Illinois

FROGS & TOADS

Frogs and toads are the most conspicuous members of a very secretive group of animals called amphibians. Frogs and toads are well known for their mating call and long, insect-catching tongue. They are excellent gauges of environmental health because of their close contact with aquatic, wetland, and terrestrial* environments. They have moist, sensitive skin that allows chemicals in the environment to pass into their bodies. Furthermore, their eggs lack a hard shell so their developing young also are directly exposed to the environment. The puzzling disappearance of some frog and toad species in remote, pristine parts of the world has scientists concerned about overall planetary health.

*see glossary

Key

Photographs by Michael Redmer©.
Frogs and toads are not shown in equal proportion to actual size.



1. wood frog, *Rana sylvatica*
2. northern leopard frog, *Rana pipiens*
3. chorus frog complex, *Pseudacris triseriata-maculata**
4. Fowler's toad, *Bufo fowleri*
5. green treefrog, *Hyla cinerea*
6. green frog, *Rana clamitans*
7. spring peeper, *Pseudacris crucifer*
8. gray treefrog complex, *Hyla chrysoscelis-versicolor**
9. cricket frog, *Acris crepitans*
10. southern leopard frog, *Rana sphenocephala*
11. American toad, *Bufo americanus*
12. plains leopard frog, *Rana blairi*
13. bullfrog, *Rana catesbeiana*
14. eastern spadefoot, *Scaphiopus holbrookii*
15. eastern narrowmouth toad, *Gastrophryne carolinensis*
16. Illinois chorus frog, *Pseudacris streckeri illinoensis*
17. bird-voiced treefrog, *Hyla avivoca*
18. crawfish frog, *Rana areolata*
19. pickerel frog, *Rana palustris*
20. upland chorus frog, *Pseudacris feriarum*

* Both the western chorus frog, *Pseudacris triseriata*, and the boreal chorus frog, *Pseudacris maculata*, are found in Illinois. They are difficult to distinguish by their appearance, so they are represented by one image on this poster. The eastern gray treefrog, *Hyla versicolor*, and Cope's gray treefrog, *Hyla chrysoscelis*, also are similar in appearance and are represented by one image.

This poster was made possible by:

Illinois Department of Natural Resources
Division of Education
Illinois Natural History Survey
Illinois State Museum

Illinois Department of Transportation

Text: Christopher Phillips (Illinois Natural History Survey)

Design: Illinois State Museum

Anatomy

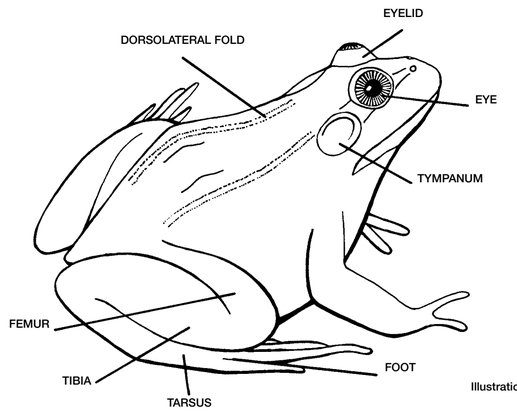


Illustration from Smith, 1961

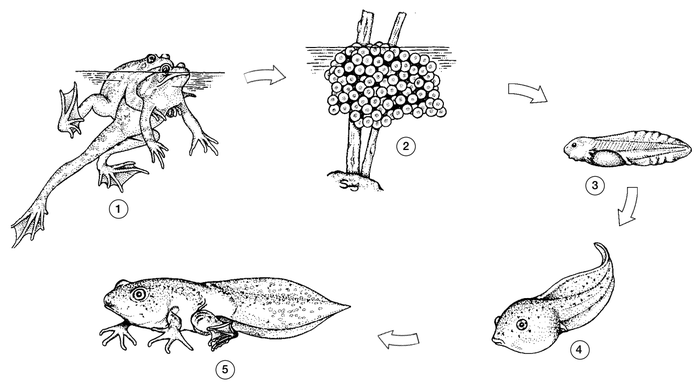
Frogs and toads are the only members of the Phylum Chordata, Class Amphibia, and Order Anura. Unlike tadpoles, adults do not have a tail. Adult frogs and toads have a squat posture and strong rear legs, which give them the ability to jump long distances. Their long, retractable tongue is used to catch their main food item, insects.

The tympanic membrane, or tympanum, aids the process of hearing. This circular structure, located on each side of the head behind the eyes, picks up vibrations in air or water and passes them to the inner ear.

Frogs and toads breathe through their lungs like most terrestrial vertebrates, but they also utilize their soft, moist skin as a secondary means of taking in oxygen. This type of breathing requires that the skin be both moist and permeable. Their skin remains permeable because they do not have a protective covering like scales, hair, or feathers. They maintain moisture through mucous gland secretions and by staying near water. Toads have a somewhat more watertight skin than frogs and can therefore venture farther from water.

Toads are also characterized by the horny bumps, sometimes called warts, on their skin. The most pronounced of these bumps, called parotoid glands, are found just behind the toad's eyes and produce a poison that helps in defense against predators. The poison repels animals as large as raccoons because of the mild mouth discomfort they experience when trying to eat a toad. Often they drop the toad, allowing its escape.

Life History



Illustrations by Mark Sabaj, Illinois Natural History Survey

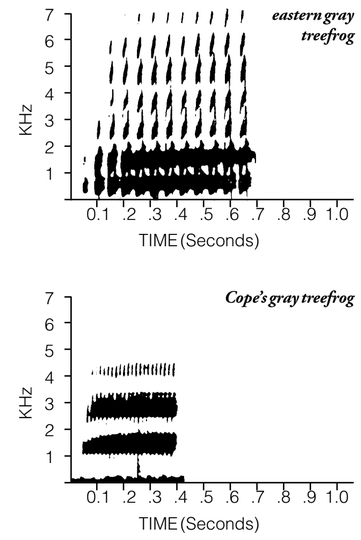
All Illinois frogs and toads have a complex, biphasic life cycle. Adults are aquatic, semi-aquatic, or terrestrial, but all species lay their eggs in water. During the breeding season, which may start as early as February in Illinois, males congregate at wetlands and begin chorusing. The males' calls attract females to the wetlands, and soon males and females are paired in amplexus (1). Amplexus ends with fertilization: the female expels her eggs into the water, and the male immediately covers them with sperm.

A gelatinous coating usually covers anuran eggs (2), which may be laid singly, in sheets, strings, or globs, depending on the species. Some species' eggs are attached to sticks or leaves; others simply float freely in the water. Fertilized eggs develop and hatch into free-swimming larvae, or tadpoles (3 & 4), within a few days. Tadpoles have a horny, beaklike mouth designed for scraping algae, and they begin feeding almost immediately after hatching. A few weeks later, hind limbs appear (5), and within a month or two the tadpoles have undergone metamorphosis. Except for a temporary tail stub, the newly transformed froglets look much like the adults. They usually leave the water and take up existence on land until cold weather prompts them to seek out a safe place, such as the muddy bottom of a pond, for hibernation.

Although the larvae are herbivorous, all adult frogs and toads in Illinois are carnivorous. The most common food items are flying insects, such as flies and mosquitoes. Although adults are primarily nocturnal, they may be seen or heard during the day, especially if the weather is overcast or rainy.

Frog Calls

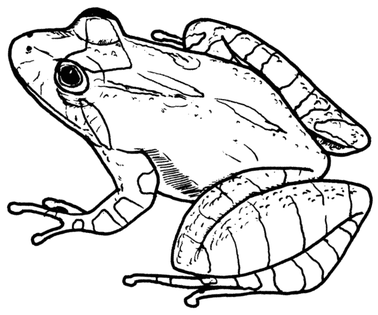
Animals produce sounds for a variety of reasons, but the primary function of vocalization is announcing the presence of one individual to others of the same species. Frogs and toads have well-developed voices that are used to attract mates, proclaim feeding territories, and signal alarm. Of these functions, the mating calls of the males are probably the most familiar to us. Just as in birds, each species of frog or toad has a unique mating song, and biologists can identify an individual species by its call alone. Anurans produce sounds in a manner similar to that of most other vertebrates, by passing air over the vocal cords. Frogs and toads take the process a step further by using the vocal sac—loose skin usually located under the lower jaw—to resonate or amplify the sound. Both males and females possess functional vocal cords, but they are better developed in males. Only males have vocal sacs, which accounts for the difference in sound production between the sexes.



The vertical axis (y) represents the pitch, and the horizontal axis (x) represents time, usually seconds.

Frog calls can be "described" in scientific terms by playing a recording of a call through an electronic sound analyzer. The resulting graph, called a sonogram, is a visual representation of the call. Scientists use sonograms to identify species whose calls cannot be distinguished with the human ear. For this reason, sonograms are used to distinguish between the two species of gray treefrog that occur in Illinois. The eastern gray treefrog, *Hyla versicolor*, and Cope's gray treefrog, *Hyla chrysoscelis*, are identical in outward appearance and were considered to be of the same species until biologists detected differences in their mating calls. Sonograms of the two mating calls show that the call of Cope's gray treefrog has a higher pitch and more pulses per second than that of the eastern gray treefrog. However, the differences that appear obvious in the sound analysis are actually very subtle in nature and can be picked up only by a trained ear.

Conservation



Cricket frog (*Acris crepitans*), from *Slime, Scales and Mudpuppy Tails*, 1997, Illinois Department of Natural Resources, Office of Public Services, Division of Education, Springfield

Over the last few years there has been increased concern about worldwide population declines and even extinctions of frog and toad species. Habitat destruction and degradation are clearly responsible in some cases, but the most alarming declines have occurred in relatively pristine environments such as the rainforests of eastern Australia and the cloud forests of Costa Rica. Closer to home, biologists in the upper Midwest have been noticing the disappearance of our smallest frog, the cricket frog (*Acris crepitans*). Until the early 1980s, cricket frogs were among the most common anurans in Illinois, and they could be found in almost every county. Recently, biologists have noticed a decline in the number of cricket frog populations in the Chicago region but not downstate. Among the causes that have been suggested for this decline is build-up of toxic substances (pesticides, heavy metals) in the frogs' breeding ponds, leading to endocrine disruption. A survey of museum specimens collected in Illinois over the past 100 years showed that more frogs from the Chicago region displayed anatomical signs of endocrine disruption compared to the rest of the state. In the heavily industrial and urban landscape of the Chicago region, habitat destruction and fragmentation are also likely involved.

Illinois FROGS & TOADS

Glossary

Amplexus	the mating clasp of frogs and toads; the male holds the female from behind with his forelegs firmly around her chest
Anuran	member of the vertebrate order Anura, characterized by lack of a tail, moist skin, and long hind legs adapted for leaping: a frog or toad
Biphasic	two distinct phases; usually refers to a life cycle that has a land and a water portion
Carnivorous	having a diet that includes mainly animals
Dorsolateral Fold	a line of raised skin along each side of the back (see Anatomy illustration)
Endocrine	ductless glands and their regulatory products
Heavy Metals	potentially poisonous metals such as lead, mercury, and cadmium
Herbivorous	having a diet that includes mainly plants
Larva	(*pl.* larvae) the newly hatched, immature form of an animal that undergoes metamorphosis, differing markedly in form and appearance from the adult
Metamorphosis	a marked change in the form or structure of an animal occurring after birth or hatching
Mucous Gland Secretion	clear watery liquid that is secreted onto the skin of amphibians through small pores distributed over the body surface
Nocturnal	active primarily at night
Parotoid Glands	paired, wartlike glands in the skin of toads; located behind the eyes or in the neck and shoulders
Snout-to-Vent Length	the distance from the tip of the snout to the excretory opening; the standard measurement for frogs and toads
Terrestrial	land based, or living on land
Tympanum	(tympanic membrane) the externally visible part of the eardrum in most frogs and toads (see Anatomy illustration)
Vertebrate	animal with a backbone

Frog & Toad Facts

- Frogs and toads do not cause warts.
- The largest Illinois anuran is the bullfrog, *Rana catesbeiana*, which can attain a snout-to-vent length of 15 cm (6 inches).
- The smallest Illinois anuran is the cricket frog, *Acris crepitans*, which averages 2 cm (1 inch) snout-to-vent length.
- The average frog can leap a distance equal to ten times its body length.
- Most burrowing frogs dig with their hind legs, but the Illinois chorus frog, *Pseudacris streckeri illinoensis*, is one of only a few burrowing species that digs with its front legs.
- The diet of the eastern narrowmouth toad, *Gastrophryne carolinensis*, consists almost exclusively of ants.
- The long tongue of frogs and toads is folded in half when stored in the mouth. When extended for capturing prey, the tongue unfolds and is "flipped" out rather than being cast out straight.
- The Illinois chorus frog, *Pseudacris streckeri illinoensis*, can hunt for food while it is underground. It probably eats a variety of insect larvae, such as cutworms (moth larvae), that it finds in its sandy burrows.
- Bullfrogs, *Rana catesbeiana*, are famous for their incredible eating habits. They will attempt to eat anything that moves—that they can at least partially swallow. They have been known to eat baby ducks, small mammals, other bullfrogs, and snakes.
- The treefrogs of Illinois have a sticky cup at the end of each toe that allows them to climb vertical surfaces such as windows and tree trunks. Treefrogs may be found in branches more than fifty feet off the ground.
- A female bullfrog, *Rana catesbeiana*, can lay over 20,000 eggs in a thin film measuring two feet by two feet.
- Some Illinois frogs, such as the wood frog, *Rana sylvatica*, accumulate glycerol in their body tissues. The glycerol acts as an antifreeze, allowing them to survive subfreezing temperatures.

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Agency Resources

The Illinois Department of Natural Resources (IDNR) offers a variety of information about frogs and toads. The Division of Fisheries Resources regulates the harvest of frogs for game purposes. The Illinois Natural History Survey studies frog and toad distributions and population levels and maintains a research collection of anurans. The IDNR Division of Education provides aquatic-related educational materials for teachers, including the *Aquatic Illinois* and *Biodiversity of Illinois*, *Volume I: Aquatic Habitats* CD-ROMs. Wetland kits from the Education Section of the Illinois State Museum are available for loan at locations statewide.

Illinois Department of Natural Resources

Division of Education
One Natural Resources Way
Springfield, IL 62702-1271
217-524-4126
http://dnr.state.il.us
dnr.teachkids@illinois.gov

Illinois Natural History Survey
1816 South Oak Street
Champaign, IL 61820
217-333-6880
http://www.inhs.uiuc.edu

Division of Fisheries Resources
One Natural Resources Way
Springfield, IL 62702-1271
217-782-6424
http://dnr.state.il.us

Illinois State Museum
Education Section
502 South Spring Street
Springfield, IL 62706-5000
217-782-5993
http://museum.state.il.us

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Printed by the Authority of the State of Illinois IISG 08-674 10M 03/08