

Learning About Amphibians

INTRODUCTION

Amphibians form the link between the gill-breathing fishes and the lung-breathing reptiles, birds and mammals. The first amphibians appeared about 350 million years ago, when they developed the ability to breathe air and could leave the water in which their fish ancestors lived. Amphibians became the ancestors of all four-limbed creatures. The reptiles developed from these earliest land-dwellers, and the birds and mammals, in turn, descended from the early reptiles.

AMPHIBIAN CHARACTERISTICS

Life Cycle

Amphibians got their name from the Greek words *amphi* (double) and *bios* (life), since most amphibians spend part of their life in water and part on land.



Figure 1. Amphibians are at home both on the land and in the water.

Typical amphibians lay eggs in water and the young live in water and breathe with gills. They look nothing like their parents during this larval, or immature, stage. As they mature, they move onto land and their gills are replaced by lungs. They keep changing form until they look like their parents.

Many amphibians do not follow these rules, however. Some keep their gills and spend their entire lives in water, while others never willingly enter water. Some lay their eggs on land in moist places rather than in water, and at hatching the young look like tiny adults. Some have neither gills nor lungs as adults, but “breathe” through their moist skins.

Form

Amphibians are *vertebrates*, or animals with backbones. In this sense they are like birds, mammals, reptiles and fish. Typically, amphibians can live both in water and on land. They are cold-blooded, meaning that their body temperature depends on the temperature of their surroundings. Many of the young breathe through gills like fish. As adults they lose their gills and develop lungs. Many amphibians burrow into moist earth to hibernate during the winter. During this time they do not feed. Their many layers of skin form a type of cocoon, and they breathe in air through these layers at a very low rate.

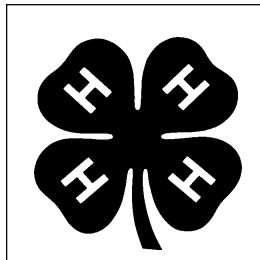
Amphibians have soft, moist skins which are free of scales, feathers or hair. The skin contains mucous glands which supply a clear fluid to keep the skin moist, and some have poison glands which protect amphibians from predators. The “warts” of toads are really masses of poison glands. Sometimes a dog which swallows a toad will die from the poison in these glands.

Amphibians do not have claws on their toes, a characteristic useful in telling them from reptiles. Salamanders are amphibians which are very similar to lizards, a member of the reptile class. But salamanders, unlike the lizards, do not have claws.

Amphibians range in length from one-half inch to 3 feet. They may be broad or slender, smooth or rough-skinned, tailed or tailless, and have four, two or no legs.

Habitat

Amphibians usually are found in or near water, or in moist places. Their habitats (homes) vary from deserts to swamps and permanent water, and from the tropics north to above the Arctic Circle and south to the tips of Africa, Australia and South America.



IMPORTANCE TO HUMANS

Amphibians are beneficial vertebrates. They do not have poisonous bites or carry disease, and they are not aggressive, destructive or ferocious. Most feed on harmful insects, and many provide food for other animals, including people. They often are used as laboratory animals. Many amphibians are beautifully colored and their forms have adorned art objects since prehistoric times.

The fluid substance which many amphibians secrete from their skin is dangerous to predators, but it usually is not a hazard to humans. However, you should avoid getting it in your eyes, nose or mouth, as it is poisonous if swallowed and irritates the eyes and the linings of the mouth and nose.

CLASSIFICATION OF AMPHIBIANS

There are 3,000 species of living amphibians, divided into three orders: *newts and salamanders*, or tailed amphibians; *frogs and toads*, or tailless amphibians; and a small group of little-known, worm-like amphibians called *caecilians*. Caecilians are legless, burrowing creatures found in tropical regions.

Newts and Salamanders

All amphibians have tails when young, but newts and salamanders keep theirs as adults. Most adult newts and salamanders are 4 to 8 inches long, with a distinct tail and four legs.

Newts and salamanders are seldom seen because they spend most of their time hiding in out-of-the-way places. They will be found only around water or other moist areas such as under logs. There are more kinds of newts and salamanders in North and South America than in the rest of the world put together.

Newts usually spend most of their adult lives on land, returning to water for about a month during the breeding season. Most salamanders live on land.



Figure 2. Adult salamanders.

Others pass their larval stage in the water and spend their adult lives on land like newts. Some salamanders live strictly in water.

Newts and salamanders are slow-moving creatures that eat insects and worms. Larger salamanders may eat crayfish, frogs or other salamanders. They make very little sound — at most a small squeak when handled.

The *mudpuppy* and *hellbender* live in water. The mudpuppy is a brownish color with three pairs of bright red gills just behind its head. It may be a foot long as an adult. The hellbender has no gills, and it may reach a length of 2 feet. It is most often found in streams that feed into rivers. Both of these salamanders may bite if caught. Their bite may be painful, but it is not poisonous.

The *tiger salamander* is found in many parts of North America. The larval form lives in water and has gills, but the adult is a black and yellow spotted amphibian that has lost its gills and lives on land.



Figure 3. Tiger salamander.

The largest amphibian in the world is the *giant salamander* of China and Japan. Some have been found that were over 5 feet long and weighed almost 100 pounds. These giant salamanders live in the mountain streams of China and Japan.

Frogs and Toads

These creatures are the most widely distributed amphibians. They are found all over the world except in permanently frozen areas and on ocean islands. They range in size from chrouous frogs less than an inch long to bullfrogs 6 to 8 inches long.

There are no definite rules for telling a “toad” from a “frog.” The typical toad has warty skin and short legs

for hopping, while the typical frog has smooth skin and long legs for leaping. Most toads are broader and flatter than frogs, and have darker, drier skin. Most toads live on land, and require less moisture than frogs. Adult toads go to water only to breed.

Frogs lay eggs in water in masses of a jelly-like substance attached to plants. Toads lay eggs in chains like beads on a string. Many frogs lay up to 20,000 eggs at a time.

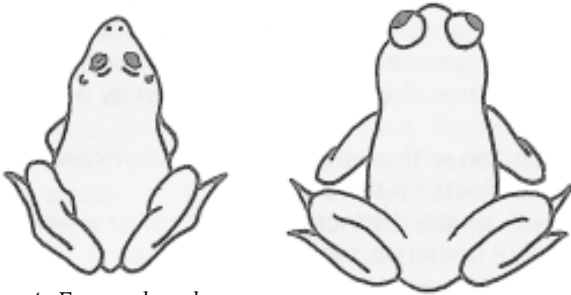


Figure 4. Frog and toad.

The eggs develop into larvae called tadpoles which are very different from the adults. Tadpoles can do little more than wriggle when they first hatch. They are first nourished by the yolk-sac, which was part of the original egg. When their mouths develop, they feed on algae and tiny organisms in the water. Tadpoles are very much like fish during this stage.



Figure 5. Frog or toad life cycle.

Gradually, the tadpole's gills get smaller as it begins to breathe air and develop its lungs. It sprouts legs and absorbs its long, powerful tail. Then it becomes a grown, air-breathing frog or toad which is ready for life on land. Some toad tadpoles remain in water for only two weeks, while bullfrog tadpoles can stay in water for up to two years.



Figure 6. Cricket frog.

There is much variation in the sounds frogs and toads make. They can sound like toy trumpets, electric buzzers, distant cow bells, sleigh bells, songbirds, baby chicks, dogs, ducks, pigs and bellowing bulls. You can tell the difference in species by the call they make. Usually only the male has a voice, and the sound is used to attract females during the breeding season.

Frogs and toads are useful in many ways. All frogs' legs are edible. But only the larger species (such as the bullfrog) are commonly used for human food. Medium-sized species (such as the leopard frog) are used in school laboratories as examples of a simple vertebrate animal. Tadpoles are often kept in fish-bowls to eat leftover food and keep the bottom clean. Frogs and toads feed on mosquitoes and many other insect pests.



Figure 7. Garden toad.

Frogs and toads make excellent pets and soon learn to eat out of a person's hand. Common toads of Europe have lived in captivity for 36 years and treefrogs for 22 years, but they probably do not live as long in the wild.

THINGS TO DO

1. Follow these guidelines in a study of amphibians:
 - a. Observe amphibians in their natural habitats. Most amphibians are nocturnal (active at night) and require lots of moisture. You'll find the greatest variety near streams or wet woodlands at night with a flashlight. You may find a few during the day by looking under stones, logs and other objects.

Salamanders are secretive and hard to find. Look in dark, damp places such as caves and old cellars and in vegetation along the edges of marshes and ponds. You can often be successful in catching salamanders and other aquatic animals by seining ponds and streams.

Male frogs advertise their presence in the spring by "singing" to attract females. So begin your frog hunting by listening. When you have located a frog, shine a flashlight into its eyes and catch it in your hand or a net. Frogs are fast, so grab quickly.

Toads are easier to catch because they are much slower than frogs. Remember to wash your hands after handling toads and keep your fingers away from your mouth and eyes until you have washed.

- b. Identify and keep records for the amphibians you observe. Always carry a small notebook and a pencil with you in the field. Record everything you notice about a specimen. Include such information as date, time, habitat, species, location, weather conditions and behavior for each amphibian that you observe. Carry a guidebook with you in the field to help you identify amphibians, or compare your records with a guidebook when you return from a field trip. Keep a census chart in addition to a field notebook as a permanent record of the amphibians you identify.

2. Visit a museum or zoo where amphibians are on exhibit. Find out how these animals are studied and kept alive in captivity. Talk to a trained person there and find out as much as you can about how each amphibian lives in its natural habitat. Report on your finding to your 4-H group or school class. This may be done as a group project.

3. Keep amphibians as pets for closer study. Most captured amphibians should be quickly identified, admired and released. But you may want to keep a few in captivity to study their habits more closely. Before you do this, check with your 4-H leader! In some states it is illegal to keep any wild creature (caught in your state) in captivity. Most amphibians are fairly easy to keep as pets, but do not keep them longer than two or three weeks. Then release them *where you found them*. Release them sooner if they will not eat or if they show signs of illness.

- a. **Transporting the catch.** Use fabric sacks as collecting bags. You can make your own from unbleached muslin or similar sturdy fabric. Make them in two or three different sizes (8 by 16 inches, 12 by 24 inches and 20 by 36 inches). Sew shoelace ties to the bags about 3 inches from the top, or just tie a knot in the bag after you drop in a specimen.

Wet the bottoms of the bags and throw in a handful of moss, wet leaves or some other damp vegetation to keep the amphibians from drying out. Amphibians will die in dry bags because they must be able to keep their skins moist. Never leave bags that contain your specimens in direct sunlight. Do not overcrowd your amphibians and take them out as soon as possible. Wash bags thoroughly before using them again.

Date	Time	Species	Number	Habitat and Activities
4-14-79	10 pm	Bullfrog	1	farm pond, sitting at edge of water, singing
4-15-79	9:45 pm.	Texas Toad	1	cattle tank on grassland area (rained the day before so probably breeding)

Figure 8. Amphibian census chart.

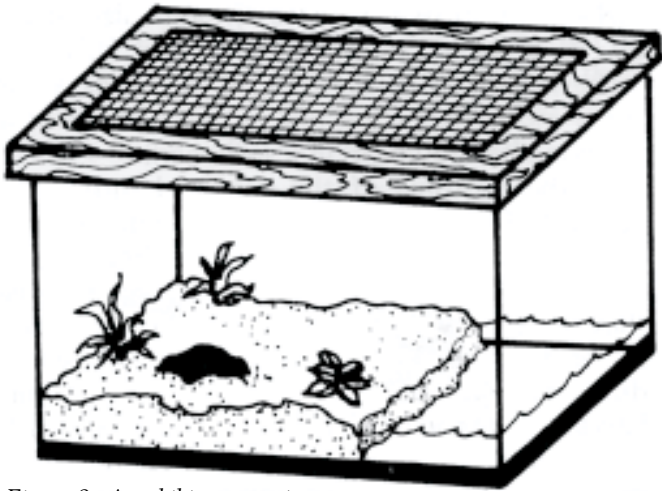


Figure 9. Amphibian aquarium.

b. **Housing.** One of the best homes for amphibians is an aquarium at least 15 inches long and 8 to 10 inches wide and deep. Use a heavy lid of wire screening to keep your pet from escaping.

Make the aquarium resemble your pet's natural habitat as closely as possible. Most toads like to burrow, so put about 4 inches of damp sand in the bottom of the aquarium for them. Place a shallow water dish in one corner, and sink small potted plants into the sand for decoration rather than trying to root plants in the sand itself.

Most frogs require more moisture than toads, so prepare a half-land, half-water home for them. Build a sloping bank of gravel and rocks along one side of the aquarium. Place a thin layer of fine sand on the other side, and add water from the frog's natural home or tap water which is free of chlorine. Keep it shallow, and drop an old penny (copper) in the water to help prevent red-leg disease. Place one or two small potted plants on the land side of the aquarium.

Most salamanders do well in the same type of home as frogs. Add a large, curved piece of broken clay flower pot as a hiding place. Keep salamanders out of the sun. *Do not* change the water very often, as a salamander will try to shed its skin every time the water is changed.

A few newts and salamanders require totally aquatic homes. Use aquatic plants to furnish resting and hiding places, and build a stone cave at the bottom of the aquarium for a retreat.

c. **Temperature.** Most amphibians will thrive at temperatures just under 70 F. If they get much colder, they become sluggish and lose their appetites. Too much heat will kill them, so do not leave amphibians in direct sunlight for any length of time.

d. **Food.** Toads and frogs are mostly *insectivorous*, or insect-feeding. Insects are easy to catch on summer nights because they are attracted by the inside house lights and fly to window screens. Insects must be alive when offered to a toad or frog, as the movements of the prey (the insects) trigger a feeding response in these amphibians. Some of them will starve to death if they are offered only dead insects. Small salamanders and frogs will eat tubifex worms, which are available from most tropical fish dealers. Larger salamanders eat earthworms, which you can dig up yourself.

e. **Raising amphibian larvae.** Eggs and larvae can be found in ponds and ditches in the spring. They are easy to raise in aquariums. Use water from the place you find them. Newly hatched larvae are vegetarians and will eat algae from the water and freshly boiled lettuce leaves. Place the lettuce on top of the water and remove what the larvae do not eat. Older larvae are carnivorous and usually will thrive on canned dog food or ground beef mixed with a vitamin-mineral concentrate. When the larvae start to change



Figure 10. An unpleasant odor coming from your amphibian aquarium tells you that it's overdue for cleaning.

into adult form, you should provide a floating object like natural cork bark or a stout branch that stays partially in the water. The animals need to crawl out of the water from time to time. As they grow the larvae will need more water. You may add tap water if you let it stand for a few days to rid it of chlorine.

f. **Records.** Study your pets carefully and keep complete notes on their behavior. Do not keep amphibians or any wild animals in captivity just for the sake of having an unusual pet. Use the opportunity to observe and study them, and carefully record what you see and learn about them.

g. Report to your 4-H group on what you have learned about your amphibians.

4. Write a natural history paper about an amphibian found in your area of the state. Use information obtained through field observations, studies of captive amphibians and research in the local library. Discuss the following topics in your paper:

- a. Scientific and common name.
- b. Description and identifying characteristics.
- c. Habitat requirements.
- d. Food and feeding habits.
- e. Method of reproduction.
- f. Range (where it is found in North America).
- g. Natural enemies.
- h. Importance to humans.
- i. Human impact on its environment.

Present your paper at a 4-H meeting or to your school class.

WORDS TO KNOW

Aquatic: Living in the water

Carnivorous: Feeding on meat

Cold-blooded animal: One whose body temperature changes as the temperature of its environment changes

Habitat: The type of place where a plant or animal lives

Hibernation: Spending the cold months in a condition where the body processes — such as heart rate and respiration — are reduced to a very slow rate

Insectivorous: Feeding on insects

Larvae: The early, immature forms of animals; a larva changes physically as it takes on the form of an adult

Order: In the classification of plants or animals, this is a group that ranks just above the family group

Predator: An animal that kills and eats another

Prey: An animal that is killed and eaten by another animal

Seine: To fish with a large net that has sinkers on one edge and floats on the other

Species: A single, distinct kind of plant or animal

Terrestrial: Living on the land

Vegetarian: An animal that feeds only on plant material

Vertebrates: Animals that have backbones (fish, amphibians, reptiles, birds and mammals)

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