

Amphibian

- Have survived for hundreds of millions of years

- The only modern descendants of an ancient group that gave rise to all other land vertebrates



- Amphibian means “double life”...live in both water and on land

Amphibians

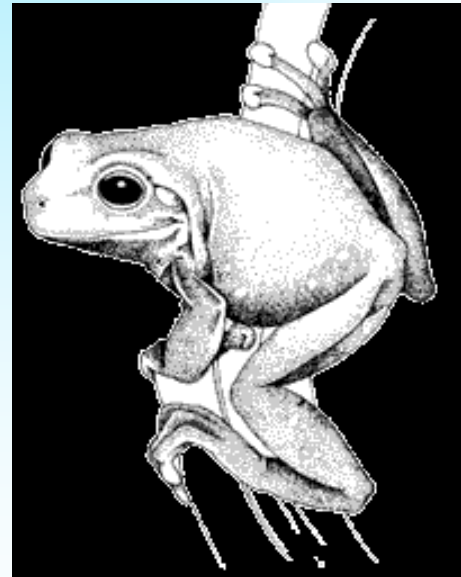
- Vertebrate
- Lives in the water as a larva and on land as an adult (with some exceptions)
- Breathes with lungs as an adult
- Has moist skin that contains mucus glands
- Lacks scales and claws



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Evolution of Amphibians

- The first amphibians to climb onto land probably resembled lobe-finned fishes similar to the modern coelacanth
- The amphibian had legs, appearing about 360 mya

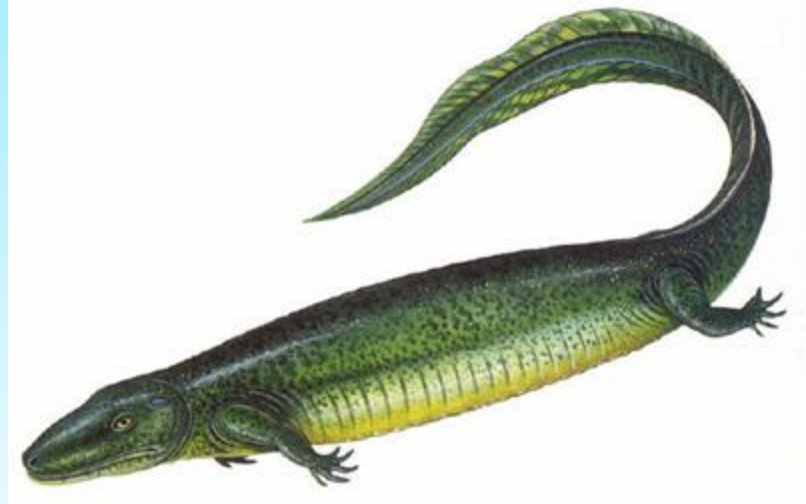


Evolution of Amphibians

- Early amphibians evolved several adaptations that helped them live at least part of their lives out of water:
 - Bones in the limbs and limb girdles became stronger for more efficient movement
 - Lungs and breathing tubes enabled them to breathe air
 - The sternum formed a bony shield to support and protect internal organs, esp. the lungs

Evolution of Amphibians

- Soon after they appeared, amphibians underwent a major adaptive radiation
- Some were huge: *Eogyrinus* was about 5 meters long!
- Amphibians became the dominant form of animal life in the warm, swampy fern forests about 360-286 mya
- Climate changes caused many of the swamps to disappear
- Most amphibians became extinct



Evolution of Amphibians

- Only three orders of small amphibians survive today:
- Frogs and toads
- Salamanders
- Caecilians



Form and Function in Amphibians

- Although the class Amphibia is relatively small, it is diverse enough to make it difficult to identify a typical species
- We will focus on the structures found in frogs...

a The life cycle of a frog involves large-scale changes in body form. First, a mass of eggs is laid in a wet or moist environment.



b The young tadpole emerges from the egg with external gills, which are later replaced by internal gills. After feeding and growing, the tadpole begins to transform into an adult frog.



c Dramatic changes occur in the tadpole. The tail and gills recede. Lungs and front and hind limbs grow. Feeding habits may also change. Herbivorous tadpoles change into carnivorous adults.



d The adult frog has completely lost its tail and gills. Its lungs enable it to breathe air. The changes that transform a tadpole into an adult frog are called metamorphosis.



Feeding

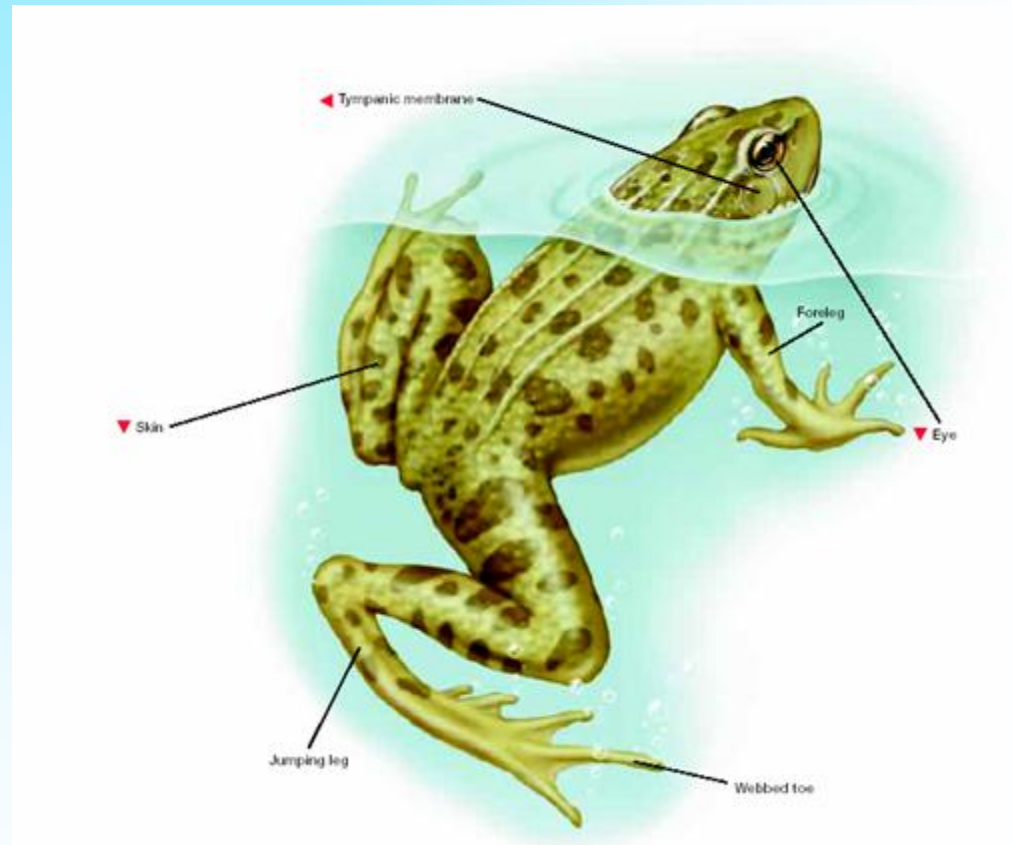
- Tadpoles
 - Filter feeders or herbivores that graze on algae
 - Eat almost constantly



- Adult amphibians
 - Almost entirely carnivorous
- Mouth → esophagus → stomach → small intestines → large intestines → cloaca

Respiration

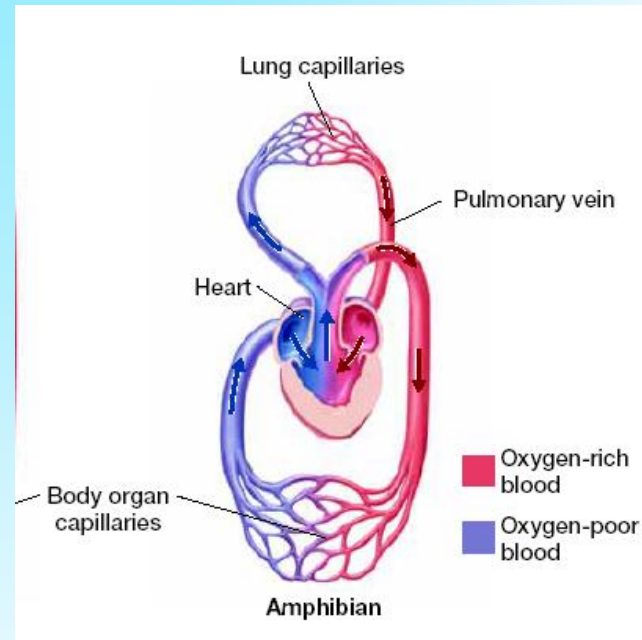
- Larval amphibians
 - Gas is exchanged through the skin and gills
- Adult amphibians
 - Lungs and skin



Circulation

- Double loop
- 3 chambered heart

First Loop

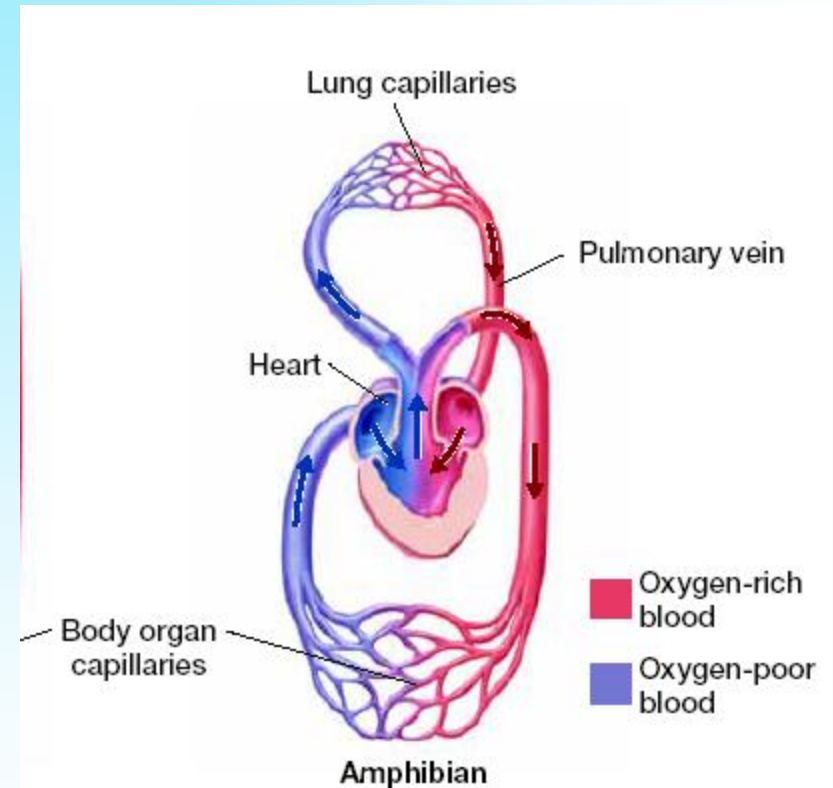


- Carries oxygen-poor blood: heart → lungs and skin
- Takes oxygen-rich blood: lungs and skin → heart

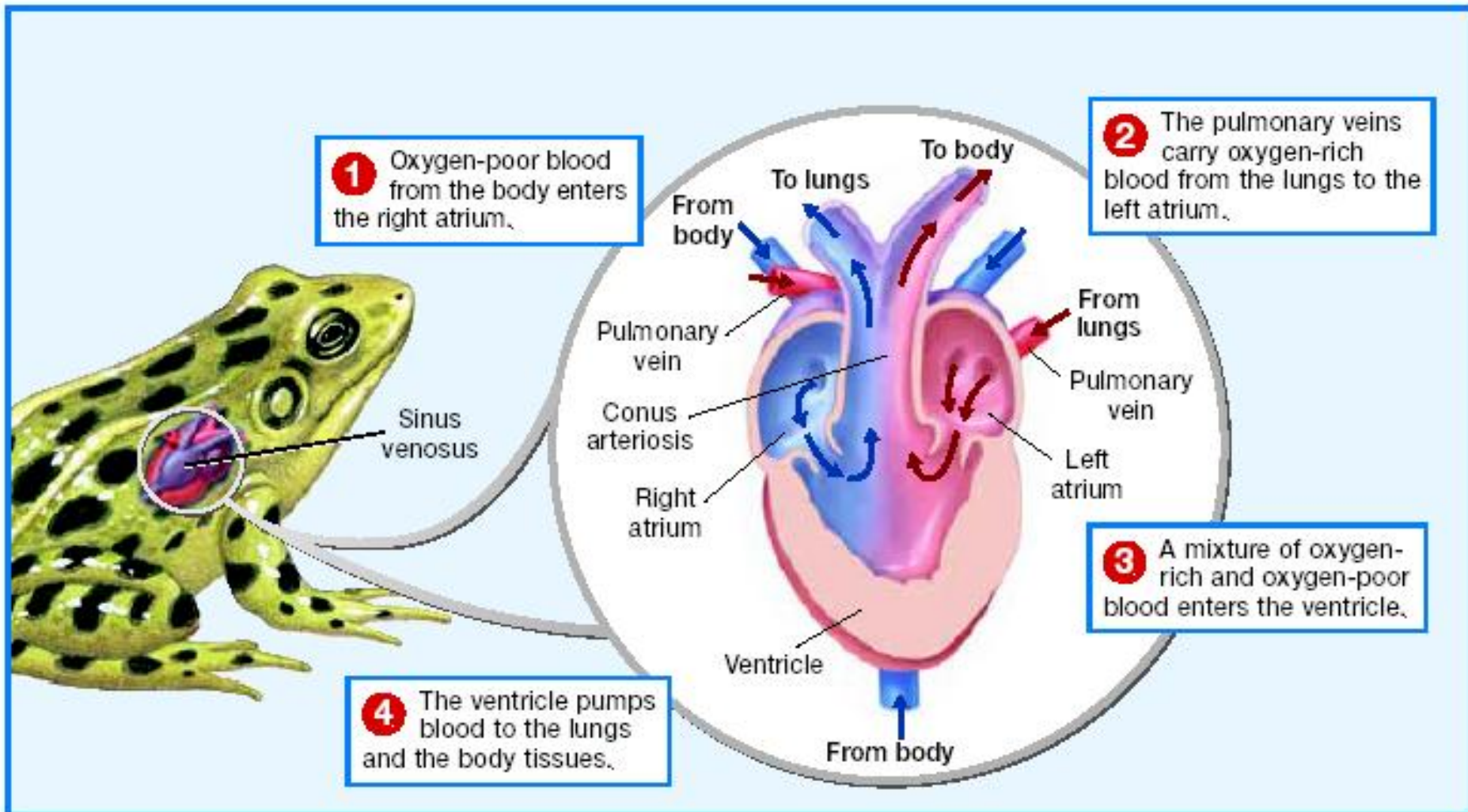
Circulation

Second Loop

- Transports oxygen-rich blood: heart → rest of the body
- Transports oxygen-poor blood: body → heart



Circulation



Excretion

- Amphibians have kidneys that filter wastes from the blood
- Urine: The excretory product of the kidneys
- Urine travels through tubes called ureters into the cloaca
- Urine is passes outside or temporarily stored in a bladder above the cloaca

Reproduction

- Eggs do not have shells and tend to dry out if they are not kept moist
- Most species lay eggs in the water
- The male fertilizes them externally
- In a few species (most salamander), eggs are fertilized internally

Reproduction

- The male climbs onto the female's back
- The female releases the eggs that are then fertilized
- The eggs are in a transparent jelly, useful for attaching the eggs to underwater plants and that provides nourishment to the growing cells



Reproduction

- Some amphibians abandon their eggs after they are laid
- Others incubate the young in their mouth, on their back, or even in their stomach!



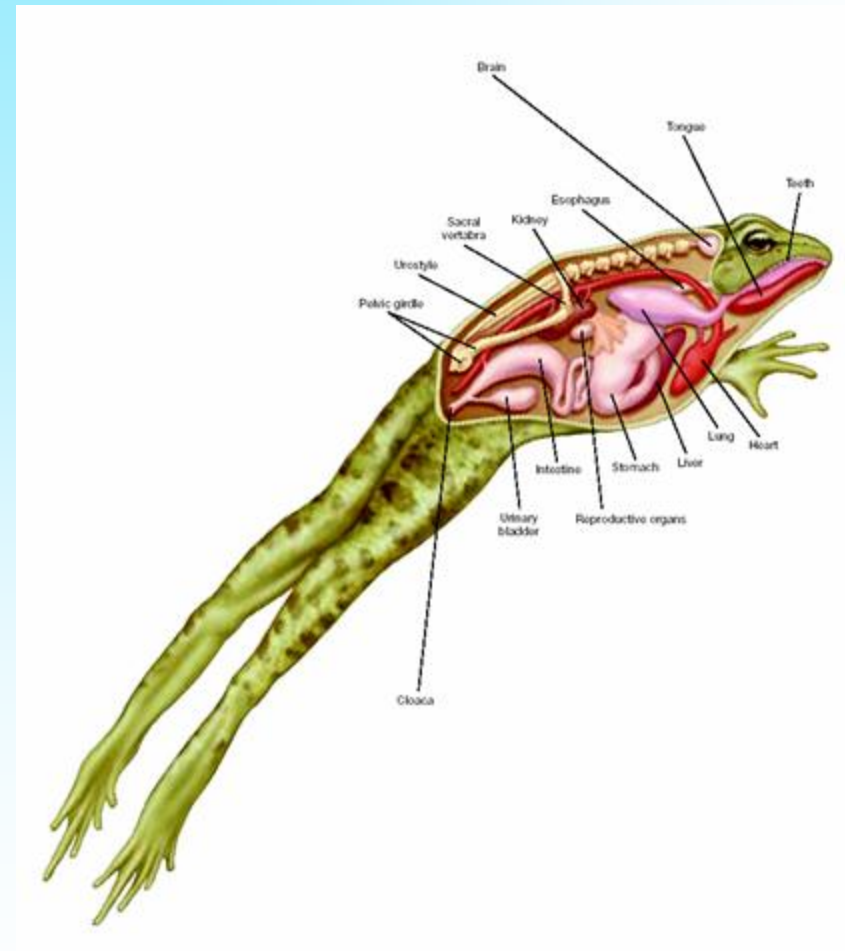
Movement

- Amphibian larvae
 - Often move very much like fishes, wiggling their bodies and using a flattened tail for propulsion



Movement

- Adult amphibians
 - Most use their front and back legs to move in a variety of ways
 - Jump, climb, run, etc.



Response

Nictitating Membrane:

- Moveable transparent membrane in amphibians located inside the regular eyelid
- Protects the surface of the eye from damage under water and keeps it moist on land



Response

Tympanic Membrane

- Eardrum of amphibians
- Inside the skull
- Vibrates in response to sound, allowing hearing



Groups of Amphibians

- Salamanders: Order Urodela

- Long bodies and tails
- Four legs
- Carnivores

- Caecilians: Order Apoda

- Legless animals that live in water or burrow in moist soil or sediment

- Frogs and Toads: Order Anura

- Frogs: Long legs and lengthy jumpers
- Toads: short legs and short hops
- Adults lack tails



Ecology of Amphibians

- Have no feathers, fur or scales
- Many are ideal for predators such as birds and mammals



Ecology of Amphibians

- Amphibians have adaptations to protect themselves
- Many have skin colors and markers that allow them to blend in with the environment
- Some release toxins
- Some are brightly colored as a warning to predators



References

- www.smackslide.com