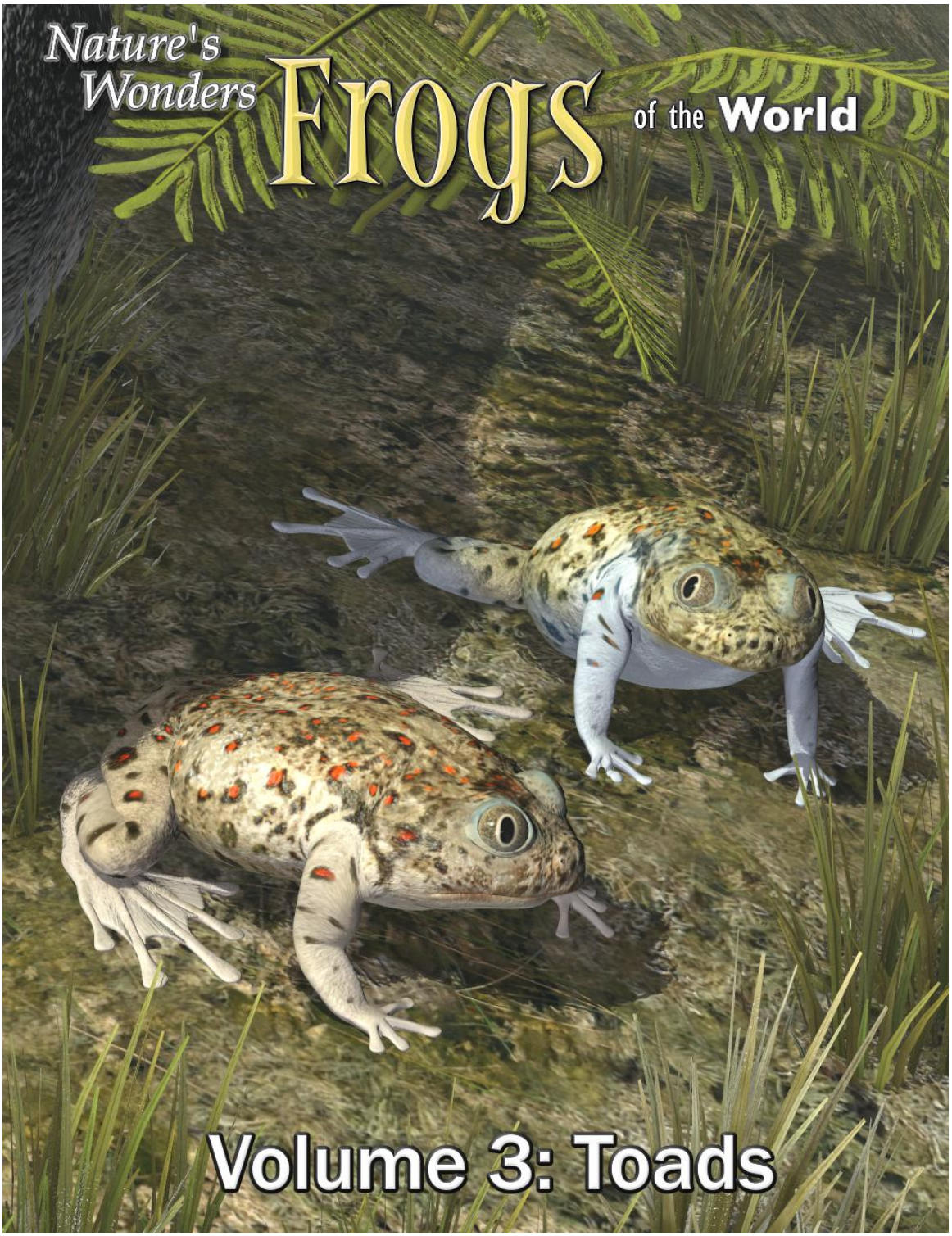

A 3D Model set by Ken Gilliland

Nature's Wonders

Frogs of the World

Volume 3: Toads

Manual

Field Guide

List of Species

Frogs of the World

Volume 3: Toads

Introduction

This third volume of Frogs of the World focuses on Toads. Toads are a specific type of frog and mostly found in the *Bufonidae* family. Toads are characterized by dry, leathery skin, short legs and large bumps covering the parotoid glands. They tend to live in more terrestrial habitats than other frogs.

Superstition has it that touching toads produces warts, which is, of course, untrue. The bumps (or "warts") on the toads skin are part of the toads genetic make-up and are not infectious.

The toad has long been considered to be an animal of ill omen or a connection to the spirit world. Repugnance to it may actually be caused by its blackish, wart-like skin, its slow movements and the way it can emerge from dark holes. Or it may have even had its origins in the fact that it is at home both on land and in the water. Whatever the reason, in Europe in the Middle Ages, the toad was associated with the Devil, for whom a coat-of-arms was invented emblazoned with three toads. It was known that the toad could poison people and, as the witch's familiar, it was thought to possess magical powers. Even ordinary people made use of dried toads, their bile, faeces and blood. In some areas, the finding of a toad in a house was considered evidence that a witch was present. In the Basque Country, the familiars were believed to be toads wearing elegant robes. These were herded by children who were being trained as witches. Between 1610 and 1612, the Spanish inquisitor Alonso de Salazar Frías investigated witchcraft in the region and searched the houses of suspected witches for dressed toads. He found none. These witches were reputed to use undomesticated toads as ingredients in their liniments and brews.

Round about the cauldron go;
In the poison'd entrails throw.
Toad, that under cold stone
Days and nights has thirty-one
Swelter'd venom sleeping got,
Boil thou first i' the charmed pot.

Double, double toil and trouble;
Fire burn, and cauldron bubble

From "Macbeth" by William Shakespeare

In Chinese culture, the Money Toad (金蟾), is said to appear during the full moon, near houses or businesses that will soon receive good financial news.

Overview and Use

The set is located within the **Animals : Nature's Wonder** folder. Here is where you will find a number of folders, such as **Manuals, Resources** and **Fauna Libraries**. Let's look at what is contained in these folders:

- **Fauna Libraries:** This folder holds the actual species and poses for the "premade" fauna. The fauna for this set can be found in the following folder(s):
  - **Amphibians/Frogs of the World**
- **Manuals:** Contains a link to the online manual for the set.
- **Props:** Contains any props that might be included in the set
- **Resources:** Items in this folder are for creating and customizing your fauna included in the set
  - **… Based Models:** This folder has the blank, untextured model(s) used in this set. These models are primarily for users who wish to experiment with poses or customize their own species. When using physical renderers such as Iray and Superfly, SubD should be turned to at least "3". For DAZ Studios 3Delight renders, the SubD must be turned from the "High Resolution" setting to the "Base" setting (otherwise some areas will render incorrectly transparent).

Creating a Specific Frog using Poser

1. For this example, we'll create the Red-legged Frog.
2. Load Poser, select the FIGURES library and go to the "Animals", "Nature's Wonders" and then the Nature's Wonders Fauna Libraries Amphibians folder.
3. Go to the Frogs of the World folder and select the Firefly or Superfly sub-folder.
4. Select the Red-legged Frog (or a frog of your choice) and load it by clicking the mouse.

Creating a Specific Frog using DAZ Studio

1. For this example, we'll create the Red-legged Frog.
2. Load DAZ Studio and go to the "Animals", "Nature's Wonders" and then the Nature's Wonders Fauna Libraries Amphibians folder.
3. Go to the Frogs of the World folder and select the Iray or 3Delight sub-folder.
4. Select the Red-legged Frog (or a frog of your choice) and load it by clicking the mouse.

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Sizing & Poser Issues

All the toads included in this set have been scaled to their appropriate sizes in relation to human figure models. In the case of the smaller toads, such as the Panamanian Golden Toad which is 1.4-2.5 inches (45-63 mm), it is suggested that the transform dials (xtrans, ytrans, zrotate, etc.) be tuned to a more delicate sensitivity (via properties) to ensure greater control over placement of the frog.

This extremely small size can produce some issues in Poser. The toad may disappear when the camera is in close focus. The "hither" setting on Poser's cameras is set to 0.800 by default. Reducing this setting to "0.0" will correct this issue.

A second issue can appear when rendering a small toad without any other items in the scene. It will produce a default square shadow. It is a known bug with Poser. To correct this issue, include a second larger item off-screen and the shadows will render correctly.

Rendering & Lighting Issues

The toads will render perfectly in most conditions in Poser and DAZ Studio. With DAZ Studio, the materials were set-up and tuned in Uber Environmental lighting, so using other lighting systems (such as AoA lighting in 3Delight) may cause texture seams and require the adjustment (lessening) of bump, displacement and/or normal map values.

Western Spadefoot Toad (*Spea hammondii)*

This toad is nocturnal, and activity is limited to the wet season, summer storms, or during evenings with elevated substrate moisture levels. It is easily handled, with less skin secretions than similar toad species. Their secretions smell like peanut butter and may cause sneezing.

Range and Habitat: North America; it is endemic to California and Baja California. Populations are localized, but widespread. It ranges throughout the central valley of California, as well as the coast south of San Jose and in some parts of the desert.

The western spadefoot prefers open areas with sandy or gravelly soils, in a variety of habitats. These habitats include mixed woodlands, grasslands, coastal sage scrub, chaparral, sandy washes, lowlands, river floodplains, alluvial fans, playas, alkali flats, foothills, and mountains. Rain pools, which do not contain bullfrogs, fish, or crayfish are necessary for breeding.

Identification (Measurements Snout to Vent): 1.5-3 inches (38-75 mm). It is a relatively smooth-skinned species of American spadefoot toad. Its eyes are pale gold with vertical pupils. It has a green or gray dorsum often with skin tubercles tipped in orange, and it is a whitish color on the ventrum.

Call: The call is a short loud trill, like a quick snore, lasting less than one second. Males call at night while floating on the water, often while they are in large aggregations.

Behavior and Reproduction: The reproductive cycle is similar to that of most North American Frogs and Toads. Mature adults come into breeding condition and the males call to advertise their fitness to competing males and to females. Males and females pair up in amplexus in the water where the female lays her eggs as the male fertilizes them externally. The eggs hatch into tadpoles which feed in the water and eventually grow four legs, lose their tails and emerge onto land where they disperse into the surrounding territory.

Females lay 300 - 500 eggs, in irregular groups of 10 to 42 eggs, that are attached to underwater vegetation. Eggs hatch very quickly in a 3 to 4 day period. Tadpoles transform in 4 to 11 weeks, depending on food availability and the duration of the rain pool.

Diet: Tadpoles feed mainly on plants and planktonic organisms, algae, ants, small invertebrates and dead aquatic larvae of amphibians, they may become cannibalistic. Adult toads feed on insects, worms and other invertebrates including; grasshoppers, true bugs, moths, ground beetles, ladybird beetles, click beetles, spiders, flies, ants and earthworms.

Typical Lifespan: About 12 years. They reach sexual maturity in their third year.

Status and Threats: Near Threatened. The Western Spadefoot Toad has lost an extensive amount of its habitat in the central valley due to urban and agricultural development of land that formerly supported the formation of temporary rain pools. It is estimated to be gone from almost 80% of its former habitat along the south coast. Formerly it was present in much of lowland southern California including the Los Angeles coastal plain, but it is now absent from this area. Mosquito fish introduced into vernal pools also threaten some populations.

Southern Toad (*Bufo terrestris)*

In the northern part of their range, southern toads are inactive during the late fall and winter, while in most of Florida they remain active year-round. The highest level of activity occurs from dusk to dawn; they usually seek cover under forest litter or dig into loose soil during the day. Burrowing is accomplished by digging with their hind feet.

Range and Habitat: North America; the Southern United States. It can be found in every southeastern state except Tennessee. Their range extending from southeastern Virginia to Florida and eastern Louisiana. There is also an isolated colony in northwestern South Carolina.

In non-breeding season, this species resides in a wide variety of terrestrial habitats, particularly those associated with sandy soils that facilitate burrowing. These include agricultural fields, coastal scrub, pine woodlands, hardwood hammocks, and residential areas, all of which must be near water. During the breeding season, these toads use a broad spectrum of aquatic environments.

Identification (Measurements Snout to Vent): 1.6-2.9 inches (41-75 mm). Males are smaller than females, and typically have a darker throat during the breeding season. The coloration is usually brown but can vary from a dark gray to black to a deep red.

Several dark spots or blotches are frequently present on the back and upper sides, each surrounding one or more bumps. A light line extends partway down the mid-dorsal of some southern toads, although it may be obscure or absent in others. The belly is grayish white, while the chest is spotted. The skin of these toads is dry and bumpy, and they have an elongated, enlarged parotoid gland behind each eye. High cranial crests extend from pronounced knobs and approach each other toward the snout. The distinctive knobs project upward in front of the parotoid glands, often giving the animal a horned appearance.

Call: A shrill, musical trill, nearly an octave higher than the call of the American toad. Duration is about 2 to 8 seconds, with approximately 75 trills per second.

Behavior and Reproduction: Between feeding, hibernation, and breeding, southern toads maintain an extensive range of up to one square mile.

Warm, rainy weather triggers these toads to make the transition from upland terrestrial habitats to breeding grounds in early to late spring. Shallow, standing water is a prerequisite for a potential breeding site. Southern toads will indiscriminately congregate in wetlands, ponds, flooded low areas in both wood and field, or even in water-filled ditches and tire ruts to breed. The chorusing of large aggregations, during breeding season, can be deafening. Breeding generally takes place from February to October, depending on location and weather conditions. Females typically lay 2500-4000 eggs in long, coiled, gelatinous strands. Eggs hatch in only 2-4 days and tadpoles undergo metamorphosis after 30-55 days, when they are less than half an inch long. Great numbers of newly metamorphosed toadlets can often be found near their natal wetlands. After reaching sexual maturity at about 2-3 years, individuals presumably continue to breed every year.

Diet: Beetles, earwigs, ants, cockroaches, crickets, snails, bees, and lightning bugs

Typical Lifespan: At least 10 years.

Status and Threats: Least Concern. Southern toads are not protected in any part of their geographic range. They are common and appear to do well in suburban and agricultural areas. However, Cane toads, an introduced species in parts of Florida, may compete with or even prey upon these smaller cousins and as a result there has been a decrease in southern toad populations in some areas.

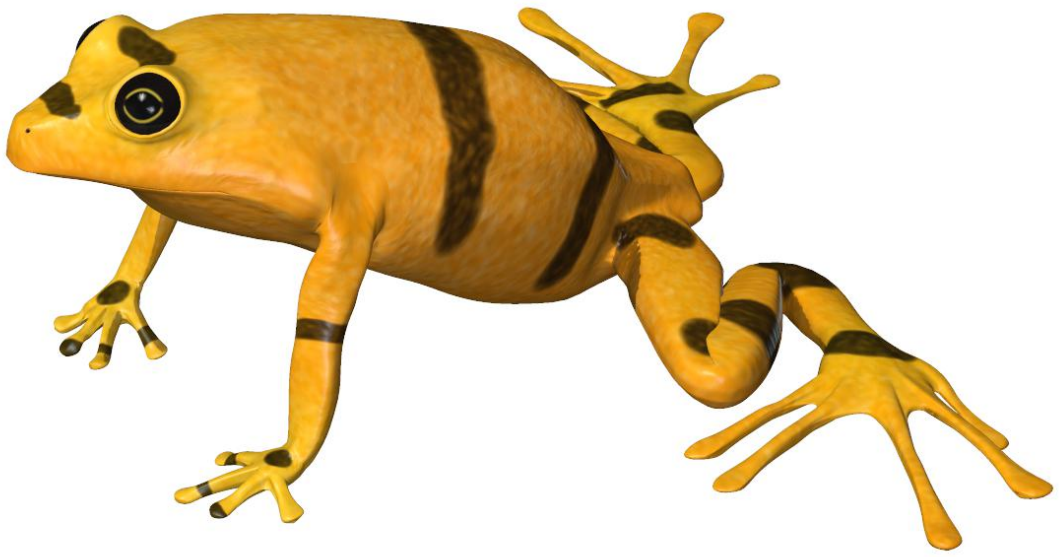
Panamanian Golden Toad (*Atelopus zeteki)*

Despite one of its common name, the "Panamanian Golden Frog" is a true toad. It is considered to be one of the most beautiful toads in Panama and in 2010, the Panamanian government passed legislation recognizing it as a national symbol and August 14 as "National Golden Frog Day". This species shares much in common with the Poison Dart frog family. It carries a variety of toxins, including steroidal bufadienolides and guanidinium alkaloids of the tetrodotoxin class. These are water-soluble and they affect the nerve cells of anyone who comes in contact with them. The Panamanian Golden Toad uses this toxin to protect itself from most predators. A large dose can be fatal in 20 to 30 minutes

Range and Habitat: Central America; endemic to Panama. It occurs in western-central Panama on the eastern side of the Tabasará mountain range in the Coclé and Panamá provinces and in both wet rain forests and dry cloud forests in the Cordilleran Mountains of western-central Panama.

They are found in areas with montane streams in two habitat types, montane wet forests and montane dry forests.

Identification (Measurements Snout to Vent): 1.4-2.5 inches (45-63 mm). With females being larger than males. The sexes have similar coloration, which is usually uniform golden yellow with one to several large black dorsal markings. The head is longer than broad, with a pointed, protuberant snout. The pupil is horizontally elliptical. The body is slim with long limbs, and the upper surface is smooth with minute spicules. The fingers are elongated and narrow. The toes are extensively webbed. Males also have a well-developed brownish nuptial pad on the upper and inner surface of the first finger.



Call: The Panamanian golden toad appears to socialize with other amphibians using low sounds from the throat and visually signaling.

Behavior and Reproduction: Male frogs perch on rocks in or along the banks of streams and waterfalls, where they defend their territory by semaphoring: visually signalling with hand-waving, plus an unusual form of foot-raising (which is different than foot-flagging), as well as reorientation. Males also vocalize, but prefer semaphoring over vocalization, apparently due to the noisiness of waterfalls and stream flow in their natural habitat The male tends to stay near the streams where breeding occurs, while in the non-breeding season, the females retreat into the forests. The male uses a soft call to entice prospective mates that cross his path, then grabs the female and hangs on. If she is receptive, she will tolerate amplexus; if not, she will attempt to buck him off by arching her spine. Egg laying usually takes place in a shallow stream.

Diet: Small invertebrates, mainly ants.

Typical Lifespan: 12 years

Status and Threats: Critically Endangered. While the IUCN lists it as critically endangered, it may in fact have been extinct in the wild since 2007. Individuals have been collected for breeding in captivity in a bid to preserve the species.

The Panamanian Golden Toad began vanishing from its high mountain forests in the late 1990s, which prompted a scientific investigation and rescue process that continues today. It was filmed for the last time in the wild in 2006 by the BBC Natural History Unit for the series "Life in Cold Blood" by David Attenborough. The remaining few specimens were taken into captivity and the location of filming was kept secret to protect any remaining Panamanian Golden Toads from potential poachers. Although captive populations seem to thrive well, reintroducing them to an area will not stop the threat of chytridiomycosis (a life-threatening fungal infection). Although efforts are being made, no current remedies prevent or control the disease in the wild. One attempt that was made to protect a wide variety of frogs from the disease used the bacterium, *Janthinobacterium lividium,* which produces a chemical against the infections; however, the skin of Panamanian Golden Toads were unsuitable for the bacterium used. The San Diego Zoo started a conservation effort and received their first toads in 2003. Since then, they have been able to successfully breed 500 individuals in captivity, but they will not release them into the wild until the fungal disease is less of a threat. The San Diego zoo also sends money to Panama to keep up the conservation effort in the toads' native country.

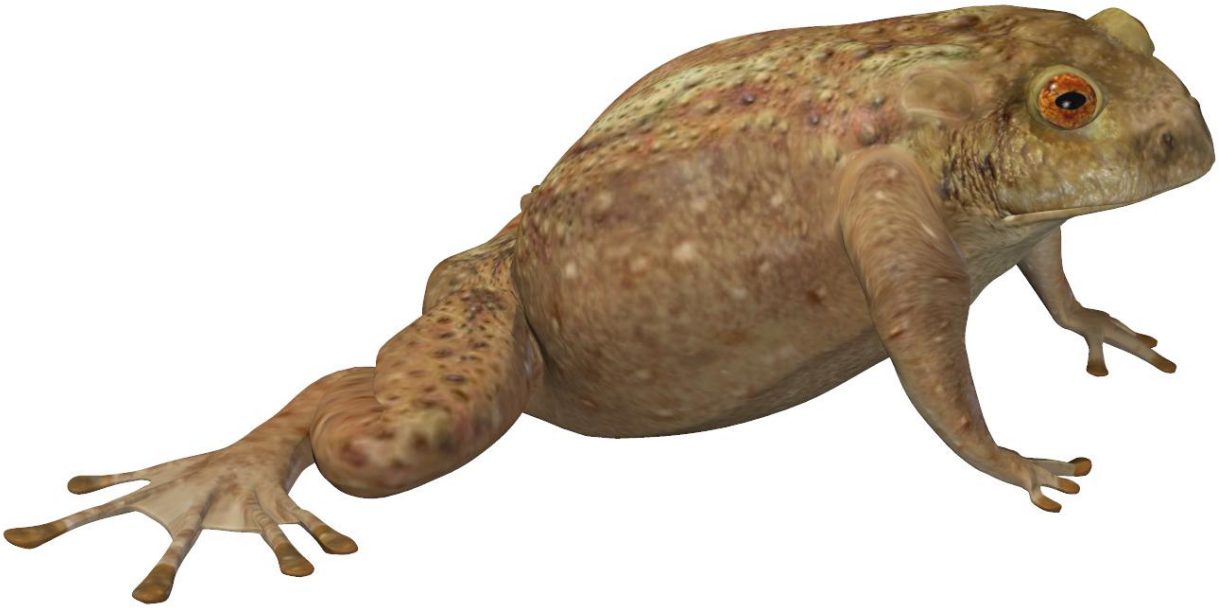
European Common Toad (*Bufo bufo)*

"Bufo" comes from Latin which literally means Toad.

Range and Habitat: Eurasia and Africa; The European Common Toad is found throughout most of Europe (with the exception of Ireland, Iceland, and some Mediterranean islands), it is also in the western part of North Asia and in a small portion of Northwest Africa.

It inhabits altitudes of up to 2,500 m (8,200 ft) in the southern part of its range. It is largely found in forested areas with coniferous, deciduous and mixed woodland, especially in wet locations. It also inhabits open countryside, fields, copses, parks and gardens, and often occurs in dry areas well away from standing water.

Identification (Measurements Snout to Vent): 6 inches (150 mm). Females are usually heavier than males and browner in color; while males tend to be grayer. Toads found in southern regions also tend to be larger than those found in the north. The head is broad with a wide mouth. The eyes are protruding and bulbous, with yellow to copper-colored irises and horizontal pupils. The paratoid glands appear behind the eyes and are positioned obliquely. They contain a noxious substance, bufotoxin,



which is used to deter potential predators. The head joins the body without a noticeable neck and there is no external vocal sac. The body is broad, squat and positioned close to the ground. The fore limbs are short with the toes of the fore feet turning inwards. At breeding time, the male develops nuptial pads on the first three fingers, which he uses to grasp the female when mating. The hind legs are short relative to other frogs' legs and the hind feet have long, unwebbed toes. The skin is dry and covered with small wart-like lumps. The color is a fairly uniform shade of brown, olive-brown or gray-brown, sometimes partly blotched or banded with a darker shade. The underside is a dirty white speckled with grey and black patches.

Call: The mating call is quiet and slow, with long croak-like notes. It is not often heard.

Behavior and Reproduction: The European Common Toad usually moves by walking rather slowly or in short shuffling jumps involving all four legs. It is most active in wet weather, emerging at dusk to hunt. By morning it has returned to its concealed lair that it has hollowed out under foliage or beneath a root or a stone where it is camouflaged by its coloring. It may occupy the same place for several months.

When attacked, it adopts a characteristic stance, inflating its body and standing with its hindquarters raised and its head lowered. Its chief means of defense lies in the foul tasting secretion that is produced by its paratoid glands and other glands on its skin.

It emerges from hibernation in spring. Although toads are usually solitary animals, in the breeding season, large numbers of toads converge on certain breeding ponds. Adults use the same location year after year and over 80% of males that have been marked as juveniles have been found to return to the pond at which they were spawned. They find their way to these mainly by using olfactory and magnetic cues. Toads experimentally moved elsewhere and fitted with tracking devices have been found to be able to locate their chosen breeding pond when the displacement exceeded three km (two miles).

The males arrive first at the pond and remain in the location for several weeks while the females only stay long enough to mate and spawn. Rather than fighting for the right to mate with a female, male toads may settle disputes by means of the pitch of their voice. Croaking providing a reliable sign of body size and hence their prowess.

The males mount the females' backs, grasping them with their fore limbs under the armpits in a grip that is known as amplexus. Males have been observed performing amplexus to fish, inanimate objects and even other males. The female lays a long, double string of small black eggs, which the male then fertilizes. The pair then brings the eggs to the shallow edge of the pond. The strings of eggs absorb water and swell in size and small tadpoles hatch out after two to three weeks.

Diet: Woodlice, slugs, beetles, caterpillars, flies, earthworms and even small mice.

Typical Lifespan: 10-12 years in the wild

Status and Threats: Least Concern. There are parts of its range where the European Common Toad seems to be in decline due to human interaction (habitat destruction and pollution). For instance in Spain, increased aridity and habitat loss have led to a diminution in numbers and it is regarded as "near threatened".

Common Spadefoot Toad (*Pelobates fuscus)*

When frightened, it emits a very loud alarm call. It can also exude a noxious secretion which smells like garlic, hence one of its common names, the "garlic toad".

Range and Habitat: Eurasia; The Common Spadefoot Toad is distributed through the plains and hills of Central, Eastern and Southeastern Europe, as well as in Western Asia, towards the Southern Transuralia and Northern Kazakhstan. The northern margin of its range is limited by the shore of the Baltic Sea. There are two subspecies that are generally recognized, although there are no physical or behavioral distinguishing characteristics between them. The nominate subspecies, *P. f. fuscus*, is relatively rare at its western limit of distribution in some areas of France, Belgium and The Netherlands, while it is a common species throughout Central and continental Eastern Europe (with the exception of some marginal areas). The other subspecies, *P. f. insubricus*, is found in northern Italy.

It prefers sandy and plowed soils.

Identification (Measurements Snout to Vent): 2.6-3.1 inches (65-80 mm). Males grow to a length of approximately 65mm (2.6 in) and females measure 80 mm (3.1 in). The skin coloration varies depending upon habitat, gender and region, but it is usually

light-gray to beige-brown on the dorsal surface and is mottled by darker marks that differ between individuals. The belly is white, sometimes with gray mottling. Albino specimens have been observed.

Call: When alarmed, it emits a very loud alarm call.

Behavior and Reproduction: Hibernation occurs between September and the beginning of October or November in the south and it lasts until March or April. Common Spadefoot Toads hibernate in burrows in the soil that are up to 2 meters deep. These burrows may be made by other animals or by the toads themselves. The soil must be light and grainy for the toads to make burrows using digging movements of the spade-shaped inner metatarsal tubercles on its hind legs, while moving down into the soil with its posterior body end first. Once in the ground, the spadefoot starts to move loosened soil with its forelegs to bury the entrance. It only takes the toad a couple of minutes to make a burrow.

Reproduction starts soon after the end of hibernation and sometimes extends to June. Males do not form breeding choruses, instead they vocalize under water, making a quiet sound that resembles clicking or the bubbling of water. Amplexus is pelvic (inguinal). Clutches contain 480-3000 eggs and resemble paired, thick, sausage-like cords up to 1 m in length. Embryogenesis takes 5-11 days and larval development takes from 56-110 days. Young tadpoles usually stay on the bottom. They grow very fast and after 1-2 months attain a size of 35-50 mm or more. At this time, the tadpoles tend to stay on plants within the water column and often appear near the water surface. Metamorphosis occurs in July thru September. Newly metamorphosed juveniles may bury themselves near the shore and overwinter there. Or they may hibernate in unfrozen water and complete metamorphosis the following spring or summer; such tadpoles reach an especially large size. The long larval period makes the species sensitive to pond quality. Sometimes larval mortality may be high due to the drying of wetlands or larvae may die in frozen water.

Diet: Insects, worms and other invertebrates including; grasshoppers, true bugs, moths, ground beetles, ladybird beetles, click beetles, spiders, flies, ants and earthworms.

Typical Lifespan: 10 years

Status and Threats: Near Threatened. As with all frogs/toads, this species is in decline due to human interaction (habitat destruction and pollution). At the end of the 19th century, the Italian subspecies was known in about 50 localities, but at the beginning of the seventies (20th century) it was found in only a few. For this reason it was considered to be a very threatened variety. Active researches carried out by a group of Italian and Swiss herpetologists led to the discoveries of many additional localities, and now at the beginning of the 21st century *P. f. insubricus* has been found in Piedmont, Lombardy, Emilia Romagna, Friuli and Venetia.

Oriental Fire-bellied Toad (*Bombina orientalis)*

They are commonly kept as pets and it is also known as the 'tuti toad'. When disturbed or frightened a mildly toxic, milky-like secretion is emitted through the skin, mostly from the hind legs, and sometimes the belly. In addition to emitting this toxin, this toad will also lie on its back to show the color of its belly, indicating its toxicity to any predators.

Range and Habitat: Asia; Native to South-eastern Siberia, North-eastern China, and Korea.

It inhabits mountain lakes and ponds from 1,700-3,000 m (5,300-10,000 ft.) above sea level. The toad is aquatic throughout the spring and summer, and then buries itself in soft ground for winter, emerging at the first signs of warm weather in the spring.

Identification (Measurements Snout to Vent): 1.5-2.5 inches (28-63 mm). The toad's dull brown to bright green back is usually dotted with black spots. Its belly is red or orange-red. It has a small round head and large eyes with horizontal pupils. Males can be distinguished from females by their generally rougher backs and thicker forearms.

Call: A plaintive, melodious croak that sounds like a clinking bell.

Behavior and Reproduction: The Oriental fire-bellied toad moves about very little during the day, except to hunt for food. When a fire-bellied toad senses danger it arches its body, flashing the brilliant warning spots on its belly. This reaction is called the “unken” reflex and is derived from the German name for fire-bellied toads

Breeding takes place in the spring with the warming of the weather and increase in rain. Males call to the females with a light barking croak.

They jump onto the back of any other fire-bellied toad that happens to pass by, often leading to male-male confusion, but rarely any sort of fighting. Females lay 40 to 100

eggs in a large cluster, usually around submerged plants, near the water's edge. Tadpoles hatch from the eggs in 3 to 10 days depending on the temperature of the water. The tadpoles begin to develop legs in 6–8 week, and are fully metamorphosed and begin venturing on to land in 12–14 weeks.

Diet: Small insects, worms and mollusks

Typical Lifespan: 20-30 years

Status and Threats: Least Concern. Wild populations have declined due to over-harvesting for the pet trade and due to human interaction including habitat destruction and pollution.

Special Thanks to:

.. to my beta tester, FlintHawk
…and to Charles Taylor for Poser Coding help and Szark for Iray Material help

Sources:

- "300 Frogs: A Visual Reference to Frogs and Toads from Around the World" by Chris Mattison. Firefly Books Ltd, Buffalo, NY, 2007

- Wikipedia http://wikipedia.org
- Amphibia Web http://amphibiaweb.org
- California Herps http://www.californiaherps.com
- Animal Diversity Web. http://animaldiversity.org

Watch and Read:

- Why We Must Save the Frogs. https://youtu.be/NvP6j4Dj0VA
- Save the Frogs. http://savethefrogs.com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