

Nature's
Wonders

Frogs of the World

Volume 4: Bullfrogs

A 3D Model set by Ken Gilliland

Nature's Wonders

Frogs of the World

Volume 4: Bullfrogs

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Nature's Wonders

Frogs of the World

Volume 4: Bullfrogs

Introduction

This fourth volume of Frogs of the World focuses on Bullfrogs. Bullfrogs are a common term for a type of frog that is very large and tends to be aggressive (regardless of the specific species). Most bullfrogs tend to have a deep, resonant croak call.

In many cultures, the bullfrog is a symbol of fertility and luck. Native Americans see the bullfrog as a symbol of change. From its start as a tadpole to froglet to adult, the bullfrog adapts to different environments, so it's seen as a symbol of adaptability and resilience.

The bullfrog's loud croak is also believed to be a call for change. This noise is thought to signal a new beginning, which is why the bullfrog is often seen as a harbinger of good news. The bullfrog is also associated with water, a symbol of emotions. The bullfrog can help you navigate your feelings and connect with your intuition. In Asia, the bullfrog is believed to have special powers, which can be used for healing.

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.

Sizing & Poser Issues

All the frogs included in this set have been scaled to their appropriate sizes in relation to human figure models. In the case of the smaller frogs, 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.

Malaysian Bullfrog (*Limnonectes macrodon*)

This bullfrog is also known as the Fanged River Frog, the Javan Giant Frog, the Malaya Wart Frog or the Stone Creek Frog. In spite of its fearsome name, the Fanged River Frog is completely harmless. Its “fangs” are actually more like blunt teeth and they are not venomous.

Range and Habitat: Asia; it is endemic to Sumatra, Thailand, the Malaysian Peninsula, Sumatra and Java.

It lives in forested areas near streams. It prefers slow-moving water.

Identification (Measurements Snout to Vent): 2.76-5.91inches (70-150 mm). A large, bulky bullfrog with powerful limbs and webbed feet. The head is broad and the ears obvious. It tends to be brown, tan or reddish-brown in color with some scattered darker markings. There is a thin whitish to yellow line that runs from snout to rump down the center of the back. There also is a line that runs from thigh to foot on the front of the hind legs. Their undersides are whitish in color.



Call: They are known as “voiceless” frogs because they don’t have vocal sacs. They do call however by using their entire body to amplify a sound.

Behavior and Reproduction: It is semi-aquatic and nocturnal.

They breed in streams. Males create a shallow basin with a sand or gravel edge in which the female lays eggs. The walls of this pool prevents their young from being swept downstream.

Diet: Invertebrates and small verbrates.

Typical Lifespan: Unknown.

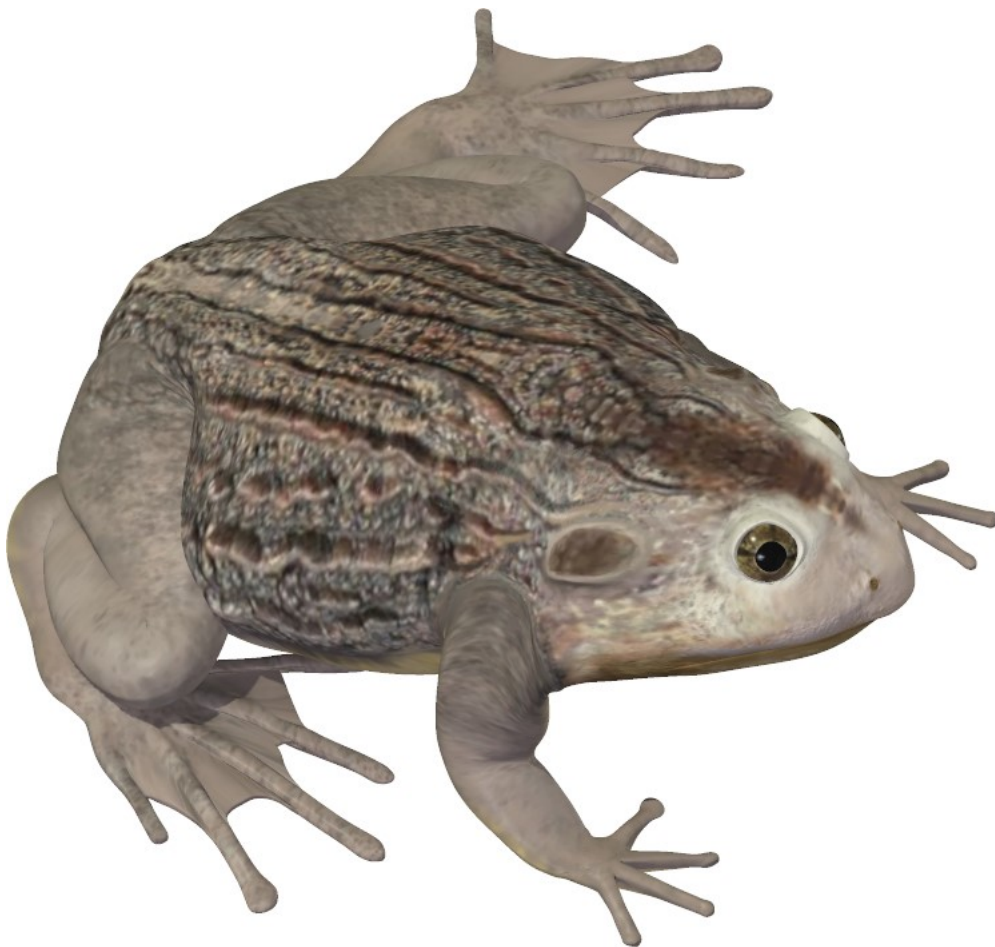
Status and Threats: Listed as “Vulnerable” in 2004. Their habitat is decreasing and declining in extent and quality. It is widely collected for human consumption in Java.

Giant Bullfrog (*Pyxicephalus adspersus*)

*It is also known as the African Bullfrog or the “Pixie” frog (due to its scientific name) . It is a voracious carnivore. Males are known for occasionally eating the tadpoles they guard and one bullfrog kept at the Pretoria Zoo in South Africa once ate 17 juvenile Rinkhals snakes (*Hemachatus haemachatus*) in one sitting.*

Range and Habitat: Africa; it is found in Angola, Botswana, Kenya, Malawi, Mozambique, Namibia, South Africa, Tanzania, Uganda, Zambia, Zimbabwe, and possibly the Democratic Republic of the Congo. It has been extirpated from Eswatini.

Its habitat is moist-to-dry savanna, subtropical to tropical dry shrubland, intermittent freshwater lakes, intermittent freshwater marshes, arable land, pastureland, canals, and flooded ditches.



Identification (Measurements Snout to Vent): 9.6 inches (245 mm). Females are half the size of males. The dorsum is dark olive-green in adults. Juveniles have bright green coloration with a yellow stripe down the back. The abdomen is white to creamy-yellow with breeding males having yellow forelimbs

Call: Males call out during the rainy season. The call lasts about a second and can be described as a low-pitched ‘whoop’.

Behavior and Reproduction: Breeding typically starts during the rainy season. They breed in shallow, temporary water bodies caused by the rain. Eggs are laid in the shallow edge of the pond, but fertilization takes place above water.

The African bullfrog males call out during the rainy season. They have two breeding strategies, depending on their age. Young males congregate in a small area, perhaps only 1–2 metre square of shallow water. The larger males occupy the centre of these breeding arenas or leks, and attempt to chase off other males. Often, they fight, causing injury or even killing one another. The dominant male attempts to prevent other males from breeding. A female approaches the group of males by swimming along at the surface until she is within a few metres of the group. Then, the female dives to avoid the smaller males and surfaces in the defended area of a larger male in the middle of the group. This helps to ensure that she mates with the dominant male.

The female lays about 3,000 to 4,000 eggs at a time. The tadpoles hatch, and after two days, start feeding on vegetation, small fish, invertebrates, and even each other. Defending males continue to watch over the tadpoles, which metamorphose within three weeks. During the tadpole's development, the father guards his young. Due to the male bullfrog's overprotective behaviour, he pounces and bites anything that he views as a threat. If the pool is in danger of drying out, the father uses his legs and head to dig a canal from the drying pond to a bigger pond. He continues to guard the tadpoles until they are old enough to fend for themselves, although he may also eat some of them.

Diet: Insects and other invertebrates, small rodents, reptiles, small birds, fish, and other amphibians that can fit in their mouths.

Typical Lifespan: Pet Giant Bullfrogs may live for up to 35 years in captivity.

Status and Threats: Least Concern. It is considered an exotic pet in many countries around the world and sold from a bred in captivity population. They are considered "near threatened" in South Africa due to habitat loss. This frog is hunted for human consumption. It is considered a delicacy in Namibia.

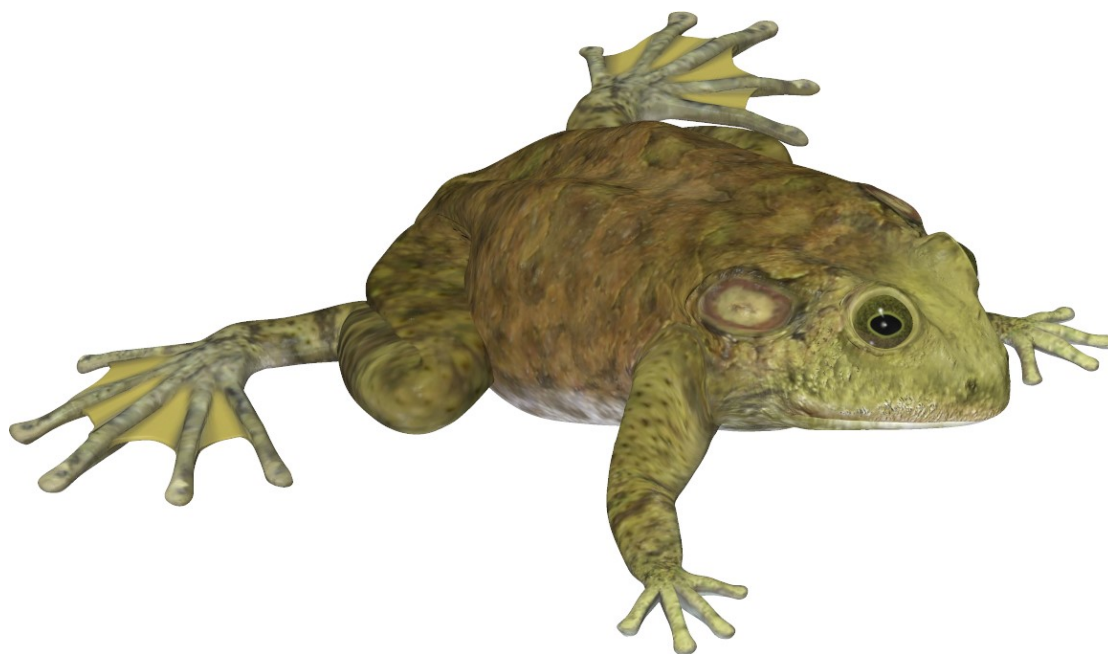
American Bullfrog (*Lithobates catesbeianus*)

The bullfrog gets its name from the sound the male makes during the breeding season, which sounds similar to a bull bellowing. The bullfrog is large and is commonly eaten throughout its range, especially in the southern United States where they are plentiful. Yes, this is the main source of "Frog Legs" on your dinner plate. It also is often used for dissection in science classes.

Range and Habitat: North America; endemic to eastern North America, where it is commonly found in every U.S. state east of the Mississippi River. Its natural range extends from the eastern Canadian Maritime Provinces to as far west as Idaho and Texas, and as far north as Michigan (including the Upper Peninsula), Minnesota and Montana; it is largely absent in North Dakota.

It has been introduced onto Nantucket island, as well as portions of the western U.S., including Arizona, Colorado, Hawaii, Idaho, Nevada, New Mexico, Oregon, Utah, Washington and Wyoming. It has also been introduced into South America, Western Europe, China, Japan, and southeast Asia. It is considered an invasive species in almost every place it has been introduced.

It typically inhabits large permanent water bodies such as swamps, ponds, and lakes. Bullfrogs can also be found in man-made habitats such as pools, koi ponds, canals, ditches and culverts.



Identification (Measurements Snout to Vent): 3.6-6 inches (90-150 mm). It is sexually dimorphic, with males being smaller than females and having yellow throats. The dorsal (upper) surface of the bullfrog has an olive-green basal color, either plain or with mottling and banding of grayish brown. The ventral (under) surface is off-white blotched with yellow or gray. Often, a marked contrast in color is seen between the green upper lip and the pale lower lip. The teeth are tiny and are useful only in grasping. The eyes are prominent with brown irises and horizontal, almond-shaped pupils. The tympana (eardrums) are easily seen just behind the eyes and the dorsolateral folds of skin enclose them. The limbs are blotched or banded with gray. The fore legs are short and sturdy and the hind legs are long. The front toes are not

webbed, but the back toes have webbing between the digits with the exception of the fourth toe, which is unwebbed.

Call: At least three different types of calls have been noted in male bullfrogs under different circumstances. These distinctive calls include territorial calls made as threats to other males, advertisement calls made to attract females, and encounter calls which precede combat.

Behavior and Reproduction: The bullfrog breeding season typically lasts two to three months starting in May or June. Male bullfrogs aggregate into groups called choruses. The male chorus behavior is analogous to the lek formation of birds, mammals, and other vertebrates. Choruses are dynamic, forming and remaining associated for a few days, breaking down temporarily, and then forming again in a new area with a different group of males.

The bullfrogs have a prolonged breeding season, with the males continuously engaging in sexual activity throughout. Males are present at the breeding pond for longer periods than females during the entire season, increasing their chances of multiple matings. After selecting a male, the female deposits eggs in his territory.

Diet: They are voracious, opportunistic, ambush predators that prey on any small animal they can overpower and consume. Bullfrog stomachs have been found to contain rodents, small lizards and snakes, other frogs and toads, other amphibians, crayfish, other crustaceans, small birds, scorpions, tarantulas and bats, as well as the many types of invertebrates, such as snails, worms and insects.

Typical Lifespan: Unknown.

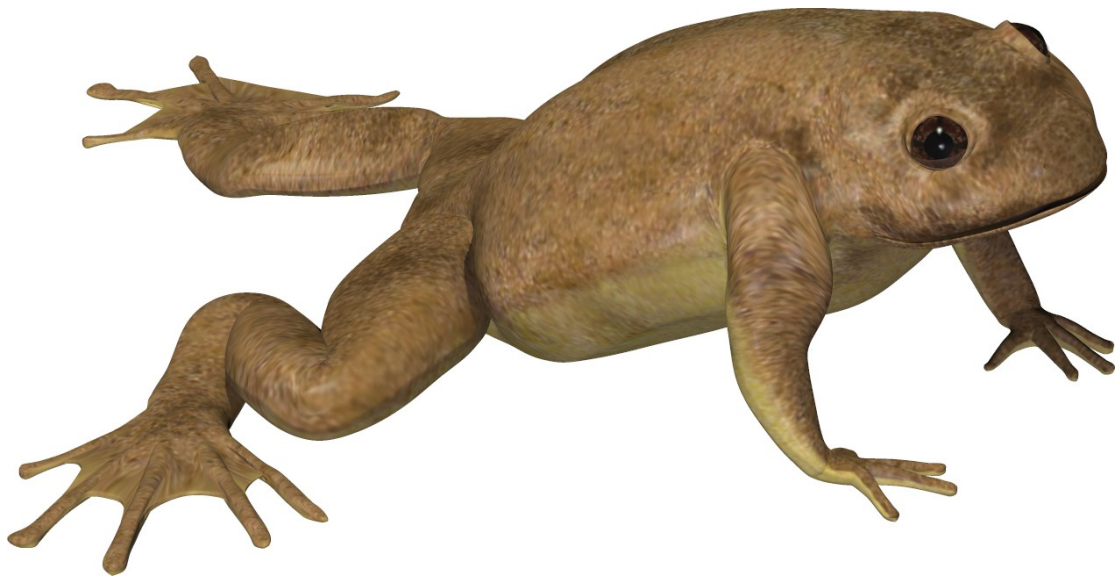
Status and Threats: Least Concern. It has been introduced on purpose, or by accident to many locations outside of its native habitat. In these places they are considered invasive species due to their voracious appetite and the large number of eggs they produce, which has a negative effect on native amphibians and other fauna. Bullfrogs are very skittish which makes capture difficult and so they often become established.

Goliath Bullfrog (*Conraua goliath*)

This bullfrog is the largest living frog in the world. It can weigh up to 7.3 lbs (3.3 kg). It can leap up to 10 feet (3m) in one jump.

Range and Habitat: Africa; endemic to Guinea and Cameroon. It has been located in Sanaga Basin (mainly appearing near the Nachtigal cascades and in the Sakbayeme rapids), Kienke Basin, Ntem Basin (mainly being located near the rapids of the Mensolo and Nsana), and Mbía Basin (where it was found to be very abundant in the rapids and cascades).

Due to its large size, this bullfrog has an extremely selective distribution. It is primarily located in a dense equatorial forest fringe which is somewhat parallel to the coast and surrounded by rivers. It prefers areas with waterfalls.



Identification (Measurements Snout to Vent): 6-14 inches (170-350 mm). Females are smaller. A lateral fold extends from the eye to the posterior portion of the tympanum. Their toes are fully webbed, with large interdigital membranes extending down to the toe tips. The second toe is the longest. The skin on the dorsum and on top of the limbs is granular. Dorsal coloration is green sienna, while the abdomen and ventral part of the limbs are yellow/orange. They have acute hearing, but no vocal sac, and also lack nuptial pads.

Call: There is no call as they do not have vocal sacs.

Behavior and Reproduction: The Goliath frog creates nests as sites for their offspring as a form of parental care. There are three main types of nests: type 1 mainly contains rock pools that were cleared from detritus and leaf litter, type 2 contains existing washouts at riverbanks, and type 3 were depressions dug by the frogs into the gravel riverbanks. Each nest type contains advantages and disadvantages. Nest type 1 was the easiest to create since only cleaning of the substrate was required to create the nest. Consequently, these types of nests were the least reliable since they were usually positioned in the river bed which makes them extremely vulnerable to being washed out by the rising water levels and to having predators enter the nest. Both nest types 2 and 3 were less likely to be washed out, however, they have an increased risk for being dried-up during the dry season.

Consequently, while each nest promotes clear advantages, nests are typically constructed depending on the environment cues (whether it is the dry season or the rainy season). All nest types can be used several times, and can consist of three distinct cohorts of tadpoles. The construction of these nests can also explain how the goliath frog became the largest frog. Digging out these nests which exceed 1 m in diameter is an extremely arduous task. Other species which perform this task are also quite large in size. This includes: male African Bullfrogs, Gladiator Frogs, and the Bornean Giant River Frog.

Typically, the goliath frog attaches its eggs either underwater, in small groups to rocks, or in gravel or larger pieces of wood. The construction of the nests may help reduce predation for it would be more difficult for the fish and shrimp (species which typically eat the eggs) to find the eggs and it may prevent the eggs from being washed away by the rapid current. However, in contrast, the changing water levels may also cause an increase in predation, cause more of the eggs to spill out, and increase tadpole mortality as well since the tadpoles and eggs may remain trapped within the nests. Additionally, these nests allow the Goliath frogs to become less dependent on existing structures for egg deposition which can allow these frogs to prolong their breeding season and also increase the amount of suitable breeding sites (they are determined to be suitable by the absence of predators or water presence since water is required for the offspring to survive). The process of constructing a nest for the offspring is used as a method of promoting a male's reproductive benefits to the females. It also serves as the main parental investment since once the female deposits the eggs after fertilization, there is no more parental investment.

Diet: They are omnivorous with a carnivorous preference. Their prey are terrestrial, aquatic, and semi-aquatic, indicating that they hunt both on land and in water. Food preferences were different among the different weight groups of frogs, possibly correlating to different stages of development. Frogs weighing less than 400 g (14 oz) consumed annelids, arachnids, myriapods, insects, crustaceans, gastropods, and reptiles. Frogs weighing more than 1,000 g (35 oz) consumed arachnids, myriapods, insects, crustaceans, and gastropods with a significantly higher occurrence of myriapods. Annelids and reptiles were present only in the diet of lower weight frogs, emphasizing a more diversified diet for younger Goliath frogs. Fully developed frogs are also believed to prey on fish, small mammals, and smaller frogs.

Typical Lifespan: 15 years in the wild and up to 21 years in captivity.

Status and Threats: Endangered. Its numbers are dwindling due to habitat destruction, collection for food, and the pet trade. The primary threat to the Goliath frog is hunting, as it is considered a food source in its native range. Due to their classification as an endangered species, the Equatorial Guinean government has declared that no more than 300 Goliath frogs may be exported per year for the pet trade, but few now seem to be exported from this country.

Asian Bullfrog (*Kaloula pulchra*)

It is also known as the Asian painted frog, digging frog, Malaysian bullfrog, common Asian frog, and painted balloon frog. In the pet trade, it is sometimes called the chubby frog. When threatened, they inflate their lungs and secrete a noxious white substance.

Range and Habitat: Asia; Endemic to Southeastern Asia.

It prefers sandy and plowed soils. It has assimilated itself to human developed areas.

Identification (Measurements Snout to Vent): 2.1-3.0 inches (54-75 mm). Males are larger than females. It is a roundish frog with a short, blunt snout and short limbs. The hind feet are webbed but the front feet aren't. Its dorsal side has a olive colored section bordered with two dark-lined yellow-to-orange wide stripes extending from the snout/eyes to the vent. The underside is pinkish-white to olive-white.

Call: Its call is a loud groan, similar to what is heard with cattle.

Behavior and Reproduction: They are nocturnal and semi-burrowing. It can inflate itself to twice its size when threatened.



Breeding sites include flooded rice paddies and fields, gardens, and drainage ditches. Eggs form a film on the water surface and black tadpoles will disperse over a wide area of shallow pools.

Diet: Primarily invertebrates. Despite its large size, its favorite food is ants.

Typical Lifespan: 10 years

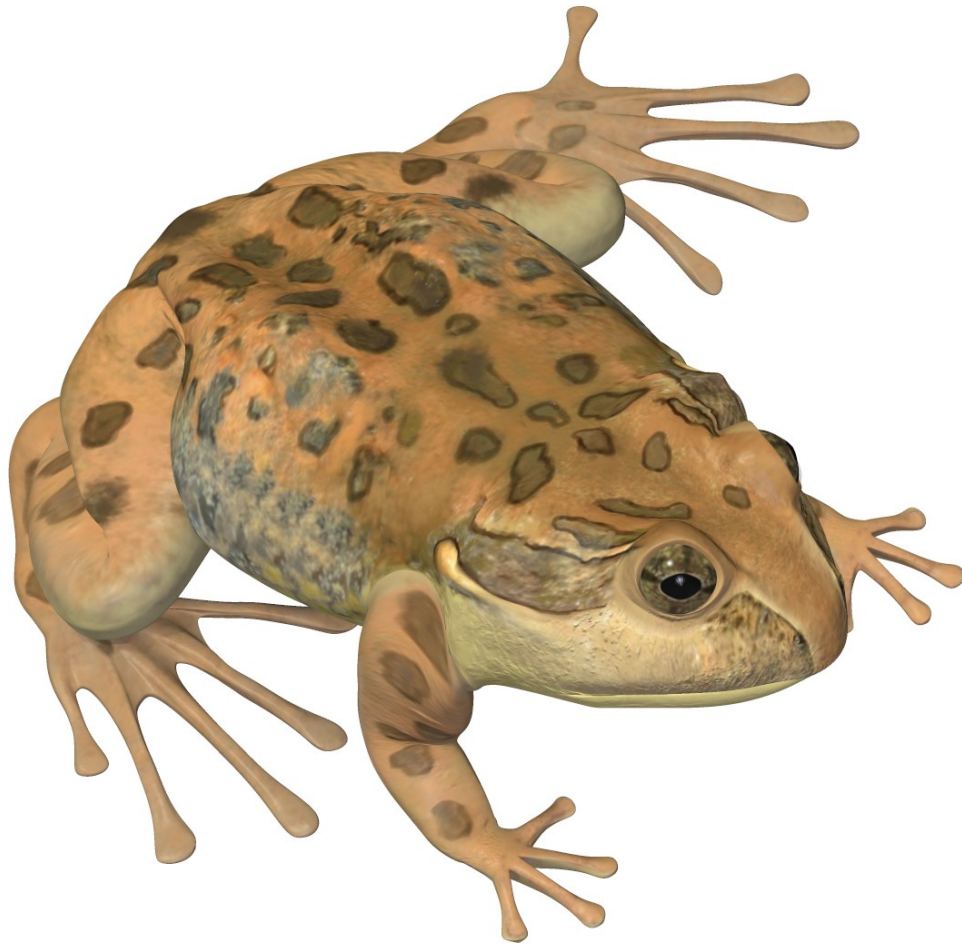
Status and Threats: Least Concern. The species is prevalent in the pet trade and is a potential invasive species being introduced in Taiwan, the Philippines, Guam, Singapore, Borneo, and Sulawesi.

Eastern Banjo Frog (*Limnodynastes dumerilii*)

There are five subspecies of Eastern Banjo Frog. Their nickname is the 'Pobblebonk'. This bullfrog has poisonous glands on its calves to discourages those who might try to eat it..

Range and Habitat: Oceania; endemic to eastern Australia and Tasmania.

Near large ponds or lakes, the distinctive 'bonk' calls can often be heard. The most common subspecies of Eastern Banjo Frog can be found living in waterways, backyards and even children's sandpits across inland New South Wales, northern Victoria, and along the Murray River in South Australia. Other subspecies vary in colour and live in south-east Queensland, the Snowy Mountains, and Tasmania.



Identification (Measurements Snout to Vent): 3 inches (75 mm). The frog is gray to brownish-olive colored, with irregular blotches and marbling of a very dark or black color. They can be quite 'warty', which is unusual for bullfrogs.

- *L.d. dumerilii*. The nominate race is known as the "Eastern banjo frog". It is the most widespread of the five subspecies. It is found in South-East Queensland, the Australian Capital Territory, the slopes and ranges of New South Wales, northern Victoria and the Murray River into South Australia. This race normally inhabits woodland, heathland and farmland. Breeding takes place in streams, ponds and dams. Males of this subspecies have the most characteristic banjo-like "bonk" of all the subspecies. They are distinguished from other subspecies by more orange present on the flank and orange raised stripe present from the eye

to the shoulder. The subspecies is normally one solid colour on the dorsal surface.

- *L.d. grayi*. This race occurs along the coast of New South Wales, south to Jervis Bay. It inhabits coastal swamps, dams, ponds associated with forest and heathland. This species does not breed in flowing water, which helps with distinguishing it from the nominate race in places where both occur. This is the most variegated of the subspecies, often with patches or blotches of a different colour on the dorsal surface. The call of this species sounds more like a "tok", similar but louder than the striped marsh frog.
- *L.d. fryi*. The "Snowy Mountains banjo frog" is the most restricted of the subspecies. It is only found in the Snowy Mountains area of south-eastern New South Wales. Males call from ponds or pools of streams in spring and summer. Due to its restricted range it is unlikely to be confused with other subspecies, however it is pale on the dorsal surface with fairly indistinct patches or variegations.
- *L.d. insularis*. This race is called the "Southern banjo frog". It occurs south of Jervis Bay, along the south coast of New South Wales, in eastern Victoria and throughout Tasmania. It is characterized and distinguished by blue coloration present on the flank. There is often a pale mid-dorsal stripe. Males call from a concealed position in water during spring, summer and autumn.
- *L.d. variegata*. This race is also called the "Southern banjo frog" and is very similar to Race *insularis*. It occurs in western Victoria and south-eastern South Australia. It is chiefly distinguished by range.

Call: It has a call distinctly like the twang of a banjo string.

Behavior and Reproduction: Heavy rains across much of eastern Australia cause Banjo Frogs to leave their usual haunts and move about the countryside in search of a mate. The breeding season will last from August through to April, and during this time you will hear their familiar call.

As the frogs become ready for mating, the male develops a dark yellow or green throat, while the female grows large flaps of skin, called flanges, on the first two fingers. Most of the action takes place in or around the pond. The male calls while he is floating out in the open water and some will call from inside a burrow to amplify the sound.

After mating, the female lays a large white floating raft of eggs. Anything from 500 to several thousand pigmented eggs are within the foam which is usually tucked underneath water plants to hide it from predators.

This is not a species that lays its eggs and leaves. There is parental care involved. Using the large flaps of skin on her fingers, the female carries air bubbles from the surface of the water into the foam nest to keep the eggs oxygenated.

When the tadpoles hatch, they are dark brown and spotted. They can take up to 15 months to metamorphose into frogs, depending on the temperature. Frogs in Tasmania, for example, might take longer to mature.

Diet: Primarily invertebrates

Typical Lifespan: unknown.

Status and Threats: Least Concern.

Special Thanks to:

.. to my beta testers Alisa and FlintHawk

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>
- Spirit Animals and Symbolism. <https://spiritanimalsandsymbolism.com>
- Gone Froggin'. <https://gonefroggin.com>

Watch and Read:

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

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