29.3B: Modern Amphibians

Amphibians can be divided into three groups: Urodela (salamanders), Anura (frogs), and Apoda (caecilians).

Learning Objectives

• Differentiate among the orders of amphibians

Key Points

• Adult salamanders usually have four limbs and a tail, moving by lateral undulation in a fish-like manner while "walking" their arms and legs forward and back.
• The majority of salamanders are lungless; respiration occurs through the skin or through external gills; some terrestrial salamanders have primitive lungs; a few species have both lungs and gills.
• Salamanders utilize internal fertilization after males transfer sperm to the eggs via the spermatophore; there is a prolonged egg phase; metamorphosis occurs before hatching.
• Caecilians are blind, limbless vertebrates that resemble earthworms and are adapted for a soil-burrowing or an aquatic lifestyle.
• Adult frogs use their hind legs to jump; they fertilize externally, laying their shell-less eggs in moist environments.
• Tadpoles (the larval stage of a frog) have gills, a lateral line system, long-finned tails, and lack limbs; when tadpoles become adults, gills, tails, and the lateral line disappear, while an eardrum and lungs develop.

Key Terms

• lateral undulation: movement by bending the body from side to side
• **spermatophore**: a capsule or mass created by males, containing sperm and transferred in entirety to the female during fertilization

• **metamorphosis**: a change in the form and often habits of an animal after the embryonic stage during normal development

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**Modern Amphibians**

Amphibia comprises an estimated 6,770 extant species that inhabit tropical and temperate regions around the world. Amphibians can be divided into three clades: Urodela (“tailed-ones”), the salamanders; Anura (“tail-less ones”), the frogs; and Apoda (“legless ones”), the caecilians.

![Salamander](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/29%3A_V...)

Figure \(\PageIndex{1}\): **Salamanders**: Most salamanders have legs and a tail, but respiration varies among species.

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**Urodela: Salamanders**

Salamanders are amphibians that belong to the order Urodela. Living salamanders include approximately 620 species, some of which are aquatic, other terrestrial, and some that live on land only as adults. Adult salamanders usually have a generalized tetrapod body plan with four limbs and a tail. They move by bending their bodies from side to side, called lateral undulation, in a fish-like manner while “walking” their arms and legs back and forth. It is thought that their gait is similar to that used by early tetrapods. Respiration differs among the species. The majority of salamanders are lungless, with respiration occurring through the skin or through external gills. Some terrestrial salamanders have primitive lungs; a few species have both gills and lungs.

Unlike frogs, virtually all salamanders rely on internal fertilization of the eggs. The only male amphibians that possess copulatory structures are the caecilians, so fertilization among salamanders typically involves an elaborate and often prolonged courtship. Such a courtship allows the successful transfer of sperm from male to female via a spermatophore. Development in many of the most highly-evolved salamanders, which are fully terrestrial, occurs during a prolonged egg stage, with the eggs guarded by the mother. During this time, the gilled larval stage is found only within the egg capsule, with the gills being resorbed, and metamorphosis being completed, before hatching. Hatchlings resemble tiny adults.
Frogs: The Australian green tree frog is a nocturnal predator that lives in the canopies of trees near a water source.

Anura: Frogs

Frogs are amphibians that belong to the order Anura. Anurans are among the most diverse groups of vertebrates, with approximately 5,965 species occurring on all of the continents except Antarctica. Anurans have a body plan that is more specialized for movement. Adult frogs use their hind limbs to jump on land. Frogs have a number of modifications that allow them to avoid predators, including skin that acts as camouflage. Many species of frogs and salamanders also release defensive chemicals that are poisonous to predators from glands in the skin.

Frog metamorphosis: A juvenile frog metamorphoses into a frog. Here, the frog has started to develop limbs, but its tadpole tail is still evident.

Frog eggs are fertilized externally. As with other amphibians, frogs generally lay their eggs in moist environments. This is required as eggs lack a shell and will dehydrate quickly in dry environments. Frogs demonstrate a great diversity of parental behaviors: some species lay many eggs and exhibit little parental care; other species carry eggs and tadpoles on their hind legs or backs. The life cycle of frogs, as with other amphibians, consists of two distinct stages: 1) the larval stage followed by 2) metamorphosis to an adult stage. The larval stage of a frog, the tadpole, is often a filter-feeding herbivore. Tadpoles usually have gills, a lateral line system, long-finned tails, and lack limbs. At the end of the tadpole stage, frogs undergo metamorphosis into the adult form. During this stage, the gills, tail, and lateral line system
disappear, and four limbs develop. The jaws become larger and are suited for carnivorous feeding, while the digestive system transforms into the typical short gut of a predator. An eardrum and air-breathing lungs also develop. These changes during metamorphosis allow the larvae to move onto land in the adult stage.

Apoda: Caecilians

An estimated 185 species comprise caecilians, a group of amphibians that belong to the order Apoda. Although they are vertebrates, a complete lack of limbs leads to their resemblance to earthworms in appearance. They are adapted for a soil-burrowing or aquatic lifestyle; they are nearly blind. These animals are found in the tropics of South America, Africa, and Southern Asia. They have vestigial limbs which is evidence that they evolved from a legged ancestor.