



Frogs

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# Observer Cards



**Breda Zimkus, PhD, MCZ, Harvard University**

Edited by Tracy Barbaro, MA & Jeff Holmes, PhD

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# Observing Frogs

EOL Observer Cards

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Amphibians are a unique group of vertebrates that are distributed across the globe. Sadly, nearly one-third of the world's over 7,400 species are threatened. Frogs are the most speciose of three orders of amphibians, which also includes salamanders and worm-like caecilians. Use these cards to help you focus on the key traits and behaviors that make different frogs species unique. Drawings, photographs, and recordings of frog calls are a great way to supplement your field notes as you explore the diversity of these amazing animals. Find out what species are in your area before you go looking for frogs by searching online or using a field guide for the state or country where you live.

## About Observer Cards

Each set of observer cards provides information about key traits and techniques necessary to make accurate and useful scientific observations. The tool is not designed to identify species, but rather to encourage detailed observations. Take a journal or notebook along with you on your next nature walk and use these cards to guide your explorations.

**Image:** *Cryptothylax greshoffii*, © B. Zimkus.

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Frogs

Anatomy

# Body Size and Shape



1



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## Body Size and Shape

Make observations regarding the general body shape and record the total body length. Body length in amphibians is recorded using snout-vent length (SVL), the distance from the tip of the snout to the vent. A typical adult frog has a large head, short body, long hind limbs and no tail, but frogs may have many other body shapes, especially if they are adapted to a particular habitat. A number of additional body measurements are useful in the identification of frogs, including lengths of the humerus (upper arm), radioulna (forearm), femur (thigh), tibiafibula (shank), foot and hand, as well as various features of the head (See Head Shape).

### Supplemental Notes

Some species may exhibit sexual dimorphism in size. It is not uncommon for females to be significantly larger than males, especially when they are gravid (pregnant).

**Images:** 1. *Hemismus microscaphus*, © R. Kerney and B. Zimkus; 2. *Hyperolius parkeri*, © D.L. Mahler and B. Zimkus; 3. *Leptopelis flavomaculatus*, © D.L. Mahler and B. Zimkus; 4. *Phrynobatrachus krefftii*, © D.L. Mahler and B. Zimkus.

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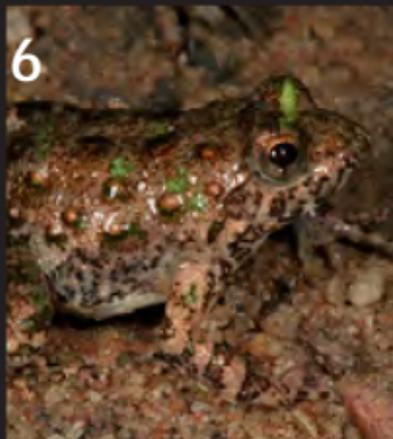
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Frogs

Anatomy

# Body Color and Pattern



## Body Color and Pattern

EOL Observer Cards

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Frogs exhibit a huge range of colors and patterns. Frogs are found in every color of the rainbow, and some even have transparent skin. Record the body coloration and any patterns that you see on the skin. The pattern on the dorsal (back) side is normally quite different from the ventral (stomach) side. Also take note whether the flanks (sides), throat or hind limbs have vivid colors or complex patterns. See if the frog that you are observing has spots, blotches, ocelli (light spots with darker borders), flecks/speckles, reticulum (network of lines), bands/stripes or any other color patterns.

### Supplemental Notes

Many frog species have cryptic coloration on the dorsal (back) side, allowing them to blend into their environment, while the belly may be lighter in color or have a contrasting bright pattern. A light color on the belly of an aquatic frog would camouflage it from predators swimming beneath it.

**Images:** 1. *Atelopus certus*, © B. Gratwicke; 2. *Atelopus zeteki*, © B. Gratwicke; 3. *Hyperolius bolifambae*, © B. Zimkus; 4. *Hyperolius nasutus*, © B. Gratwicke; 5. *Hyperolius mitchelli*, © D.L. Mahler and B. Zimkus; 6. *Phrynobatrachus natalensis*, © D.L. Mahler and B. Zimkus.

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Frogs

Anatomy

# Head Shape



Make observations regarding general shape of the head. From above, the snout may look rounded, pointed or truncate (as if cut off). From the side, the snout may look rounded, truncate, sloping, tapering or protruding past the lower jaw. Does the head appear wider than the body? Are the nostrils closer to the tip of the nose or the corners of the eyes? Take note if a bony ridge is present on the skull. If possible, record the head width at the widest part, head length (from the snout tip to the jaw angles), eye-naris distance (from the nostril to eye), interorbital distance (between the eyes), internarial distance (between the nostrils), eye diameter and tympanum diameter.

## Supplemental Notes

The shape of a frog's head can say a lot about its lifestyle or feeding behavior. Some frogs may be fossorial (adapted for digging) with small eyes and snouts that are hardened or pointed for digging face first, while arboreal frogs are nearly the opposite with large heads and prominent eyes, which may be related to nocturnal habits.

**Images:** 1. *Craugastor gollmeri* showing pointed snout in lateral view, © B. Gratwicke; 2. *Gastrotheca cornuta* showing truncate snout in lateral view, © B. Gratwicke; 3. *Leptodactylus savagei* showing rounded snout in lateral view, © B. Gratwicke; 4. *Atelopus zeteki* showing protruding snout in lateral view, © B. Gratwicke.

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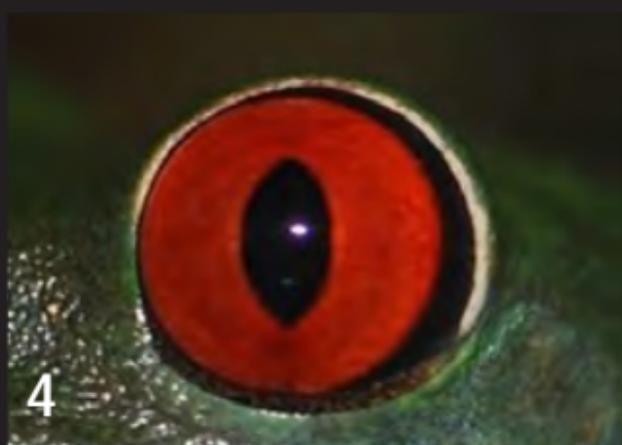
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# Eyes



Note the color and size of the eyes, as well as the shape of the pupil. Much like body coloration, frogs display a remarkable variation in iris coloration with colors ranging from bright red to gold. The shape of a frog's pupil may also aid in its identification. Make an observation whether the pupil is circular, vertically elliptical, horizontally elliptical, rectangular or diamond-shaped. Some frogs have bands of coloration running through their eyes that are continuous with bands on the sides of their heads, which may help them camouflage into their environment.

## Supplemental Notes

If you are having trouble determining the shape of a frog's pupil, briefly shine a flashlight at one of the eyes. This will cause the pupil to shrink, revealing its true shape.

**Images:** 1. *Cryptothylax greshoffii* showing golden-green eye and diamond shaped pupil, © B. Zimkus; 2. *Amietophrynus gutturalis* showing a circular pupil, © D.L. Mahler and B. Zimkus; 3. *Raorchestes luteolus* showing golden iris with blue ring on the outer margins and horizontally elliptical pupil, © V. Baliga; 4. *Agalychnis callidryas* showing red iris and vertically elliptical pupil, © P. Ritchie.

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Frogs

Anatomy

# Tympanum

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Note the presence, size and shape of the tympanum, which is a frog's eardrum. These paired structures look like two flat circles behind the eyes on a frog's head. The annulus, a bony or cartilaginous ring supporting the eardrum, may also be visible through the tympanic skin. The tympanum can be described as prominent (visible with a clear tympanic annulus), distinct (visible but tympanic annulus difficult to see), indistinct (barely visible and tympanic annulus not able to be seen) or absent. Also make an observation regarding the size of the tympanum in comparison to the size of the eye.

## Supplemental Notes

Although the tympanum is the major means of detecting sounds, frogs without a tympanum can still hear because most have the middle ear bones.

**Images:** 1. Tympanum absent in *Hyperolius puncticulatus*, © D.L. Mahler and B. Zimkus; 2. Distinct tympanum of *Ptychadena anchietae*, © D.L. Mahler and B. Zimkus; 3. Somewhat visible tympanum of *Hyla cinerea*, © Continis; 4. Large tympanum of *Lithobates catesbeianus*, © C.D. Howe.

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# Male or Female?

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# Male or Female?

Determine whether the frog is male or female. Depending on their sex, frogs of the same species can differ in external characteristics or exhibit different behaviors.

- Females are often larger or plumper than males because they have to carry eggs.
- During the breeding season, males may have nuptial pads (swollen pads on their thumbs) to help them keep hold of the female.
- Males may have different colored throats than their female counterparts.

## Supplemental Notes

Females may have the ability to make distress calls, so make call observations from a distance without picking up the frog. In addition, females of some frog species reply to male calls, so don't identify the sex of a frog using acoustic observations alone.

**Images:** 1. Toad Mountain Harlequin frog (*Atelopus certus*); female left, male right, © B. Gratwicke; 2. Limosa Harlequin Frog (*Atelopus limosus*); female left, male right, © B. Gratwicke.

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Frogs

Anatomy

# Ridges, Skin Folds and Glands



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Folds or raised ridges on the body and limbs of frogs can be useful in identifying some species. Ridges or skin folds may be single and mid-dorsal (in the middle of the back), paired and dorsolateral (on either side of the back), lateral (on the sides of the body), supratympanic (above the tympanum) or on the arms or feet. Folds may be interrupted or continuous. The size and shape of glands, which may produce toxins (e.g., parotoid glands), may also be useful in species identification.

### Supplemental Notes

The paired parotoid glands are present in certain groups, such as toads (Bufonidae), behind their eyes. When threatened, a milky fluid is released from these glands. This poison can simply cause a predator's eyes or mouth to burn, or it can cause muscle spasms, heartbeat irregularities or breathing problems.

**Images:** 1. *Ptychadena anchietae* exhibiting many parallel ridges on its back, © R. Kerney and B. Zimkus; 2. When threatened, the Cane Toad (*Bufo marinus*) secretes a milky-white poisonous fluid known as bufotoxin from its parotoid glands, © K.C. Schneider; 3. Prominent supratympanic (above the tympanum) ridge of *Polypedates otophilus*, © B. Gratwicke; 4. Brilliant Forest Frog (*Rana warszewitschii*) with a prominent dorsolateral ridge, © D. Huth.

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# Skin Texture



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Frogs have permeable skin, allowing them to absorb water. The thickness and texture of the skin are adaptations to their habitat. Make observations regarding the texture of the dorsal (back) and ventral (belly) skin. Is the skin smooth, shagreened (rough to the touch with very small tubercles), granular (with small, rounded bumps), tuberculate (with rounded bumps of various sizes), spiculate (with small, pointed tubercles) or warty? Note that the skin may appear different on the back compared to the belly, and it may also have different textures anteriorly (towards the front) and posteriorly (towards the back).

## Supplemental Notes

Using a magnifying glass to look at the skin closely is often the best way to determine the skin texture. Often skin may look smooth when observed with the naked eye, but a magnifying glass may reveal tiny tubercles or bumps.

**Images:** 1. Smooth skin of *Hyperolius mitchelli*, © D.L. Mahler and B. Zimkus; 2. Spiculate skin of Fornasini's spiny reed frog (*Afraxalus fornasini*), © D.L. Mahler and B. Zimkus; 3. Granulated skin of Kreffft's warty frog (*Callulina krefftii*), © D.L. Mahler and B. Zimkus; 4. Warty skin of *Amietophrynus regularis* (African Common Toad), © R. Kerney and B. Zimkus.

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Frogs

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# Vocal Sacs

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The vocal sac is a flexible membrane of skin in the throat that acts as sound resonator or amplifier when inflated. Normally only males have a vocal sac. Observe whether there is a single vocal sac, two vocal sacs connected under the throat, or two vocal sacs that are completely separate. Note that males of some species may not have an external vocal sac but can still create an advertisement call.

## Supplemental Notes

Since the primary purpose of a vocal sac is to amplify the advertisement call of a male, species without a vocal sac may not be able to attract females from as far away as species with large vocal sacs. In addition, if a frog species lives in an area close to loud, flowing water, it may not call, having evolved other means of communication.

**Images:** 1. *Hyla cinerea*, © G. Gallice; 2. *Engystomops pustulatus* male calling vigorously with its vocal sac inflated while floating in a pool, © S. Ron; 3. *Dendropsophus microcephalus*, © B. Gratwicke; 4. Unidentified frog at the British Wildlife Centre, Newchapel, Surrey, © P. Trimming.

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Frogs

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# Digits and Webbing



Examine the fingers and toes, making notes regarding the extent of webbing (absent, rudimentary, moderate or extensive), shape of digit tips (discs not present, bulbous digit tips or discs) and presence of claws or claw-like structures. There may be small tubercles present between the bony elements of the digits. To get more specific information regarding the extent of webbing, count the number of phalanges (individual bony elements of the fingers and toes) that are not webbed, starting from the tip of the digit.

### Supplemental Notes

Extensive webbing may indicate that a frog is primarily aquatic, although some arboreal species may also use webbing to glide from tree to tree. Arboreal species may have fingers in opposing pairs, enabling them to grasp branches, and the tips of their digits may be expanded into discs, aiding them when climbing. Fossorial (digging) species may have stubby, claw-like fingers that are adapted for digging.

**Images:** 1. Prominent webbing of Malabar gliding frog (*Rhacophorus malabaricus*), © C. Sengupta; 2. Illustration of webbed foot of puddle frog with digital discs on toes (*Phrynobatrachus*), © B. Zimkus; 3. Enlarged digit tips of *Dendrobates tinctorius*, © B. Dupont; 4. Illustration of unwebbed foot of puddle frog (*Phrynobatrachus*), © B. Zimkus.

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Frogs

Behavior

# Locomotion



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Observe how the frog moves. Frogs use a variety of locomotor modes, including jumping, walking, running, swimming and gliding. They may be able to locomote in a different way depending on whether they are in a terrestrial, aquatic or arboreal environment. Many ground-dwelling species jump, but some are able to walk or run. Aquatic and semi-aquatic species have webbing to allow them to swim efficiently, and the degree of webbing may be proportional to the amount of time the species spends in water. Arboreal species often use enlarged toe pads to climb vertical surfaces, and some even use their extensive webbing to glide from one tree to another.

## Supplemental Notes

Frogs are considered exceptional jumpers, and many of their anatomical characteristics, including elongate bones in the hind limbs, feet and pelvis, are adaptations that have improved their ability to jump.

**Images:** 1. *Atelopus limosus*, © B. Gratwicke; 2. Chinese Gliding Frog (*Rhacophorus dennysi*) "flying", © M. Teschner; 3. Running frog (*Kassina maulosa*), © V. Gvoždík; 4. Ukrainian frog swimming, © I. Mei.

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Frogs

Behavior

# Food and Feeding



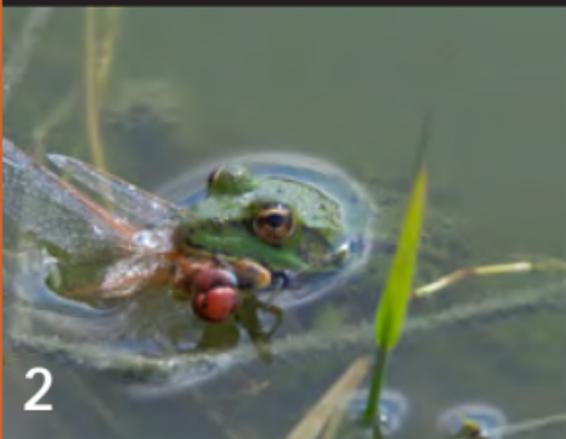
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## Food and Feeding

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Frogs are generally considered to be opportunistic feeders, eating any available food of the appropriate size, but some species are selective. Observe the type of prey and how the frog captures it. Most adult amphibians are carnivores, feeding principally on invertebrates, especially insects, although some are known to eat small mammals, birds, snakes, turtles and other frogs. Tadpoles are omnivorous, eating plankton, algae, insect larvae and occasionally other tadpoles. Prey availability, habitat and season are all factors that are known to influence the diets of frogs. Frogs that have specialized diets often use a sit-and-wait strategy, while generalists are active foragers.

### Supplemental Notes

Most frogs capture their prey using their tongues, which have glands that produce a sticky secretion, flipping the tongue over the prey item while pulling it into the mouth. Some aquatic frogs suck food into their mouths, using their hands to help.

**Images:** 1. Juvenile Gray treefrog (*Hyla versicolor*) eating fruit fly, © D. Huth; 2. Unidentified Ranidae, © D. Salvagnin; 3. Frog eating damselfly, © A. Vermazeren; 4. Unidentified tadpole, © D. Winterwolf.

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Frogs

Behavior

# Defense



Although many frogs rely on cryptic or aposematic (warning) coloration, toxicity or escape to avoid predators, some have evolved defensive behaviors. Does the frog you are observing behave differently if you approach it? Some frogs pretend they are dead by remaining motionless, stretching out their limbs, closing their eyes or sticking out their tongues. Others make themselves look larger by sucking air into their lungs. Some species assume a posture that points their poison glands towards a predator. Mouth gaping and biting are also effective methods of defense in some species.

## Supplemental Notes

Some frogs use vocalizations in defense, providing a warning of potential danger to other individuals. Distress calls are usually emitted with the mouth open, and they sound very different from the advertisement call. Some species emits distress calls that are short and loud, while some have calls that sound like a person screaming.

**Images:** 1. *Bufo terrestris*, © squamatologist; 2. *Pseudophryne coriacea*, © teejaybee; 3. *Bufo bufo*, © Lukasz Olszewski ImreKiss; 4. *Bombina orientalis* exhibiting the unkenreflex, flipping on their backs and arching their spines, © P. Lambourne.

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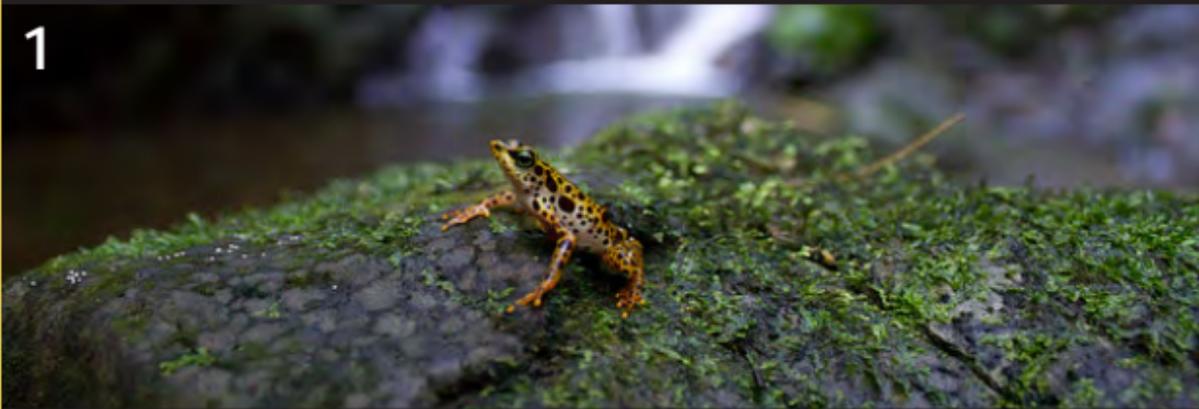
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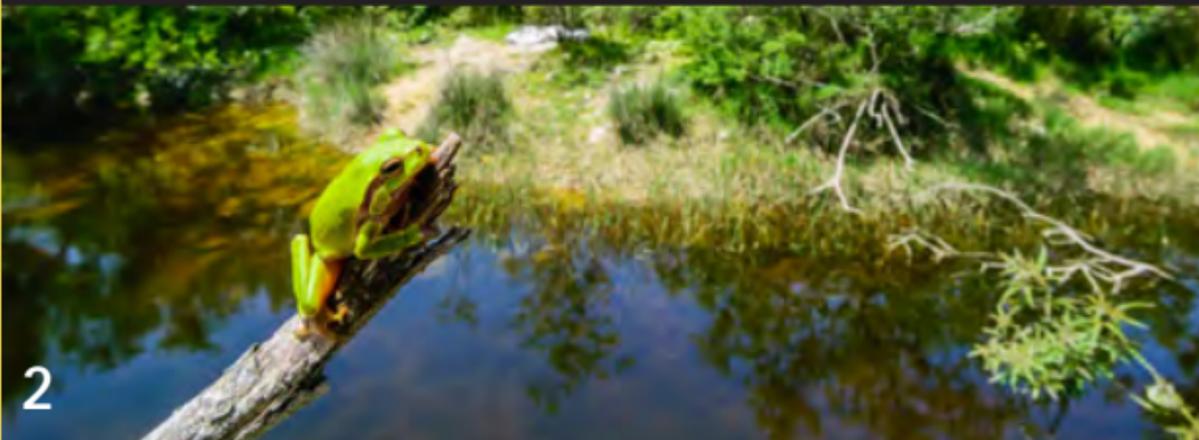
# Habitat



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Frogs are found on all continents, except Antarctica, and they are found in diverse biomes and habitats, including rainforest, savannas, and temperate deciduous forests. They are often closely associated with bodies of water (e.g., creeks, lakes, ponds, rivers, swamps, vernal pools) because that is where they breed and lay their eggs, and where their tadpoles develop. Make detailed notes on where you observed or collected the frog, including types of vegetation (e.g., trees, shrubs, vegetation at edges of water, vegetation in water), details about waterbodies (e.g., stagnant, slow-moving, fast-flowing, water depth, aquatic substrate) and whether the habitat is near any roads or settlements. Taking a number of photographs of the habitat from different angles also can help document the features of the area.

## Supplemental Notes

Many frogs have specific altitudinal distributions, so knowing the approximate elevation or determining it using a GPS is important. Recording information about the temperature and weather in your field notes is also very useful.

**Images:** 1. *Atelopus certus* from Panama, © B. Gratwicke; 2. European Green Tree Frog (*Hyla arborea cretensis*), © J.P. Clare.

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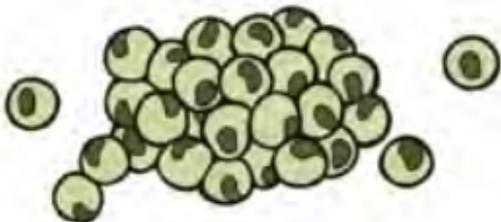
Frogs

Life History

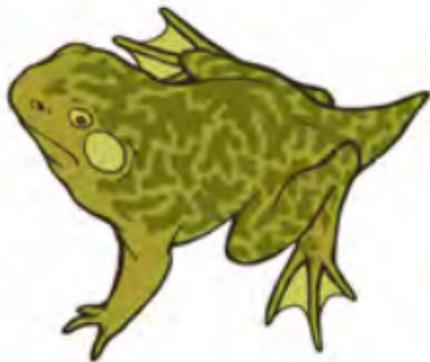
# Life Cycle



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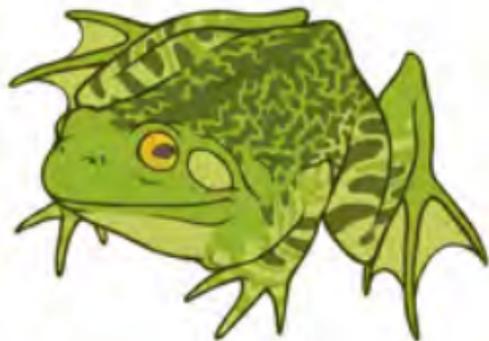
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Look for frogs at various developmental stages: egg, larva (tadpole), metamorph, juvenile and adult. The life cycle of a frog normally begins in water with an egg that hatches into a larva, called a tadpole. Tadpoles have elongate tails, gills and specialized mouthparts, including a beak. After further growth, the tadpole undergoes metamorphosis, which includes the development of the lungs and legs, as well as the disappearance of the gills and tail. After metamorphosis, juvenile frogs are able to leave their aquatic habitat for land. It should be noted that some frogs are direct developers, lacking a larval stage with froglet hatching directly from eggs.

## Supplemental Notes

Tadpoles may also have a completely different color pattern when compared to their adult counterparts. The drab coloration of tadpoles functions as camouflage, allowing them to blend into their surroundings and avoid predators.

**Images:** 1. Spawning occurs when the male frog fertilizes the eggs after the female has laid them, © J. Yu; 2. Embryos leave their eggs to become tadpoles, © J. Yu; 3. After metamorphosis, tadpoles become froglets or juvenile frogs, © J. Yu; 4. Be aware that juvenile and adult frogs may not always look similar, © J. Yu.

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Frogs

Life History

# Seasonality and Breeding



## Seasonality and Breeding

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Observe mating pairs, noting the habitat where they mate and/or where a female lays her eggs. The fertilization of frog's eggs happens outside the female's body in most species. The female releases her eggs and the male releases his sperm at the same time while in amplexus, which is a mating posture. Most frogs have axillary amplexus with the male on the female's back, and the males uses his forearms to grasp the female under her arms. Frogs may mate and lay eggs within water, but some species may lay their eggs on leaves or branches, above water, while others construct foam nests.

### Supplemental Notes

In temperate areas, frogs may breed only at times of the year that have more rainfall, while in tropical areas, frogs may breed continuously.

**Images:** 1. *Leptopelis ragazzii* in amplexus, © B. Gratwicke; 2. Gravid *Hyperolius spinigularis* female with eggs visible through body wall, © D.L. Mahler and B. Zimkus; 3. *Atelopus limosus* in amplexus, © R. Kerney and B. Zimkus; 4. Gravid *Leptopelis ragazzii* female, © R. Kerney and B. Zimkus.

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Frogs

Life History

# Eggs

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Most frog eggs have a jelly-like exterior covering that protects the egg, while the embryo lives off the internal yolk. The size and shape of the egg mass is generally characteristic of the species, so note the approximate number of eggs and whether eggs are in masses or long chains. Many species lay thousands of eggs at once, while others may lay only a few, large eggs. Observe where the eggs are laid (e.g., in water, on leaf). In general, the length of the egg stage depends on the species and the surrounding environmental conditions.

## Supplemental Notes

Most frogs abandon their eggs once they are fertilized, but some species provide parental care. The female or male may stay with the eggs, guarding them until they hatch. Some unique species carry the eggs in their vocal sacs or abdomens.

**Images:** 1. Eggs of arboreal *Dendrobates variabilis*, © J.-F. Brousseau; 2. Unidentified eggs from Simcoe, Ontario, Canada, © R. Hodnett; 3. Glassfrog (*Cochranella*) eggs, © B. Gratwicke; 4. *Hyperolius* sp. guarding eggs, © D.L. Mahler and B. Zimkus.

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Frogs

Life History

# Tadpoles

eOL

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Tadpoles hatch from eggs, and most have long tails and external gills. Make observations regarding tadpole morphology, including the total body length, tail length and position of the mouth, nostrils, eyes, spiracles (for exit of water from gills) and vent. The mouth may be positioned anteriorly (at the front and pointed forward) or ventrally (on the bottom and pointed downward). Nostrils may be positioned close together or widely spaced. Eyes may be positioned laterally (on the sides) or dorsally (on top of the head). Examine the dorsal and ventral fins and make notes regarding their overall shape and coloration. Examine the mouthparts and determine the number of complete and incomplete rows of teeth above and below the keratinized jaw sheaths, which are the dark biting mouthparts.

## Supplemental Notes

Just like fish, tadpoles have gills and can only breathe underwater. If you want to observe them closely, make sure you have a small container of water to keep them in.

**Images:** 1. *Cruziohyla calcarifer*, © J. Clare; 2. *Lithobates catesbeianus*, © T. Pierson; 3. *Hylarana* sp. in lateral view, showing dorsal and ventral fin, © B. Zimkus and J. Larson; 4. *Cruziohyla calcarifer*, © J. Clare.

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Frogs

Life History

# Metamorphosis



Metamorphosis is a biological process of development that involves a drastic change in an animal's body. Make observations about metamorphosis and the stage of your frog by looking at its limbs, mouth, tail or gills. When a tadpole begins to metamorphose, it begins to grow hind legs, which are soon followed by its forelimbs. Its mouth widens, and the tail becomes smaller. The gills are lost as lungs develop, and it develops eyelids. Frogs with all four legs and a tail are called metamorphs or froglets, while adult frogs generally have no tail.

## Supplemental Notes

You may be able to find frogs at different developmental stages as the timing of metamorphosis may differ slightly among individuals. You can also make observations regarding metamorphosis by visiting a habitat repeatedly over 1–2 weeks.

**Images:** 1. *Rana catesbeiana*, © Carolina Biological Supply Company ([www.flickr.com/carolinabio](http://www.flickr.com/carolinabio).); 2. Gopher frog (*Rana capito*) in metamorphosis with visible hind limbs, © FWC Fish and Wildlife Research Institute; 3. *Rana catesbeiana*, © Carolina Biological Supply Company ([www.flickr.com/carolinabio](http://www.flickr.com/carolinabio).); 4. *Hyalinobatrachium vireovittatum* at end of metamorphosis with tail still visible, © B. Gratwicke.

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# Observing and Collecting



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There's a lot to learn about animals by observing them in their natural habitat, but collecting and examining frogs is often necessary for identification. You can often catch frogs by hand if they are living on the ground in leaf-litter, within vegetation (trees, shrubs, bushes, grass) or at the edges of waterbodies. You may need a small net for species that live in water, as well as for collecting tadpoles or eggs. Make sure to bring a notebook to record the locality information, as well as making observations about the frog's appearance. A camera or phone that can take photographs is also very useful.

### Supplemental Notes

If you plan to catch a frog or tadpoles so you can observe and then release it, make sure to bring some small, clear containers to place them into. Frogs often get stressed when being handled, so place them into the container for a short period of time. Make sure that you don't leave the containers in direct sunlight because the animals can overheat.

**Images:** 1. Record observations in a field notebook, © M. Dales; 2. Nets are useful for catching frogs, tadpoles or eggs from water, © U.S. Forest Service; 3. Clear containers allow close examination, © M. Zjeroen; 4. *Leptopelis gramineus* caught while in amplexus, © R. Kerney and B. Zimkus.

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# Characterizing Vocalizations



# Characterizing Vocalizations

EOL Observer Cards

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Listen and/or record a frog calling, making observations regarding the call itself, when the frog is calling (time of year and time of day/night), and from where it is calling (e.g., water, trees, vegetation). Characterize the sound of the call (buzz, click, croak or chirp) or compare the call to a familiar sound (e.g., twang of a banjo string, pebbles being clicked together, a quacking duck, etc.). Note the duration (short/long or use a watch to time the call), volume (loud, soft) and whether the call is repetitive. Recording the call may be helpful because you can listen to it more closely at a later time and compare it to other calls.

## Supplemental Notes

Use a recorder, camera or phone to record frog vocalizations. Calls can most often be heard during the evening and at night. Bring a flashlight or headlamp to reach an area where you hear a frog or many frogs calling, which may be around a body of water that is suitable for breeding. Turn off your light, remain silent and record the call for 3–5 minutes. Learn more about recording frog calls and frog data from Frogwatch, [www.aza.org/frogwatch](http://www.aza.org/frogwatch).

**Images:** 1. Listen to frog calls, © T. Isaacs; 2. Use camera or phone to record frog calls and make other observations in a notebook, © C.C. Chapman; 3. Recording frog calls at night, © B. Gratwicke; 4. Frogwatch logo, © Association of Zoos & Aquariums (AZA).

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# Indicator Species

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An indicator species is an organism whose presence, absence or abundance reflects the condition of its environment. Frogs are indicator species because they are often the first to disappear when their environment starts to change. Frog population declines act as an early warning sign to humans, providing insight into the health of an ecosystem. If you make observations about the number of frogs that you see at a specific place each year, it is possible that you can detect when an environment has begun to change. You can also reach out to frog monitoring organizations and volunteer to monitor local frog populations.

## Supplemental Notes

The moist, permeable skin of frogs is sensitive to numerous pollutants, which is one reason why frogs are considered a good indicator species of ecosystem health. Industry, mining, agriculture, and the application of lawn and garden chemicals all release toxins into the environment, which can affect tadpole and adult survival.

**Images:** 1. North American Amphibian Monitoring Program, © U.S. Geological Survey; 2. Frog skin, © H. Bakk-Hansen; 3. Male *Ranitomeya imitator* transporting tadpole, © J. Clare; 4. Crude oil in an open toxic oil waste pit in the Ecuadorean Amazon Rainforest, © Rainforest Action Network.

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# Save the Frogs!



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A number of different factors have been implicated in the recent decline of amphibian populations worldwide, including climate change, habitat loss, pesticides, pollution, and a fungus that affects amphibians (*Batrachochytrium dendrobatidis*). Learning about local frog diversity through careful observation is one way to become interested in amphibians, and hopefully this interest will lead to actions that help save frog populations.

## Supplemental Notes

There are a number of things that you can do to help protect amphibians. Don't use pesticides and herbicides because they often end up in waterways, and amphibians have skin that easily absorbs these toxic chemicals. Don't eat frogs legs. Don't buy wild-caught or endangered amphibians for pets. Don't dissect frogs; use virtual dissection software instead. Build a frog pond in your yard or outside your school. Reduce your consumption, re-use what you already have and recycle what you are done with it. Go to <http://www.savethefrogs.com> for more complete information.

**Images:** 1. Save The Frogs, © K. Kriger; 2. Reducing your consumption and increasing your recycling will keep frog habitats clean; 3. Habitat destruction is the number one cause of amphibian declines, so help frogs by building them a pond in your yard, © Josie via K. Kriger; 4. Swabbing *Litoria wilcoxii* for chytrid fungus, © D. Hall.

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