100 million years, evolve into dinosaurs.
- This discovery and the discovery of ancient amphibians became invaluable evidence to support the theory of evolution and to serve as a historical <sup>414</sup>reference point where animals first began to live on land. ([ref](#))

## Story Time

- As many as 17 fossils have been found inside one trunk!
- One widely held theory, first proposed by Dawson, was that animals such as Hylonomus lyelli became trapped in hollow tree stumps which had been snapped off and the exterior surrounded with sediment until the openings were at ground level. The unsuspecting animal would have then fallen into the hollowed tree trunk. Once trapped, Hylonomus lyelli and others either drowned immediately, starved to death or survived for a time scavenging on previous victims, only to be eaten by the next.
- A more recent theory suggests that the animals lived and made their dens inside the hollow stumps.



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